

## In response: neuraxial and peripheral misconnection events leading to wrong-route medication errors

To the Editor

We thank Dr Patel for calling attention to his very thoughtful and insightful reviews of neuraxial and potassium chloride administration errors.<sup>1-3</sup> We are pleased that his work complements and amplifies the results of our study.<sup>4</sup> Our literature search was performed using PubMed and Embase, which served as the primary sources for published references on misconnection events. To supplement this, we conducted an internet search strictly for related public access documents from regulatory bodies such as the Food and Drug Administration.

The reviews authored by Dr Patel and colleagues include multiple types of human errors, while our narrative review focused on one specific error: the misconnection of intravenous tubes and syringes. To that end, we specifically omitted wrong-route cases attributed to causes other than misconnection (eg, mislabeled medication containers) and included only reports of confirmed misconnection events that noted the name of the drug administered and the patient's health outcomes. It is of interest that in the case series of neuraxial potassium chloride administrations, approximately 50% of errors were the consequence of misconnections.<sup>1</sup> Administration errors that were not due strictly to misconnection events, even errors occurring during the perioperative period, were beyond the scope of our current review.

We agree with Dr Patel's assertion that there is a need for better scales to categorize incident harm in this context. Our goal in using the National Reporting and Learning System criteria<sup>5</sup> was not to specify which reports were representative of each level of severity, but rather to collectively describe which drugs have the

most severe outcomes when administered incorrectly. With regard to classifying harm, we focused on mortality because this is an unambiguous outcome and represents a 'never event'.

When assessing the efficacy of different safety preventions, forcing functions are at the top of the pyramid. The use of non-Luer neuraxial devices to prevent the misconnection of tubing and syringes falls into this most effective safety prevention category and cannot be defeated by human error. Although non-Luer devices will not prevent all administration errors, if universally adopted, these devices could have a substantial impact. Why do clinicians and health systems tolerate these events when there is a 'foolproof' solution that could reduce mortality due to intravenous medication administration errors by 50%?

Eugene Viscusi<sup>1</sup>, Vincent Hugo,<sup>2</sup>  
Klaus Hoerauf,<sup>3,4</sup> Frederick S Southwick<sup>5</sup>

<sup>1</sup>Department of Anesthesiology, Thomas Jefferson University, Philadelphia, Pennsylvania, USA

<sup>2</sup>Global Medical Affairs, Becton, Dickinson and Company, Franklin Lakes, New Jersey, USA

<sup>3</sup>Medical Affairs, Becton Dickinson and Company, Franklin Lakes, New Jersey, USA

<sup>4</sup>Department of Anesthesiology and Intensive Care Medicine, Medical University, Vienna, Austria

<sup>5</sup>Department of Medicine, University of Florida College of Medicine, Gainesville, Florida, USA

**Correspondence** to Dr Eugene Viscusi, Thomas Jefferson University, Philadelphia, PA 19107, USA; eugene.viscusi@jefferson.edu

**Contributors** All authors participated in the planning, preparation, and critical review of this letter and granted final approval for submission.

**Funding** This study was funded by Becton, Dickinson and Company. Assistance with manuscript preparation was provided to the authors by Sean Anderson, PhD, Peloton Advantage, LLC, an OPEN Health company, Parsippany, New Jersey, USA, and was sponsored by Becton, Dickinson and Company, Franklin Lakes, New Jersey, USA. No honoraria or other forms of payment were made for authorship.

**Competing interests** FS declares no conflicts of interest. VH and KH are employees of Becton, Dickinson and Company and own stock or stock options in the company. EV receives consulting fees from AcclRx, Concentric, Heron Therapeutics, Innacoll, Merck, Neumentum, Pfizer, Recro, Salix, and Trevena.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; internally peer reviewed.



### OPEN ACCESS

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, an indication of whether changes were made, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

© American Society of Regional Anesthesia & Pain Medicine 2021. Re-use permitted under CC BY-NC. No commercial re-use. Published by BMJ.



**To cite** Viscusi E, Hugo V, Hoerauf K, *et al*. *Reg Anesth Pain Med* Epub ahead of print: [please include Day Month Year]. doi:10.1136/rapm-2021-102672

Received 2 March 2021

Accepted 3 March 2021



► <http://dx.doi.org/10.1136/rapm-2021-102527>

*Reg Anesth Pain Med* 2021;0:1.  
doi:10.1136/rapm-2021-102672

### ORCID iD

Eugene Viscusi <http://orcid.org/0000-0003-0260-4396>

### REFERENCES

- Patel S, Dexter F. Case series of 28 neuraxial KCl administrations shows half the errors are not preventable by Nrfit [abstract a2042]. Annual Meeting of the American Society of Anesthesiologists, 2020.
- Patel S. Erroneous neuraxial administration of neuromuscular blocking drugs: clinical and human factors analysis. *Eur J Anaesthesiol* 2020;37:857-63.
- Patel S, Loveridge R. Obstetric neuraxial drug administration errors: a quantitative and qualitative analytical review. *Anesth Analg* 2015;121:1570-7.
- Viscusi ER, Hugo V, Hoerauf K, *et al*. Neuraxial and peripheral misconnection events leading to wrong-route medication errors: a comprehensive literature review. *Reg Anesth Pain Med* 2021;46:176-81.
- MacLennan AI, Smith AF. An analysis of critical incidents relevant to pediatric anesthesia reported to the UK national reporting and learning system, 2006-2008. *Paediatr Anaesth* 2011;21:841-7.