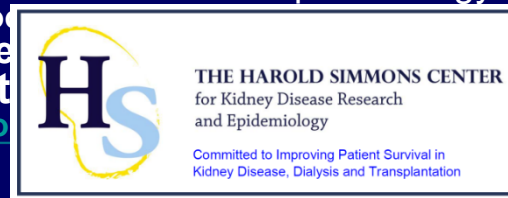


# The USRDS Special Study Center: Transition of Care in CKD Prelude to Dialysis: Trends and Timely Transitions

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## Disclosure of Financial Relationships

Kamyar Kalantar-Zadeh, MD, MPH, PhD

Alphabetical order:

**Abbott**: Grant, Speaker bureau  
**Alexion**: consultation  
**Amgen**: Advisory Board, Speaker bureau  
**DaVita**: grant, medical directorship  
**Fresenius**: Speaker, Consultant  
**Genzyme/Sanofi**: Consultant, proctorship  
**NKF**: Grants, advisory boards  
**NIH**: Study sections, grants  
**Otsuka**: Speaker bureau, consultation  
**Shire**: Speaker bureau, consultation  
**Vifor**: consultation

# **Educational Objectives: Prelude to Dialysis: Trends and Timely Transitions**

- To provide highlights of key concepts and Objectives of the Transition of Care in CKD (TC-CKD) Special Study Center of the United States Renal Data System (USRDS)
- Updates from recently published Annual Data Report (ADR) chapters, covering key topics and innovations such as national data of all veteran who transition to ESRD each year since 2007, and similar data from Kaiser Permanente of Southern California.
- Review data on the impact of pre-ESRD prelude on post-ESRD outcomes, prelude trends towards ESRD, high mortality during the first months upon transition to ESRD, comparing morbidities and hospitalization during prelude and upon transition to ESRD,

## Pre-/Post- Questions

- **Question 1**: Among the 110,000 to 120,000 people who initiate maintenance dialysis therapy in the USA each year, what proportion are veterans (usually receiving general care in a Veterans Affairs medical center and clinics)?
- A. 1 to 2% (approx. 2,000 veterans)
- B. 5 to 6% (approx. 6,000 veterans)
- C. 10 to 12% (approx. 13,000 veterans)
- D. Almost 50% (approx. 50,000 veterans)
- 
- **Answer: C**
- **Rationale:** *USRDS data on Transition of Care in CKD have shown constantly that over the past several years since 2007, each year approximately 13,000 veterans transition to ESRD, mostly to maintenance dialysis therapy, making this 10 to 12% of the entire national ESRD incident population.*
- This question meets the objectives of reviewing/highlighting the national data of all veteran who transition to ESRD each year since 2007.

## Pre-/Post- Questions

- **Question 2**: What statement is true about the very high mortality in the first several month upon transition to dialysis?
- A. In the first 3 months of dialysis therapy the *annualized* mortality can reach as high as 40 to 50%.
- B. The very high first-3-month mortality is seen only in non-veterans patients.
- C. The very high first-3-month mortality is seen only in veterans who are dialyzed in a VA hospital based dialysis unit.
- D. The very high first-3-month mortality is seen only in the for-profit dialysis centers.
- 
- ***Answer: A***
- ***Rationale***: *USRDS data on Transition of Care in CKD have shown that the annualized first-3-month mortality approaches 40%-50%, if the monthly rate is annualized for the entire year, and that this very high mortality rate is seen universally in all hemodialysis patents, be it veterans or non-veterans, and in any dialysis clinic setting, be it a VA dialysis unit or a for-profit dialysis unit.*
- This question meets the objectives of reviewing/highlighting the high mortality during the first months upon transition to ESRD.

## Pre-/Post- Questions

- **Question 3**: Which of the following are examples of “transition” of care in CKD?
- A. Transition from non-dialysis dependent CKD to in-center thrice-weekly maintenance hemodialysis therapy.
- B. Transition from maintenance hemodialysis to kidney transplantation.
- C. Transition from functioning (non-dialysis dependent) kidney transplant recipient to maintenance hemodialysis therapy.
- D. Withdrawal from dialysis therapy after 3 years of maintenance hemodialysis.
- E. All of the above
- 
- ***Answer: E***
- ***Rationale***: *Transition of kidney care among CKD patients happen frequently and in different formats, and A to D are all examples of these transitions.*
- This question meets the objectives of providing highlights of key concepts and objectives of the Transition of Care in CKD

# Pre-/Post- Questions

- **Question 4:** Which of the following are the CKD periods with least amount of data in the old USRDS reports prior to 2014?
- A. Prelude time, i.e., the period of time prior to transition from non-dialysis CKD to ESRD
- B. Transition to ESRD and the first 3 months after transition
- C. ESRD prevalent time after 3 months of therapy.
- D. Period of time after kidney transplantation
- 
- **Answer: A**
- **Rationale:** *The USRDS has traditionally had no data during the prelude period, i.e. the time prior to ESRD transition. The Transition of Care in CKD (TC-CKD) Special Study Center has provided data for the first time about this period of CKD care as patients progress towards ESRD. The first 3 months of ESRD have been well reviewed, so are the time after 3 months of dialysis and the transplant time, which have all been well presented in annual USRDS reports.*
- This question meets the objectives of introducing the Transition of Care in CKD (TC-CKD) Special Study Center of the United States Renal Data System (USRDS) and the impact of pre-ESRD prelude on post-ESRD outcomes and prelude trends towards ESRD.

**The United States Renal Data System  
(USRDS)  
Special Study Center**

***Transition of Care in CKD  
(TC-CKD)***

**NIH, NIDDK, KUH**  
U01-DK102163 2014-2019

- (1) University of California Irvine School of Medicine**  
Harold Simmons Center for Kidney Disease Research & Epidemiology  
UC Irvine Medical Center, Orange, CA  
VA Long Beach Healthcare System, Long Beach, CA
- (2) University of Tennessee Health Sciences Center**  
VA Memphis Healthcare System, Memphis, TN
- (3) Dept. Research, Kaiser Permanente of Southern California,**  
Pasadena, CA



# USRDS Special Study center (SCC) Transition of Care in CKD (TC-CKD)

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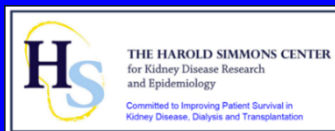
- **Elani Streja, MPH, PhD**, VA Long Beach Healthcare System, Long Beach, CA
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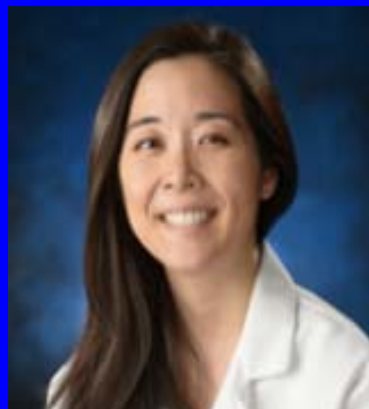


# Transition of Care in CKD (TC-CKD) Team at UC Irvine and VA Long Beach

U01 DK102163



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**Kam Kalantar-Zadeh, MD,  
MPH, PhD (UCSF, UCLA)**



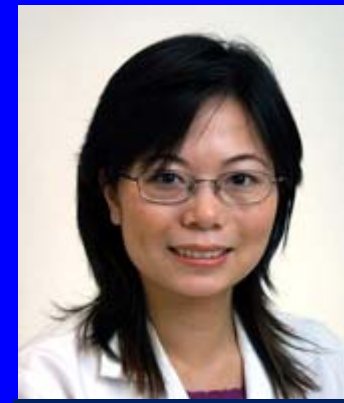
**Yoshi. Obi, MD  
(Osaka)**



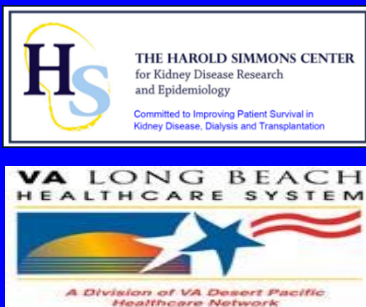
**Daniel Gillen, PhD**



**Dahn Nguyen, PhD**

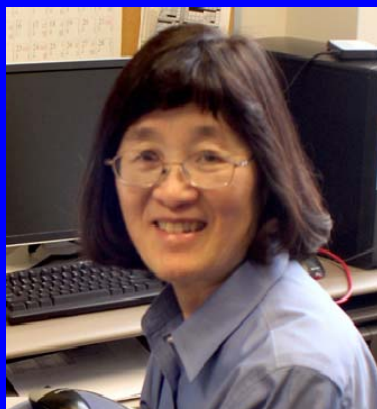


**Joline Chen, MD,  
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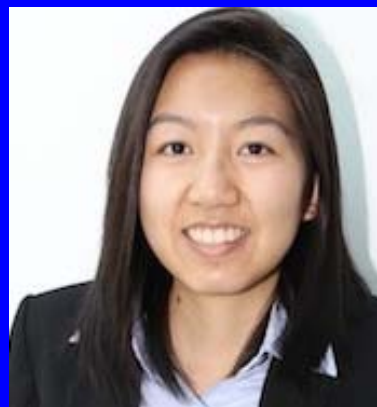


# Transition of Care in Chronic Kidney Disease (TC-CKD) U01 DK102163

## UC Irvine & VA Long Beach Project Team



**Jennie Jing, MSc**



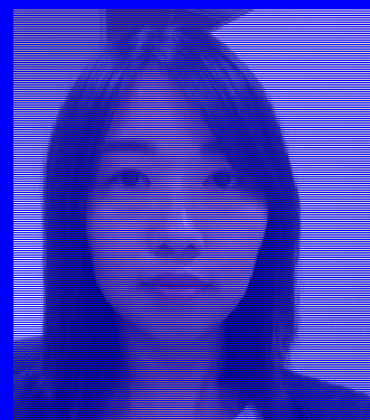
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**Vanessa Ravel, MPH**



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Csaba P. Kovesdy,  
MD  
Principal Investigator



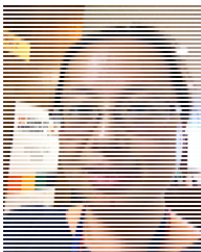
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**University of Tennessee Health Science Center  
Memphis VA Medical Center  
Memphis, TN**



# USRDS TC-CKD Team at KPSC

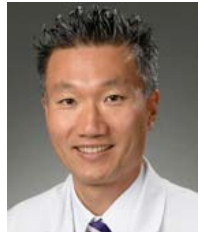
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Biostatistician /  
Analyst



John J. Sim, MD  
Principal Investigator



Hui X. Zhou, PhD  
Biostatistician /  
Analyst



Shayna L. Henry, PhD  
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David K. Yi, MPH  
Programmer



Jose R. Pio,  
MD, MPH  
Research Project Manager



# Transition of Care in CKD: BACKGROUND & HYPOTHESES:

- In patients with very late stage non-dialysis dependent (NDD) CKD (**eGFR <25** ml/min /1.73 m<sup>2</sup>) the optimal **transition** of care to **kidney replacement therapy (KRT**, i.e., dialysis or transplantation) is not known.

Klahr et al, *NEJM* 1994

Kalantar-Zadeh et al, *NDT* 2016 [in press]

KRT: kidney replacement therapy

# **~110,000 Americans TRANSITION to Dialysis Each Year (including 13,000 veterans)**

## **Historical Background:**

In 1973 the US Congress extended Medicare coverage to all persons under age 65 suffering from ESRD (End-Stage Renal Disease), i.e. individuals who cannot survive without kidney dialysis treatment, to cover all costs related to their dialysis Rx.

The intent of this law (PL 92-603, the Social Security Amendments of 1972) was to allow all Americans access to an emerging and very expensive technology, regardless of their ability to pay.



**The effectiveness of the ESRD program:**

**No Kidney Function = No Life**

**→ Dialysis = Life (?)**

# transition

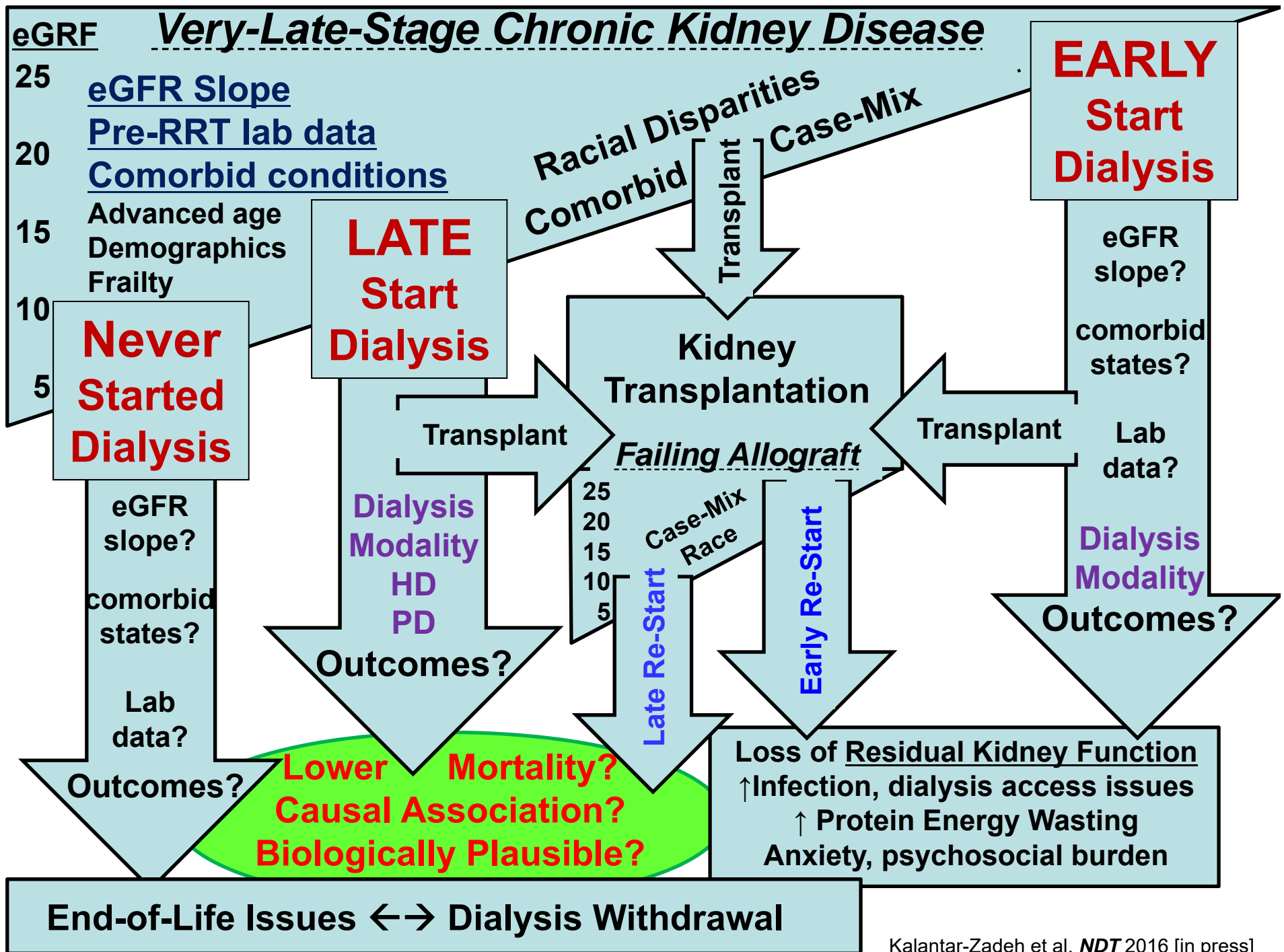
- [tran-zish-uh n, -sish-]
- noun 1. *movement, passage, or change from one position, state, stage, subject, concept, etc., to another;*
- “the transition from adolescence to adulthood.”

– Dictionary.com

# start

- [stɑrt]
- 1. to begin or set out, as on a journey or activity.
- 2. to appear or come suddenly into action, life, view, etc.; rise or issue suddenly forth.
- 3. to spring, move, or dart suddenly from a position or place: The rabbit started from the bush.
- 4. to be among the entrants in a race or the initial participants in a game or contest.
- 5. to give a sudden, involuntary jerk, jump, or twitch, as from a shock of surprise, alarm, or pain: The sudden clap of thunder caused everyone to start.





