

Monitoring of drug-associated electrolyte disturbances in a hospital[†]

Nenad Zornic MD, MSc¹, Danijela Jovanovic Radojevic MD, MSc¹, Slobodan Jankovic MD, PhD²,
Dusan Djuric MD, PhD³, Mirjana Varjadic MD, PhD⁴, Viktorija Dragojevic Simic MD, PhD⁵
and Dragan R. Milovanovic MD, PhD^{2*}

¹Center for Anesthesiology, Clinical Centre, Kragujevac, Serbia

²Medical Faculty and Clinical Centre, Department of Basic and Clinical Pharmacology, Kragujevac, Serbia

³Medical Faculty, Department of Pharmacy, Kragujevac, Serbia

⁴Medical Faculty and Clinical Centre, Gynecology and Obstetrics Clinic, Kragujevac, Serbia

⁵Center for Clinical Pharmacology, Military Medical Academy, Belgrade, Serbia

SUMMARY

Purpose The aim of our study was to find drug-associated changes in serum levels of major electrolytes using clinical-event monitoring method.

Methods During 1-year period, electrolyte disturbances in serum samples from patients of Clinical Center Kragujevac, Serbia, were monitored in central biochemical facility. A sample of 982 patients was randomly selected from total population of 43 120 patients whose electrolyte serum levels were measured in the facility during the study period.

Results Clinically important drug-associated electrolyte disturbances were detected in 181 patient. There were 25 significant associations between the drugs and electrolyte values outside the reference range. However, only four causal connections were established: use of normal saline infusion with hypernatremia (OR 6.97, 95%CI 2.24–21.67), theophylline with acid–base disturbances (7.75, 1.46–41.02), polygeline infusion with decrease in bicarbonate levels (4.08, 1.42–11.73), and association of risperidone and hypocalcemia (4.10, 1.42–11.81).

Conclusion Although clinical-event monitoring method is far from optimal, it could quantify the known risks and provide evidence for credible hypothesis of drug adverse reactions, based on both relevant biological pathways and reasonable clinical thinking, as it was the case in our study. Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS — drug therapy; adverse effects; electrolyte; drug monitoring

Received 11 March 2009; Revised 4 May 2009; Accepted 24 June 2009

INTRODUCTION

Disturbances of major electrolytes are frequently encountered in hospitalized patients. In general, patients most commonly experience hyponatremia¹ and then, various changes in serum levels of potassium and magnesium, often accompanying each other.² Exact prevalence and consequences of these disturbances vary depending on particular analyte, direction, and magnitude of its change, particularly on clinical settings. For example, mild and moderate hyponatremia occurs in 15–22% and in 1–7% of subjects treated in hospitals, respectively,¹ and hyperkalemia in

3.3% of these.³ On the other hand, the prevalence is even higher in selected patient groups; hypermagnesemia was identified in 27% of hospital blood samples for which magnesium assay was requested, and 18% and 25% of them were accompanied by hyperkalemia and hyperphosphatemia, respectively.⁴

Electrolyte disturbances, particularly being of severe grades and if present in vulnerable populations, impose patients to additional health risks such as transfer to intensive-care unit and increase of mortality rate.⁵ In addition, they caused substantial economic burden. For example, in United States, about 3.2–6.1 million people annually have different grades of hyponatremia and, thus, direct costs of treatment was estimated at \$1.6–\$3.6 billion.⁶

Reports often associated the drugs with electrolyte disorders, but, generally, causal relationships were definitively proved in a limited number of such cases.⁷

*Correspondence to: Professor D. R. Milovanovic, Medical Faculty and Clinical Centre, Department of Basic and Clinical Pharmacology, Svetozara Markovica 69, PO Box 124, 34000 Kragujevac, Serbia. E-mail: piki@ptt.rs

[†]The authors have no conflict of interests that are directly relevant to content of this study.

