Comparative Cost-Effectiveness Study of Hyperkalemia Management With Patiromer

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BACKGROUND

- Hyperkalemia (HK) is a serious condition and is associated with life-threatening cardiac arrhythmias and sudden death.[1,2]
- HK represents a common side effect of renin-angiotensin-aldosterone system inhibitor (RAASi) medications, which often limits their use.[1,2]
- HK has been shown to increase healthcare resource utilization (HRU) and cost for patients with cardiorenal conditions.[3]

OBJECTIVE

- To assess the cost-effectiveness of treating HK with patiromer (PAT) vs. without patiromer (NoPAT) in a Medicare Advantage population.

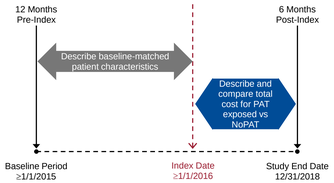
METHODS

- A retrospective, matched cohort study using a deidentified national commercial and Medicare Advantage claims database (Optum's de-identified Clinformatics® Datamart) from January 1, 2016 through December 31, 2018.
- Two cohorts were identified: PAT (exposed) and NoPAT (unexposed).
- Patient inclusion criteria were HK event (HKE) with potassium (K^+) ≥5.0 mEq/L; Medicare Advantage insurance; 6 months of continuous insurance coverage before index date; HK diagnosis within 12 months before index date.

Table 1. Study Population

	PAT Cohort	NoPAT Cohort
Unmatched HKE number	1111	226,282
Unmatched patients	1111	89,636
Matched patients	1002	1002

Figure 1. Study Schema



- Propensity score matching and coarsened exact matching (CEM) with baseline variables were used to identify the complete set of matching unexposed and exposed HK episodes. The matched population included 2004 total patients with 1002 matched patients in each cohort at the index date (PAT dispensed date or HK diagnosis date).
- Follow-up began on the index date and ended at the first censoring event (insurance disenrollment, death, study end date [12/31/18], sodium polystyrene sulfonate [SPS] or sodium zirconium cyclosilicate [SZC] initiation, PAT discontinuation [exposed only], or PAT initiation [NoPAT only]).
- Cost outcomes were measured at 6 months post-index: total, inpatient, emergency department (ED), outpatient services, and outpatient pharmacy (mean US$; confidence interval [CI] 95%). The study population included 300 total patients with 150 patients in each cohort at 6 months.

RESULTS

Table 2. Matched Patient Demographics (n=1002/cohort)*

Number of qualifying HKE per patient	Mean (SD)	Median (IQR)
NoPAT HKE	6.7 (5.9)	5 (2, 9)
PAT HKE	3.7 (3.9)	2 (1, 5)
Age	Mean (SD)	Median (IQR)
NoPAT HKE	74.1 (9.1)	74.5 (68.7, 80.7)
PAT HKE	74.4 (9.0)	74.5 (69.1, 81.2)
Gender, n (%)	NoPAT HKE	PAT HKE
Female	385 (38)	405 (40)
Male	617 (62)	597 (60)
Low income subsidy eligibility, n (%)	NoPAT HKE	PAT HKE
	391 (39)	**391 (39)**

*Bold numbers represent the variables that had CEM.
IQR, interquartile range; SD, standard deviation.

RESULTS

Table 3. Matched Baseline Comorbidities*

	Mean (SD)	Median (IQR)
NoPAT HKE	4.9 (2.2)	5 (3, 6)
PAT HKE	5.0 (2.2)	5 (3, 6)
	NoPAT HKE n (%)	PAT HKE n (%)
Chronic kidney disease	976 (97)	965 (96)
Diabetes mellitus	731 (73)	729 (73)
Coronary artery disease	450 (45)	442 (44)
Congestive heart failure	**346 (35)**	**346 (35)**
ESRD	102 (10)	112 (11)

