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Efficacy of Sodium Polystyrene Sulfonate in Hyperkalemia

Rajandeep Kaur PharmD

Dustin D Linn PharmD, BCPS, BCCCP

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Rajandeep Kaur, PharmD Candidate
Dustin D. Linn, PharmD, BCPS, BCCCP
Manchester University College of Pharmacy, Natural & Health Sciences Fort Wayne, IN

BACKGROUND AND OBJECTIVE

Clinically significant hyperkalemia, defined as potassium ≥ 6.0 mEq/L can be a life-threatening, and urgent lowering of serum potassium is needed to prevent life-threatening arrhythmias. There are many potential causes of hyperkalemia including acute or chronic kidney disease, medications (e.g. ACE-inhibitors), and rhabdomyolysis among other causes. Patients with clinically significant hyperkalemia are managed with the following options:[1]

Goal of Therapy	Treatment Options
Protect against adverse CV consequences	Calcium Chloride or Calcium Gluconate
Intracellular redistribution of potassium	Insulin/Dextrose, Sodium Bicarbonate, Beta-agonists
Potassium Elimination	Loop diuretics, gastrointestinal cation exchange, hemodialysis

Sodium polystyrene sulfonate (SPS) is a cation-exchange resin that exchanges sodium for potassium in the colon. SPS was approved in 1958 before the FDA required evidence of efficacy and safety; therefore, compelling proof of its efficacy is lacking.[2] Two recent retrospective studies sought to evaluate the efficacy of SPS:

1. Hagan, et al. found an average reduction in potassium of 0.93 mEq/L at first re-check after SPS administration (average dose: 32.4 grams).[3]
2. Hunt, et al. found a median decrease in serum potassium of 0.8 mEq/L at a median of 14 hours post-SPS administration (15-30 grams) in patients with ESRD or CKD stage 4 or 5.[4]

The purpose of our study was to retrospectively evaluate the efficacy of SPS compared to usual care in patients with hyperkalemia while also accounting for the effect of concomitantly administered potassium-lowering therapies.

DESIGN AND METHODS

Inclusion Criteria
- Adult patients admitted to a Parkview Health facility between January 2013 and December 2018
- Serum potassium ≥ 6.0 mEq/L

Exclusion Criteria
- Patients were excluded if they had diabetic ketoacidosis, did not have a follow-up potassium level drawn, or had limitations of care in place

Data Collection
- Demographic data (age, gender, weight), presence of CKD or AKI
- Use of outpatient medications that may impact serum potassium (ACEI/ARB, loop diuretic, potassium-sparing diuretic, or potassium supplements)
- Receipt and dose of all potassium-lowering therapies

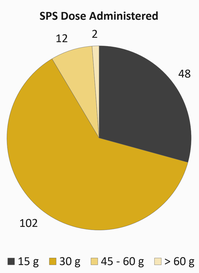
Primary Outcome
- Change from baseline to first potassium re-check in patients who received SPS and in patients who did not receive SPS

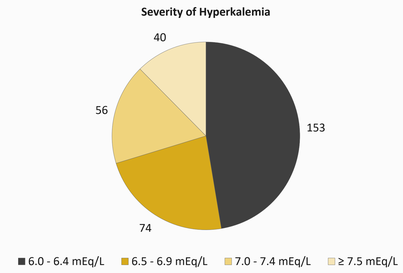
Statistical Analysis
- The student t-test was used to compare the change in serum potassium between study groups

Results

Baseline Characteristics

	SPS (n=159)	No SPS (n=164)
Age (years)	66.4	65.9
Weight (kg)	94.3	92.6
Potassium (mEq/L)	6.5 +/- 0.66	6.5 +/- 0.66
Bicarbonate (mEq/L)	21	23.6
Creatinine, median (mg/dL)	3.3	3.4
SPS Dose, median (mg)	30	-
Chronic Kidney Disease, #	78 (47.6%)	51 (32.1%)
End-Stage Renal Disease, #	10 (6.3%)	25 (15.2%)

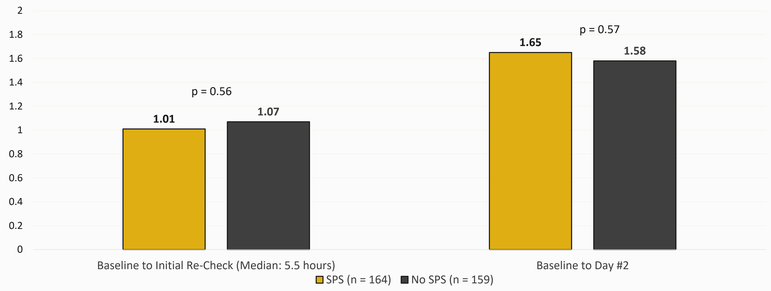




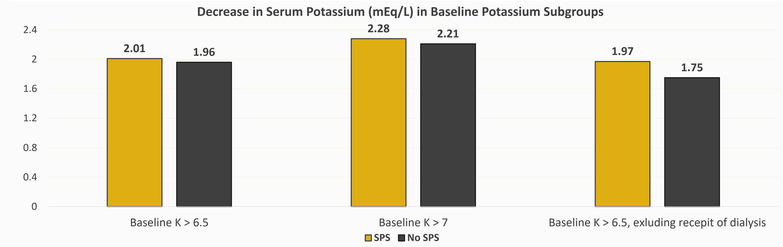
Other Potassium-Lowering Therapies

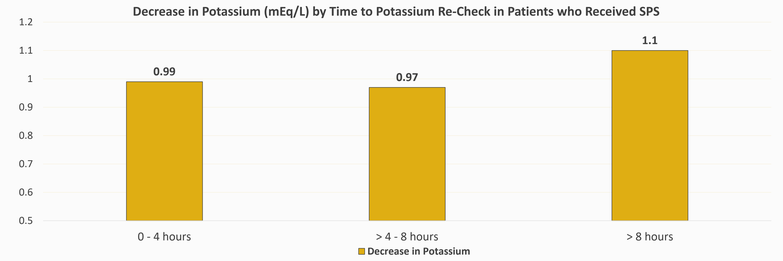
	SPS (n = 159)	No SPS (n = 164)
Insulin	72%	58.5%
Dose, median (units)	10	10
Sodium Bicarbonate	48.2%	42.8%
Dose, median (mEq)	50	50
Loop Diuretic	21.3%	11.9%
Dose, furosemide equivalent (mg)	40	40
Dialysis	9.8%	25.8%

Primary Outcome: Decrease in Serum Potassium from Baseline (mEq/L)



RESULTS





DISCUSSION

- No difference was found in the decrease of serum potassium between those who received SPS and those who did not, independent of the severity of hyperkalemia or time to potassium re-check.
- Use of other potassium-lowering therapies was slightly higher in patients who received SPS, suggesting that lack of efficacy of SPS in this study was not related to the use of these therapies.
- The time to initial potassium re-check may have been too short for SPS to have an impact (median: 5.5 hours); however, decrease in potassium was similar when potassium was re-checked 0 – 4 hours after SPS administration compared to > 8 hours after SPS administration.
- While we did not exclude patients who received dialysis from our primary analysis population, decrease in potassium was no different when patients who received dialysis were excluded due to more severe hyperkalemia (K > 6.5 mEq/L).
- Future studies should evaluate newer agents to acutely lower potassium levels, particularly sodium zirconium cyclosilicate which may have a faster onset of action.
- Future studies should evaluate if any potassium-lowering therapies or combinations of therapies are more effective than others at lowering serum potassium.

CONCLUSION

SPS does not lead to greater reductions in serum potassium compared to usual care in patients with hyperkalemia.

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