# Questions re *Transition of Care in CKD:* *Impact of pre-transition conditions?*

Major uncertainty and significant knowledge gaps have persisted pertaining to differential or individualized transition of care across different pre-KRT categories of **age** and **race** and **demographics** and **comorbid** conditions and events in the following areas:

1. The best **timing** for KRT initiation (early vs. late?)
2. The optimal **KRT type** (dialysis vs. transplant);  
and in case of dialysis:
  - a) Best **modality** (hemodialysis, HD, vs. peritoneal dialysis, PD)
  - b) **Format** (in-center vs. home)
  - c) **Frequency** (daily vs. thrice-weekly vs. infrequent e.g. 2x/week)
  - d) Vascular **access preparation** (preemptive arteriovenous [AV] fistula; PD catheter placement vs. no access preparation)
3. The post-KRT impact of pre-transition conditions and events
4. The impact of pre-KRT conditions on end-of-life care and decision-making (**deferring**, **interrupting** or complete **withdrawal** of KRT).

KRT: kidney replacement therapy

# Challenges of Transition Period from NDD to ESRD

1. Higher mortality
2. Higher costs
3. Best timing?
4. Transition of elderly to ESRD
5. Transition across race/ethnicity
6. Residual kidney function
7. Best format? Incremental vs. abrupt

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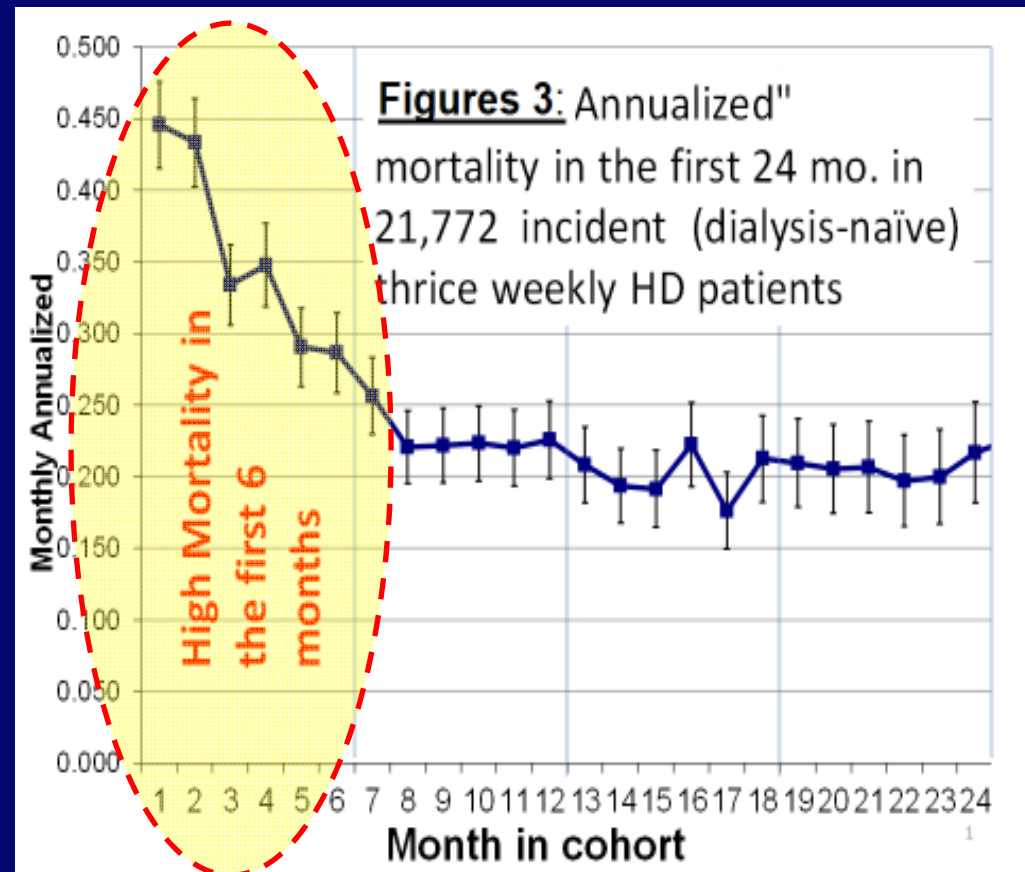
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# Challenges of the CKD Transition

The first 3-6 months of dialysis or transplantation is associated with an even higher risk of death compared to prevalent dialysis patients.

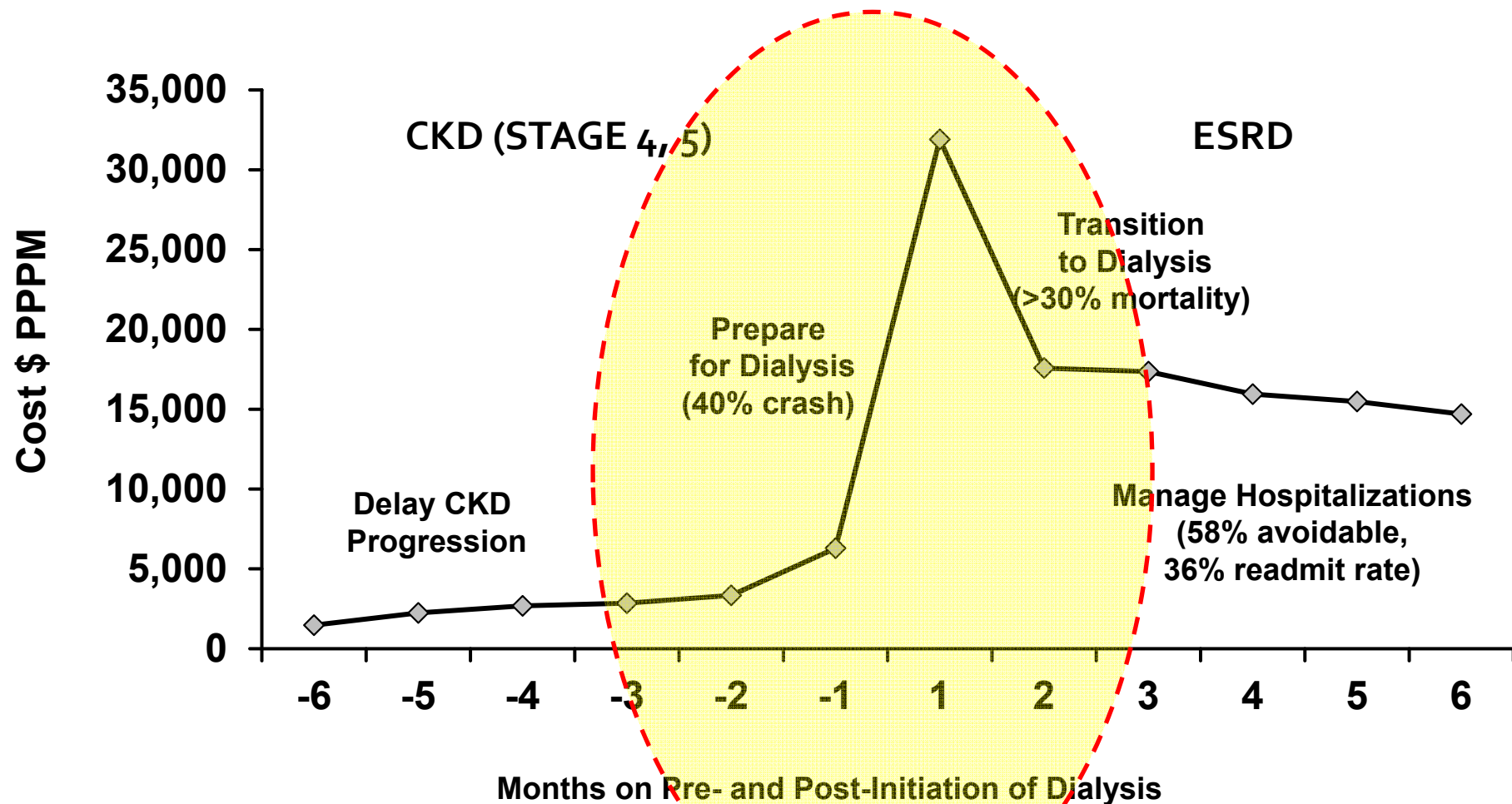


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# Costs of CKD to ESRD Transition

AVERAGE \$PPPM COST THROUGH TRANSITION TO DIALYSIS



For Commercial member; based on MarketScan data, from 2010 USRDS ADR, Volume 1, Page 137.

MarketScan is a commercial claims dataset comprised of 10.5 million covered lives that USRDS uses as a benchmark for CKD utilization.

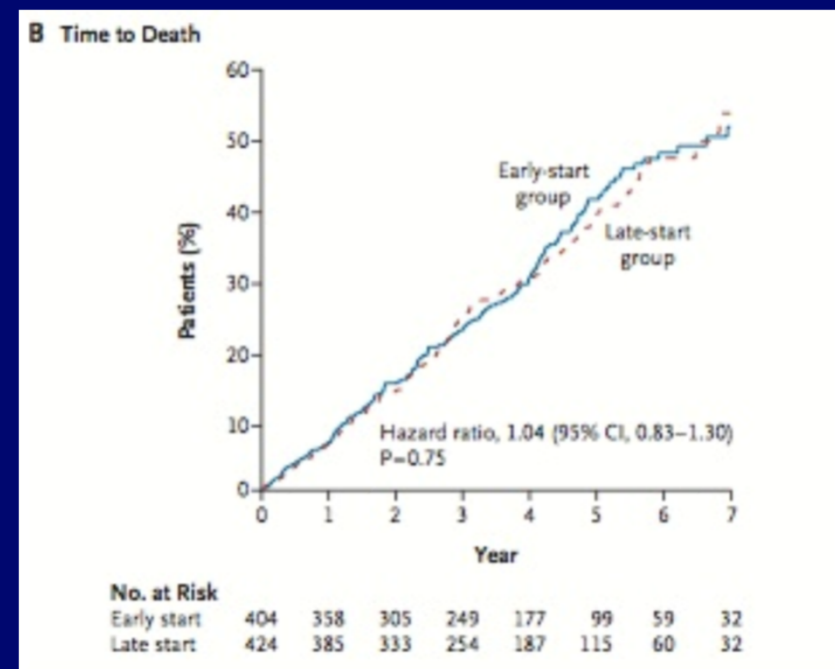
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# Late vs. Early Transition to Dialysis

- The IDEAL Study did not show any superiority of EARLY transition to dialysis.



Cooper et al NEJM 2010

# **Challenges of Transition Period from NDD to ESRD**

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# Transition of Care in ELDERLY and Multi-Morbid CKD Patients

The number of elders grew from 29.6 million in 1990 to 36.8 million in 2008, representing a 20% growth.

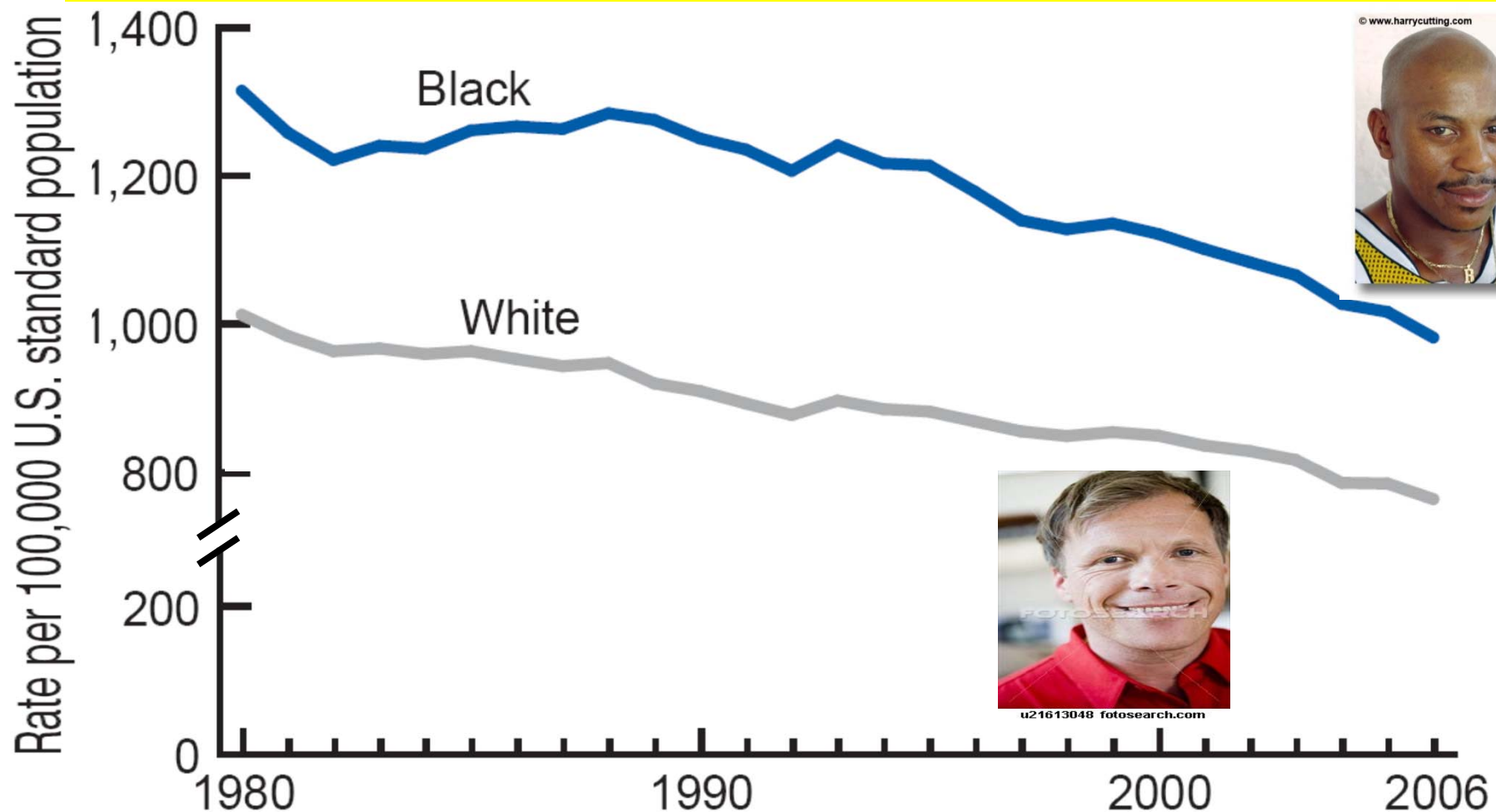
In 1990, 2000 and 2010, 39%, 43% and 44% of all prevalent dialysis patients, and 4%, 10% and 20% of all kidney transplant recipients were older than 65 years, respectively.