Table 4. Matched Medications (12 Months Before Index Date)*

	NoPAT HKE n (%)	PAT HKE n (%)
ACEi	359 (36)	388 (39)
ARB	301 (30)	329 (33)
MRA	87 (9)	77 (8)
Continuous RAASi exposure 6 months before index date	**316 (32)**	**316 (32)**
Max RAASi dose	**238 (24)**	**238 (24)**
SPS	404 (40)	387 (39)
Loop diuretic	480 (48)	508 (51)
Beta blocker	395 (39)	398 (40)
Thiazide diuretic	210 (21)	218 (22)
NSAID	121 (12)	134 (13)
Cyclosporine/ tacrolimus	50 (5)	42 (4)

*Bold numbers represent the variables that had CEM.
ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin-receptor blocker; ESRD, end-stage renal disease; MRA, mineralocorticoid receptor antagonist; NSAID, nonsteroidal anti-inflammatory drug.

Table 5. Matched Baseline K^+ and eGFR Levels*

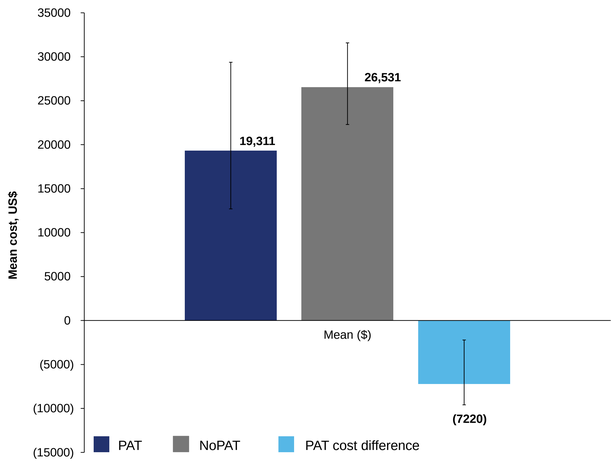
Baseline K^+, mEq/L	Mean (SD)	Median (IQR)
NoPAT HKE	**5.6 (0.4)**	**5.5 (5.3, 5.8)**
PAT HKE	**5.6 (0.4)**	**5.5 (5.3, 5.8)**
Baseline K^+ value mEq/L, n (%)	NoPAT HKE	PAT HKE
K^+ 5.0–<5.5	**389 (39)**	**389 (39)**
K^+ 5.5–<6.0	**471 (47)**	**471 (47)**
K^+ 6.0–<6.5	**114 (11)**	**114 (11)**
K^+ ≥6.5	**28 (3)**	**28 (3)**
eGFR within 12 months before index date, mL/min/1.73m^2	Mean (SD)	Median (IQR)
NoPAT HKE	35.6 (20.2)	31.4 (19.9, 48.3)
PAT HKE	36.3 (20.9)	31.2 (20.9, 47.2)
eGFR category mL/min/1.73m^2, n (%)	NoPAT HKE	PAT HKE
eGFR ≥90	15 (2)	27 (3)
eGFR 60–89	117 (12)	106 (11)
eGFR 30–59	394 (39)	401 (40)
eGFR 15–29	337 (34)	342 (34)
eGFR <15	139 (14)	126 (13)

*Bold numbers represent the variables that had CEM.
eGFR, estimated glomerular filtration rate.

Table 6. Matched Medical and Pharmacy Costs (1 Month and 12 Months Before Index Date)

Total medical costs: 1 month	Mean US$ (SD)	Median US$ (IQR)
NoPAT HKE	3453 (9288)	601 (271,1847)
PAT HKE	3248 (8467)	601 (269,1996)
Total medical costs: 12 months	Mean US$ (SD)	Median US$ (IQR)
NoPAT HKE	31,364 (55,624)	13,288 (4886, 34,952)
PAT HKE	33,563 (62,226)	13,437 (5249, 37,138)
Total drug costs: 1 month	Mean US$ (SD)	Median US$ (IQR)
NoPAT HKE	633 (1443)	208 (52, 689)
PAT HKE	778 (2192)	220 (49, 706)
Total drug costs: 12 months	Mean US$ (SD)	Median US$ (IQR)
NoPAT HKE	7031 (12,301)	3831 (1502, 8174)
PAT HKE	8592 (17,507)	4194 (1519, 8794)

