

Research article

## Survey of short-term oral corticosteroid administration by orthopaedic physicians in college and high school athletes

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### Abstract

The use of oral corticosteroid (OCS) drugs is advocated because of their potent anti-inflammatory effects. They also possess many potential adverse effects. No study has assessed physician prescribing practices of OCS therapy in high school (HS) or college (COL) athletes. This paper reports the prescribing patterns of sports medicine physicians who used short-term OCS therapy and to describe associated complications in HS and COL athletes within a 24-month period. An internet link to a descriptive epidemiology survey was included in an e-mail to all members of the Arthroscopy Association of North America and the American Orthopaedic Society for Sports Medicine. Descriptive statistics and correlation analysis were used to examine responses. Total response rate was 32% (615/1,928). Sixty-six percent of the physicians indicated prescribing OCS to both groups of athletes, while 29% reported prescribing OCS to COL athletes and 5% to HS athletes for musculoskeletal injuries. Physicians who prescribed multiple OCS regimens to the same athlete within the same season ( $P = 0.01$ ) and physicians who prescribed OCS to the skeletally immature athlete ( $P = 0.009$ ) reported more complications than other physicians. Among the 412 physicians who did not prescribe OCS in the treatment of athletic induced musculoskeletal injury, 251 (61%) cited a risk of developing medical complications as the primary reason for avoiding use. The reported number of medical complications was low with no cases of avascular necrosis reported for the 2-year recall period. Orthopaedic surgeons who treated athletic induced musculoskeletal injuries with a short-term course of oral corticosteroids reported that high school and college athletes benefited with few medical complications.

**Key words:** Glucocorticoids, oral corticosteroids, sports injuries, risk factors.

### Introduction

Oral corticosteroids (OCS) have widespread clinical application and are used to suppress inflammation, allergy and immune responses in disease (Rahusen et al., 2004; van Staa et al., 2000a; Zochling et al., 2006). Although OCS are potent anti-inflammatory agents, they have potential adverse effects such as fracture, osteonecrosis, and osteoporosis, particularly at high dosages and with prolonged use (Hougardy et al., 2000; Nichols, 2005; Sambrook et al., 1984; Scaggs, 1886; Taylor, 1984; van Staa et al., 2000a; van Staa et al., 2001; 2003).

The prescribing patterns and the prevalence of complications associated with the short-term use of oral corticosteroids in athletes are not well documented (Harmon and Hawley, 2003; Langer et al., 2006; Nichols, 2005). Harmon and Hawley (2003) reported that despite

little evidence to support their use for musculoskeletal injuries, OCS was prescribed by 59% of the primary care sports medicine physicians they surveyed. Nichols (2005) reviewed the medical literature for all years between 1966 and 2003 and identified no articles that addressed the usage of OCS in the treatment of athletic injuries. Langer et al. (2006) reported methylprednisolone taper by orthopaedic physicians and reported its use primarily in patients less than 40 years of age, with a lack of proven efficacy and developing osteonecrosis as deterrents to prescribing OCS following injury. Although the results from survey research have increased our understanding of the prescribing practices of physicians who use OCS therapy, there is no published information regarding specific sports medicine physician prescribing patterns for short-term oral corticosteroid use in competitive high school and college athletes.

The objectives of this study were 1) to investigate the prescribing patterns of sports medicine orthopaedic surgeons who used short-term oral corticosteroid therapy of less than 10 days in the treatment of sports injuries in competitive high school and college athletes; and 2) to document the types and numbers of medical complications associated with OCS use in these athletes over a 2-year recall period.

### Methods

#### Study respondents and procedures

Registered members (N= 2,488) of the Arthroscopy Association of North America (AANA) and the American Orthopaedic Society for Sports Medicine (AOSSM) were solicited between January and February 2006, via e-mail to participate in a 23-question internet survey (see Appendix). An internet link to the survey using SurveyMonkey.com™ was included in the e-mail. Five-hundred and sixty (23%) e-mails were rejected or returned due to an incorrect address or notification by the physician of no longer actively practicing medicine. Both deadline and follow-up reminders to non-respondents were conducted via e-mails at 2-week intervals for a period of 6-weeks. Among the final 1,928 physicians who received the survey, 615 (31.8%) responded.

