

# Hyponatremia is an Overlooked Sign of Trouble following Total Joint Arthroplasty

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## INTRODUCTION:

Hyponatremia is a common electrolyte abnormality in arthroplasty patients. However, these values are often overlooked by surgeons. There is currently a lack of institutional data evaluating the implications of sodium disturbances following total joint arthroplasty (TJA). This study aimed to 1) report the incidence of hyponatremia, and 2) examine the impact of postoperative hyponatremia as well as the change in sodium levels on the perioperative course of arthroplasty patients.

## METHODS:

This was a retrospective analysis of 3,071 primary and revision TJAs performed at a single institution between 2015 and 2017. Patients with at least one preoperative and postoperative serum sodium measurement were included. Based on preoperative and postoperative sodium values (pre-post), patients were classified into four groups: normonatremic-normonatremic (Group 1), normonatremic-hyponatremic (Group 2), hyponatremic-normonatremic (Group 3), and hyponatremic-hyponatremic (Group 4). Primary endpoints were length of stay (LOS), non-home discharge, 90-day complications, and readmissions.

## RESULTS:

The distribution of cases was: Group 1 (84.6%), Group 2 (9.4%), Group 3 (2.1%), and Group 4 (3.8%). Overall, 13.2% developed hyponatremia after TJA. Older age, hip arthroplasty, revision surgery, general anesthesia, Charlson Comorbidity Index, history of stroke, congestive heart failure, liver disease, and chronic kidney disease were risk factors for postoperative hyponatremia.

Group 4 had the highest rate of cardiovascular, neurological, genitourinary, septic, wound complications, and periprosthetic joint infection. Mortality rate was 2.6% in Group 4 compared to 0% in the other groups (p<0.001). Patients with postoperative hyponatremia (Group 2 and 4) had a greater likelihood of having a 90-day complication, non-home discharge, and greater LOS (**Table 1**). Similarly, a greater decrease in sodium level was also associated with poorer perioperative outcomes (**Table 2**).

## DISCUSSION AND CONCLUSION:

Postoperative hyponatremia was a relatively common occurrence in patients undergoing TJA, and was associated with increased complications, LOS, and non-home discharge. Surgeons should identify patients at risk of developing sodium abnormalities in order to optimize these patients and avoid increased resource utilization.

Figure 1. Forest plot demonstrating the Odds Ratio for representing any complication using group 1 as the reference.

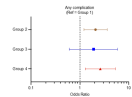


Figure 2. Forest plot demonstrating the Odds Ratio for representing non-home discharge using group 1 as the reference.

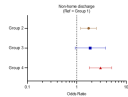


Figure 3. Forest plot demonstrating the Odds Ratio for representing 90-day readmission using group 1 as the reference.

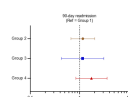


Table 1. Multivariable regression showing the association between each group and perioperative outcomes.

Outcome	Reference	Adjusted OR (95% CI)	p-value
Any complication*	1.00	1.20 (1.05-1.36)	<0.001
Group 2	1.00	1.20 (1.05-1.36)	<0.001
Group 3	1.00	1.10 (0.95-1.26)	0.008
Group 4	1.00	1.50 (1.25-1.75)	<0.001
Non-home discharge†	1.00	1.30 (1.15-1.45)	<0.001
Group 2	1.00	1.30 (1.15-1.45)	<0.001
Group 3	1.00	1.20 (1.05-1.35)	0.002
Group 4	1.00	1.60 (1.40-1.80)	<0.001
90-day readmission‡	1.00	1.40 (1.25-1.55)	<0.001
Group 2	1.00	1.40 (1.25-1.55)	<0.001
Group 3	1.00	1.30 (1.15-1.45)	0.001
Group 4	1.00	1.70 (1.50-1.90)	<0.001
Length of stay§	1.00	1.05 (1.02-1.08)	<0.001
Group 2	1.00	1.05 (1.02-1.08)	<0.001
Group 3	1.00	1.03 (1.00-1.06)	0.001
Group 4	1.00	1.10 (1.05-1.15)	<0.001
Mortality¶	1.00	1.00 (0.99-1.01)	0.001
Group 2	1.00	1.00 (0.99-1.01)	0.001
Group 3	1.00	1.00 (0.99-1.01)	0.001
Group 4	1.00	1.02 (1.01-1.03)	<0.001

Table 2. Multivariable regression showing the association between decrease in sodium (in a continuous variable) and perioperative outcomes.

Outcome	Reference	Adjusted OR (95% CI)	p-value
Any complication*	1.00	1.02 (1.01-1.03)	<0.001
Group 2	1.00	1.02 (1.01-1.03)	<0.001
Group 3	1.00	1.01 (1.00-1.02)	0.001
Group 4	1.00	1.03 (1.02-1.04)	<0.001
Non-home discharge†	1.00	1.01 (1.00-1.02)	0.001
Group 2	1.00	1.01 (1.00-1.02)	0.001
Group 3	1.00	1.00 (0.99-1.01)	0.001
Group 4	1.00	1.02 (1.01-1.03)	<0.001
90-day readmission‡	1.00	1.01 (1.00-1.02)	0.001
Group 2	1.00	1.01 (1.00-1.02)	0.001
Group 3	1.00	1.00 (0.99-1.01)	0.001
Group 4	1.00	1.02 (1.01-1.03)	<0.001
Length of stay§	1.00	1.01 (1.00-1.02)	0.001
Group 2	1.00	1.01 (1.00-1.02)	0.001
Group 3	1.00	1.00 (0.99-1.01)	0.001
Group 4	1.00	1.02 (1.01-1.03)	<0.001
Mortality¶	1.00	1.00 (0.99-1.01)	0.001
Group 2	1.00	1.00 (0.99-1.01)	0.001
Group 3	1.00	1.00 (0.99-1.01)	0.001
Group 4	1.00	1.01 (1.00-1.02)	<0.001

\*ORs are non-adjusted odds ratios with multivariable regression controlling for age, sex, BMI, ASA, CCI, comorbidity, hospital visit, operative time, regional anesthesia, depth of anesthesia, anesthesia type (general vs. spinal), bilateral procedure (isolated vs. bilateral), operated joint (hip vs. knee) and nonoperative type (primary vs. total).

†ORs are non-adjusted odds ratios with multivariable regression controlling for age, sex, BMI, ASA, CCI, comorbidity, hospital visit, operative time, regional anesthesia, depth of anesthesia, anesthesia type (general vs. spinal), bilateral procedure (isolated vs. bilateral), operated joint (hip vs. knee) and nonoperative type (primary vs. total).

‡ORs are non-adjusted odds ratios with multivariable regression controlling for age, sex, BMI, ASA, CCI, comorbidity, hospital visit, operative time, regional anesthesia, depth of anesthesia, anesthesia type (general vs. spinal), bilateral procedure (isolated vs. bilateral), operated joint (hip vs. knee) and nonoperative type (primary vs. total).

§ORs are non-adjusted odds ratios with multivariable regression controlling for age, sex, BMI, ASA, CCI, comorbidity, hospital visit, operative time, regional anesthesia, depth of anesthesia, anesthesia type (general vs. spinal), bilateral procedure (isolated vs. bilateral), operated joint (hip vs. knee) and nonoperative type (primary vs. total).

¶ORs are non-adjusted odds ratios with multivariable regression controlling for age, sex, BMI, ASA, CCI, comorbidity, hospital visit, operative time, regional anesthesia, depth of anesthesia, anesthesia type (general vs. spinal), bilateral procedure (isolated vs. bilateral), operated joint (hip vs. knee) and nonoperative type (primary vs. total).