Risk factors and prevalence of injuries in horses during various types of steeplechase races

Jennifer O. Stephen, BVMS; Nathaniel A. White II, DVM, MS, DACVS; William H. McCormick, VMD; R. Reynolds Cowles, DVM; Kevin T. T. Corley, BVMS, PhD, DACVIM, DACVECC

Objective—To identify the types of injuries sustained by horses that competed in steeplechase races and determine the prevalence of and risk factors for those injuries.

Design—Prospective study.

Animals—2,680 horses that competed in various types of steeplechase races from 1996 through 2000.

Procedure—Data regarding races; environment; equipment problems; the number of horses that entered, started, and finished races; the number of riders that fell; and the number of horses that were slowed or stopped by the rider, ran off the course, fell, and sustained injuries or physical abnormalities during races were collected on a standard form by the official veterinarian who attended each meet. Data from all meets were not recorded; however, in recorded meets, data from every race were reported.

Results—Data for 197 hurdle, 65 timber, 76 flat, and 8 mixed races were recorded. Nine (3.4/1,000 horses that started in races) horses died or were euthanatized, and 7 of those were associated with catastrophic musculoskeletal injury. Seven fractures were recorded. Four fractures involved forelimbs, 1 involved a hind limb, and 2 involved the cervical portion of the vertebral column. All horses with fractures were euthanatized. Deep or hard course conditions were associated with an increased risk of breakdown injuries.

Conclusions and Clinical Relevance—Successful development and implementation of strategies to prevent injuries and death in horses in steeplechase races depend on a clear understanding of the types and prevalence of injuries involved and risk factors associated with those injuries. (J Am Vet Med Assoc 2003;223:1788–1790)

Injuries sustained by horses during racing are a concern for all involved in the racing industry. Racetrack injuries have a negative impact on animal welfare, jockey safety, economic costs, and the public's perception of racing. To prevent injuries during racing, there must be a clear understanding of the types and prevalence of the injuries involved. Although there are many reports on the prevalence and types of injuries sustained by Thoroughbreds racing on flat racetracks, there are few reports on injuries sustained by horses during steeplechase races, particularly in the United States.

Although the prevalence of injuries in horses in steeplechase and national hunt races has been determined in the United Kingdom, only 1 study has examined risk factors for injuries during these races. The purpose of the study reported here was to identify the types of injuries sustained by horses that competed in steeplechase races and determine the prevalence of and risk factors for those injuries.

Materials and Methods

All horses that competed in official races of the Virginia Steeplechase Association (VSA) from 1996 through 2000 were included in the study. Races were held at 7 courses, and each race varied by distance (1.5 to 3.5 miles) and included races with various numbers and types of jumps and flat races on turf with no jumps. All horses had a prerace examination by an official veterinarian selected by the race committee. In the judgment of the official veterinarian, horses with any evidence of lameness, injury, or illness that might cause increased risk of injury during the race were not allowed to race.

At each meet, data regarding the number of races; length and type (flat, hurdle, mixed, and timber) of each race; running time of the winner; course conditions; temperature and humidity; equipment problems; number of riders that fell; and the number of horses that entered races, started races, finished races, were removed from races by the trainer or veterinarian, were slowed or stopped by the rider, fell, and ran off course were recorded by the official veterinarian on a standard form. Course conditions were categorized according to official terms used by the racing association and recorded as soft (the most moisture), deep, good, firm, and hard (the least moisture). Horses that sustained an injury or physical abnormality as determined by the official veterinarian at any time during or immediately after the race were also recorded. Before the study, definitions for abnormalities that may have been observed during races were established. Abnormalities included epistaxis, fatigue, breakdown injuries, fractures, tendon injuries, and lameness from any other cause. Diagnostic methods other than observation and physical examination were not used. Epistaxis was recorded when blood was observed from both nostrils. Breakdown injuries were defined as an obvious disruption to the suspensory apparatus of the metacarpophalangeal joint. Fatigue was recorded if a horse slowed its pace and lagged behind other horses and if it had labored breathing, sweating, and a pro-
longed recovery after the race. An injury was classified as catastrophic if the horse died or was euthanatized on the basis of prognosis for recovery as determined by the official veterinarian and with the consent of the owner or trainer.

Statistical analyses—The prevalence of injury was calculated by dividing the number of horses with new injuries by the total number of horses that started the race and multiplying by 100. This was calculated for each type of race. The mortality rate and prevalence of various types of injuries were compared for each type of race and course condition by use of a computer program. The Fisher exact test or χ² test, as determined by the number of data points, was performed on categoric data. A value of \( P < 0.05 \) was considered to be significant.