Oral corticosteroid users were defined as athletes who participated in high school or college athletics within the previous two-years from the time of the survey and who received 10-days or less (short-term) of oral corticosteroid therapy. An introductory letter in the e-mail message explained the purpose of the study and participants were instructed how to activate the link to participate in

the survey. Survey questions asked for physician responses concerning medical services provided to the competitive high school and college athlete and the use of short-term oral corticosteroids within the previous 2 years, dosage and duration of treatment, indications for use and efficacy of treatment, and incidence and types of complications. This study was approved by the Institutional Review Board. Respondents implied consent by virtue of their completion of the survey.

### Statistical analysis

Descriptive statistics and correlation analysis were used to examine responses. We calculated chi-square ( $\chi^2$ ) analyses to measure associations between practice patterns and physician reported complications related to short-term oral corticosteroid use. The alpha level was set at .05. Data were analyzed using JMP version 5.0.1.2 software (SAS Institute, Cary, NC).

### Results

Among the 615 respondents, 463 (72%) indicated completion of a sports medicine fellowship. Four-hundred and forty-five (72%) were in private practice and 140 (23%) practiced medicine in an academic setting. Five-hundred and ninety-eight (98%) of the respondents reported providing orthopaedic medical services to either the competitive high school or college athlete and of these, 203 (34%) reported administering a short-term course of oral corticosteroids in the treatment of musculoskeletal injuries within the previous two years of completing the survey (Table 1).

**Table 1. Orthopaedic physician (N = 615) demographics.**

Characteristics	N (%)
<b>Medical practice setting</b>	
Private	445 (72%)
Academic	140 (23%)
Other	30 (5%)
<b>Years in practice</b>	
1-5	160 (26%)
6-10	98 (16%)
11-15	110 (18%)
16-20	99 (16%)
≥ 21	148 (24%)
<b>Sports medicine fellowship</b>	
Yes	463 (75%)
No	152 (25%)
<b>Years since completion of fellowship (n = 463)</b>	
1-5	172 (37%)
6-10	95 (21%)
11-15	89 (19%)
16-20	64 (14%)
≥ 21	43 (9%)
<b>Provided orthopaedic services to athletes (n = 615)</b>	
Yes	598 (97%)
No	17 (3%)
<b>Prescribed oral corticosteroids to athletes (n = 615)</b>	
Yes	203 (34%)
No	412 (66%)

### Oral corticosteroid use in the athlete

The types of athletes and estimated numbers of athletes treated with OCS by survey respondents within the previ-

ous two years is shown in Table 2. The prevalence of OCS use was higher in the college athlete than the high school athlete. Fifty-nine (29%) physicians reported prescribing OCS to only college athletes and 11 (5%) to only high school athletes. The majority of the respondents (133/203; 66%) indicated prescribing OCS to both high school and college athletes. When asked how many total athletes were treated with short-term OCS within the past 2 years, the majority of physicians indicated they prescribed OCS to less than five total high school (93/144; 64%) and college (98/191; 51%) athletes.

**Table 2. Type and number of athletes treated with short-term oral corticosteroids within the past 2 years.**

Type of Athlete	Number of Respondents
High School Athlete	11 (5%)
College Athlete	59 (29%)
Both	133 (66%)
<b>Number of high school athletes treated within previous 2 years (n = 144)</b>	
< 5	93 (65%)
6-10	28 (20%)
11-15	6 (4%)
>16	17 (12%)
<b>Number of college athletes treated within previous 2 years (n = 191)</b>	
<5	98 (51%)
6-10	44 (23%)
11-15	25 (13%)
>16	24 (13%)

### Indications for oral corticosteroid treatment

The most frequently recorded indications for OCS treatment were chronic inflammation (119 respondents; 58.6%) and acute injury (117 respondents; 57.6%) (Table 3). Post-surgery indications were reported by 41 physicians. When physicians cited other indications for OCS use, lumbar radiculopathy was most often reported (15 responses), followed by acute inflammation (6 responses) and cervical radiculopathy (3 responses).

**Table 3. Indications for oral corticosteroids treatment of sports medicine injuries**

Indications	Number of Respondents*
Acute injury	117
Chronic inflammation	119
Post surgery	41
Other indications	28
Lumbar radiculopathy	15
Acute inflammation	6
Cervical radiculopathy	3
Impeding RSD	1
Skin rash/problems	2
Severe muscle contusion	1

\*n = 203; Respondents checked all applicable answers.