It is not clear whether the poor outcomes of KRT justify these expensive therapies in the elderly esp. if mortality remains essentially unchanged

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Blacks are more likely to be a dialysis patient:  
US General Population: 14% Blacks  
US Dialysis Population: 35% Blacks



Blacks are more likely to be a dialysis patient:

US General Population: 14% Blacks

US Dialysis Population: 35% Blacks

*Black Americans have lower life expectancy than Whites*

**African American Dialysis Paradox**

*Why? Does race/ethnicity impact transition from NDD to KRT? Do different transition approaches result in different outcomes across different racial/ethnic groups? Whites have lower life expectancy than Blacks.*

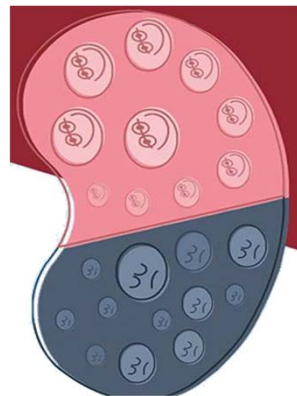
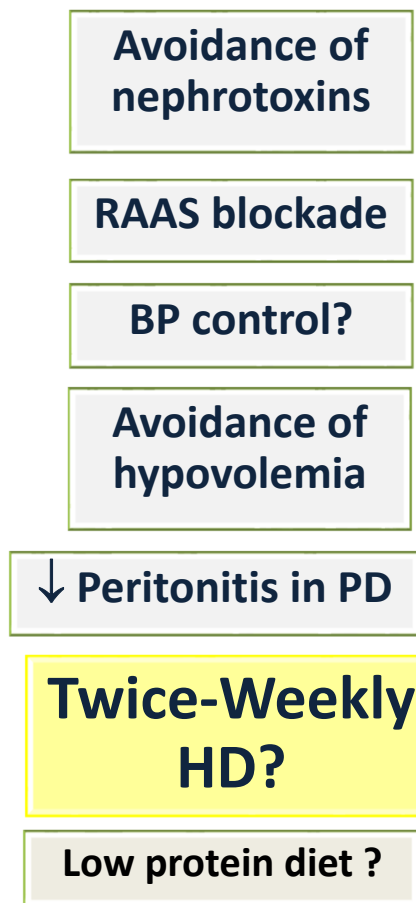


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# Residual Kidney Function (RKF) upon Transition and Dialysis Patients

## Therapeutic options



## Benefits of RKF

↑ middle molecule & uremic toxins

Maintenance of liquid balance

Improved BP control & ↓ in LVH

**Endocrine:** Epo,  $\text{Ca}^{++}$ , Pi, VitD3

↓ Malnutrition and inflammation



↑ Survival & quality of life



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# Dialysis Treatment Frequency

## Discussion: Twice vs. Thrice Weekly

FROM THE EDITOR

### How About Twice-Weekly Hemodialysis?

In recent trips to India, China, Brazil, and other countries, I was intrigued by large numbers of patients with end-stage renal disease who underwent hemodialysis (HD) less frequently than three times a week. Indeed, I encountered several patients who received HD infrequently as only once to twice a month! Dialysis treatment time could be as short as two to three hours per session. I was told that these patients

## Renal & Urology News

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Kamyar Kalantar-Zadeh, MD, PhD, MPH

**AJKD**  
Perspective

### American Journal of Kidney Disease 2014

#### Twice-Weekly and Incremental Hemodialysis Treatment for Initiation of Kidney Replacement Therapy

Kamyar Kalantar-Zadeh, MD, MPH, PhD,<sup>1,2</sup> Mark Unruh, MD,<sup>3</sup> Philip G. Zager, MD,<sup>3</sup> Csaba P. Kovesdy, MD,<sup>4</sup> Joanne M. Bargman, MD,<sup>5</sup> Jing Chen, MD,<sup>6</sup> Suresh Sankarasubaiyan, MD,<sup>7</sup> Gaurang Shah, MD,<sup>2</sup> Thomas Golper, MD,<sup>8</sup> Richard A. Sherman, MD,<sup>9</sup> and David S. Goldfarb, MD<sup>10</sup>

Mortality is highest in the first months of maintenance hemodialysis (HD) therapy. In many Western countries, patients who transition to kidney replacement therapy usually begin thrice-weekly HD regardless of their level of residual kidney function (RKF). RKF is a major predictor of survival. RKF may decline more rapidly with thrice-weekly HD treatments, is associated with a reduced need for dialytic solute clearance, and is an important factor in the prescription of peritoneal dialysis. In this article, we review the concept of incremental HD, in which weekly dialysis dose, in particular HD treatment frequency, is based on a variety of clinical

## Our Recent Publications on:

### (1) Residual Kidney Function in HD pts; and

### (2) Infrequent (twice-weekly) HD

1. Rhee CM, Unruh M, Chen J, Kovesdy CP, Zager P and Kalantar-Zadeh K. Infrequent dialysis: a new paradigm for hemodialysis initiation. ***Semin Dial.* 2013;26(6):720-7.**
2. Kalantar-Zadeh K and Casino FG. Let us give twice-weekly hemodialysis a chance: revisiting the taboo. ***Nephrol Dial Transplant.* 2014;29(9):1618-20.**
3. Kalantar-Zadeh K, Unruh M, Zager PG, Kovesdy CP, Bargman JM, Chen J, Sankarasubbaiyan S, Shah G, Golper T, Sherman RA and Goldfarb DS. Twice-weekly and incremental hemodialysis treatment for initiation of kidney replacement therapy. ***Am J Kidney Dis.* 2014;64(2):181-6.**
4. Zhang M, Wang M, Li H, Yu P, Yuan L, Hao C, Chen J and Kalantar-Zadeh K. Association of initial twice-weekly hemodialysis treatment with preservation of residual kidney function in ESRD patients. ***Am J Nephrol.* 2014;40(2):140-50.**
5. Obi Y, Eriguchi R, Ou SM, Rhee CM and Kalantar-Zadeh K. What Is Known and Unknown About Twice-Weekly Hemodialysis. ***Blood Purif.* 2015;40(4):298-305.**
6. Obi Y, Streja E, Rhee CM, Ravel V, Amin AN, Cupisti A, Chen J, Mathew AT, Kovesdy CP, Mehrotra R and Kalantar-Zadeh K. Incremental Hemodialysis, Residual Kidney Function, and Mortality Risk in Incident Dialysis Patients: A Cohort Study. ***Am J Kidney Dis.* 2016 [epub]. doi: 10.1053/j.ajkd.2016.01.008.**
7. Mathew AT, Fishbane S, Obi Y and Kalantar-Zadeh K. Preservation of Residual Kidney Function in Hemodialysis Patients: Reviving an Old Concept for Contemporary Practice. ***Kidney Int.* 2016 [in press].**
8. Obi Y, Rhee CM, Mathew A, Shah G, Streja E, Brunelli S, Kovesdy CP, Mehrotra R and Kalantar-Zadeh K. Residual Kidney Function Decline and Mortality in Incident Hemodialysis Patients. ***J Am Soc Neph.* 2016 [in press].**
9. Mathew A, Obi Y, Rhee CM, Chen JLT, Shah G, Lau W-L, Kovesdy CP, Mehrotra R and Kalantar-Zadeh K. Twice Weekly Hemodialysis and Mortality in the United States. ***Kidney Int.* 2016 [submitted, revision suggested]**

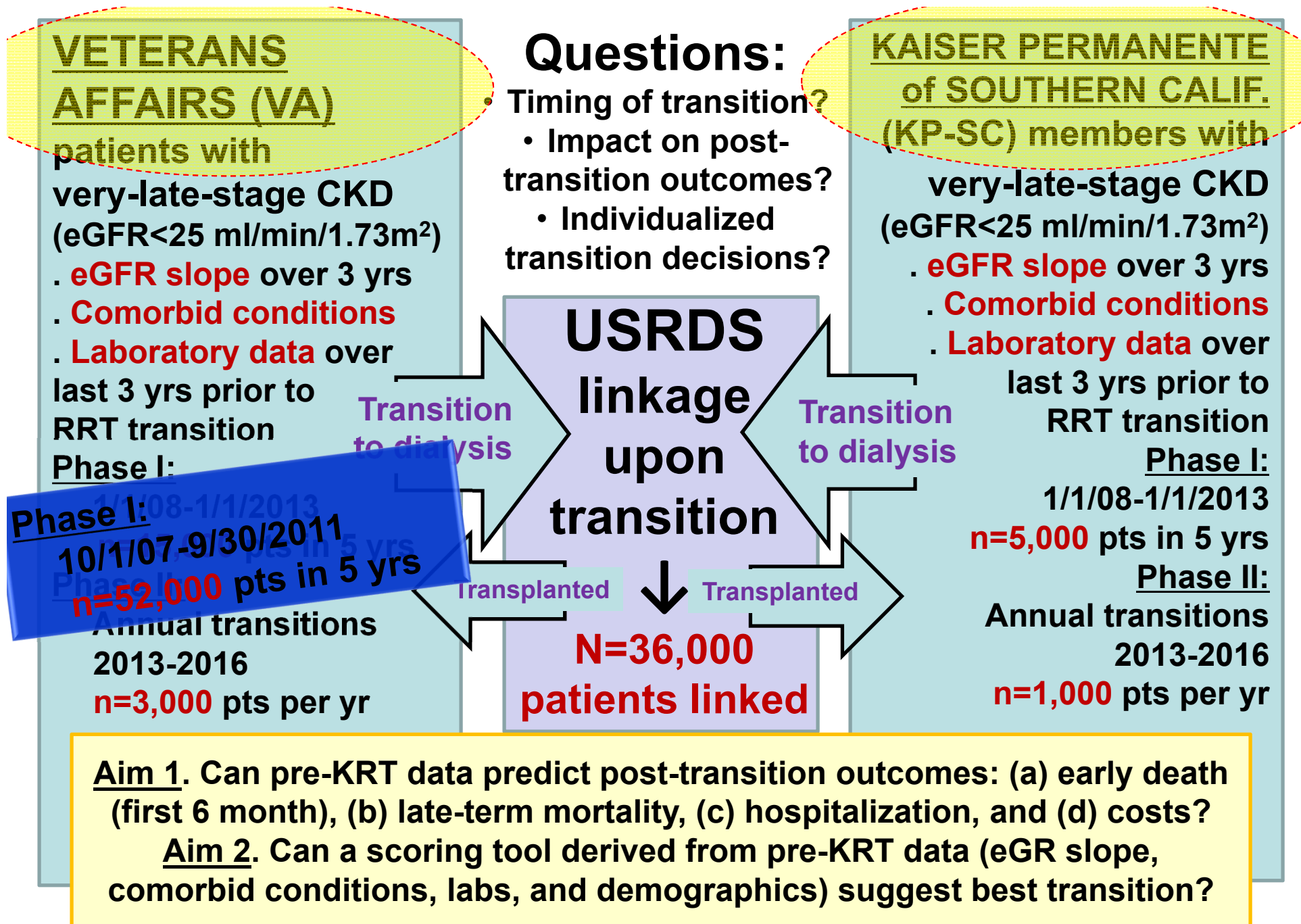
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# 6 Types of TRANSITION in CKD

Major knowledge gaps surrounding types of transitions of care during very-late-stage CKD (eGFR <25 ml/min):

1. Transition from NDD-CKD to dialysis therapy with different subtypes according to:
  - a) Dialysis Modality (HD vs. PD)
  - b) Format (in-center vs. home)
  - c) Frequency (infrequent, conventional and frequent)
2. Transition from NDD-CKD to pre-emptive transplantation
3. Transition among/within dialysis modalities, formats and frequency (HD to PD or vice versa, in-center to home, and less to more frequent);
4. Transition from dialysis to transplantation,
5. Transition from gradually failing kidney transplantation back to dialysis therapy
6. Transition from any of the above stages to partial or full withdrawal of care



**Figure 1.** Overview of the “Transition of Care in CKD” Special Study Center Proposal

# VA Healthcare System

## 22.6 Million Veterans

(>10% of US Adults)

- The Veterans Health Administration is home to the **largest integrated health care system** consisting of 150 medical centers, in addition to 800 community based outpatient clinics and 280 Vet Centers.
- Together these facilities provide comprehensive care to over **22.6 million veterans**.
- **Each year 13,000 veterans transition to KRT (mostly dialysis) (=11-12% of all incident dialysis pts in the nation!)**

# National Veterans (VA) data to examine CKD transition

- **Strengths:**

- Large cohort size with >10% CKD (millions-wise CKD!)
- Representation of the entire USA
- Access to healthcare not limited by socio-demographics:  
Lab data, CKD progression data,
- Excellent longitudinal and outcome data:  
including veterans who do not transition to dialysis

- **Weaknesses:**

- Use of outside healthcare (for pre-dialysis care)
- Majority are men (but changing fast >10% women)
- Complex and redundant approval process
- Inherent limitations of a large administrative database



# California



- The most populous US state (38 million, larger than Canada)
- Home to 1 out of 8 Americans
- The most racially/ethnically diverse US state
- Harbors the largest economy in the USA
  - The 8th largest economy in the world (US, China, Japan, Germany, France, Brazil, UK, California, Russia)

## **Southern California → Kaiser Permanente**

- The most populous mega-region of California
  - 23 million people (60% of California's population)
  - Home to 4 of the nation's 50 most populated cities (Los Angeles, San Diego, Fresno, and Long Beach)
  - Encompasses Los Angeles Metropolitan (including LA and Orange Counties together, >17 million people, the 15th largest world's economy), Inland Empire, and Greater San Diego.
- Substantial socio-economic diversity,
- Remarkable racial/ethnic diversity
  - 38% Hispanics, 14% Asians, and 7% Blacks

# Kaiser Permanente of Southern California

- 3.8 M members
- > 6,000 physicians
- > 36,000 employees
- 14 Medical centers
- > 200 MOBs
- Integrated care model
- Care tracked by common E
- Strong culture of practice guidelines



## Dept. Research at Kaiser Permanente Southern California

- 30 Scientists, 3 Post-docs, 300 support staff, (~200 Physicians)
- Eclectic backgrounds
- Descriptive epi studies to RCTs
- All have projects that could have impact on practice in portfolio



Highlights of the USRDS 2014 Chapter:

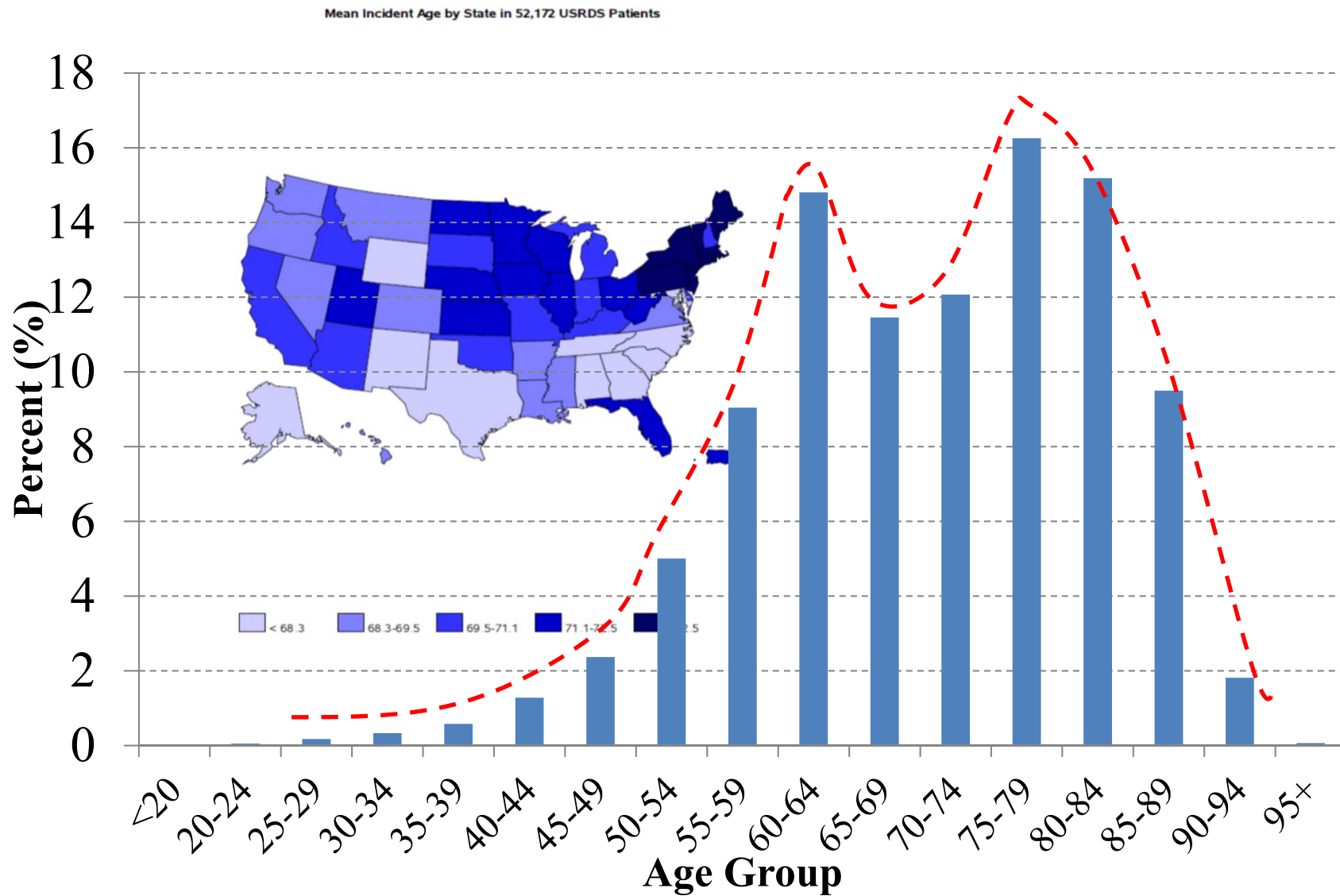
# Transition of Care in CKD

52,172 Incident ESRD Veterans

10/1/2007-9/30/2011

- Between 10/1/2007 and 9/30/2011 (4 fiscal years), a total of **52,172 veterans** transitioned to ESRD.
- They are **70.3** ±12.1 years old (mean ±SD).
- They include **24% Blacks** and 6% Hispanics
- The cause of ESRD is **diabetes in 42%** and hypertension in 31.4%.

