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Deputy Assistant Director, Medical Affairs

Military-Specific Care Clinical Community

DHA Practice Recommendation:
Exercise Associated Hyponatremia
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Exercise Associated Hyponatremia

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This guideline is not intended to define a standard of care and should not be construed as such, nor should it be interpreted as prescribing an exclusive course of management for said condition or disease process. Variations in practice will inevitably and appropriately occur when clinicians consider the needs of individual patients, available resources, and limitations unique to an institution or type of practice. Every healthcare professional making use of this guideline is responsible for evaluating the appropriateness of applying it in the setting of any particular clinical situation.

This guideline is not intended to represent TRICARE policy. Further, inclusion of recommendations for specific testing and/or therapeutic interventions within this guide does not guarantee coverage in Private Sector Care. Additional information on current TRICARE benefits may be found at www.tricare.mil or by contacting the regional TRICARE Managed Care Support Contractor.

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Purpose

This practice recommendation (PR) was constructed jointly within the United States Military and is intended to provide a synopsis of care recommended to assist providers in the prevention, assessment, and management of exercise associated hyponatremia (EAH).

Overall, the reported incidence of asymptomatic EAH has ranged from 0%[1-2] to as high as 51%[3] immediately following exercise events.[4] However, it appears to have a greater impact on warfighting populations. From 2004 through 2019, there were 1,612 cases of EAH among Active Component DoD Service members (SMs), with an overall incidence rate of 7.4 cases per 100,000 person-years.[5] The overall incidence rate during the 16-year period (2004-2019) was highest in the United States Marine Corps, followed by the United States Army and United States Air Force, respectively.[5]

Specific warfighter management questions can be directed to an Ask-the-Expert function at https://www.hprc-online.org/ask-the-expert.

Diagnosis

Definition and Presentation

EAH is defined by a serum or plasma sodium concentration below 135 mmol/L that occurs during, or up to 24 hours after, prolonged physical activity, independent of symptoms.[4,6] EAH has previously been thought of as a rare condition, but with greater awareness, incidence rates are growing across the board with low, moderate, and high intensity exercise and events.[6] Unfortunately, despite increased recognition and research[4], athletes and Soldiers continue to die from complications associated with hyponatremic encephalopathy.[7-11]

Athletes with symptomatic EAH can present with mild, non-specific symptoms such as lightheadedness and nausea, but typically present with headache, vomiting, and/or altered mental status.[4] Severe EAH manifests as significant mental status changes, such as confusion, delirium, seizures, or coma resulting from cerebral edema (termed exercise-associated hyponatremic encephalopathy).[6] One study showed of 2,135 athletes from 8 endurance events running between 42.2 to 161 km[12], 1% symptomatic EAH (compared to 6% with asymptomatic EAH). Other studies have shown the incidence to be as low as 0.1% .[13,14] However, the incidence of symptomatic EAH has been reported to be as high as 23%[15] and 38%[16] of athletes seeking medical care in an Ironman Triathlon and in ultramarathon events,respectively.

While hypotheses suggest a chronic adaptive version of exertional hyponatremia, this PR will focus on treatment of acute EAH, defined as hyponatremia occurring during or up to 24 hours after physical activity.[4]

The diagnosis of EAH is contingent upon measurement of serum sodium. Availability of serum sodium testing is critical, especially in situations where incidence of EAH is higher, such as prolonged training evolutions, endurance racing events, etc.

When patients have suspected EAH, serum sodium testing should be obtained to confirm the diagnosis.[6] Alternative pathologies that mimic the symptoms of EAH should be excluded through close history and physical exam to include rectal temperature if at risk for heat injury (Grade 1C).[6] If EAH remains the leading diagnosis, empiric treatment of EAH according to the algorithm in the Figure is justified.

Clinical Management

Prevention

It is important to highlight the crucial role prevention plays in reducing the risk of developing EAH. The single, most important risk factor is sustained, excessive fluid intake (water, sports drinks, or other hypotonic fluids) in volumes greater than loss through sweat, respiratory, and renal water excretion so that a positive fluid balance accrues over time.[4,17,18] Other significant risk factors for EAH include high ambient temperature, longer exertion times, nonsteroidal anti-inflammatory drug use, and weight gain during exercise.[6] To avoid excessive hypotonic fluid consumption, athletes should be educated to "drink to thirst." This approach may counteract previous inappropriate hydration recommendations, such as "drink as much as possible," risk which can be compounded by the wide availability of fluids along event courses. Although unpublished and not meeting the definition of EAH, there have been documented cases of SMs hydrating excessively in preparation for intense activity and, thereby, inducing hyponatremia and developing altered mental status and seizure activity.

There is no role for the use of salt tablets for prevention of EAH. Studies have shown that when taken as prophylaxis, salt tablets do not significantly change the serum sodium or plasma volume.[22] Additionally, taking salt tablets before high-endurance activities can often cause unpleasant side effects, such as stomach cramps, nausea, vomiting, and can even lead to dehydration of intra-vascular volume due to osmotic shifts further compromising peak performance. While oral rehydration solutions are often hypertonic, the use of these as fluid-electrolyte replacement beverages is not warranted. Prevention of EAH is best accomplished when excess fluid consumption is avoided, rather than increasing sodium consumption to offset fluid overconsumption.