### Dosage pattern

When examined as a percentage of physician responses, both the initial and total OCS dosages prescribed were similar between the high school and college athletes

(Table 4). Ten milligrams was the most frequently prescribed initial OCS dose (high school: 52/144 responses; 36% and college: 65/191 responses; 34%). The most frequently prescribed total OCS dose was between 51-200

mg for both the high school (68/144 responses; 47%) and the college (94/191 responses; 49%) athlete.

**Table 4. Physician reported oral corticosteroid dosage and treatment patterns.**

Initial Dose	High School	College
10 mg	52 (36%)	65 (34%)
11-30 mg	36 (25%)	48 (25%)
31-40 mg	24 (17%)	29 (15%)
>40 mg	17 (12%)	29 (15%)
No Response	15 (10%)	20 (11%)
Total Dose		
<50 mg	41 (29%)	47 (25%)
51-200 mg	68 (47%)	94 (49%)
201-400 mg	17 (12%)	26 (14%)
>400 mg	3 (2%)	7 (4%)
No Response	15 (10%)	17 (9%)
Days of Treatment		
<3	5 (4%)	6 (3%)
4-7	119 (83%)	160 (84%)
8-10	7 (5%)	9 (5%)
>10	4 (3%)	5 (3%)
No Response	9 (6%)	11 (6%)
Dosage Regimen		
Tapered	119 (83%)	158 (83%)
Non-Tapered	14 (0%)	18 (9%)
Both	2 (1%)	4 (2%)
No Response	9 (6%)	11 (6%)

Most patients received OCS treatment for a short period of time, with 4-7 days being the most common treatment period for both the high school (119/144 responses; 83%) and college (160/191 responses; 84%) athlete. Only 3% of the physicians responded that the high school or college athlete received OCS treatment for more than 10 days. The dosage regimen was also found to be similar for both groups with approximately 82% of all physicians reporting administering a tapered dosage (Table 4).

**Table 5. Reasons why physicians did not prescribe oral corticosteroids.**

Perceived Complications*	N (%)
Risk of medical complications	251 (61%)
No clinical data to support use	191 (49%)
Medico-legal issues	59 (15%)
Other	94 (24%)

\* Respondents checked all answers that applied.

Thirty-nine (19%) physicians reported administering a multiple regimen of oral corticosteroids to the same athlete within the same athletic season. Only 22 (11%) of the responding physicians reported prescribing OCS to the skeletally immature athlete. Among the 412 physicians who did not prescribe OCS in the treatment of athletic induced musculoskeletal injury, 251 (61%) cited a

risk of developing medical complications as the primary reason for avoiding use (Table 5). Among physicians who did not prescribe corticosteroids to the skeletally immature patient, risk of medical complications and a lack of medical literature supporting efficacy (60%) were the primary reasons given for nonuse.

#### Efficacy of oral corticosteroid treatment

Approximately half of responding physicians indicated that more than 75% of high school and college athletes who received OCS therapy benefited from treatment. When asked if less than 25% of athletes medically benefited from OCS therapy, only 7% of physicians answered yes. Approximately 86% (124/144) of the physicians who treated high school athletes and 89% (169/191) of the physicians who treated college athletes responded that the athlete's overall treatment appeared to be shortened after receiving OCS therapy (Table 6).

**Table 6. Benefits of oral corticosteroid (OCS) use.**

Number of Physicians who reported the athlete's treatment was shortened from Prescribed OCS		
	High School (n = 144)	College (n = 191)
Yes	124 (86%)	169 (89%)
No	7 (5%)	9 (5%)
No response	13 (9%)	13 (7%)
Percentage of Athletes Reported to Benefit from OCS		
	High School	College
< 25%	7%	7%
26-75%	42%	43%
>75%	51%	50%

#### Medical complications of oral corticosteroid treatment

The type and number of reported complications associated with corticosteroid treatment for the 2-year recall period are listed in Table 7. Only 11 (6%) physicians reported the occurrence of medical complications associated with the use of short-term oral corticosteroids in the competitive high school or college athlete. Overall, the occurrence of side-effects was extremely low with no cases of avascular necrosis of the bone reported in either group for the 2-year recall period.