# Age at first ESRD service in 52,172 Incident Dialysis Veterans



[Transition of Care in CKD, Veterans Data, www.USRDS.org](http://www.USRDS.org)

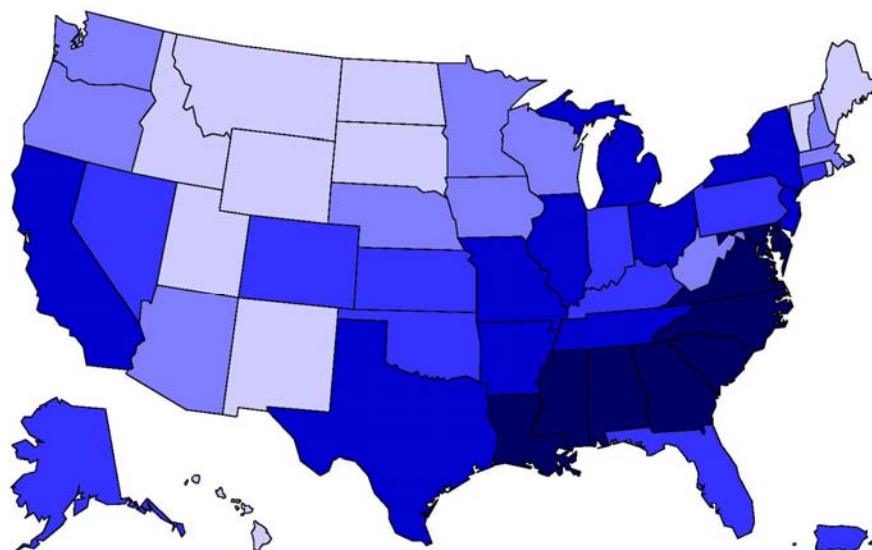
# African American Race

## in 52,172 Incident Dialysis Veterans (24%)

Blacks constituted **24%** of the population (n=12,584), whereas Asians (n=957, 2%) and native American (n=543, 1%) had much smaller proportions.

Most Southeast states had larger proportions of black incident ESRD veterans.

Among mainland states and territories, **District of Columbia** had 92% blacks, followed by **Maryland** (55%), **Georgia** (49%) and **South Carolina** (46%)



**Table 1.1. Status of 52,172 incident ESRD veterans during the first 90 days after transition to KRT, 10/1/2007-9/30/2011**

	Day 1		Day 30		Day 60		Day 90	
	n	%	n	%	n	%	n	%
<b>Dialysis Modality</b>								
<b>In-center</b>	43,256	82.9	43,258	82.9	43,163	82.7	40,918	78.4
<b>Home HD</b>	260	0.5	260	0.5	259	0.5	258	0.5
<b>CAPD</b>	1,405	2.7	1,405	2.7	1,398	2.7	1,302	2.5
<b>CCPD</b>	1,174	2.2	1,174	2.2	1,182	2.3	1,395	2.7
<b>Uncertain*</b>	5287	10.1	3,495	6.7	612	1.2	447	0.9
<b>Outcomes**</b>								
<b>Death</b>	201	0.4	1,561	3.0	3,672	7.0	5,348	10.3
<b>Transplant</b>	589	1.1	654	1.3	679	1.3	701	1.3
<b>Lost to f/u</b>	n/a		3	<0.1	3	<0.1	5	<0.1
<b>Recovered</b>	n/a		362	0.7	1,204	2.3	1,798	3.5
<b>Total</b>	52,172	100		100		100	52,172	100

**Table 1.1. Status of 52,172 incident ESRD veterans during the first 90 days after transition to KRT, 10/1/2007-9/30/2011**

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<b>Total</b>	52,172	100		100		100	52,172	100

# Dialysis PROVIDERS

## to 52,127 Incident ESRD Veterans

10/2007-9/2011

Provider (%)	At Baseline	At 3 months
DaVita	24.5	24.6
Fresenius	27.6	27.8
Other Chains	13.1	13.2
Non-Chain	21.1	21.1
<b>VA units</b>	<b>9.9</b>	<b>10.7</b>
None Assigned	3.9	2.5

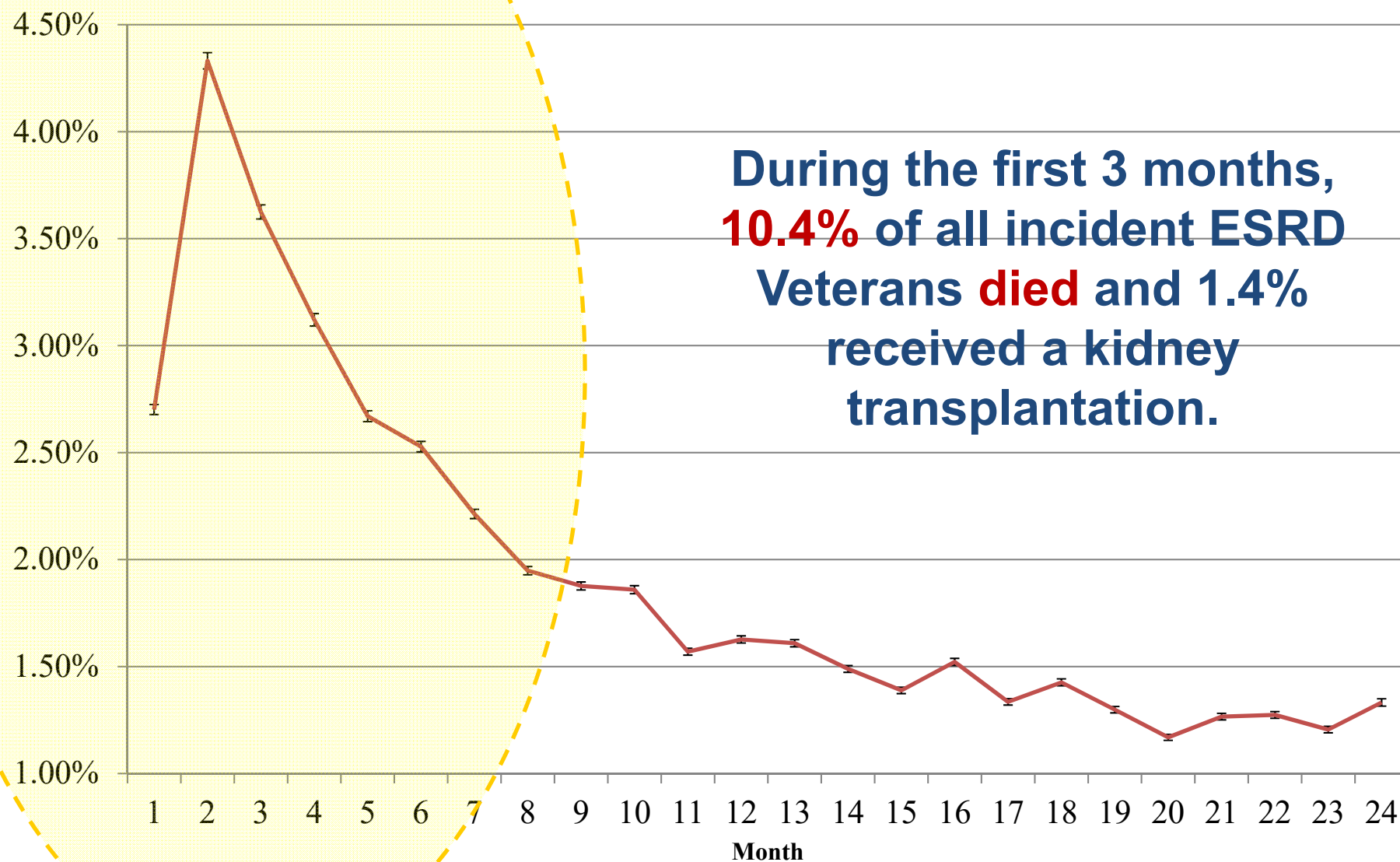


**Table 1.2. Day 1 of ESRD service in 52,172 incident ESRD veterans upon transition to KRT, 10/1/2007-9/30/2011**

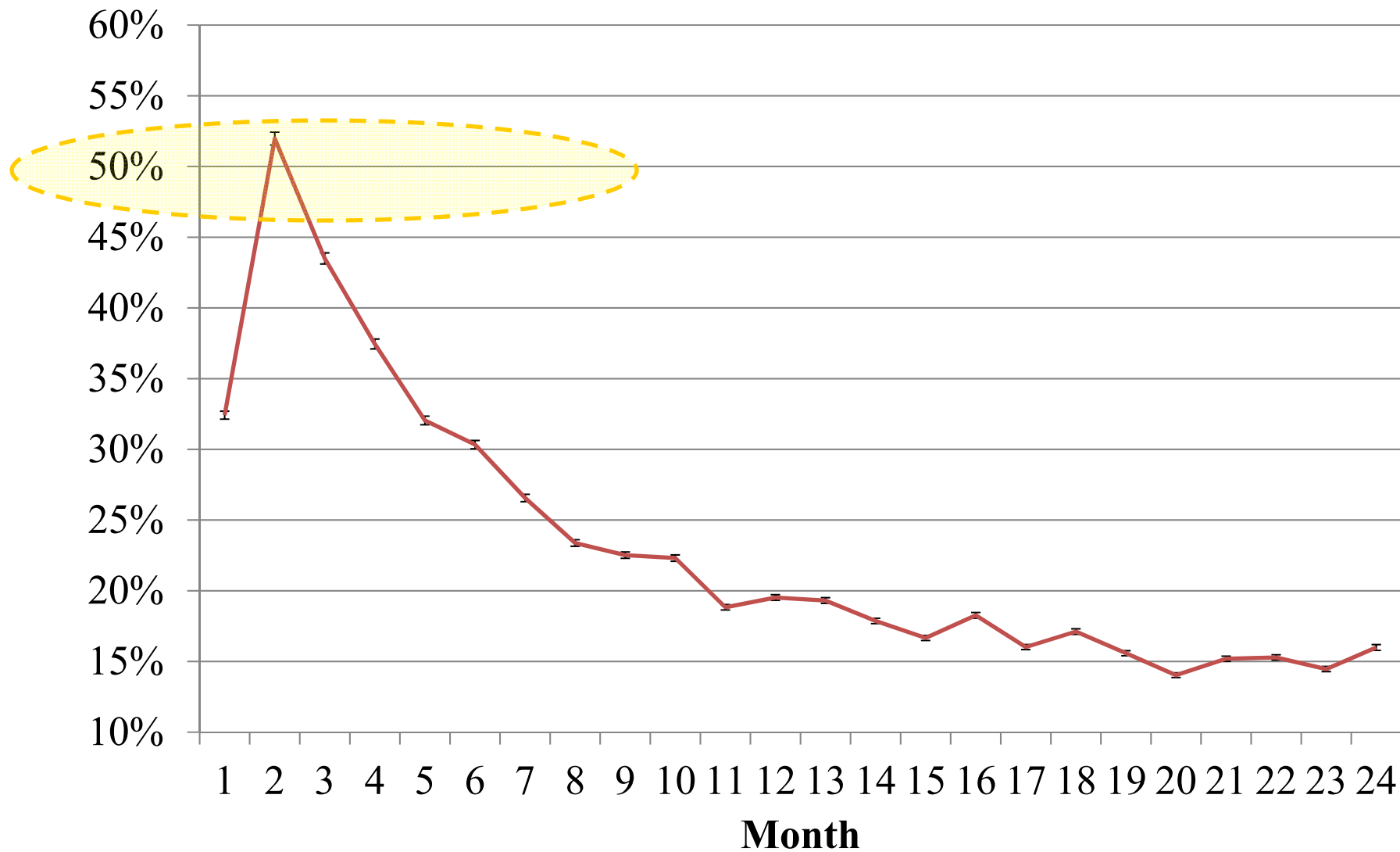
	All veterans	VA units	Fresenius	DaVita	Other Chains	Non-Chain
Veterans, n (%)	52,172 (100%)	5,157 (9.9%)	14,380 (27.6%)	12,766 (24.5%)	6,850 (13.1%)	11,007 (21.1%)
Number of facilities	5504	68	1686	1352	793	1425
Age, year (SD)	70.3 (12.1)	64.6 (11.4)	70.7 (11.8)	70.3 (12.1)	71.2 (11.9)	72.1 (11.8)
Older than 85 yrs (%)	11.4	4.6	11.1	11.3	12.2	14.3
Females (%)	5.7	2.5	6.1	6.0	6.1	5.7
Race/Ethnicity						
Native American (%)	1.0	0.7	0.8	1.1	0.8	1.5
Asian (%)	1.8	1.8	1.3	1.7	3.4	1.2
Black (%)	24.1	41.3	23.4	24.9	22.1	18.5
White (%)	72.6	55.7	74.3	72.1	73.6	78.6
Hispanic (%)	6.0	8.8	5.9	5.4	6.1	5.3
Primary Cause of ESRD						
Diabetes (%)	41.7	47.0	42.6	42.7	41.7	40.1
Hypertension (%)	31.4	22.2	34.2	32.8	32.6	32.3
GN (%)	5.5	7.8	5.1	4.9	5.6	5.0
Cystic Kidney (%)	1.5	1.6	1.5	1.5	1.3	1.4
KRT modality						
HD (%)	82.9	90.6	84.8	84.6	84.9	78.2
PD (%)	4.9	3.6	4.9	5.1	4.9	5.7

**Transition of Care in CKD, Veterans Data, [www.USRDS.org](http://www.USRDS.org)**

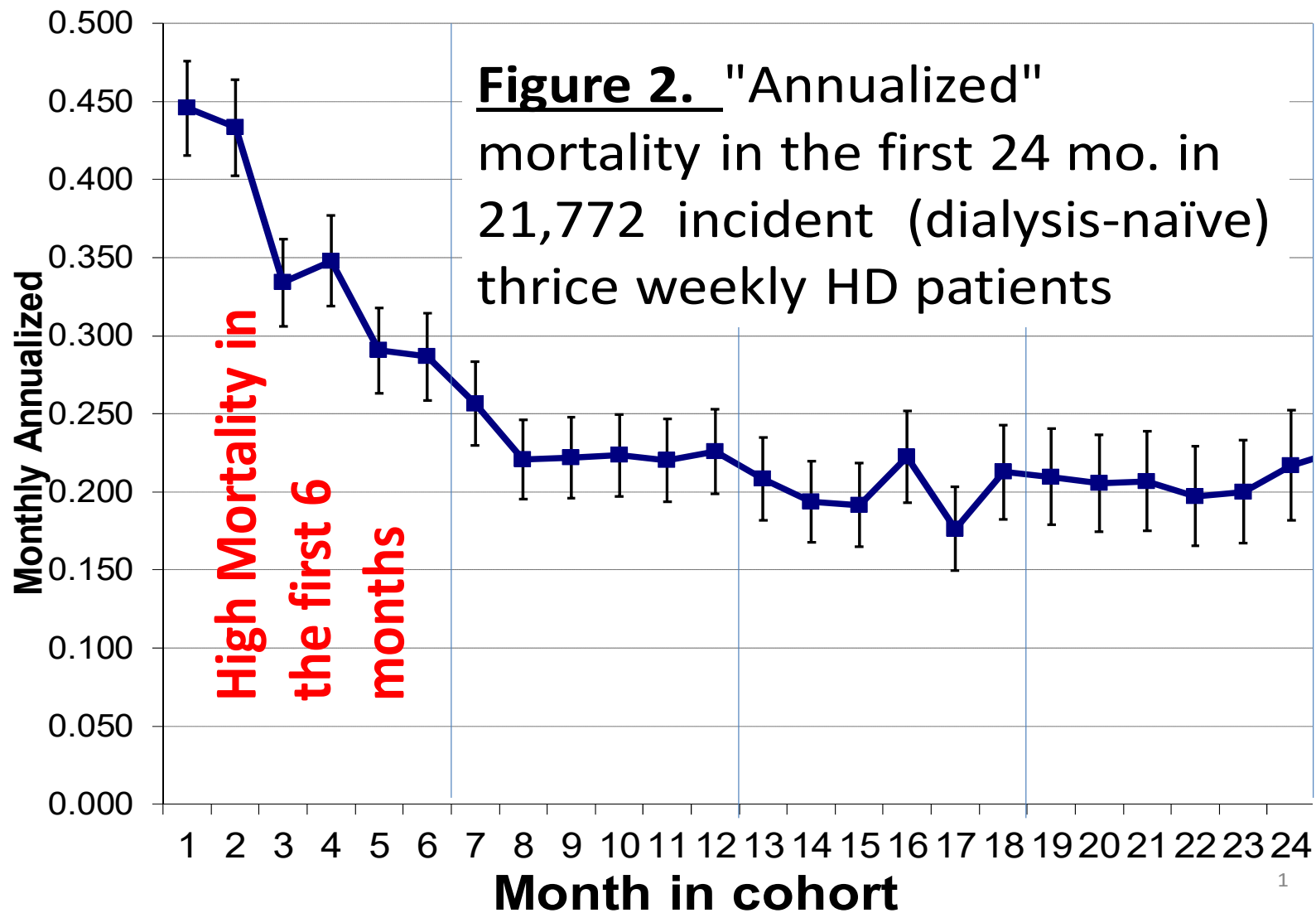
## Crude Mortality Rates over First 24 Months in 52,172 Incident Dialysis Veteran Patients

