ORIGINAL RESEARCH

Injury and Illness During a Multiday Recreational Bicycling Tour

David A. Townes, MD, MPH, FACEP; Christopher Barsotti, MD; Michael Cromeans, MD

From the Division of Emergency Medicine, University of Washington School of Medicine, Seattle, WA (Dr Townes); Berkshire Medical Center, Pittsfield, MA (Dr Barsotti); and Illinois Masonic Medical Center, Chicago, IL (Dr Cromeans).

Objective.—To describe the incidence and types of injury and illness treated during a multiday recreational bicycling tour.

Methods.—In July 2001, 2100 bicyclists rode 520 miles from Minneapolis, MN, to Chicago, IL, during the 2001 Heartland AIDS Ride. A volunteer medical staff provided medical care along the route. All patient encounters were recorded in an injury and illness log. Information from the log was used to describe the incidence and types of injury and illness treated during the event.

Results.—A total of 2100 riders participated, with 244 patient encounters recorded. The 2 most common reasons for requiring medical care were dehydration (35%) and orthopedic injuries (27%). Forty patients were transferred to the hospital and 7 required admission.

Conclusions.—Individuals charged with providing medical care for recreational bicycling events should be prepared to treat a wide variety of injuries and illnesses. In this and other studies, dehydration, heat illness, and overuse injuries were the most common reasons to require medical care. The results of this study suggest that implementation of prevention strategies before and during bicycling events may significantly reduce the requirement for on-site medical care.

Key words: bicycle tour, event medicine, injury and illness pattern, multiday charity bicycle event

Introduction

Multiday bicycle rides have increased in popularity in recent years. Many are noncompetitive events designed to raise money for charity. They are staged events with participants resting at night and actively participating during predetermined, daylight hours. The order of finish and time are not emphasized or recorded.

Medical support is essential to ensure the health and safety of the participants and, thus, the success of the event. Determination of the types and amount of equipment, supplies, and personnel that are required is normally the responsibility of the event's medical director, who is often a local physician with no formal training and little experience in event medicine who has volunteered for the task. Limited information is available to

assist medical directors, leaving them to develop the medical support plan by themselves.

We describe our experience during the 2001 Heartland AIDS Ride and quantify the incidence and types of injury and illness treated during this event. Because a medical support plan is based on anticipation of need, this information should prove useful to medical directors of future similar events. These results, combined with those from similar studies, might help guide the development of medical support plans for future events. As more events are held and investigations are undertaken, guidelines may be developed and refined.

Methods

This study took place during the Heartland AIDS Ride held in July 2001, during which 2100 participants were to ride 520 miles from Minneapolis, MN, to Chicago, IL, during a 6-day period. To participate, riders raised money through sponsorship. The money was to support research and services for people infected with the human immunodeficiency virus (HIV). The participants included experienced, well-conditioned cyclists and those with

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Corresponding author: David A. Townes, MD, MPH, FACEP, University of Washington School of Medicine, PO Box 356123, 1959 NE Pacific St, Seattle, WA 98195-6123 (e-mail: townesd@u.washington.edu).

Table 1. Temperature, number of pit stops, route length, and number of people treated for dehydration on each day

	Day					
	1	2	3	4	5	6
Maximum temperature (°F)	81	83	81	84	87	88
Pit stops (<i>n</i>)	4	5	5	5	4	4
Route distance (miles)	83	102	101	102	74	58
People treated for dehydration (<i>n</i>)	49	15	10	8	4	0

no experience in long-distance bicycling. Many of the participants were HIV positive and some had chronic diseases, including several who required continuous positive airway pressure at night while sleeping.

During the event, riders, support crews, and event staff stayed in base camps along the route. Tents, meals, bathroom and shower facilities, and medical care were provided in these base camps. Riders checked out of a base camp in the morning after breakfast and had to check into the next one by a predetermined time in the late afternoon. Riders were only allowed on the route during daylight hours. If a rider was unable to reach the next base camp by the predetermined time, he or she was picked up and driven to that location. In the morning, once all the riders had left for the day, the base camp was disassembled, loaded onto trucks, and moved to the next site and set up before the arrival of the first rider in the afternoon.