Results

During the 5-year study, there were 54 meets with 346 races that included 197 hurdle, 65 timber, 76 flat, and 8 mixed races. There were 717 horses voluntarily withdrawn from races and 26 excluded on the basis of results of prerace examinations. Of 2,680 horses that started in races, 2,363 horses finished. Forty-two horses were stopped by their riders, 40 horses were stopped or stopped by their riders, 4 ran off course, and 3 stopped because of equipment failure (eg, reins broke or saddle slipped). Twelve horses had epistaxis, 205 had fatigue, 45 became lame with no specific diagnosis during or shortly after a race, and 9 died or were euthanatized; 9 horses sustained breakdown injuries, 7 sustained fractures, and 34 sustained tendon injuries (Table 1). The prevalence of all horse or rider problems that affected performance was 13% (401/2,680) for all horses that started in races and 16.9% (274/1,624), 27.6% (90/326), 4.9% (32/656), and 19.6% (11/56) for horses that started in hurdle, timber, flat, and mixed races, respectively. The prevalence of musculoskeletal injuries was 3.5% (95/2,680) for all horses that started in races and 3.9% (64/1,642), 7.1% (23/326), 1.07% (7/656), and 1.8% (1/56) for horses that started in hurdle, timber, flat, and mixed races, respectively. There were significantly \( P < 0.001 \) more fractures during races than in flat and hurdle races. The overall prevalence of catastrophic injuries was 0.34% (9/2,680).

Nine of 2,680 horses that started in races (3.4 fatalities/1,000 starts) died or were euthanatized. Seven of those were because of fractures. One horse collapsed and died after a 1.5-mile flat race on good course conditions with an ambient temperature of 60°F and 60% humidity. Epistaxis was observed in this horse; however, a final diagnosis was not available. One horse fell and died during a 3.25-mile timber race; the cause of death was not determined.

Seven fractures were recorded for 2,680 horses that started in races (2.6 fractures/1,000 starts). Five of 7 horses with fractures were euthanatized (1.87 fatal limb injuries/1,000 starts), and 2 horses died with apparent fractures of the cervical portion of the vertebral column. Six of 7 fractures were caused by falls. Fractures occurred during hurdle (\( n = 5 \)), timber (1), and mixed (1; Steeplethon) races on course conditions that were described as good (\( n = 4 \)), hard (2), or firm (1). Fractures occurred during races that ranged from 2.125 to 3.25 miles long, and all fractures were sustained in the last quarter of the race.

Course conditions and type of race were examined as possible risk factors for injuries. Horses were significantly \( P = 0.002 \) more likely to fall on courses with good conditions, compared with those described as soft, deep, hard, or firm. Fatigue developed more frequently \( (P = 0.001) \) during races on soft or firm course conditions, compared with courses described as good, deep, or hard. There was no significant association between breakdown injuries and deep or hard course conditions, although this association approached significance \( (P = 0.053) \). Epistaxis, catastrophic injuries, fractures, lameness, and tendon injuries were not significantly associated with course conditions.

Fatigue and lameness developed more frequently \( (P = 0.001 \) and \( P = 0.004, \) respectively) during hurdle and timber races than during flat or mixed races. Tendon injuries developed most frequently \( (P = 0.01) \) in timber races, compared with other types of races. Horses fell more frequently \( (P = 0.001) \) in timber and mixed races than in flat and hurdle races. Breakdown injuries, epistaxis, catastrophic injuries, and fractures were not significantly associated with race type.

Table 1—Prevalence of horse and rider problems occurring during various types of steeplechase races of the Virginia Steeplechase Association from 1996 through 2000

<table>
<thead>
<tr>
<th>Problem</th>
<th>Hurdle (% with injury)</th>
<th>Timber (% with injury)</th>
<th>Flat (% with injury)</th>
<th>Mixed (% with injury)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistaxis</td>
<td>7 (0.4)</td>
<td>4 (0.92)</td>
<td>1 (0.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>160 (9.8)</td>
<td>34 (10.1)</td>
<td>10 (1.5)</td>
<td>1 (1.7)</td>
</tr>
<tr>
<td>Horse slowed or stopped by rider</td>
<td>30 (1.8)</td>
<td>10 (3.0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Horse ran off course</td>
<td>4 (0.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Rider fell</td>
<td>26 (1.5)</td>
<td>14 (4.3)</td>
<td>2 (0.45)</td>
<td>2 (3.5)</td>
</tr>
<tr>
<td>Equipment failure</td>
<td>4 (0.2)</td>
<td>0 (0)</td>
<td>1 (0.15)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Horse fell</td>
<td>40 (2.4)</td>
<td>30 (9.2)</td>
<td>5 (1.4)</td>
<td>7 (5.3)</td>
</tr>
<tr>
<td>Breakdown injury</td>
<td>6 (0.4)</td>
<td>2 (0.6)</td>
<td>1 (0.15)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Fracture</td>
<td>5 (0.3)</td>
<td>1 (0.3)</td>
<td>0 (0)</td>
<td>1 (2.1)</td>
</tr>
<tr>
<td>Tendon injury</td>
<td>20 (1.2)</td>
<td>10 (3.1)</td>
<td>4 (0.6)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Lameness</td>
<td>33 (2)</td>
<td>10 (3.1)</td>
<td>2 (0.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Died or euthanatized</td>
<td>5 (0.3)</td>
<td>2 (0.6)</td>
<td>1 (0.3)</td>
<td>1 (1.79)</td>
</tr>
</tbody>
</table>
Discussion