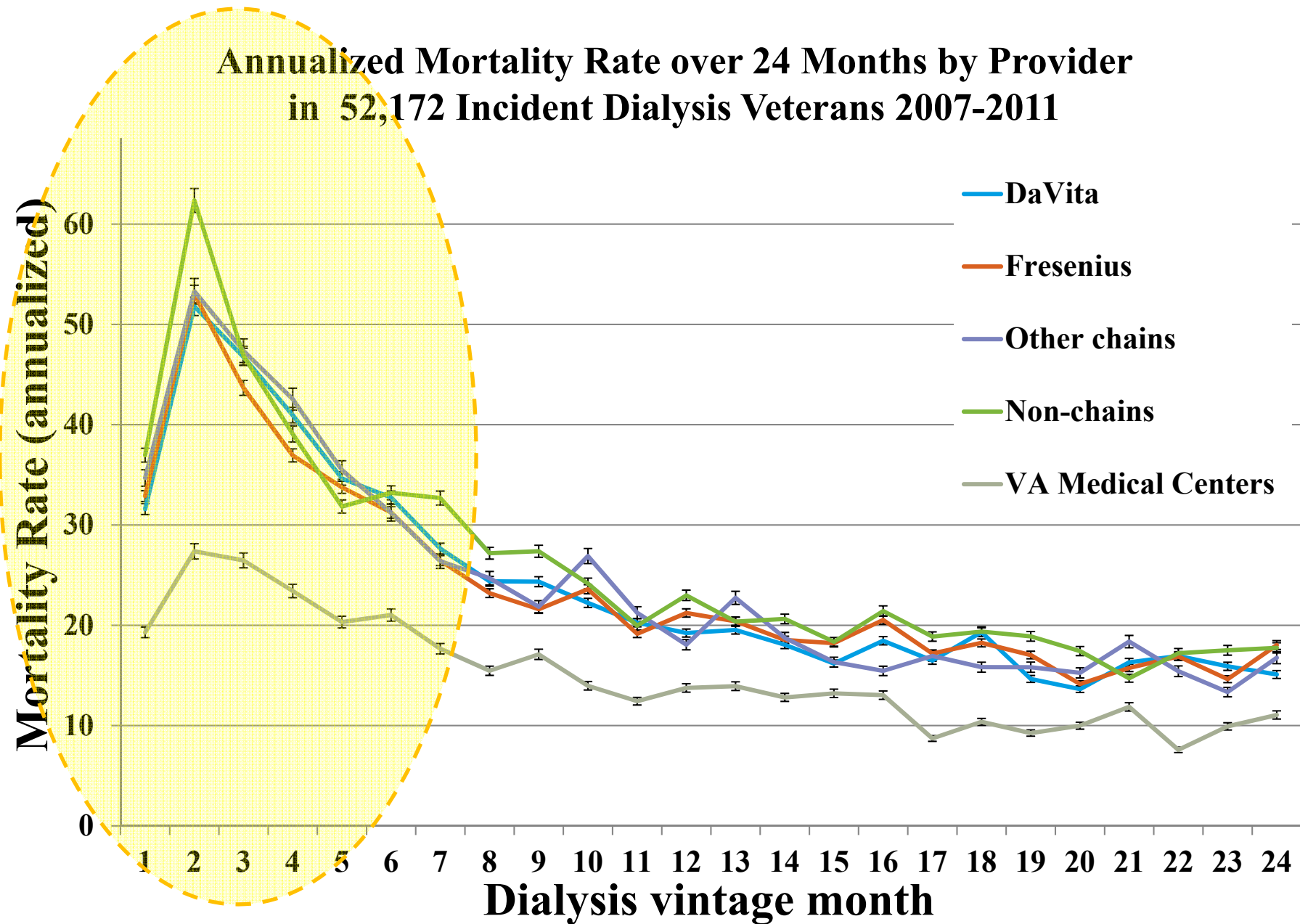


## Annualized Mortality Rates over 24 Months in 52,172 Incident Dialysis Veteran Patients



[Transition of Care in CKD, Veterans Data, www.USRDS.org](http://www.USRDS.org)





[Transition of Care in CKD, Veterans Data, www.USRDS.org](http://www.USRDS.org)

# The Concept of PRELUDE

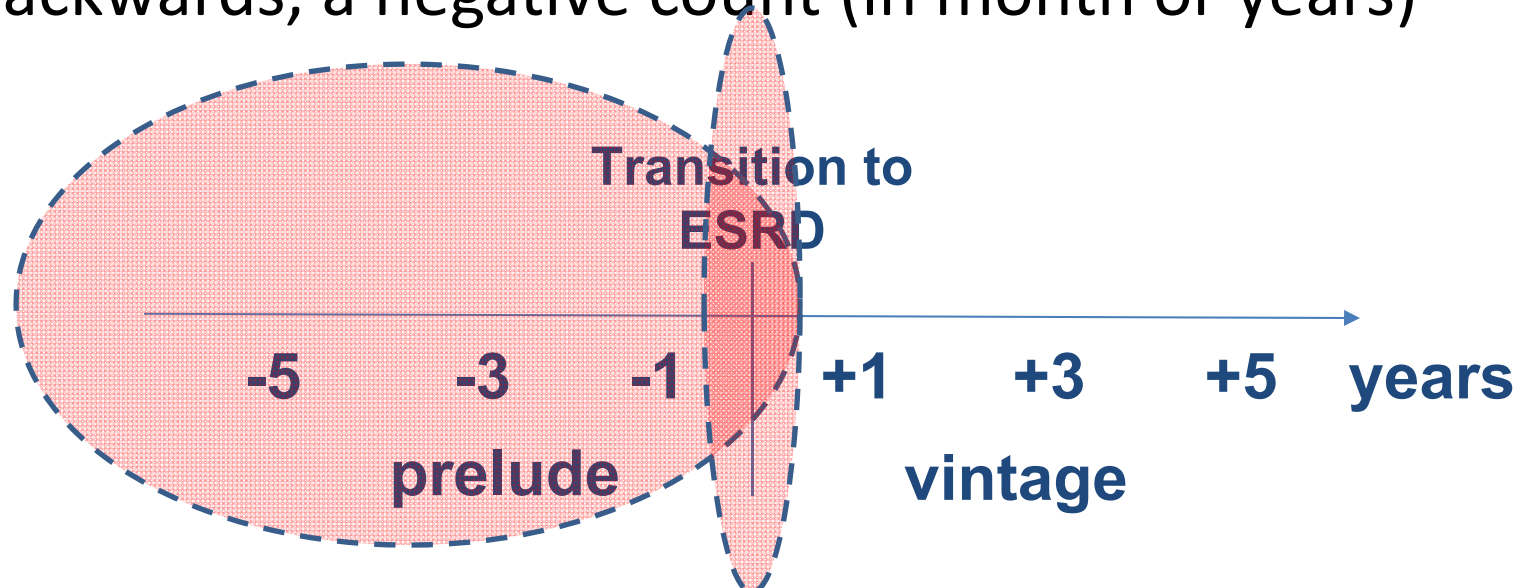
Time prior to TRANSITION to ESRD

- How to count the time prior to ESRD transition point?
- It is going backward in time
  - Hence, a NEGATIVE count!



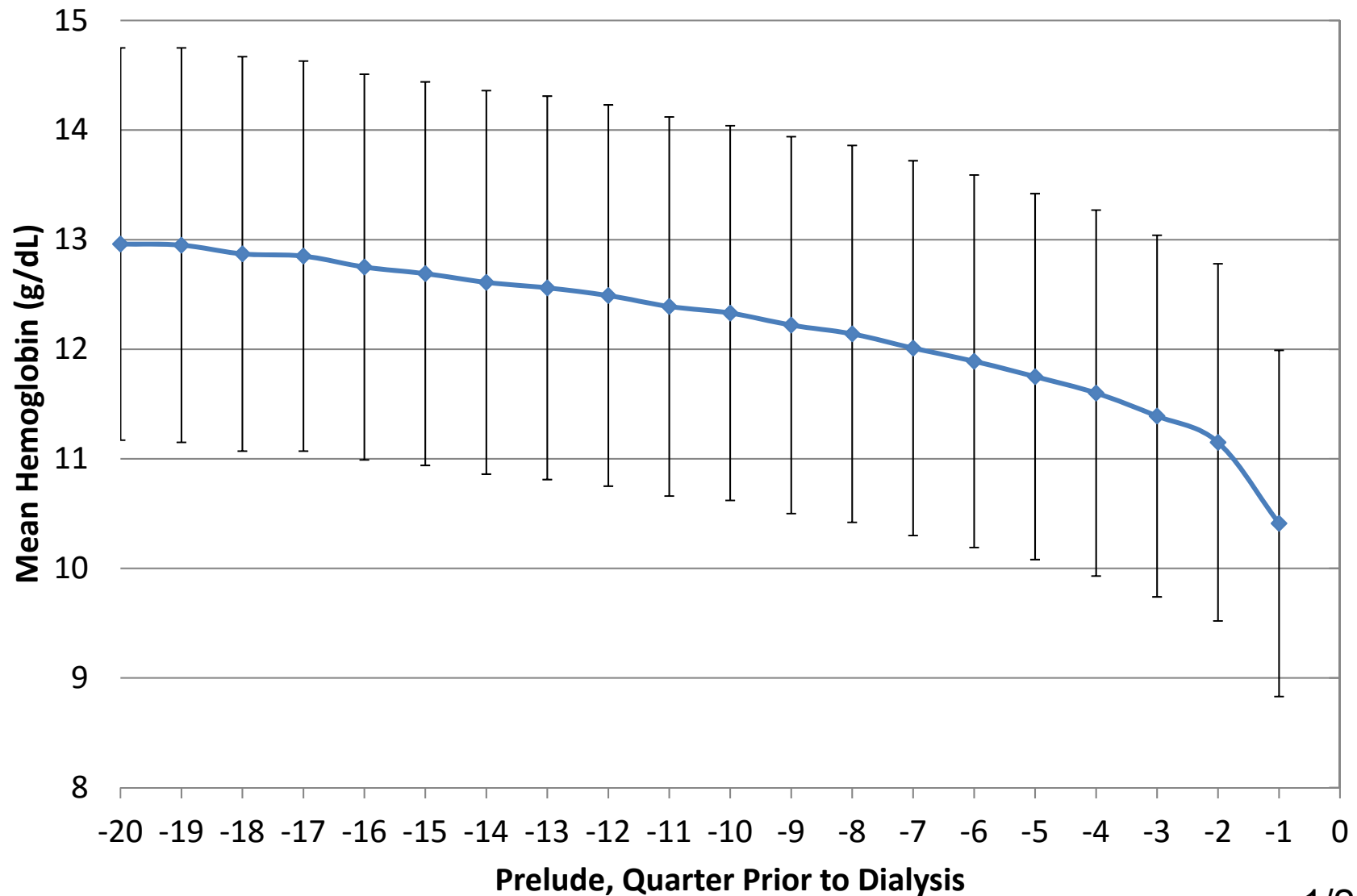
# New Nomenclature has come to the USRDS ADR : “Prelude” Analyses

- **Vintage:** The time from transition to dialysis (or KRT) forward, a positive count (in month or years)
- **Prelude:** The time from transition to dialysis (o KRT) backwards, a negative count (in month or years)



# Hemoglobin by Prelude Quarters

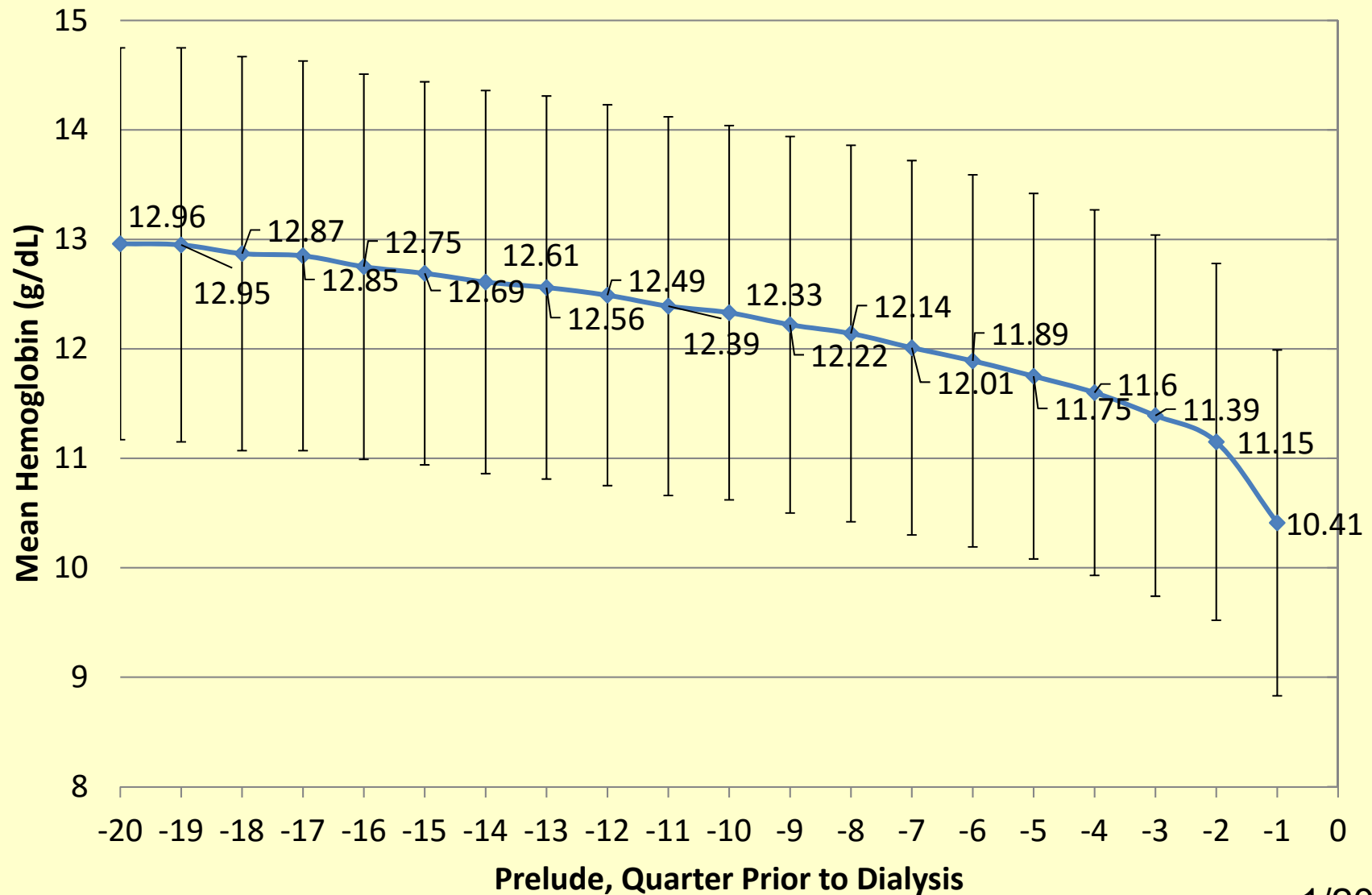
Mean Hemoglobin Over 20 Quarters Prior to Dialysis Start in  
28,717 TCCKD Patients





# Hemoglobin by Prelude Quarters

Mean Hemoglobin Over 20 Quarters Prior to Dialysis Start in  
28,717 TCKD Patients



## Key Messages & Highlights of the TCKD Chapter: Transition of Care in CKD, Year 2 (Nov 2015 USRDS ADR)

1. Almost 30% of all 52,172 veterans who transitioned to ESRD across the nation over a 4-year period (10/2007-9/2011) received anti-depressants prior to transition (prelude period), while after transition to ESRD (vintage period) the anti-depressants prescription rate increased slightly.
2. Phosphorus binders were rarely prescribed during the prelude time prior to ESRD transition, but a major surge was observed in the final 6 months of the prelude period, followed by a substantial rise during the dialysis vintage period.
3. Among comorbid conditions that were obtained from multiple sources for 47,555 veterans who transition to ESRD with at least one identified comorbidity, congestive heart failure (CHF) and diabetes mellitus were each present in over half of the veterans, chronic pulmonary disease was recorded in over 40%, and almost a quarter of all patients had the diagnosis of cancer, while 28% had prior myocardial infarction.
4. Among the 46,625 veterans who transitioned to ESRD over the 4-year period with at least one hospitalization event, the most common causes of hospital admission that also included the ESRD transition day in the hospital included: acute kidney injury (AKI, acute renal failure), hypertension, congestive heart failure, and CKD per se, while septicemia related hospital admissions increased dramatically after ESRD transition.
5. Congestive heart failure (CHF) was the most common reason for hospital admission prior to ESRD transition (prelude time), whereas dialysis access complications was the most common cause after ESRD transition (vintage time).
6. For hospitalizations that included the transition to ESRD event, i.e., the first hemodialysis treatment, AKI was the leading cause of hospitalization.
7. Prelude trend analyses provide important information about changes in clinical and laboratory measures over time during several years prior to transition to ESRD, including measured serum phosphorus in 11,896 veterans who eventually transitioned to ESRD over 5 years, which gradually increased from the 3.8 to 4.0 range to above 5.5 mg/dL immediately prior to transition to ESRD.

