Early Clinical Indicators of Renal Recovery or ESKD Transition in AKI-Dialysis Patients

DaVita Clinical Research

Scott Sibbel, PhD, MPH[1]; Claire Ryan, MSBA[1]; Carey Colson, MBA[1]; Cicely Gibson, RN, BSN[2]; Irina Goykhman, RN, BSN, MBA[2]; Francesca Tentori, MD, MS[1]; Steven Brunelli, MD, MSCE[1]

[1]DaVita Clinical Research, Minneapolis, Minnesota; [2]DaVita Inc., Denver, Colorado

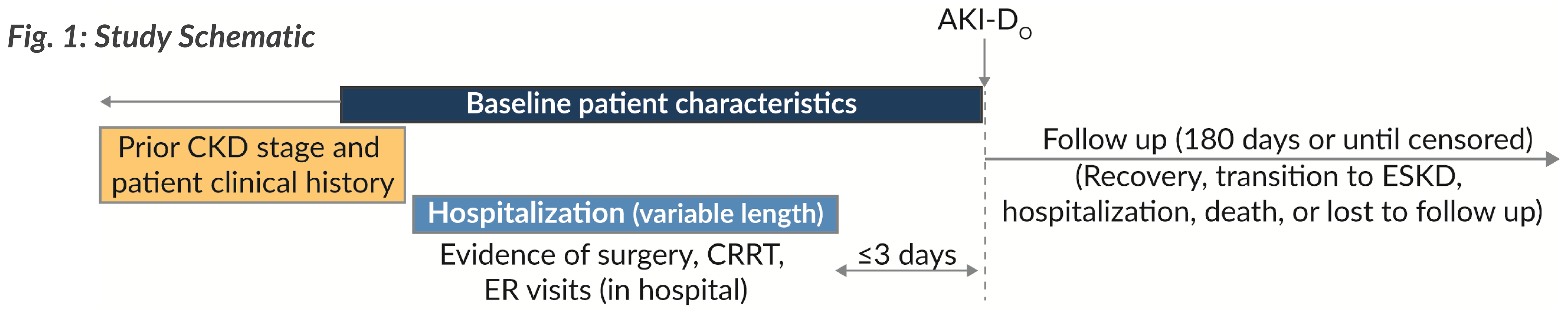
Introduction and Objective

- Following the 2017 Medicare Reimbursement changes, individuals with AKI that dialyze in the outpatient setting (AKI-D) are increasing in number.
- Models to predict renal recovery or transition to end-stage kidney disease (ESKD) in individuals with acute kidney injury (AKI) are in use worldwide. However, previous studies reporting factors impacting recovery were limited to the inpatient setting.
- There is likely little utility of these models for the existing AKI-D population for two reasons:
  1) In-hospital AKI patient characteristics are likely different than the smaller subset of patients that go on to become AKI-D, and
  2) the data available in hospital EHR systems are vastly different than US outpatient dialysis EHR systems.
- We sought to investigate which early indicators in individuals with AKI-D, those preceding or captured during hospitalization, predict the likelihood of an individual transitioning to ESKD or recovering.

Methods

- The following criteria were used to identify individuals who arrive at outpatient facilities for AKI-D:
  - Inclusion Criteria: Adult individuals with claims for in-hospital dialysis and an AKI-D diagnosis between 2017-2023 in Optum's® de-identified Integrated Claims-Clinical data set that links administrative claims and clinical data from providers across the continuum of care.[1] Amongst these patients, a course of outpatient dialysis within <3 days after discharge was identified.
  - Exclusion Criteria: Any previous dialysis treatment or ESKD diagnosis prior to the hospitalization event. ESKD diagnoses were not considered during the admit.
- Analytic Approach:
  - Identify individuals meeting In/Ex criteria in the Integrated data set.[1]
  - Dichotomize individuals into yes/no category based on kidney recovery patterns.
  - Describe these individuals based on observed clinical characteristics identified within the hospital stay and outpatient dialysis claims history.
  - Screen single variable associations for differences that might distinguish individuals as more/less likely to recover.
  - Find optimal segregation patterns for recovery vs. non-recovery for analyzed variables.

Fig. 1: Study Schematic



CKD, chronic kidney disease; CRRT, continuous renal replacement therapy; ER, emergency room