Overall prevalence of injuries and physical abnormalities, including fatigue, recorded in our study was 15%, which was greater than that observed in steeplechase (National Hunt), flat, and hurdle races on British racecourses. Because fatigue was not defined, it is not clear if the overall prevalence of physical abnormalities that occurred on British racecourses can be directly compared with that in our study. Overall musculoskeletal injuries (3.5%) in our study were higher than those of other studies (0.33% and 0.12%) in flat races with Thoroughbreds in the United States. In a review of risk factors associated with racetrack injuries, most studies involve Thoroughbreds racing on dirt flat tracks. In these studies, information regarding horses that slowed down during the race or did not finish races because of fatigue or other unknown problems is not known. Similarly, specific types of injuries that are not catastrophic are not commonly reported; therefore, the number of specific types of injuries (ie, tendon injuries) in horses in steeplechase races cannot be compared with the same injuries in horses raced on flat dirt tracks.

In our study, the prevalence of catastrophic musculoskeletal injuries, as defined by Peloso et al, was 0.26% (7/2,680). This is higher than that reported in flat races (0.14% [51/35,484]) and slightly lower than the fatality rate reported by Williams et al in races over fences (0.29%) and Bailey et al, who reported a prevalence of 0.63% and 1.43% for catastrophic musculoskeletal injuries in hurdle and steeplechase races, respectively, in Australia. In our study, the prevalence of catastrophic injuries did not change with race type, although the number of timber and mixed races was small; therefore, a definitive statement about the prevalence of catastrophic injuries was not possible. In our study, death of the horse (0.15% [1/656]) during a flat race was not believed to be caused by musculoskeletal injury; therefore, the prevalence of catastrophic musculoskeletal injuries occurring in flat races in our study cannot be compared with that in other studies.

Nine (0.34%) horses died or were euthanized because of catastrophic injury in our study. The prevalence of death was lower than that reported by McKee in national hunt flat (0.47%), hurdle (0.49%), and steeplechase (0.7%) races at 59 tracks in the United Kingdom. One study with 222,993 horses reported fatality rates of 0.25% for steeplechase, 0.19% for hurdle, and 0.08% for national hunt flat races. In a study of 67 racecourses in Australia, the prevalence of death was 0.6% and 1.1% in hurdle and steeplechase races, respectively, with 60% of deaths caused by falls during races with jumps. In our study, 8 of 9 horses with catastrophic injuries involved a fall during races with jumps. Horses were more likely to fall on courses with good conditions; however, there was no significant association between course conditions and increased risk of fractures or catastrophic injuries.

In the study presented here, 4 of 5 limb fractures were in forelimbs, which may be because of the increased force placed on the forelimbs at higher speeds. In England, most forelimb fractures that occur in national hunt races involve the shoulder region. In our study, 3 of 5 long bone fractures involved the scapula or humerus. Course conditions and type of race were not associated with increased risk of fractures in our study.

In this study, epistaxis observed during or just after a race was not confirmed to be exercise-induced pulmonary hemorrhage (EIPH) by endoscopy and was only observed in 0.45% of horses that started in races. If we assume that epistaxis observed during or immediately after racing was an indication of EIPH, then the prevalence of EIPH in our study was lower than that in 1 study (0.6%) and similar to that (0.76%) in another study. Because horses in our study were only observed for a short period just before, during, and after races, it is possible that epistaxis may have been more prevalent than reported. Because EIPH was not confirmed by endoscopy, the true prevalence of EIPH was not determined in our study.

Factors such as age, previous injuries, and quality of horses; experience of the rider (amateur or professional); and design and surface of the course may account for differences in the prevalence of injuries observed in steeplechase races, compared with that in flat races. In our study, the association between injuries and type of race suggests that these are important risk factors in the determination of the prevalence of injuries in steeplechase races. Although the association between course conditions and injuries was not significant in the study reported here, further research with increased quantitation of course conditions, such as water content of the soil, and race speed are required to determine if an association exists.

References