When the incidence of medical complications related to OCS treatment was analyzed in relation to physician practice patterns, significant relationships were observed. Physicians who prescribed multiple OCS regimens to the same athlete within the same season [ $\chi^2$  (1, N = 184) = 6.59,  $P = 0.01$ ] and physicians who prescribed OCS to the skeletally immature athlete [ $\chi^2$  (1, N = 184) = 7.11,  $p = 0.009$ ], reported more complications than other physicians. No significant correlations were found when the incidence of medical complications was correlated to medical practice setting, years in practice, fellowship training, initial and total OCS dosage, duration and the

**Table 7. Physician reported complications from oral corticosteroid therapy.**

Complications	High School Athlete	College Athlete
Discontinued sports participation	3	4
Discontinued sports participation permanently	1	1
Sustained a re-injury upon return to sports	5	5
Developed elevated blood glucose	1	2
Developed avascular necrosis of the bone	0	0
Developed a soft tissue infection	0	0
Developed other complications	4	4

type of regimen, and type of athlete. It is interesting to note that although statistically non-significant, a total OCS dosage greater than 400 mg showed a strong relationship ( $p = 0.1$ ) with an increased incidence of medical complication.

## Discussion

Clinical and treatment characteristics were examined for indications of treatment, usage patterns, and complications following administration of oral corticosteroid therapy in athletes. We chose to survey orthopaedic physicians exclusively about OCS prescribing patterns in competitive high school and college athletes and only for the two years prior to completing the survey. Believing that our data would rely upon limited medical documentation and recall of past OCS use, we tried to reduce these limitations by restricting data collection to the 24 months prior to completing the survey.

Thirty-four percent of orthopaedic sports medicine physicians we surveyed reported prescribing a short-term course of oral corticosteroids for the treatment of an athletic-related musculoskeletal injury within the previous 24 months. The types and ages of athletes surveyed by Langer et al. (2006) and Harmon and Hawley (2003) were not specified, implying that recreational and older athletes were likely included in their data. We chose to survey OCS prescribing practices in the competitive high school and college athlete because less is known about use and the associated health risks in these groups.

Our results showed that oral corticosteroids were often prescribed by orthopaedists who received fellowship training in sports medicine. We found 60% of reporting physicians prescribed short-term OCS therapy as treatment for acute injury and chronic inflammation (Table 3). Harmon and Hawley (2003) reported approximately one third of primary care physicians' surveyed prescribed oral corticosteroids for acute injury conditions, one third prescribed OCS for chronic conditions, and one third used OCS for both acute and chronic conditions. Whereas, Langer et al. (2006) found that post-injury pain, swelling, and stiffness were the most common indications reported for use of a Medrol Dosepak.

Oral corticosteroids administered as a steroid burst, in which an initial dose is tapered over 5 to 14 days, is a common treatment prescribed for various acute non-athletic conditions (Hougardy et al., 2000; van Staa et al., 2000a). In our survey, approximately 90% of the respondents said they used a tapered dose. Eighty-nine percent reported prescribing oral corticosteroid therapy for an average of 4 to 7 days with 41% indicating 10 mg as the most common starting dose. Despite these findings, it is difficult to understand why almost 90% of the respondents reported they used a tapered dosing and why 41% of the same respondents also reported prescribing an initial 10 mg dose. This seems like a very low dose to start a taper and we felt it important to identify this apparent inconsistency in our findings.

Data regarding low-dose OCS therapy are scarce, especially in children and young adults. Da Silva et al. (2006) analyzed the safety of low dose ( $\leq 10$  mg predni-

solone equivalent per day) glucocorticoid treatment in rheumatoid arthritis and reported that adverse effects associated were modest, and often not statistically different from those of placebo. In their review, no cases of avascular necrosis were observed in any of the four reviewed trials of low-dose glucocorticoids used in treating rheumatoid arthritis. Similarly, we found no incidence of avascular necrosis when the physician reported prescribing an initial starting OCS dose of  $\leq 10$  mg over a four to seven day period.

There is limited information about the relationship of the risk of fracture with oral corticosteroid use in nonathletes. In one population-based study of adults, OCS use was shown to be more strongly related to daily dose than to cumulative dose on the risk of fracture (van Staa et al., 2000b). Several randomized, double-blind, placebo controlled studies of patients with carpal tunnel syndrome reported one and two-week treatment periods with prednisone, 20 mg daily followed by a one or two-weeks of 10 mg daily (Chang et al., 1998; Herskovitz et al., 1995; Hui et al., 2001). These studies generally reported a low risk and incidence of health complications with short-term oral corticosteroid use of less than two weeks. Adverse effects were generally considered small and included nausea/abdominal discomfort, constipation, and dysgeusia; one, a diabetic, developed mild hyperglycemia.

