

# Facility-level CKD-MBD Composite Score and Risk of Adverse Clinical Outcomes Among Patients on Hemodialysis

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## Introduction

- A recent epidemiologic study\* found that hemodialysis patients with  $\geq 2$  CKD-MBD biomarkers out of or above target ranges (PTH:  $<150/>600$  pg/mL; P:  $<3.5/>5.5$  mg/dL; Ca:  $<8.4/>10.2$  mg/dL) were at significantly higher risk of CV hospitalization or death relative to patients with none out of target.
- We examined whether patients in facilities with higher proportions of patients with  $\geq 2$  CKD-MBD biomarkers out of or above target are at higher risk of these outcomes.

\* Danese M, et al. Refining the definition of clinically important mineral and bone disorder in hemodialysis patients. *Nephrol Dial Transplant* (in press).

## Methods

- Data sources:
  - DaVita Clinical Data Warehouse
  - United States Renal Data System
- The study population was derived from the source population of all DaVita in-center hemodialysis facilities from September 1, 2009 through December 31, 2010.
- The baseline period was the first four consecutive months within the study period (i.e., September 1, 2009 through December 31, 2009).
- The index date was defined as the day following the end of the baseline period (i.e., January 1, 2010) while the 12 months following the index date (i.e., January 1, 2010 through December 31, 2010) was the study follow-up period.
- Dialysis facilities were included based on the following criteria:
  - 16 months of data (i.e., 4 months for baseline and 12 months for follow-up) during the study period.
  - Same ownership for at least one year prior to the index date.
  - At least 10 patients:
    - Aged  $\geq 18$  years
    - Hemodialysis  $\geq 1$  year
    - At the facility for the entire 4-month baseline period
    - Medicare A/B primary
    - At least one value for each of PTH, phosphorus, and calcium during the baseline period

## Methods

- Patients were considered out of or above target based on the following pre-defined target ranges during the 4-month baseline period: 150-600 pg/mL for PTH, 3.5-5.5 mg/dL for phosphorus, 8.4-10.2 mg/dL for calcium.
- Each facility was assigned a single CKD-MBD composite score, calculated as the proportion of patients at each facility with  $\geq 2$  CKD-MBD biomarkers out of target, and separately, above target range during the baseline period.
- Facilities were grouped into quintiles based on the CKD-MBD composite score distribution (lowest quintile assigned as the reference).
- Poisson regression using generalized estimating equations was used to examine the association between facility-level quintiles and CV hospitalization or death, and separately, parathyroidectomy (PTx), over a 1-year follow-up period, adjusting for case-mix differences across facilities. Patient-level PTH, phosphorus, and calcium were not included in the models.
- Patients were censored at transplant, loss to follow-up, modality change, facility change, and end of Medicare coverage.

## Results

- The study cohort included 39,085 patients who were receiving hemodialysis in 1,298 DaVita facilities.
- The median (25<sup>th</sup>, 75<sup>th</sup>) proportion of patients with  $\geq 2$  CKD-MBD biomarkers out of target was 0.16 (0.10, 0.22) and above target was 0.06 (0.02, 0.10).

