

## Letters to the Editor

### HYPERKALEMIA IN THE EMERGENCY DEPARTMENT: URGENT NEED FOR A RIGOROUS EVALUATION OF THE FIRST-LINE TREATMENTS



#### To the Editor:

We have read with great interest the article, “Controversies in Management of Hyperkalemia,” by Long et al. (1). The authors reviewed the classic treatments of hyperkalemia used in the emergency department (ED) and discussed controversies and new medications for management of hyperkalemia. Hyperkalemia is a common presentation in the ED (2). Severe hyperkalemia can impair cardiac function, with life-threatening consequences (3). First-line treatments redistribute potassium ions from the bloodstream into the cells with the aim to push away a life-threatening situation (4). The Investigator Network Initiative Cardiovascular and Renal Clinical Trialists reported that regular insulin with glucose alone, or nebulized  $\beta$ 2-agonist alone, or combination of regular insulin with glucose and nebulized  $\beta$ 2-agonist can be used to shift potassium intracellularly (5). However, robust evidence is lacking to guide the treatment of patients with hyperkalemia in the ED (6). What level of serum potassium constitutes a hyperkalemic emergency? What treatment should be started in the ED for what level of serum potassium?

To evaluate current strategies in the management of hyperkalemia in the ED, we performed a short survey that included 48 EDs in France. We questioned emergency physicians about their typical management of hyperkalemia in the ED. We used Google<sup>®</sup> Forms to create a survey with open-ended questions. The survey was sent to emergency physicians through the French Society of Emergency Medicine (Société Française de Médecine d’Urgence) and the regional associations of Emergency Medicine. Data were collated and analyzed using Microsoft Excel<sup>®</sup>. From January 2018 to April 2018, 399 emergency physicians answered the survey. First, we found that 46% of the physicians answered that they start a treatment in the ED in the case of hyperkalemia for a potassium level  $\geq 6$  mEq/L, 32% for a potassium level  $\geq 5.5$  mEq/L, and 22% for a potassium level  $\geq 5.0$  mEq/L. We then presented the case of a patient with a serum potassium level between 5.5 and 6 mEq/L without ketoacidosis and elec-

trocardiographic (ECG) changes. In this case, 44% of the emergency physicians answered that they plan to start a treatment with sodium polystyrene sulfonate alone, 21% a treatment combining sodium polystyrene sulfonate and insulin with glucose, and 8% a treatment combining sodium polystyrene sulfonate, and  $\beta$ 2-agonist. Of note, 5% did not start any medication. We also presented the case of a patient with a serum potassium level between 6 and 7 mEq/L without ketoacidosis or ECG changes. Here, 25% of the emergency physicians answered that they plan to start a treatment combining insulin with glucose and nebulized  $\beta$ 2-agonist, 18% a treatment combining sodium polystyrene sulfonate with insulin and glucose, and 10% a treatment with insulin with glucose alone. Interestingly, 8% planned to prescribe insulin and glucose with sodium polystyrene sulfonate, nebulized  $\beta$ 2-agonist, and sodium bicarbonate together.

Our short multicenter survey showed great variation in treatment of hyperkalemia without obvious rationale. However, treatment strategies are based largely on small studies that might explain such practice patterns (2,7). A rigorous evaluation of the first-line treatments of hyperkalemia in EDs is warranted to update recommendations for practice and define which treatments to prescribe in case of hyperkalemia in the ED.

---

*Acknowledgments*—We thank Pierre-Luc Maclot for his contribution in creating the survey.

Loic Lemoine, MD  
Department of Emergency Medicine  
Centre Hospitalier Universitaire Nantes  
Nantes, France

Tahar Chouihed, MD, PHD  
Department of Emergency Medicine  
University Hospital of Nancy  
Nancy, France  
Institut National de la Santé et de la Recherche Médicale  
Centre d’Investigations Cliniques 1433  
Institut National de la Santé et de la Recherche  
Médicale U1116  
Centre Hospitalier Universitaire Nancy  
Université de Lorraine  
Association Lorraine pour le Traitement de

l'Insuffisance Rénale  
French Clinical Research Infrastructure Network  
Investigator Network Initiative Cardiovascular and  
Renal Clinical Trialists  
Nancy, France