Although oral corticosteroids have been used for many years in the non-athletic population, there are few published reports on the magnitude of risk of health-related complications and the determinants of this risk in the athletic population. Nichols (2005) searched the medical literature for all years between 1966 and 2003 and identified no studies that discussed the usage or complications of oral corticosteroids in the treatment of athletic injuries. Respondents in this study recalled a very-low incidence of health-complications related to short-term oral corticosteroid treatment. Only 4% of the physicians we surveyed reported the occurrence of medical complications, with only one case of elevated blood glucose reported. Of the orthopaedists' surveyed by Langer et al. (2006) the most frequent complication reported from prescribing a Medrol Dosepak was glucose intolerance (37%; 222/603). In their study, 171 of the 672 (25%) non-prescribing physicians reported that they had seen a combined total of 500 cases of osteonecrosis as a complication of MDP use. It was also reported that 9% of the physicians (51 of 603) who prescribed a MDP had seen 101 cases of osteonecrosis, mostly in the hip. What is not clear from their findings is whether the osteonecrotic cases reported included only athletes or if the respondent answered by including all patients treated with OCS over their entire clinical practice. In addition, no indication was made of total dosage or whether multiple courses of OCS were used in treatment that may have had an effect on the large number of cases reported. Whether risk of osteonecrosis and bone fracture relate directly to OCS use or the underlying disease itself is not clear from their results.

Our finding (6%) of a lower reported incidence of medical complications from short-term corticosteroid use appears to be similar to reports in the literature for non-athletic conditions. The complications attributed to OCS

use in our study refer only to complications that were reported to and recalled by the prescribing physician for the two year recall period. Despite the reported low incidence of health complications, we found that 66% of the physicians did not prescribe a short-term OCS to athletes following musculoskeletal injury due to fear of medical complications and lack of clinical data supporting their use. Langer et al. (2006) reported fear of osteonecrosis, risk of medical complications in general, lack of proven efficacy, and fear of malpractice as the frequent reasons why 52% of the sports medicine physicians they surveyed did not prescribe OCS. Future studies should examine the post-treatment follow-up period to discover if any long term complications occur following systemic corticosteroid therapy in the high school and college athlete.

We found a statistically significant relationship between physicians who prescribed OCS in the skeletally immature athlete and a greater incidence of complications. Currently it is unknown what effects short-term OCS use has on bone growth and fracture risk in the young athlete (de Vries et al., 2007). Since complications of treatment with OCS appear to be dependent on the type of treatment regimen, size of dose, and duration of treatment, a risk-benefit decision must be made for any young athlete prescribed oral corticosteroids.

### Study limitations

We recognize several limitations to our study including the 24-month recall required of the respondents. It may be that the athlete was not followed long enough after receiving OCS therapy for the responding physician to know if a medical complication existed. Any potential medical complication could have been delayed and not present itself until after the recall period. In addition, all complications were likely not reported to the prescribing physician. Our survey analysis did not include if the rate of complication is higher in skeletally mature athletes and it is possible that the physicians who prescribed oral corticosteroids to skeletally immature athletes reported a greater incidence of complications because they prescribed oral corticosteroids more freely or more frequently.

### Conclusion

Physician responses indicated that high school and college athletes appeared to benefit from short-term oral corticosteroid therapy with few reported medical complications following athletic-induced musculoskeletal injury. Short-term oral corticosteroid use in multiple regimens in the same athlete and in the skeletally immature athlete may pose an increased risk of medical complication. Future clinical studies designed to better evaluate the efficacy of treatment and any associated complications will enable the development of more comprehensive strategies for short-term oral corticosteroid treatment of sports injuries in the high school and college athlete.

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### Key points

- Thirty-four percent of orthopaedic sports medicine physicians we surveyed reported prescribing a short-term course of oral corticosteroids for the treatment of an athletic-related musculoskeletal injury within the previous 24 months of answering the survey.
- The orthopaedic surgeons who treated athletic induced musculoskeletal injuries with a short-term course of OCS reported the high school and college athletes benefited from OCS treatment with few medical complications.
- Short-term oral corticosteroid use in multiple regimens in the same athlete and in the skeletally immature athlete may pose an increased risk of medical complication.

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## Appendix

### Orthopaedic physician survey of oral corticosteroid therapy.

#### MEDICAL PRACTICE INFORMATION

Medical Practice Setting:

- Private Practice  
 Academic Practice  
 Other (please specify): \_\_\_\_\_

How many years since residency have you been practicing medicine as an orthopaedic surgeon?