Table 1

Quintile of Facility-Level Proportion of Patients with $\geq 2$ Biomarkers Out of Target Ranges	Quintile of Facility-Level Proportion of Patients with 2+ Biomarkers Out of Target Ranges					
	Overall	Q1: $<9.1\%$	Q2: 9.1-13.6%	Q3: 13.6-18.2%	Q4: 18.2-24.5%	Q5: $\geq 24.5\%$
Number of facilities	1298	253	259	243	283	260
Number of patients	39085	5984	7635	8515	9543	7408
Age, years (mean)	62.5	64.6	64.1	62.7	61.6	60.3
Gender						
Female	45.1	43.7	46.1	45.6	45.1	44.6
Male	54.9	56.4	53.9	54.4	54.9	55.4
Race						
White	51.1	56.2	57.7	50.0	49.2	44.0
Black	42.6	37.9	35.7	44.0	45.7	47.7
Other Race	6.3	5.9	6.5	6.0	5.0	8.3
Dialysis years (mean)	5.4	4.7	5.1	5.3	5.6	6.1
ESRD cause						
Diabetes	45.2	48.0	46.3	45.2	43.6	43.7
Hypertension	29.7	29.7	28.4	30.6	30.6	29.0
CN	9.7	7.9	10.0	9.2	10.1	11.0
Other cause	15.4	14.3	15.4	15.0	15.7	16.3
Comorbidities						
ASHD	42.1	46.0	45.5	41.2	40.5	38.5
CHF	48.5	49.8	50.6	48.4	47.5	46.4
CVA/TIA	17.5	18.1	17.8	18.1	17.0	16.4
PVD	36.3	37.8	37.9	35.9	35.1	35.6
Other cardiac disease	28.1	29.1	28.2	27.9	27.7	28.0
COPD	21.4	22.1	22.2	21.5	20.9	20.6
Dysrhythmia	25.3	26.4	27.9	25.1	24.7	23.0
Cancer	9.1	10.5	9.5	9.3	8.2	8.2
Diabetes	63.4	65.8	64.8	64.1	62.4	60.7
Previous PTx	0.7	0.4	0.5	0.7	0.7	1.1
Lab values (mean,SD)						
Phosphorus	5.3 (1.3)	5.1 (1.2)	5.2 (1.2)	5.3 (1.3)	5.3 (1.4)	5.4 (1.4)
Calcium	9.0 (0.6)	9.1 (0.5)	9.0 (0.5)	9.0 (0.5)	9.0 (0.6)	8.9 (0.7)
PTH	341 (320)	294 (221)	309 (255)	339 (309)	362 (358)	391 (392)

Figure 1. Distribution of proportion of patients out of target across facilities

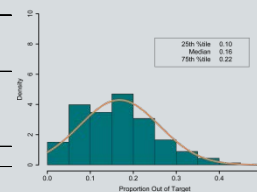


Figure 2. Distribution of proportion of patients above target across facilities

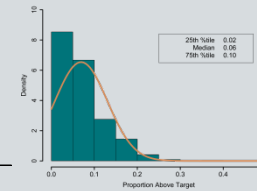


Figure 3. Adjusted Relative Risk of CV Hospitalization/Death

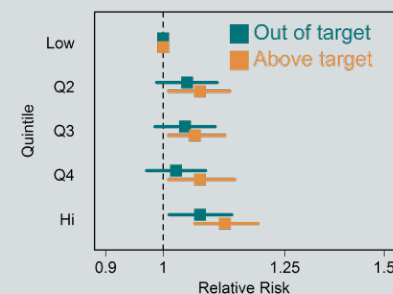
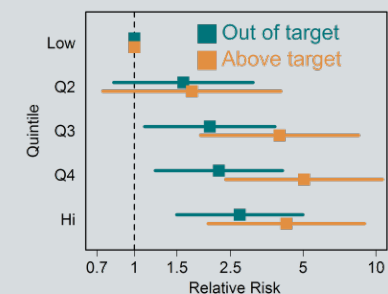


Figure 4. Adjusted Relative Risk of Parathyroidectomy



## Results

- Facilities in the higher quintiles of the CKD-MBD out of target composite score were more likely to have patients that were younger, Black, longer time on dialysis, history of PTx, and higher baseline PTH and phosphorus levels.
- Patterns of baseline characteristics by facility-level CKD-MBD above target composite score did not differ appreciably from those observed with the out of target composite score (data not shown).
- Patients receiving care in facilities in the middle and upper quintiles (highest out of or above target) were at significantly higher risk of CV hospitalization/death and PTx.
- The largest increase in risk was for patients receiving care in facilities with the highest proportion of patients with  $\geq 2$  biomarkers above target.

## Conclusions

- The CKD-MBD composite score offers an integrated approach to identifying event risk at the facility-level.
- The classification of at least 2 of 3 CKD-MBD biomarkers out of or above target ranges is discriminatory and may be a useful measure in assessing facility-level quality of care in managing patients with CKD-MBD.



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