Along the route were pit stops where riders stopped to rest, eat, drink, have minor bike repairs, and receive medical care if necessary. The pit stops were at regular intervals along the course that varied daily in length from 58 to 102 miles. The course was on paved roads and generally flat.

The basic mission of the medical team was to provide definitive treatment for minor injuries and illnesses and to provide initial stabilization and treatment and facilitate transfer of those patients who required a higher level of care. Event participants received medical care either at a base camp medical tent, at a pit stop medical tent, or along the route. The volunteer medical staff included physicians, nurses, paramedics, emergency medical technicians, and medical students. The 2 medical directors were board certified and residency trained in emergency medicine with previous experience as medical directors of similar events. A pharmacist was in charge of organization and storage of the riders' medications that they did not wish to carry with them. In addition, 2 full-time ambulances equipped with advance life support were on site at all times. At night, the ambulances were stationed at base camp. During the day, they split their time between the pit stops and patrolling the course.

When medical care was administered, the encounter was recorded in an injury and illness log. The information contained in the log was used for this study and included the diagnosis, treatment, and disposition. This study received Institutional Review Board approval at our institution.

Results

Weather conditions during the event included daytime temperatures ranging from 81°F to 88°F with humidity between 60% and 90%. Maximum temperature data, route length, number of pit stops, and number of people treated for dehydration for each day are shown in Table 1. During the event, 244 patient encounters were recorded. The 2 most common causes of all encounters were dehydration (35%) and orthopedic injuries (27%). Overuse injuries of the knee were the most common orthopedic injuries. The remaining patient encounters were related to skin and soft-tissue problems (10%), ophthalmologic problems (6%), gastrointestinal problems (6%), respiratory problems (4%), head and neck problems (3%), allergic reactions (3%), cardiac problems (2%), psychiatric problems (<1%), and other (4%). The distribution of injuries and illnesses is shown in Table 2. Forty patients were transported to the hospital, with 7 of these patients ultimately requiring admission. The reasons for transport are shown in the Figure. The average number of patient encounters per day was 34.9, and the overall transfer rate was 16.4%.

Discussion

Multiday recreational bicycling events have grown in popularity in recent years. For individuals charged with providing medical support for these events, information about the incidence and types of injury and illness treated during these events should prove useful in terms of organization of supplies, equipment, and personnel.

The incidence of injury and illness increases with event duration. In our event, the incidence may be calculated as 116 of 1000 riders or 22 of 100 000 person

Table 2. Distribution of all injuries and illnesses ($n = 244$)*

Diagnosis	No.	Total	%
Dehydration		86	35
Orthopedic		65	27
Knee	35		
Wrist/hand	6		
Foot	5		
Back	4		
Leg	4		
Shoulder	4		
Ankle	3		
Hip	2		
Torso	1		
Arm	1		
Skin and soft tissue		25	10
Cellulitis	5		
Rash	3		
Paronychia	3		
Foreign body	2		
Abrasion	2		
Felon	1		
Laceration	7		
Abscess	1		
Burn	1		
Ophthalmologic		15	6
Foreign body	6		
Conjunctivitis	4		
Corneal abrasion	4		
Hordeolum	1		
Gastrointestinal		14	6
Abdominal pain (NOS)	8		
Gastroenteritis	6		
Respiratory		9	4
Asthma/COPD	8		
Dyspnea (NOS)	1		
Other		9	4
Hypertension	2		
Headache	2		
Hypoglycemia	1		
Pedal edema	1		
Urinary tract infection	1		
Venous insufficiency	1		
Wound dehiscence	1		
Head and neck		7	3
Epistaxis	2		
Pharyngitis	2		
Otitis externa	1		
Herpes stomatitis	1		
Jaw fracture	1		
Allergic reaction		7	3
Cardiac		6	2
Chest pain	4		
Arrhythmia/palpitations	2		
Psychiatric		1	<1
Depression	1		
Total		244	100

* COPD = chronic obstructive pulmonary disease; NOS = not otherwise specified.

miles, based on 244 medical encounters, 520 miles, and 2100 riders. By comparison, in a 1-day, 42-mile bicycling event in New York City in which 28 000 riders participated, the incidence was found to be 5 of 1000 riders or 12 to 13 of 100 000 person miles.¹ The higher incidence during our event may be explained, in part, by the longer duration of the event and the role of fatigue as a contributing factor to injury and illness. Further investigation is needed to test this hypothesis.