Matthieu Legrand, MD, PHD  
Department of Anesthesiologist Critical Care  
and Burn Unit  
St. Louis Hospital  
University of Paris  
Paris, France

Institut National de la Santé et de la Recherche Médicale  
French Clinical Research Infrastructure Network  
Investigator Network Initiative Cardiovascular and  
Renal Clinical Trialists  
Nancy, France

Patrick Rossignol, MD, PHD  
Institut National de la Santé et de la Recherche Médicale  
Centre d'Investigations Cliniques 1433  
Institut National de la Santé et de la  
Recherche Médicale U1116  
Centre Hospitalier Universitaire Nancy  
Université de Lorraine  
Association Lorraine pour le Traitement de  
l'Insuffisance Rénale  
French Clinical Research Infrastructure Network  
Investigator Network Initiative Cardiovascular and  
Renal Clinical Trialists  
Nancy, France

Gilles Potel, MD, PHD  
Emmanuel Montassier, MD, PHD  
Department of Emergency Medicine  
Centre Hospitalier Universitaire Nantes  
Nantes, France  
MiHAR Lab  
Université de Nantes  
Nantes, France

<http://dx.doi.org/10.1016/j.jemermed.2018.11.024>

## REFERENCES

1. Long B, Warix JR, Koyfman A. Controversies in management of hyperkalemia. *J Emerg Med* 2018;55:192–205.
2. Pfortmüller CA, Leichtle AB, Fiedler GM, Exadaktylos AK, Lindner G. Hyperkalemia in the emergency department: etiology, symptoms and outcome of a life threatening electrolyte disorder. *Eur J Intern Med* 2013;24:59–60.
3. Núñez J, Bayés-Genís A, Zannad F, Rossignol P, et al. Long-term potassium monitoring and dynamics in heart failure and risk of mortality. *Circulation* 2018;137:1320–30.

4. Elliott MJ, Ronksley PE, Clase CM, Ahmed SB, Hemmelgarn BR. Management of patients with acute hyperkalemia. *Can Med Assoc J* 2010;182:1631–5.
5. Rossignol P, Legrand M, Kosiborod M, et al. Emergency management of severe hyperkalemia: guideline for best practice and opportunities for the future. *Pharmacol Res* 2016; 113:585–91.
6. Hollander-Rodriguez JC, Calvert JF. Hyperkalemia. *Am Fam Physician* 2006;73:283–90.
7. Iqbal Z, Friedman EA. Preferred therapy of hyperkalemia in renal insufficiency: survey of nephrology training-program directors. *N Engl J Med* 1989;320:60–1.

**HYPERKALEMIA IN THE EMERGENCY DEPARTMENT: YES, A NEED FOR FURTHER EVIDENCE, BUT DO NOT DISCOUNT WHAT WE HAVE**



**To the Editor:**

We thank Dr. Lemoine and colleagues for their insightful Letter to the Editor regarding therapies in hyperkalemia. The authors of this letter discuss first-line therapies for transcellular shift and excretion of potassium and raise questions regarding the specific serum potassium level defining a hyperkalemic emergency, what therapies should be initiated in the emergency department (ED), and the specific serum potassium level at which treatment should be started. The authors of this letter also conducted a survey evaluating specific potassium treatment thresholds and therapies, finding significant variation in treatment thresholds and strategies. Such a study is an important contribution to the medical literature, and authors call for “a rigorous evaluation of the first-line treatments of hyperkalemia” in the ED.

Dr. Lemoine is correct in calling for further evidence regarding treatment of hyperkalemia, specifically at what level of serum potassium medical management is indicated. Potassium is an essential ion in cellular physiology, and elevated serum potassium levels can destabilize cardiac membranes and result in dysrhythmia and death (1–4). Classically, electrocardiogram (ECG) changes include peaked T waves, prolonged PR interval, widened QRS complex, loss of the P wave, a “sine wave” appearance, and asystole (5–7). However, providers should not rely on these “classic” findings, as discussed in our review, and patients can progress from sinus rhythm to ventricular fibrillation (5–8). No clear order of ECG changes has been found in animal models or, more importantly, the clinical setting. The sensitivity of ECG for hyperkalemia

---

Disclaimer: This letter does not reflect the views or opinions of the US government, Department of Defense, US Air Force, Brooke Army Medical Center, or San Antonio Uniformed Services Health Education Consortium Emergency Medicine Residency.