

BACKGROUND

- Hyperkalemia is a significant electrolyte abnormality and medical emergency that can be fatal with the onset of acute arrhythmias in severe cases.
- Common medications and diseases can predispose patients to hyperkalemia.
- There is currently no single preferred method for managing hyperkalemia.

OBJECTIVES

- To identify the most common medications used to treat hyperkalemia.
- To evaluate the effectiveness of the different medications ordered to treat hyperkalemia.
- To identify the frequency of home medications and disease states that predispose to hyperkalemia.

METHODS

Study Design:

- Retrospective, cross-sectional chart review.

Data Source:

- Data were collected from a 500-bed teaching hospital in Springfield, Illinois.

Study Population:

- Adults 18-89 years of age that were hospitalized and received at least one dose of a medication to treat hyperkalemia between 4/1/2017 and 4/1/2021.
- Medications considered: calcium chloride, calcium gluconate, sodium bicarbonate, sodium polystyrene sulfonate (SPS), sodium zirconium cyclosilicate (SZC), patiromer, loop diuretics, thiazide diuretics, albuterol, levalbuterol, and regular insulin.
- Exclusion Criteria:
 - Hospital length of stay <24 hours.
 - Receiving hospice or end-of-life care.
 - Did not obtain a repeat serum potassium level within 8 hours of drug administration.
 - Receiving scheduled dialysis.

METHODS

Study Measures: Dependent Variables

- Achieving a serum potassium level <5.5 mEq/L \leq 4 hours after drug administration or >4-8 hours after drug administration.
- Frequency of electrocardiogram (ECG) changes.

Study Measures: Independent Variables

- Demographic data
- Frequency of home medications or concomitant disease states that can predispose to hyperkalemia.
- Individual medications used to treat hyperkalemia that were ordered and administered.
- Frequency of ECG results within 24 hours of hyperkalemia presentation.
- Frequency of hyperkalemia protocol usage.

Analytical Strategy:

- Sample demographics, home medications, comorbidities, ECG abnormalities, protocol usage, and the total number of drugs used per patient were assessed using mean and frequencies.
- Chi-Squared and Fischer's Exact tests were used to evaluate if each medication resulted in achievement of serum potassium levels <5.5 mEq/L.

RESULTS

Table 1: Demographics

Final Sample (N) = 97
Sex, N, (%): Male: 50 (51.5%)
Age, mean, (SD) = 67.3 \pm 12.6 years
Weight, mean, (SD) = 89.6 \pm 24.7 kg
Baseline Serum Potassium, mean, (SD) = 6.7 \pm 0.6 mEq/L

