WILDERNESS & ENVIRONMENTAL MEDICINE, **26,** 29–35 (2015)

ORIGINAL RESEARCH

Characterization of Medical Care at the 161-km Western States Endurance Run

Vanessa McGowan, MD, MS; Martin D. Hoffman, MD

From the Department of Physical Medicine & Rehabilitation (Drs McGowan and Hoffman), University of California Davis Medical Center; and the Department of Veterans Affairs, Northern California Health Care System (Dr Hoffman), Sacramento, CA.

Objective.—To examine the medical care at a highly competitive 161-km mountain ultramarathon.

Methods.—Encounter forms from the 2010 through 2013 Western States Endurance Run were analyzed for trends in consultation and use of intravenous fluids.

Results.—A total of 63 consultations (8.2% of starters) were documented in 2012 and 2013, of which 10% involved noncompetitors. Most (77%) of the consultations with competitors occurred on the course rather than at the finish line, and were generally during the middle third of the race. Of the on-course consultations, the runner was able to continue the race 55% of the time, and 75% of those who continued after consultation ultimately finished the race. Relative number of consultations did not differ among competitors within 10-year age groups ($P = .7$) or between men and women ($P = .2$). Overall, consultations for medical issues were predominant, and nausea and vomiting accounted for the single highest reason for consultation (24%). Although there was an overall decrease in finish line consultations and intravenous fluid use from 2010 through 2013 ($P < .0001$ for both) that was independent of maximum ambient temperature ($P = .3$ and $P = .4$), the proportion of those being treated with intravenous fluids relative to those receiving consultation at the finish line was directly related to maximum ambient temperature ($r = .93$, $P = .037$). Both 2012 and 2013 had a single medical emergency that required emergency evacuation.

Conclusions.—This work demonstrates that the medical needs in a 161-km ultramarathon are mostly for minor issues. However, occasional serious issues arise that warrant a well-organized medical system.

Key words: endurance, exercise, injury, medical coverage, running, ultramarathon

Introduction

Marathon participation has shown continued steady growth for the last 3 decades,[1] while participation in ultramarathons has grown exponentially in recent years.[2,3] Ultramarathons, defined as running races longer than the 42.195-km marathon distance, may take place in a single day, be continuous, or be staged (noncontinuous) over several days, and often occur in wilderness environments. In addition to the inherent physiological stress of running long distances, these events may carry additional risks attributable to environmental factors such as challenging terrain and adverse weather conditions. Furthermore, ultramarathons often present geographical barriers to the provision of medical care unlike the typical marathon that takes place in an urban setting. Ultramarathons also differ from marathons in terms of participant characteristics. For example, the participants in ultramarathons tend to have a higher median age than those running marathons.[1,2] Because of distinctions such as this, the large volume of research on marathons is not necessarily suitable for clarifying medical needs at ultramarathons.

Two prior studies systematically examined the medical needs during staged, multiple-day ultramarathons,[4,5] but as far as we are aware, there is only one report on medical issues during a continuous ultramarathon, and that was from a relatively short (45-km) event.[6] Thus, the main purpose of the present work was to examine the

Presented in part at the American College of Sports Medicine annual meeting, May 29, 2013, Indianapolis, IN.

Disclaimer: The contents reported here do not represent the views of the Department of Veterans Affairs or the United States Government.

Corresponding author: Martin D. Hoffman, MD, Department of Physical Medicine & Rehabilitation (117), Sacramento VA Medical Center, 10535 Hospital Way, Sacramento, CA 95655–1200 (e-mail: martin.hoffman@va.gov).

medical care that has been provided in recent years at the Western States Endurance Run (WSER), the first mountain 161-km ultramarathon, and one of the most physically challenging running events in the world. A secondary aim was to examine the trend in use of intravenous (IV) fluids at the event. This is particularly important given that it has recently been recognized that ultramarathons can have a high incidence of exercise-associated hyponatremia,[7,8] that provision of IV isotonic or hypotonic fluids can exacerbate the condition resulting in serious consequences,[9,10] and that IV fluids are often overutilized at endurance events.[7,9,11–14]

Methods

The study was approved by our institutional review board, with the requirement for informed consent waived.

The WSER is a 161-km ultramarathon that travels mostly on single-track trail through the Sierra Nevada Mountains of Northern California from Squaw Valley to Auburn, California. The course has a total ascent of 5500 m, a total descent of 7000 m, and reaches a maximum altitude of 2667 m. Ambient temperatures can fluctuate widely from year to year and during each event. All participants are experienced ultramarathon runners who are either awarded an entry based on a recent high-level performance or drawn by lottery from applicants who have met specific qualifying standards. Runners have a 30-hour time limit to complete the distance. The race provides 24 aid stations, with the longest distance between these stations being 12.5 km. Medical support is available at 8 of the aid stations and at the finish line. Each medical station has a medical captain who is either a physician, nurse, physician assistant, or emergency medical technician, and is typically staffed by 1 to 10 additional individuals with a variety of medical credentials. A standardized encounter form is to be completed by race medical staff for each consultation. Competitors are not penalized for seeking medical attention, with the exception that IV hydration on the course results in disqualification.

Completed encounter forms were collected from all medical stations of the 2012 and 2013 events and only from the finish line of the 2010 and 2011 events. Encounter forms documented course location, subject identifying information, symptoms, presumed diagnoses, and treatment provided. Encounter forms and race split data were used to determine whether a runner continued and finished the race or not. Consultations related to pace runners and race volunteers were included in the analysis because these individuals contribute to the medical needs at the event. Minimum and maximum ambient temperatures during each race were obtained from the weather stations nearest to the race start and finish as done previously, and noted to likely overestimate the early morning temperatures at the higher altitudes and underestimate the afternoon temperatures in the canyons.[7,15]

The main reasons for each consultation, including the symptoms and presumed diagnoses that were recorded on the encounter forms, were initially listed collaboratively by the authors. Examination of this list revealed distinct categories within broad diagnostic groups of medical, musculoskeletal, and other conditions. For encounters listing symptoms and presumed diagnoses of nausea/vomiting and dehydration, the former was chosen as the main reason for the consultation under the presumption that the nausea and vomiting was the underlying cause of the dehydration. Because minor blister care was not uniformly documented and there were no known cases in which a runner dropped out at a medical station where they received blister care, blisters were not included in the analysis. For each encounter, we recorded the primary reason for consultation based on the defined categories, the course location of the encounter, the type of subject (competitor, pacer, or race volunteer), and the subject's sex and age, as well as whether or not they continued in the race and finished if they were a competitor. In addition to these data from the 2012 and 2013 events, finish line encounters for years 2010 through 2013 were examined for whether treatment included IV fluids.

Group comparisons were made with χ^2 and Fisher exact tests. Relationships for frequency of consultation and IV fluid treatment with maximum ambient temperature during the race were examined with Pearson correlation analyses. Statistical significance was set at a probability value of less than .05.

Results

Pertinent information about the 4 events considered in this analysis is shown in Table 1. Ambient temperature conditions were particularly cool in 2012 and hot in 2013. Competitors encountered rain and sleet in the early portion of the 2012 event.

A total of 63 consultations (8.2% of starters), each for a unique individual, were documented in 2012 and 2013 (Table 2). No runner repeatedly sought care. Six consultations involved noncompetitors: 1 safety runner, 1 aid station volunteer, and 4 pacers. Most (77%) of the consultations with competitors occurred on the course rather than at the finish line. Of those consultations on the course, the runner was able to continue 55% of the time after consultation, and 75% of those who continued after consultation ultimately finished the race. Overall, nausea and vomiting accounted for the largest number (24%) of consultations,