Figure 2. Total Mean Costs PAT vs NoPAT at 6 Months (N=300) (*P*=0.012)



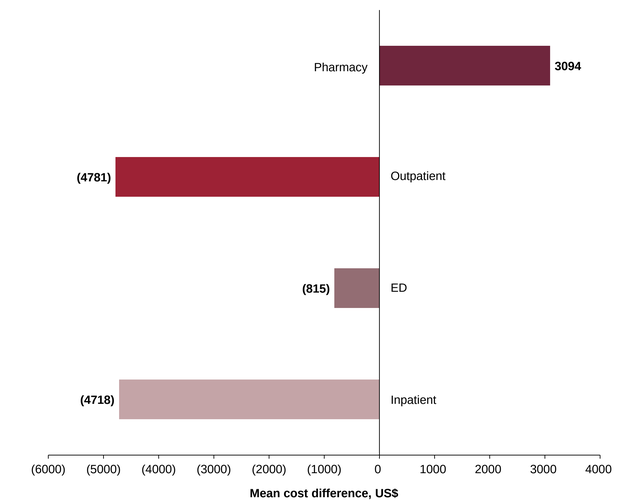
- Total mean costs showed that the PAT cohort produced a reduction of $7220 as compared with the NoPAT cohort at 6 months of continuous therapy. (**Figure 2**)

Table 7. Matched HRU (12 Months Before Index Date)

	NoPAT HKE n (%)	PAT HKE n (%)
Surgical claim	342 (34)	326 (33)
ED visit	356 (36)	333 (33)
Inpatient admission	313 (31)	312 (31)
SNF admission	68 (7)	65 (6)
HCP office visits	Mean (SD)	Median (IQR)
NoPAT HKE	10.3 (10.3)	9 (0, 16)
PAT HKE	9.6 (10.0)	8 (0, 15)
Total days in hospital (LOS)	Mean (SD)	Median (IQR)
NoPAT HKE	2.4 (5.9)	0 (0, 2)
PAT HKE	2.9 (7.3)	0 (0, 2)
Total days in SNF (LOS)	Mean (SD)	Median (IQR)
NoPAT HKE	1.5 (7.4)	0 (0, 0)
PAT HKE	1.4 (6.9)	0 (0, 0)

HCP, healthcare provider; LOS, length of stay; SNF, skilled nursing facility.

Figure 3. Patiromer Mean Cost Difference (Savings) by Category (6 Months)



- The PAT cohort showed an increase in total pharmacy costs, but that increase was offset by a greater overall reduction in medical costs (ie, inpatient, ED, and outpatient). (**Figure 3**)

LIMITATIONS

- This is an observational study; therefore, no causal claims can be made, only associations derived.
- We have assumed that patients are taking medications that are dispensed.

CONCLUSIONS

- For patients with hyperkalemia, a 27% reduction ($7220) in total mean costs at 6 months was observed for patients exposed to patiromer compared to patients who did not receive patiromer.
- With 6 months of continuous patiromer therapy, the reduction in total (mean) medical costs (ie, inpatient, outpatient, and ED services) exceeded the increased cost to the outpatient pharmacy budget.
- These results suggest that patiromer utilization may be a cost-effective therapy for the chronic management of hyperkalemia.
- Further studies are needed to confirm these results.

ACKNOWLEDGMENTS

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DISCLOSURES

SC reports consultant fees from Relypsa, Inc., a Vifor Pharma Group Company; **CGR** reports consultant fees from AbbVie, Halozyme, and Relypsa, Inc., a Vifor Pharma Group Company; **PJA** and **JF** report employment by Relysa, Inc., a Vifor Pharma Group Company, and stock in Vifor Pharma; **NRD** reports serving as a clinical investigator and receives consultant fees from Amgen, Boehringer Ingelheim, Cytokinetics, Novartis, SC Pharmaceuticals, and consultant fees from Relypsa, Inc., a Vifor Pharma Group Company.

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