- 1-5 years       16-20 years  
 6-10 years     21+ years  
 11-15 years

Are you Fellowship trained in Sports Medicine?

- Yes  
 No

#### PRACTICE SETTING

How many years since your Fellowship have you been practicing medicine as an orthopaedic surgeon?

- 1-5 years       16-20 years  
 6-10 years     21+ years  
 11-15 years

#### SPORTS MEDICINE CARE TO ATHLETES

Within the past 2 years, have you provided orthopaedic medical services to the competitive High School or College Athlete?

- Yes  
 No

**ORAL CORTICOSTEROID USE**

Within the past 2 years, have you administered a short-term course of oral corticosteroids for musculoskeletal injuries to the High School or College Athlete?

- Yes  
 No

If not, Why?

- risk of medical complications  
 no clinical data available  
 medicolegal issues  
 other (please specify): \_\_\_\_\_

**ORAL CORTICOSTEROID TREATMENT**

Approximately how many athletes have you treated with short-term oral corticosteroids in the past 2 years?

- |       |                    |                |
|-------|--------------------|----------------|
|       | <u>High School</u> | <u>College</u> |
| None  |                    |                |
| < 5   |                    |                |
| 6-10  |                    |                |
| 11-15 |                    |                |
| > 16  |                    |                |

**DESCRIPTION OF STEROID USE**

Identify the type of musculoskeletal condition(s) for which you prescribed short-term oral corticosteroid therapy in the athlete (Check all that apply).

- Chronic Inflammation  
 Acute Injury  
 Post Surgery  
 Other Indications: \_\_\_\_\_

What was the usual initial dosage used when prescribing oral corticosteroids to treat the athlete?

- |          |                    |                |
|----------|--------------------|----------------|
|          | <u>High School</u> | <u>College</u> |
| 10 mg    |                    |                |
| 11-30 mg |                    |                |
| 31-40 mg |                    |                |
| > 40 mg  |                    |                |

Identify the usual total dosage (over a course of a single treatment period) of the oral corticosteroids prescribed when treating the athlete.

- |            |                    |                |
|------------|--------------------|----------------|
|            | <u>High School</u> | <u>College</u> |
| <50 mg     |                    |                |
| 51-200 mg  |                    |                |
| 201-400 mg |                    |                |
| > 400 mg   |                    |                |

What was the average number of days (over a course of a single treatment period) you prescribed oral corticosteroid therapy when treating the athlete?

- |           |                    |                |
|-----------|--------------------|----------------|
|           | <u>High School</u> | <u>College</u> |
| < 3 days  |                    |                |
| 4-7 days  |                    |                |
| 8-10 days |                    |                |
| > 10 days |                    |                |

What was the most common dosage regimen you used when administering oral corticosteroid therapy?

- |             |                    |                |
|-------------|--------------------|----------------|
|             | <u>High School</u> | <u>College</u> |
| tapered     |                    |                |
| non-tapered |                    |                |
| both        |                    |                |

Have you ever prescribed multiple dosages to the same athlete in a given season?

- Yes  
 No

If not, why?

- risk of medical complications  
 no clinical data available  
 medicolegal issues  
 other (please specify) \_\_\_\_\_

**STEROID USE IN THE SKELETALLY IMMATURE**

Have you ever prescribed oral corticosteroids to the skeletally immature athlete?

- Yes  
 No

If not, why?

- risk of medical complications  
 no clinical data available  
 medicolegal issues  
 other (please specify) \_\_\_\_\_

## BENEFITS OF STEROID USE

Approximately what percentage of the athletes benefited because their treatment was shortened from the prescribed oral corticosteroids?

	<u>High School</u>	<u>College</u>
none		
<25%		
26-75%		
>75%		

## COMPLICATIONS OF USE

Did any of the athletes who received oral corticosteroid therapy experience any complications attributed to the drug?

Yes

No

If yes, what percentage:

were required to discontinue training or sports participation for any period of time.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

were required to discontinue sports permanently.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

sustained a re-injury upon return to sports participation.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

developed elevated blood glucose.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

developed avascular necrosis of any bone.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

developed a soft tissue infection.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		

developed other complications.

	<u>High School</u>	<u>College</u>
none		
<1%		
1-10%		
>10%		