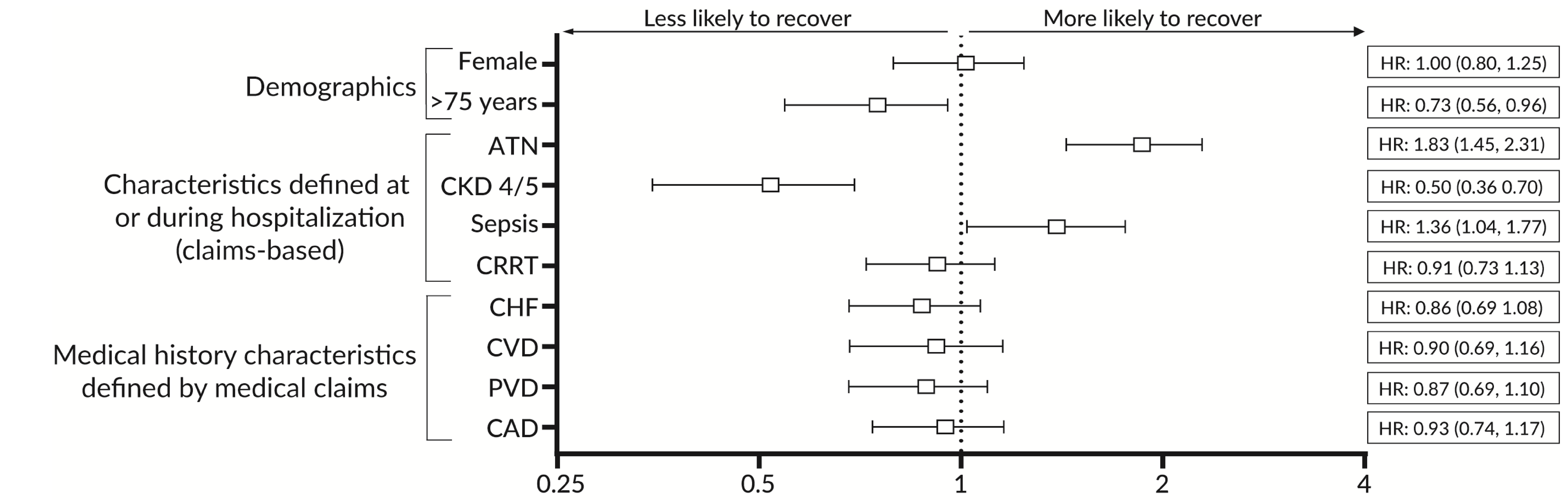
Results

Table 1: Patient Demographics, Characteristics defined at/during Hospitalization, and Claims-based Medical History

	Death, ESKD, or Censoring n=434	Recovery n=326	P value
Age, years, mean (SD)	68.4 (12.6)	63.7 (14.3)	<0.001
Female, n (%)	193 (44.7)	132 (40.5)	0.281
Race, n (%)			0.52
Black	61 (14.1)	41 (12.6)	
White	304 (70.0)	243 (74.5)	
Other/Unknown	69 (15.9)	42 (12.9)	
Length of Hospital Stay, days, mean (SD)	20.4 (15.2)	19.9 (14.7)	0.669
>30 Day Hospital Stay, n (%)	69 (15.9)	47 (14.4)	0.645
Primary Diagnosis of AKI on Admission, n (%)	152 (35.0)	92 (28.2)	0.056
AKI (any place on claim)			
Tubular Necrosis, n (%)	193 (44.5)	218 (66.9)	<0.001
Acute Cortical Necrosis, n (%)	NR	NR	NA
Medullary Necrosis, n (%)	NR	NR	NA
Other Acute Kidney Failure, n (%)	9 (2.1)	NR	NA
Acute Kidney Failure, unspecified, n (%)	253 (58.3)	120 (36.8)	<0.001
Intensive Care Unit Stay, n (%)	255 (58.8)	219 (67.2)	0.022
Continuous Renal Replacement Therapy, n (%)	257 (59.2)	179 (54.9)	0.265
Sepsis, n (%)	62 (14.3)	68 (20.9)	0.022
Surgery, n (%)	37 (8.5)	26 (8.0)	0.889
Prior Chronic Kidney Disease, n (%)			<0.001
Stage 3	115 (26.5)	57 (17.5)	
Stage 4 or 5	116 (26.7)	38 (11.6)	
None	203 (46.8)	231 (70.9)	
Prior Emergency Room Visit, n (%)	59 (13.6)	40 (12.3)	0.669
Congestive Heart Failure, n (%)	217 (50.0)	127 (39.0)	0.003
Cardiovascular Disease, n (%)	124 (28.6)	74 (22.7)	0.082
Peripheral Vascular Disease, n (%)	190 (43.8)	101 (31.0)	<0.001
Coronary Artery Disease, n (%)	214 (49.3)	128 (39.3)	0.007
Myocardial Infarction, n (%)	50 (11.5)	44 (13.5)	0.479
Diabetes, n (%)	269 (62.0)	182 (55.8)	0.102