Table 2: Home Medications and other Diseases

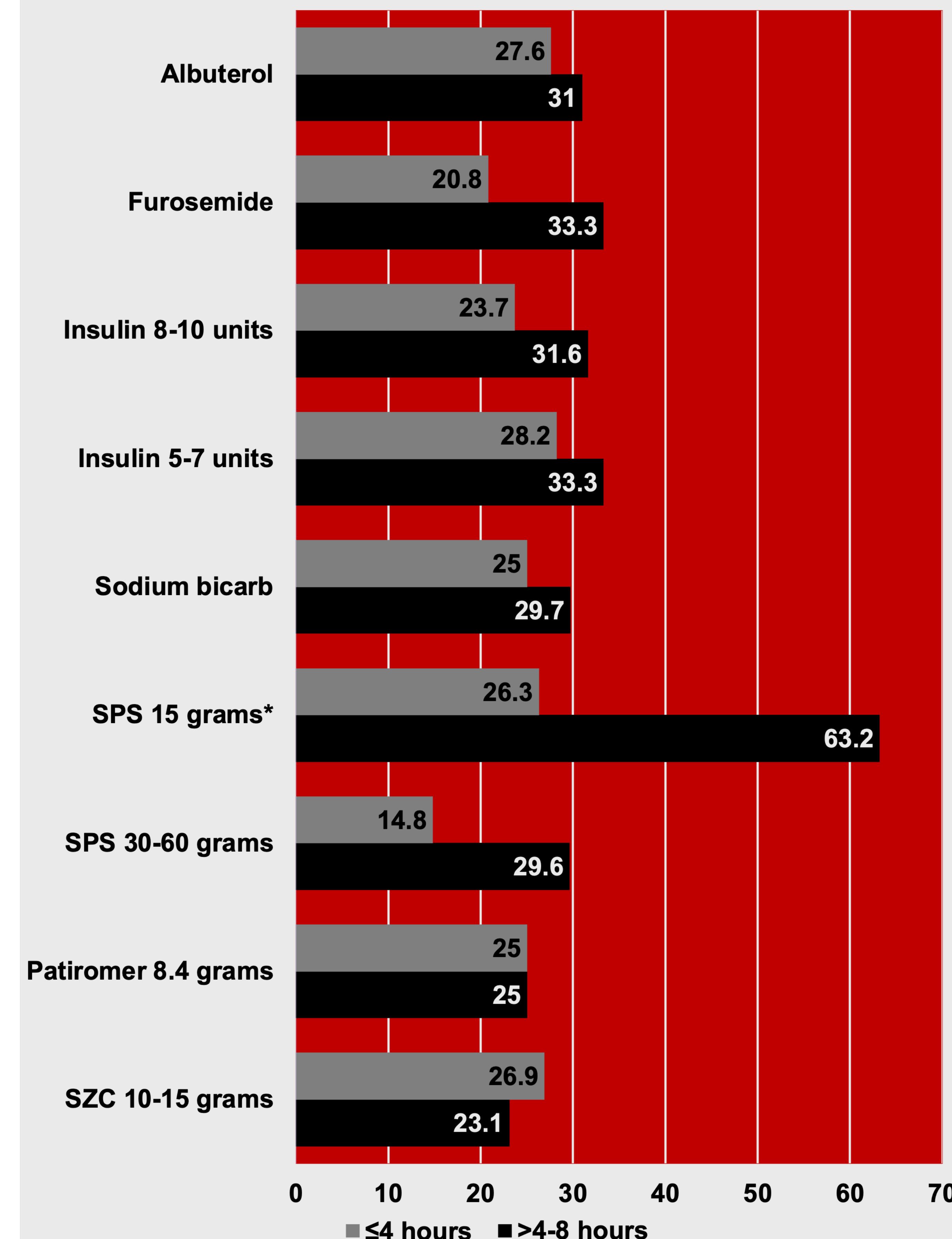
ACE-I/ARB, N, (%)	47 (48.5%)
Potassium supplement, N, (%)	29 (30.0%)
Trimethoprim, N, (%)	5 (5.2%)
Spironolactone, N, (%)	19 (19.6%)
NSAID, N, (%)	59 (60.8%)
Chronic Kidney Disease, N, (%)	48 (49.5%)
Acute Kidney Injury, N, (%)	53 (54.6%)
Heart Failure, N, (%)	24 (24.7%)
Diabetes Mellitus, N, (%)	57 (58.8%)

RESULTS

Table 3: Drugs Used Alone or in Combination

Albuterol, N, (%)	29 (29.9%)
Furosemide 20-80 mg, N, (%)	48 (49.5%)
Insulin regular 8-10 units, N, (%)	38 (39.2%)
Insulin regular 5-7 units, N, (%)	53 (54.6%)
Sodium bicarbonate 25-100 mEq, N, (%)	64 (66.0%)
SPS 15 g, N, (%)	19 (19.6%)
SPS 30-60 g, N, (%)	27 (27.8%)
Patiromer 8.4 g, N, (%)	4 (4.1%)
SZC 10-15 g, N, (%)	26 (26.8%)
Calcium gluconate, N, (%)	76 (78.4%)
Calcium chloride, N, (%)	6 (6.2%)

Figure 1: Serum Potassium Level <5.5 mEq/L (%)



Chi-squared test: *P = 0.001 (>4-8 hours time interval only)

RESULTS

Table 4: Sample Characteristics

ECG taken, N, (%) = 96 (99.0%)
ECG abnormality present, N, (%) = 85 (88.5%)
Protocol used, N, (%) = 80 (82.5%)
Drugs utilized per patient, mean, SD = 4.1 \pm 1.2

DISCUSSION

- Patients with comorbidities that can cause hyperkalemia should be assessed for appropriate discontinuation of hyperkalemia inducing medications considering the large proportion of patients that were on such medications in this study with comorbidities.
- Calcium should be considered in all cases of hyperkalemia with a serum potassium \geq 6 mEq/L at baseline considering the high frequency of ECG abnormalities observed.
- Results depicted in Figure 1 compare medication use within each timeframe but do not compare medication use between the two timeframes, so conclusions regarding the efficacy of medications within one timeframe against the other timeframe cannot be made.

LIMITATIONS

- The time of repeat serum potassium level collection varied among patients.
- Reported ECG abnormalities may not all be related to hyperkalemia.
- This study had a small sample size with several variables including drug, dose, route, and frequency of administered drugs.

CONCLUSION

- Calcium gluconate, sodium bicarbonate, insulin regular, and a potassium binder were each administered to more than half of all patients with hyperkalemia.
- Medication regimens containing SPS 15 g significantly achieved a serum potassium level <5.5 mEq/L in >4-8 hours.