First and foremost, prevention of EAH is key, with education of event participants, support crews, and medical personnel playing a large role. Understanding proper hydration strategies, risk factors, and warning signs is critical. It is also critical for medical personnel to additionally be familiar with diagnosis and management of EAH, as symptoms of severe EAH may mimic those of other life-threatening causes of exertional collapse.

Initial Management

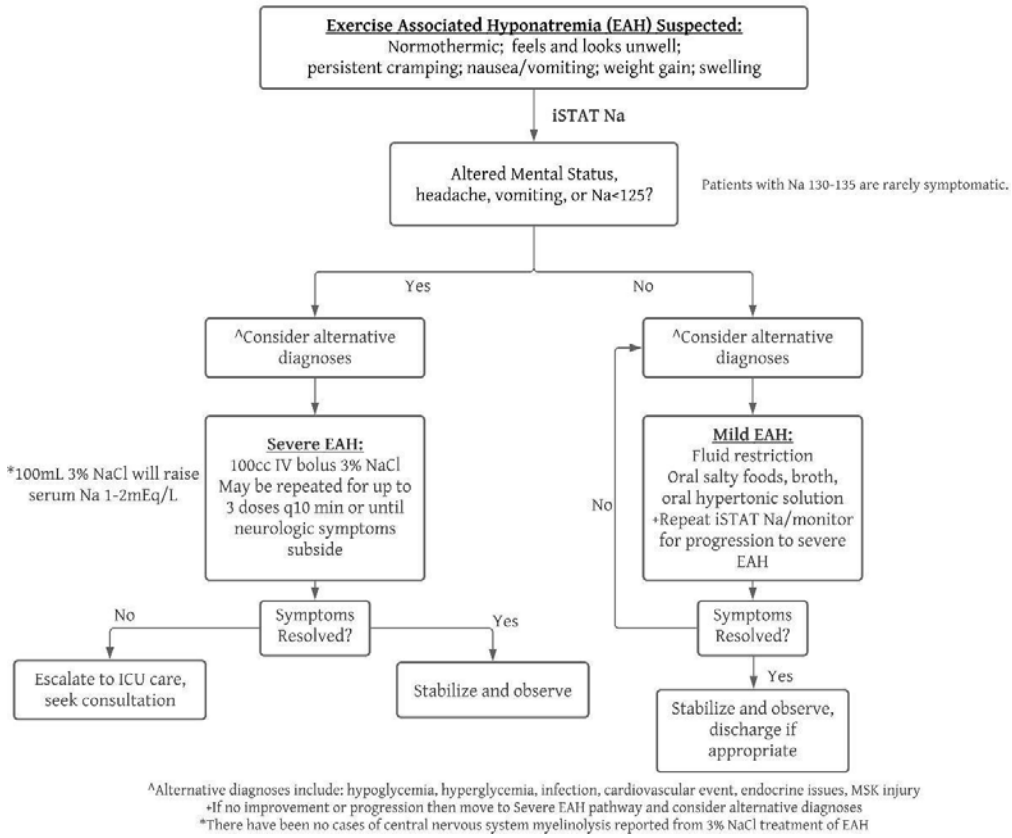
In EAH, disease severity typically coincides with both the rate and degree of sodium decrease from the athlete's baseline (Grade 1A).[4] Treatment should be based on presenting symptoms rather than the sheer sodium value. The algorithm for treatment of EAH is presented in the Figure.

Mild cases where athletes do not have signs or symptoms of alterations in mental status can be managed with oral fluid restriction and consumption of salty solids or hypertonic fluids such as broths (Grade 2B).

Acute, severely symptomatic exertional hyponatremia is a life-threatening emergency and should be treated as soon as the condition is identified. Use of 3% hypertonic saline should be employed to reduce the risk of brain edema and non-cardiogenic pulmonary edema (Grade 1B). Severe-range EAH or EAH resulting in symptoms of altered mental status should be treated with a 100mL bolus of 3% hypertonic saline (Grade 1A). This treatment can be repeated twice more at 10-minute intervals or until resolution of neurologic symptoms, whichever occurs first (Grade 1A).

If symptomatic EAH persists or worsens following the initial intervention with intravenous therapy (IV) hypertonic saline, current accepted treatment guidelines for acute symptomatic hyponatremia should be instituted, and the patient should be managed in an intensive or critical care setting with care provided or guided by a specialist familiar with this life threatening condition.[6, 19-21]

Figure. Algorithm for Treatment of EAH.



Return to Duty/Play Guidelines

There are no published standardized return to play guidelines after EAH; however, expert consensus opinion recommends the following before returning to full activity without restriction:

- No same day return to play/activity
- The patient should follow-up with a primary care or sports medicine physician.
- Serum sodium levels should be measured and returned to within normal limits (>135mmol/L).
- Return to full activity should follow a graded exercise protocol.
- Education on proper hydration strategies, risk factors, and warning signs should be provided to the patient to avoid the risk of suffering from EAH again.

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Potential Conflicts of Interest

The Authors declare no potential conflicts of interest.

External Peer-Review

N/A

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