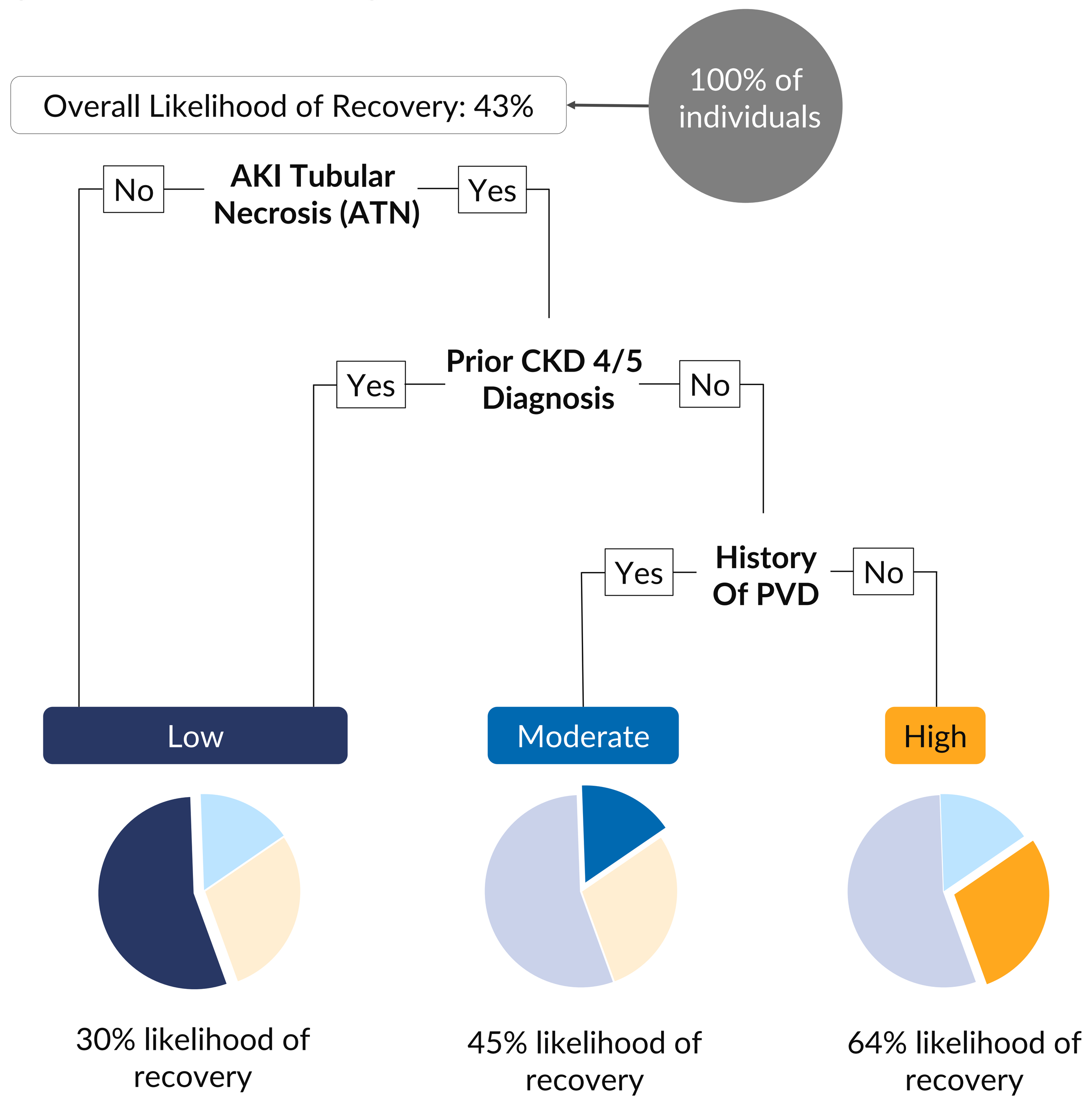
NR, not reportable

Figure 2. Hazard Ratios for Candidate Predictors (Claims-Based) of Recovery



ATN, acute tubular necrosis; CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; CRRT, continuous renal replacement therapy; CVD, cardiovascular disease; ER, emergency room; ICU, intensive care unit; PVD, peripheral vascular disease

Figure 3. Individual Segmentation for AKI-D Recovery



Pie chart shows the proportion of patients in each recovery type.

Conclusions

- When considered together, three attributes of an individual's medical history and diagnoses can be used to reasonably predict which individuals will recover in the outpatient dialysis setting.
  - These attributes include: the presence or absence of ATN upon hospitalization, a CKD 4/5 diagnosis prior to hospitalization, and a history of PVD, or lack thereof.
  - Using these 3 criteria, around 30% of the population would have a high likelihood (~64%) of recovery vs. the rest of population (~30%).
- However, better data collection strategies (real-time vs. retrospective data collection), model testing, and validation are necessary to ensure validity.

Limitations

- The data is retrospective and gathered from diagnostic codes of patient medical claims.
- The current proposed algorithm will require prospective testing/external validation in separate data sets to ensure external validity.
  - Additional sample size and algorithm development/testing could enable more performance, or a revision to a clinically appropriate/feasible approach for clinical prognosis.

References and Acknowledgements

1. Optum's de-identified Integrated Claims-Clinical dataset (The Integrated data set)

We extend our sincere appreciation to the teammates in more than 2,000 DaVita clinics who work every day to take care of patients and to ensure the extensive data collection on which our work is based. We specifically acknowledge Kathryn Husarek of DaVita Clinical Research for editorial contributions in preparing this poster.

Correspondence: Scott.Sibbel@davita.com

Presented at ASN Annual Meeting 2024 Kidney Week, San Diego, CA