# ESRD Rates among Veterans

- Each year **~13,000** veterans transitioned to ESRD, with an average rate of ESRD transition of **1,087 veterans per month** across the entire nation (Concept of “**ESRD Fountain**”).
- For the three calendar years **2008**, 2009 and 2010, the ESRD incident rates among veterans were **604.6**, 624.0 and 604.1 per million veterans, respectively.
- Given the ESRD incident rates of **488.0**, 499.3 and 495.6 per million per the USRDS population, the calculated **crude rate ratio** of ESRD incidence among veterans **compared to the US general population** is **1.24**, **1.25**, and **1.22** for calendar years 2008 through 2010, respectively, suggesting that the **ESRD is 22% to 25% more likely to occur among veterans than the general US population.**
- However, the VA population is considerably **older** than the general US population.

Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

**Table x.1.** Rates and ratio of the incident ESRD among veterans and in the US adults for calendar years 2008, 2009 and 2010 **across age strata** of 55-64, 65-74, and 75+ years, data are derived from US veteran incident dialysis patients during 10/1/2007-9/30/2011

Age Strata	55-64 years			65-74 years			75 years or older		
Calendar Year	2008	2009	2010	2008	2009	2010	2008	2009	2010
Incident ESRD veterans	3180	3292	3115	3054	3187	3080	5924	5787	5740
All veterans	5,718,302	5,441,739	5,340,529	4,148,572	4,152,331	4,294,221	4,911,012	4,851,671	4,839,173
ESRD rate in veterans, PM	556	605	583	736	768	717	1206	1193	1186
ESRD rate in the USA, PM	773	778	752	1297	1311	1276	545	1559	1582
ESRD rate ratio (Vet:US)*	0.72	0.78	0.78	0.57	0.59	0.56	0.78	0.76	0.75

Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

# ESRD Rates among Veterans

- On an age specific and age adjusted basis, the rate of ESRD is 25 to 40 percent lower than the US rate of ESRD.
- This lower-than-expected risk occurs despite the fact that the VA population is predominantly male.
- The remarkably low rate of ESRD among VA patients is unexplained.
  - Is it because the VA system provides an integrated health care system with better care to CKD patients?
  - Is it because there is a selection bias of persons into military service?
  - After all, there is a screening of military candidates that could remove persons with greater risk of ESRD from the resultant VA pool of persons.
- Further research may shed some light on this issue.

Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

# MEDICATIONS

- Almost 30% of all 52,172 veterans who transitioned to ESRD across the nation over a 4-year period (10/2007-9/2011) received anti-depressants prior to transition (prelude period), while after transition to ESRD (vintage period) the anti-depressants prescription rate increased slightly.
- Phosphorus binders were rarely prescribed during the prelude time prior to ESRD transition, but a major surge was observed in the final 6 months of the prelude period, followed by a substantial rise during the dialysis vintage period.

# Prescribed Medications

Creating “6-month” periods (n=13) for  
PRELUDE (n=7) and VINTAGE (n=6)

<b>Prelude-60 mo to &lt;-36 mo **</b>	<b>N=28361</b>
Prelude-36 mo to <-30 mo	N=29012
Prelude-30 mo to <-24 mo	N=30460
Prelude-24 mo to <-18 mo	N=31706
Prelude-18 mo to <-12 mo	N=32669
Prelude-12 mo to <-6 mo	N=33572
<b>Prelude-6 mo to &lt; ESRD</b>	<b>N=34970</b>
<b>Vintage ESRD to &lt;6 mo</b>	<b>N=34630</b>
Vintage 6 mo to <12 mo	N=29427
Vintage 12 mo to <18 mo	N=25235
Vintage 18 mo to <24 mo	N=21792
Vintage 24 mo to <30 mo	N=18840
Vintage 30 mo to < <b>36 mo</b>	N=16171

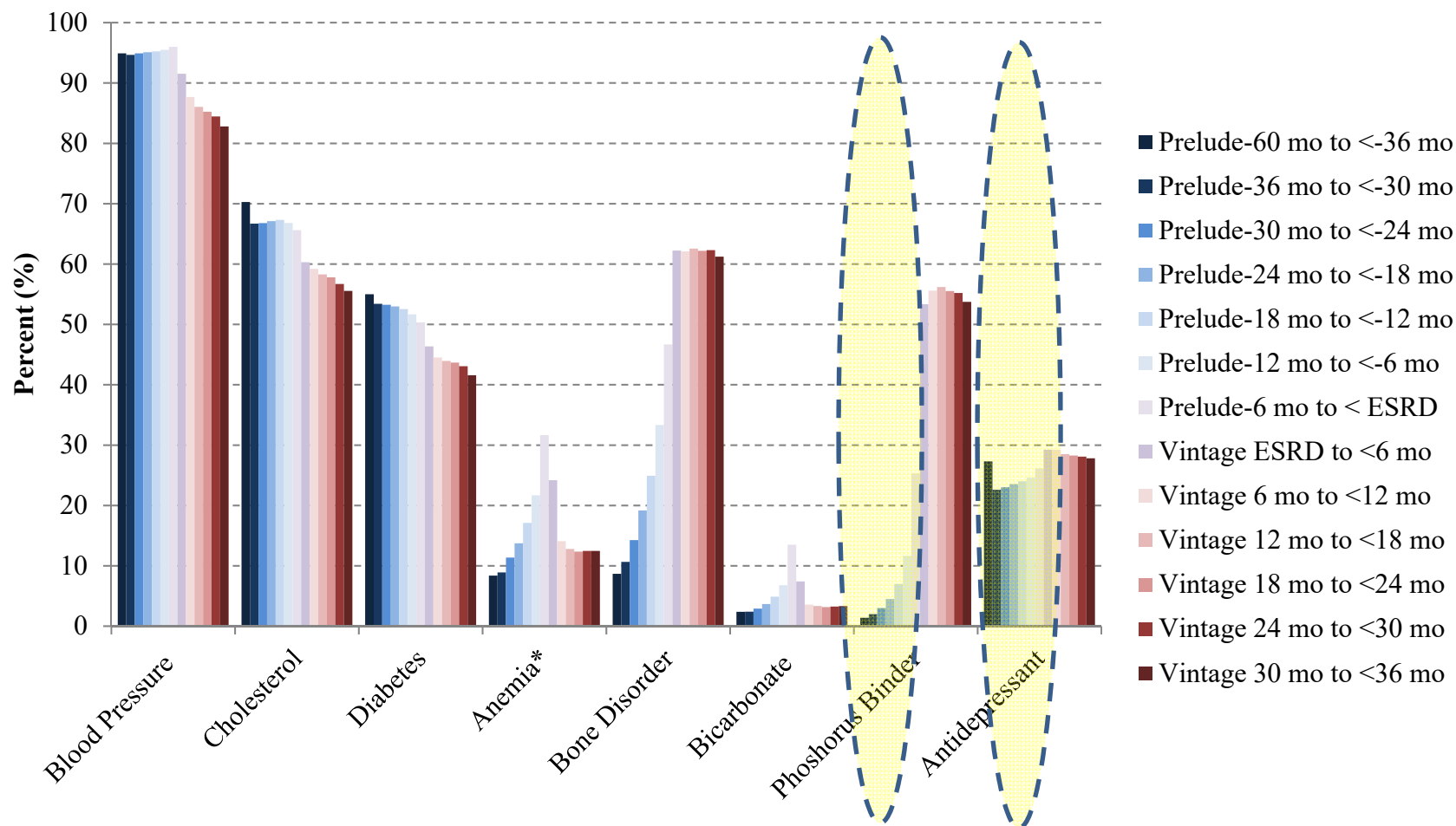
*\*\*prelude up to -5 years*

Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

## Related to “TCCKD CHAPTER 2015”

# Medications by “6 month periods” (n=13)

n=52,152, 4 years (10/1/2007-9/30/2011)



Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011



# Medications in Prelude and Vintage

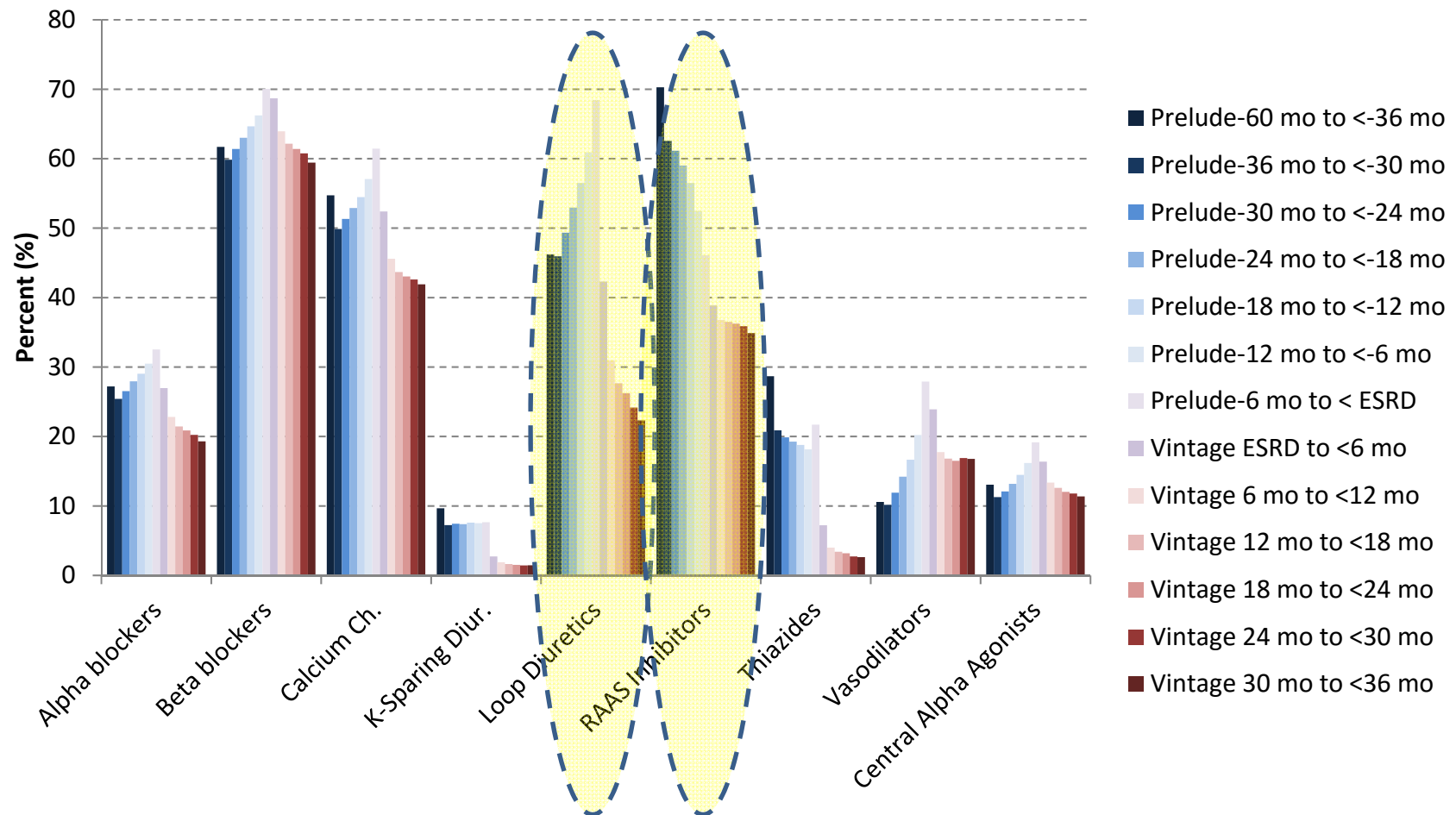
- A. Blood Pressure-** 1. Vasodialator Ahd, 2. Thiazides, 3. Loop Diuretics, 4. K sparing diuretics 5. RAAS inhibitors, 6. Beta Blockers 7. Alpha blockers,8. Calcium channel blockers, 9. Central Alpha Agonists
- B. Cholesterol** 1. Statin 2. Non statin
- C. Diabetic-** 1. Insulin 2. Oral hypoglycemic.
- D. Anemia-** 1. EPO 2. Iron
- E. Bone Mineral** – 1. Sevelamer, 2.Lanthanm, 3.Calcium Acetate, 4. 25vitD 5. Active VitaminD 6. Cinacalcet
- F. Bicarbonate-** 1. Bicarbonate
- G. Phosphorus Binder** 1. Sevelamer, 2.Lanthanm, 3.Calcium Acetate
- H. Antidepressants-**1. Antidepressants
- 

NOTE- Bone Mineral and Phos Binder Groups overlap meds.

Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

## Granular Medication Analyses

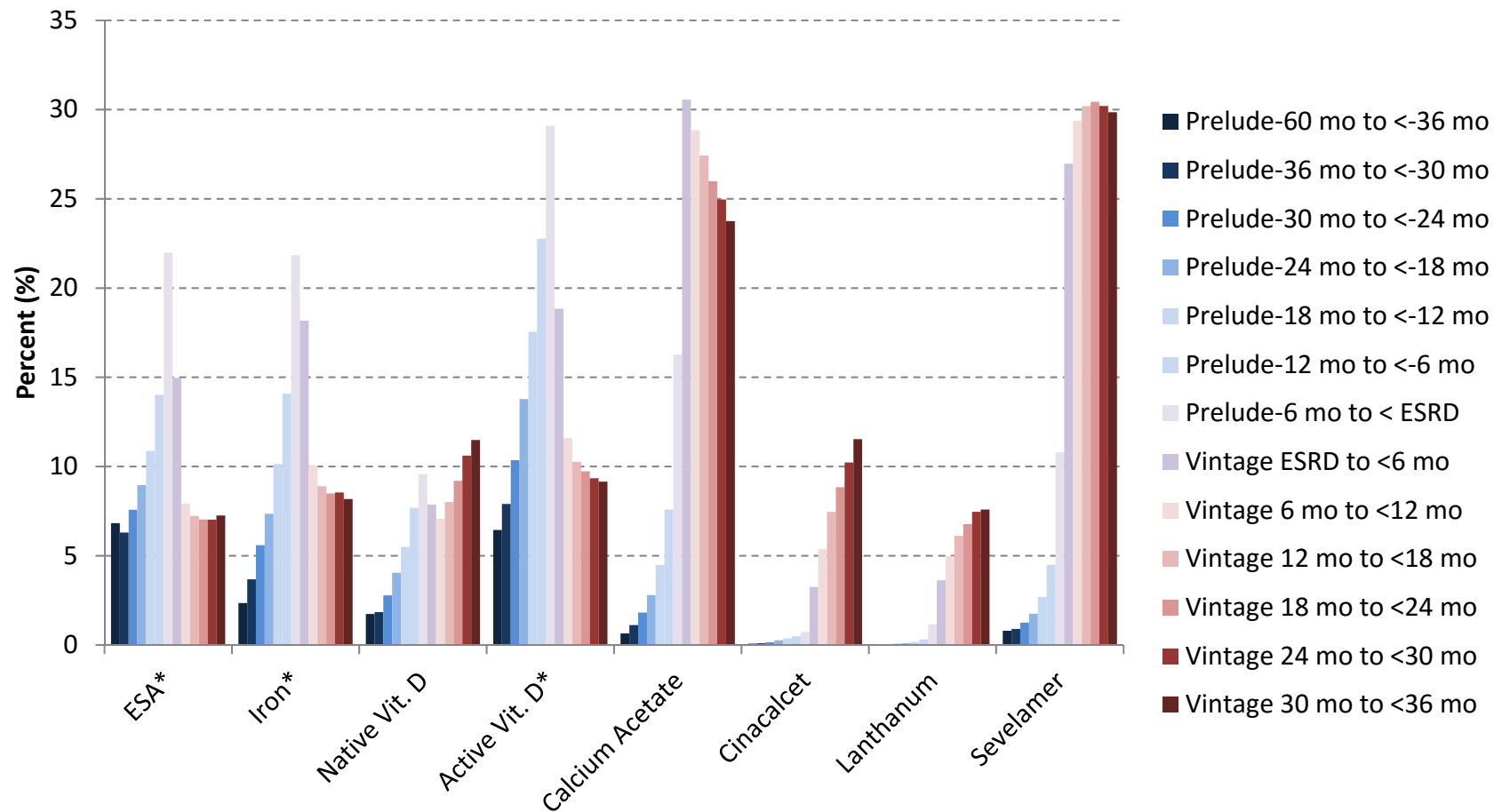
# Blood Pressure Medications



Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

## Granular Medication Analyses

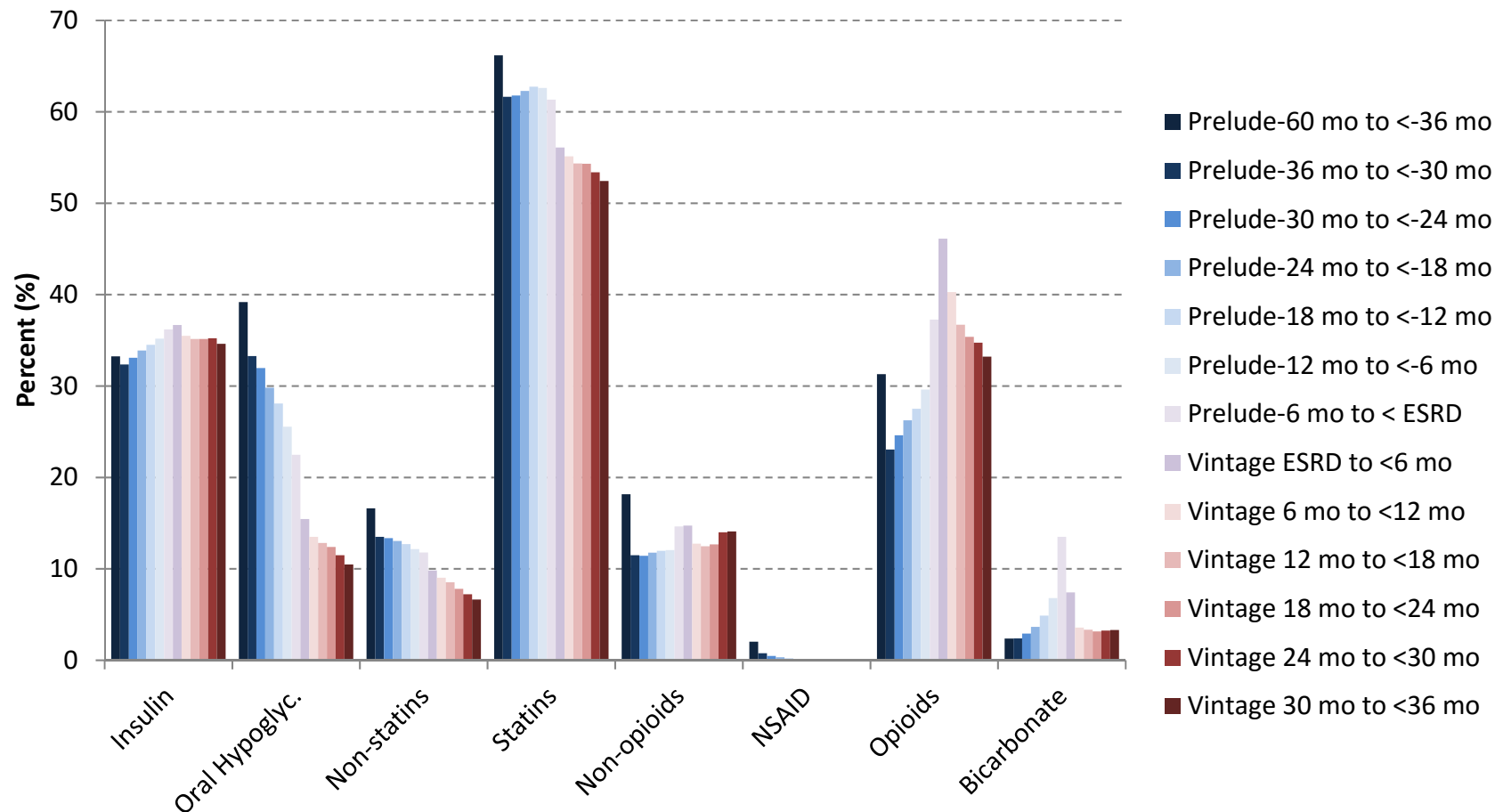
# Anemia and Bone Mineral Medications



Transition of Care in CKD (TC-CKD)  
N=52,152, 4 years, 10/1/2007-9/30/2011

## Granular Medication Analyses

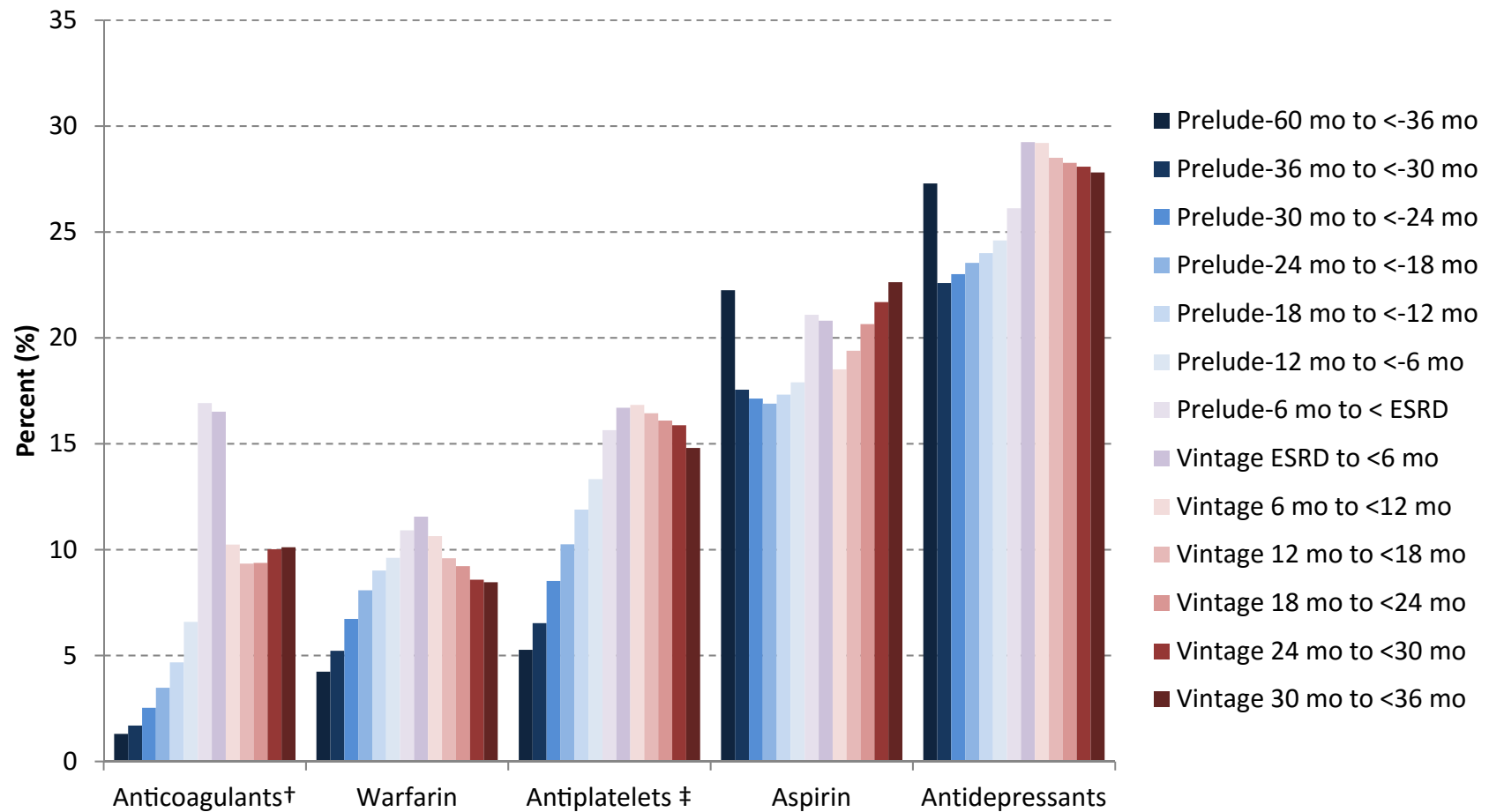
### Diabetes, Cholesterol, Analgesics



Transition of Care in CKD (TC-CKD)  
N=52,172, 4 years, 10/1/2007-9/30/2011

## Granular Medication Analyses

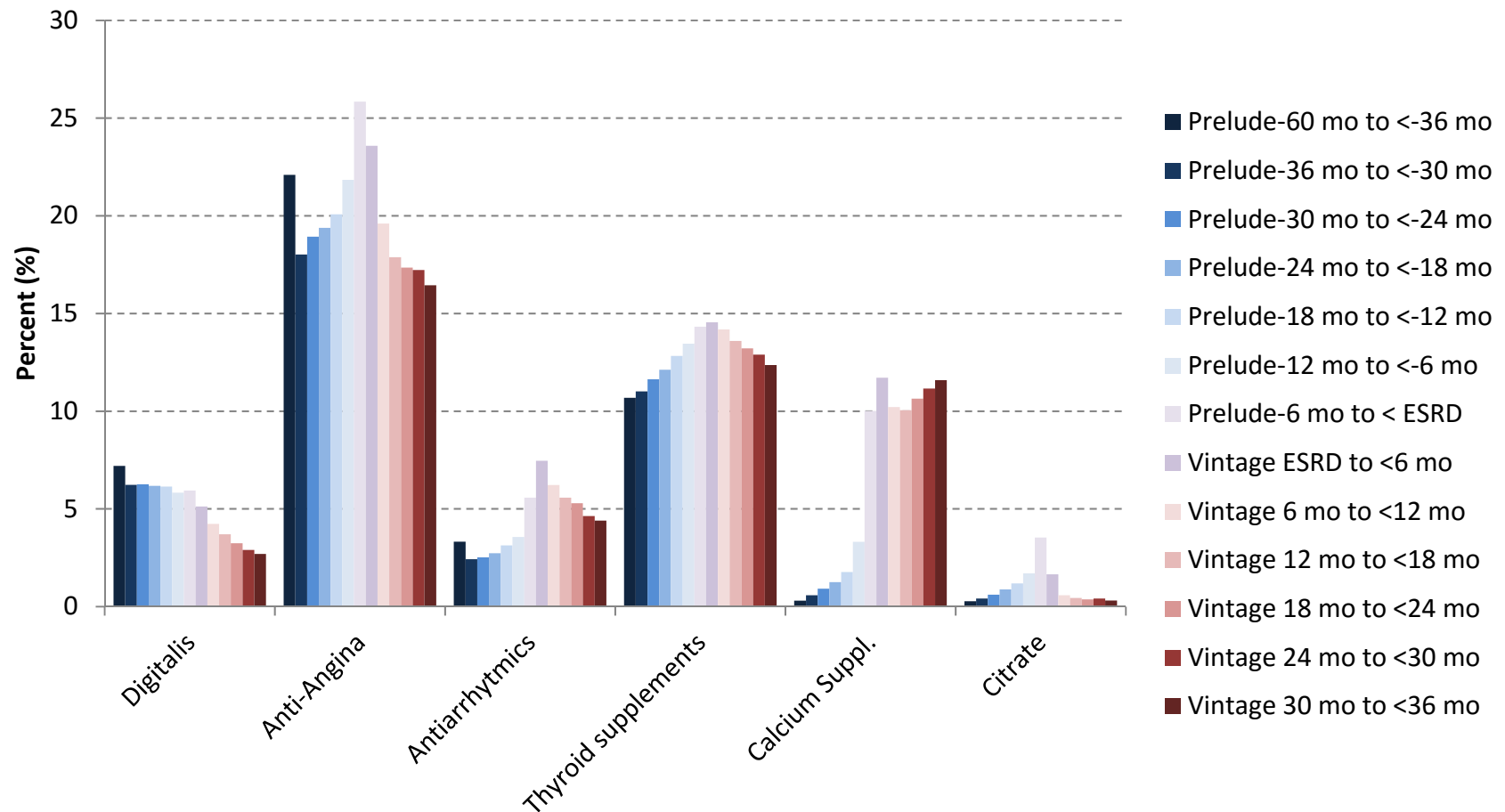
### Blood thinners, Anti-depressant



Transition of Care in CKD (TC-CKD)  
N=52,172, 4 years, 10/1/2007-9/30/2011

## Granular Medication Analyses

# Thyroid, Calcium Medications



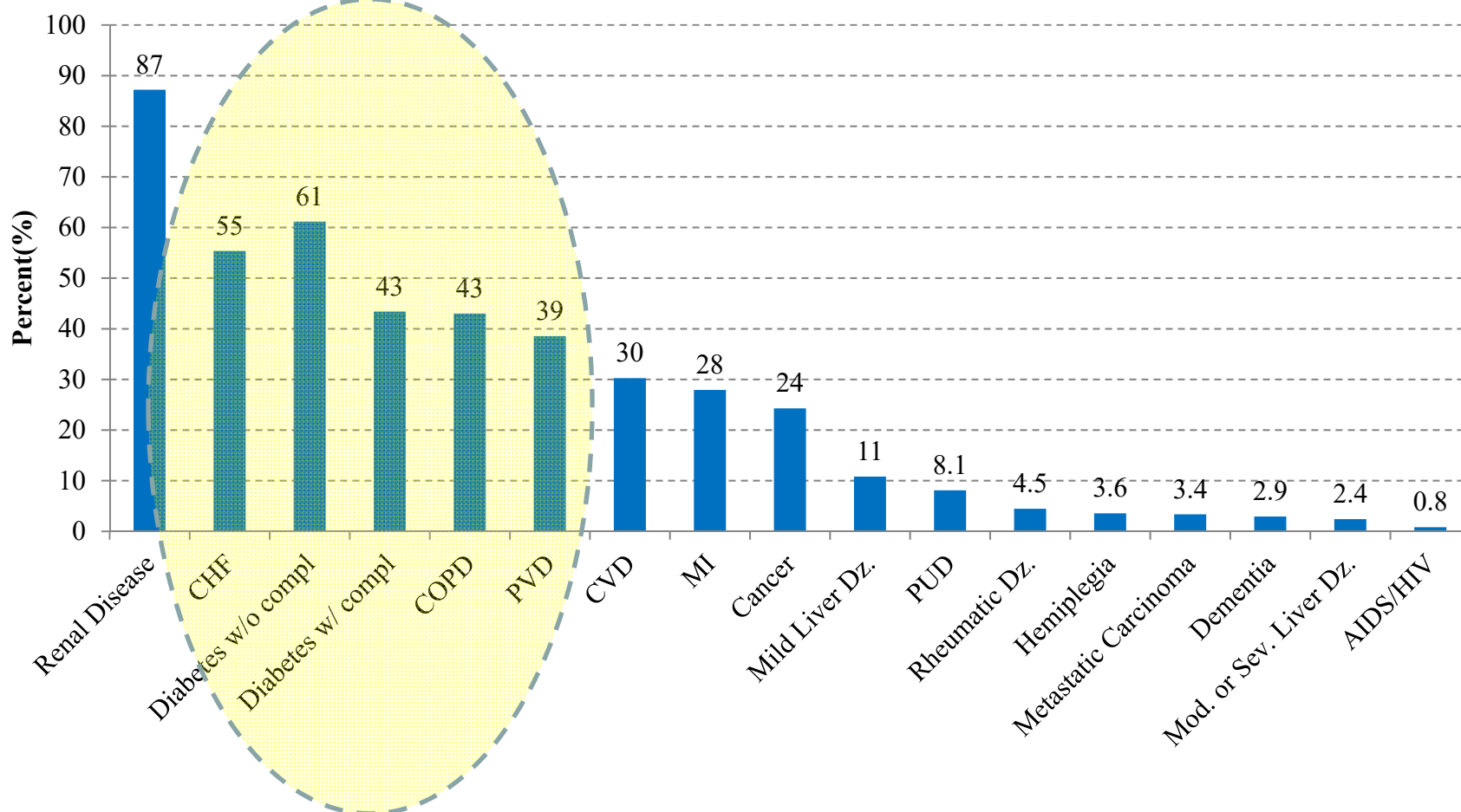
Transition of Care in CKD (TC-CKD)  
N=52,172, 4 years, 10/1/2007-9/30/2011

# Comorbidities

Among comorbid conditions that were obtained from multiple sources for 47,555 veterans who transition to ESRD with at least one identified comorbidity,

- congestive heart failure (**CHF**) and **diabetes** mellitus were each present in over half of the veterans,
- chronic **pulmonary** disease was recorded in over 40%, and
- almost a quarter had the diagnosis of **cancer**,
- while 28% had prior **myocardial infarction**.