In a similar investigation of the 1996 California AIDS Ride, 2250 riders rode 547 miles between San Francisco and Los Angeles. A total of 509 patient encounters were recorded, with heat-related illness accounting for 31% of all encounters, followed by pulmonary complaints (12%) and orthopedic problems (9%). Fifty-five patients required transfer to the hospital, resulting in 7 hospital admissions. The average number of patient encounters per day was 63.6, and the overall transfer rate was 10.8%.²

Several other investigations have also identified overuse injuries as a major reason to require medical care during bicycling events. In a 1-day bicycling tour in New York City, 45% of all injuries were soft-tissue injuries of the extremities.¹ In a study of 1200 bicyclists riding sections of a 4500-mile course, knee and hand problems were the most common injuries recorded.³ In another study of an 8-day, 500-mile event, buttock pain (32.8%) and knee problems (20.7%) were the most common injuries.⁴ Of 518 participants in multiday bicycling events surveyed, 85% reported overuse injuries. In order of frequency, recorded injuries were of the neck (48.8%), knee (41.7%), groin or buttocks (36.1%), hand (31.1%), and back (30.3%).⁵

Previous work has identified risk factors for overuse injuries of the knee in recreational cyclists. These include riding less than 26 miles per week, riding less than 500 miles per year, riding less than 40 miles during the longest ride of the year, riding less than 30 miles on a personal trip, riding less than 14 miles per hour on average, and having bought the bike less than 1 year before the event.⁶

Fortunately, serious traumatic injuries appear to be uncommon during these events. It has been suggested that these injuries are lessened by mandatory helmet use and by riders having some degree of protection from traffic.¹ Heat illness and dehydration are perhaps the greatest threats to the welfare of event participants. Because both of these problems can be prevented, implementation of prevention strategies should begin before and continue throughout these events. During our event, educational information about the causes, signs, symptoms, and prevention of dehydration and heat illness were provided to participants during nightly announcements given at base

Figure 1. Injuries and illnesses requiring transportation to the hospital.

camp and were included in a newsletter published daily and available each morning. This strategy has been used during other events.^{2,7} The role of daily education in prevention during these events remains uncertain. Although the number of riders treated for dehydration decreased each day of the event, it is unclear if this was a result of daily education, environmental conditions, or attrition of riders susceptible to dehydration.

In addition to daily education, a strategy for future events might be inclusion of educational materials in the registration packet mailed to each rider before the event. Additional hydration stations and cooling tents along the course between routine pit stops, especially on hot and humid days, might further reduce the incidence of heat illness and dehydration.

A limitation of this study is that all medical encounters may not have been recorded. This may be a result of incomplete documentation by the medical staff or of a rider leaving the event for a medical reason without notifying the staff. A second limitation is that all diagnoses recorded were presumptive. Because different members of the medical staff recorded the diagnoses at the time of treatment, an inherent variability exists in the determination of these diagnoses.

Caution should be used when applying the results of this study and similar studies to other events, because variables such as event length, weather conditions, geography, and the health and conditioning of participants may affect the injury and illness pattern observed. The results should, however, serve as a guide for the development of a medical support plan.

In conclusion, individuals charged with providing medical care for multiday recreational cycling events should be prepared to treat a wide variety of injuries and illnesses. Dehydration, heat illness, and overuse injuries, especially of the knee, are the most common reasons to require medical care. In future events, an emphasis on prevention of these common injuries and illnesses might significantly reduce the requirements for medical care during the event and provide a healthier and more enjoyable experience for the participants.

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