INTRAVENOUS FLUIDS AND THEIR USE IN SPORT: A POSITION STATEMENT FROM THE AUSTRALIAN INSTITUTE OF SPORT

Dr Sam Pomroy, Dr Greg Lovell, Dr David Hughes, Dr Nicole Vlahovich
Australian Institute of Sport

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Intravenous (IV) fluid prescription in medicine mainly occurs within a hospital setting. The use, timing, type and volume of IV fluids, outside of a hospital setting has, however, evolved over recent decades. Changes have occurred because of the lessons learnt in operational requirements of military and emergency response teams. Medical practitioners working within the elite sporting environment are required to give consideration to the World Anti-Doping Code (WADC) which places limitations on the location, indications and rate of delivery of IV fluids and infusions.[1] Therapeutic Use Exemptions (TUE) can be granted for use of IV fluids with appropriate clinical justification.[1,2] There is little information in the medical literature to inform clinicians in the elite sport environment about the appropriate indications for IV fluid use in balancing the medical care of the athlete against the restrictions stipulated in the WADC. This position statement seeks to assist clinicians by providing evidence-based and ethically justified guidelines for the use of IV fluids in emergency situations in elite sport.

1. Physicians must be aware that IV fluid administration is not without risk or harm. There are potential adverse effects from IV fluid administration, including;
   - Complications at the injection site (infection, phlebitis and venous thrombosis)
   - Fluid and solute overload resulting in electrolyte abnormalities
   - Over-hydration
   - Congestive conditions (central and peripheral)
   - Acid base imbalances
   - Financial cost to administer IV fluids, which includes appropriate staffing and monitoring

2. Recommendations for the treatment of severe dehydration include;
   - Monitor clinical signs and symptoms (see Table 2) and consider measurement of plasma sodium and blood glucose
   - If IV rehydration is indicated, 10-20 mL/kg bolus of 0.9% sodium chloride initially and consider repeating these boluses until adequate haemodynamics are restored
   - Where severe exercise-associated hyponatremia (EAH) is present, manifesting in neurological impairment and inability to tolerate oral hypertonic salt broth, treat with IV hypertonic saline bolus of 100ml 3% Normal Saline, once low serum sodium levels are confirmed.
   - A TUE is required if IV fluids are used >100 mL/12 hours, outside of approved settings

Table 1: Clinical signs of dehydration

Symptom	Mild	Moderate	Severe
% wt. loss	3-5%	6-9%	>10%
Pulse	Full, normal rate	Rapid, thready	Very rapid and weak or absent
Respiration	Normal	Deep, may be increased	Deep, rapid or decreased
Systolic blood pressure	Normal	Normal to low	Low
Buccal mucosa	Normal	Dry	Parched
Eyes	Normal	Sunken	Markedly sunken
Skin turgor	Normal	Reduced	Tenting
Skin	Normal	Cool	Cool, mottled
Urine output	Decreased	Oliguria	Oliguria to anuria
Systemic signs	Increased thirst, alert	Listless, irritable	Lethargic, coma
Capillary refill	2 sec	2-4 sec	>4 sec, cool limbs

3. Recommendations for the treatment of heat syncope include;
   - Encourage oral fluids
   - IV fluids are not indicated for the management of heat syncope and therefore no TUE is required
   - If there is a failure to improve after 15-20 minutes, transfer to a medical facility for further investigation

Table 2: Simple strategies for the treatment of heat syncope

Move to shaded, cool area
Lay supine with feet elevated above head
Oral fluids once mentally alert
Fanning the athlete
Wet ice towels
Water spray
Remove excess clothing and equipment

4. Recommendations for the treatment of heat exhaustion include;
   - Associated with a core body temperature of elevated to 38.3-40°C
   - IV fluids should be considered in the setting of deteriorating mental status or persistent nausea or vomiting
   - If there is no rapid improvement following cooling strategies transfer immediately to hospital to exclude heat stroke
   - A TUE is required if IV fluids are used >100 mL/12 hours, outside of approved settings

5. Recommendations for the treatment of exertional heat stroke (EHS) include;
   - Affects multiple body systems in association with high core temperatures (> 40-40.5°C)
   - Aim to cool the patient first and transport second if appropriate medical staff and cooling strategies are present
   - IV hydration can be considered for circulatory support in EHS, however small boluses should be given
   - A TUE is required if IV fluids are used >100 mL/12 hours, outside of approved settings

6. Recommendations for the treatment of trauma in sport include;
   - When there is loss of the radial pulse (or central pulse in penetrating torso trauma), IV crystalloid boluses of 250 mL are recommended
   - Boluses are titrated to maintenance of a pulse
   - If a significant head injury exists, consider larger volumes to maintain cerebral perfusion pressure
   - Priority is to transport the patient to a trauma centre as soon as possible
   - A TUE is required if IV fluids are used >100 mL/12 hours, outside of approved settings

7. Recommendations for administration of medication by IV include;
   - Only utilised when there is a clear clinical indication for use of that medication
   - The IV medication should be checked against the WADA Prohibited List as it may require a TUE
   - If not prohibited but the volume of fluid required to deliver the medication is >100 mL in 12 hours, then a TUE is required where administration takes place outside of approved settings

This AIS position statement provides recommendations for physicians working in the elite sporting environment when considering use of intravenous fluids in adherence with the WADC guidelines. The current literature supports appropriate use of intravenous fluids to protect the health of athletes in specific clinical situations. Prioritising athlete health aligns with the WADC. Clinical scenarios within elite sport that warrant use of intravenous fluids include severe dehydration, exertional heat illness, trauma and administration of medications.

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@theAIS #theAIS

Leverrier Street Bruce ACT 2617
PO Box 176 Belconnen ACT 2616
+61 2 6214 1111