**Figure x.7. Selected comorbid conditions for calculation of the Charlson Comorbidity Index prior to transition to ESRD in 47,555 incident ESRD veterans who would transition to ESRD**





# HOSPITALIZATIONS

- Among the 46,625 veterans who transitioned to ESRD over the 4-year period with at least one hospitalization event, the most common causes of hospital admission that also included the ESRD transition day in the hospital included: acute kidney injury (AKI, acute renal failure), hypertension, congestive heart failure, and CKD per se, while septicemia related hospital admissions increased dramatically after ESRD transition.
- Congestive heart failure (CHF) was the most common reason for hospital admission prior to ESRD transition (prelude time), whereas dialysis access complications was the most common cause after ESRD transition (vintage time).
- For hospitalizations that included the transition to ESRD event, i.e., the first hemodialysis treatment, AKI was the leading cause of hospitalization.

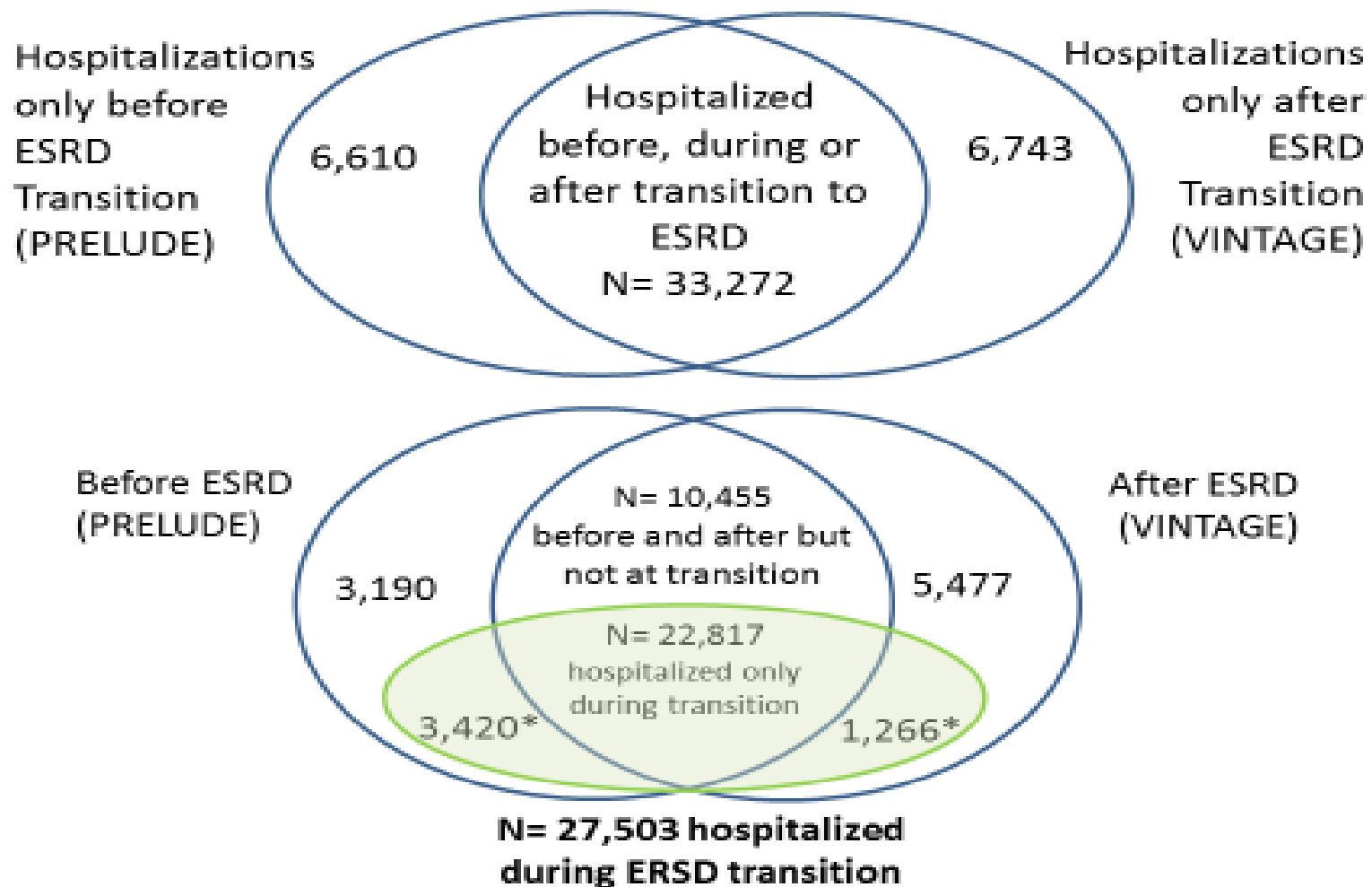
## Source of Hospitalization Data

- To obtain accurate hospitalization data for the 52,172 veterans who transitioned to ESRD over the 4 years (10/2007-9/2011),
- Additional database merging
  - Inpatient Acute Care Main,
  - Inpatient Acute Care Surgery,
  - MedSAS Outpatient Event file,
  - MedSAS Inpatient Encounters file
  - CMS Medicare-Inpatient and Outpatient data sources (including CMS RIF- Outpatient, and Additional Chronic Conditions Obtained from CMS Beneficiary Files under BASF & MBSF).

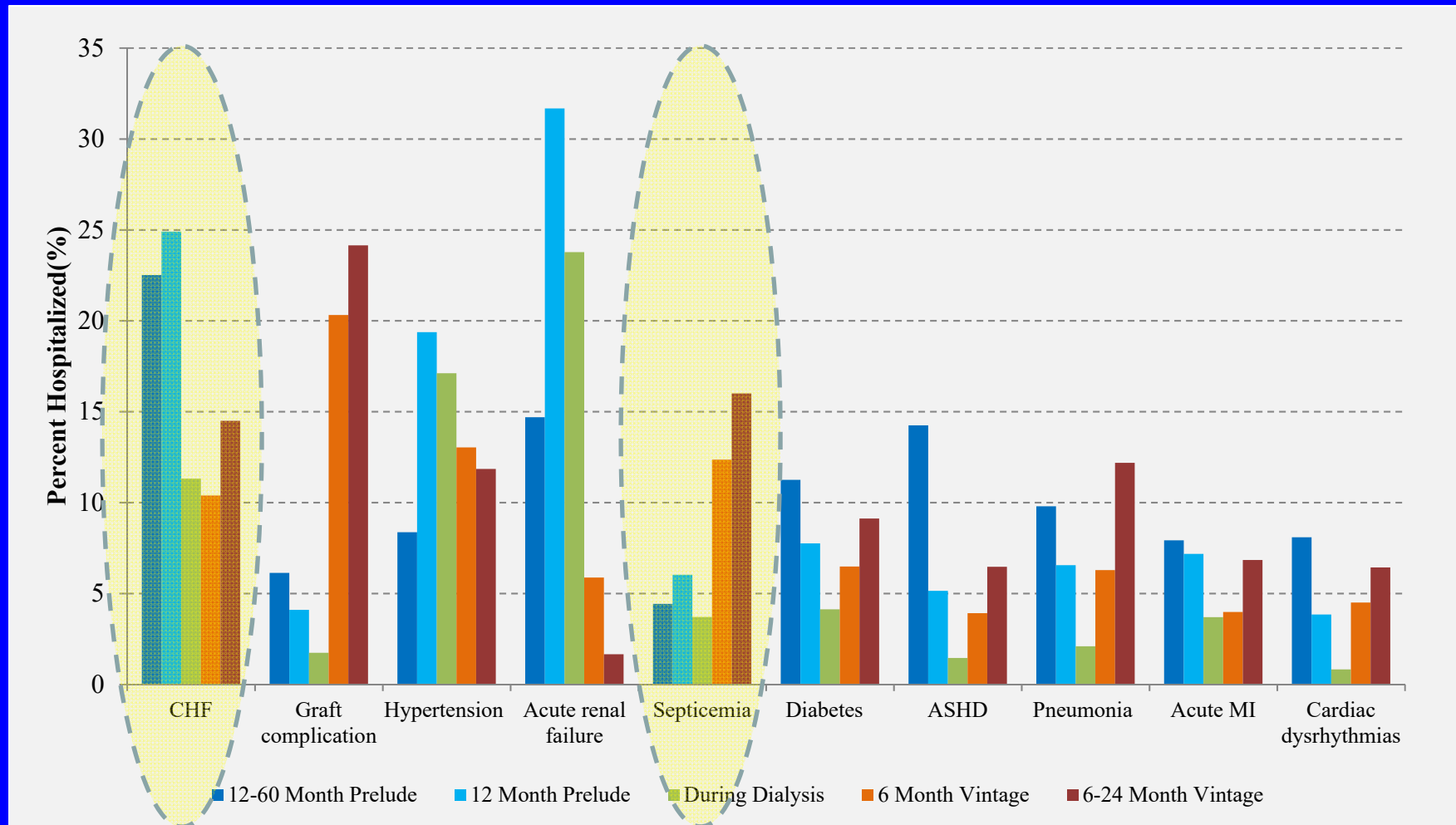
# Hospitalization

- 46,625 (89.4%) of all veterans who transitioned to ESRD were hospitalized at least once during a period of -5 yrs prior to (prelude) and +2 yrs after transition (vintage).
- 6,610 were hospitalized only before but not after ESRD
- 6,743 were hospitalized only after but not before ESRD,
- 33,272 were in the hospital both before and after transition.
- **27,503 veterans (52.7%) the transition to ESRD happened while they were in the hospital,**
  - *including 22,817 veterans (43.7%) whose only hospitalization event during the entire 7 years of observation was to transition to ESRD*

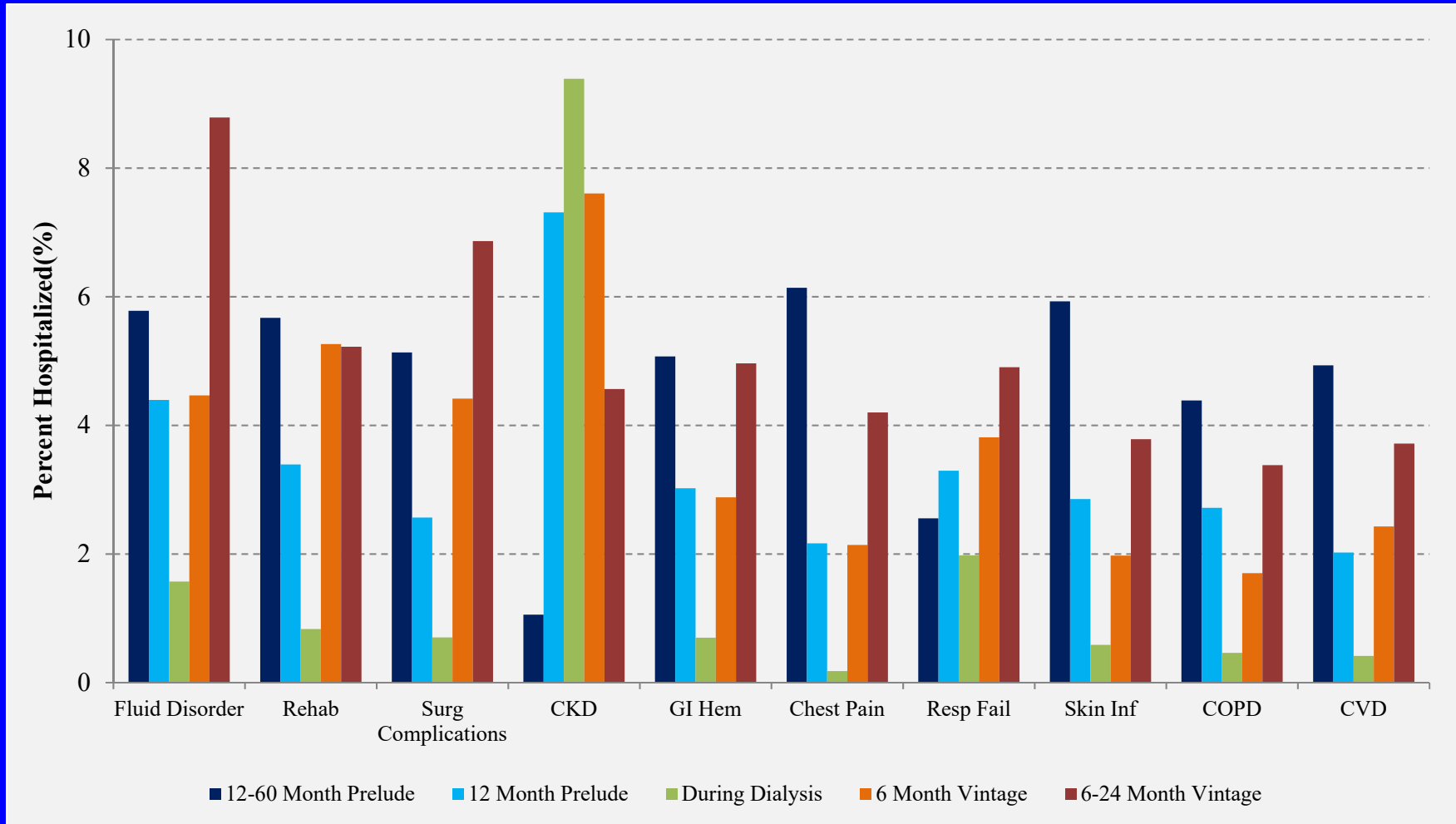
Figure x.5. **Hospitalization** events in 46,625 incident ESRD veterans who transitioned to ESRD during 10/1/2007-9/30/2011, with data ranging from -60 months prior to transition (prelude) to +24 months after transition (vintage), Upper Venn diagram: Three major hospitalization categories; Lower Venn diagram: Focus of hospital events during transition to ESRD.



# Cause-Specific Hospitalization



# Cause-Specific Hospitalization



# Cause-Specific Hospitalization:

Table x.4. Ranking of the top 20 causes of hospitalization in 46,625 incident ESRD veterans who were hospitalized at least once during the period of -60 months prior to transition (prelude) to +24 months after transition (vintage)

Hospitalization Event	Overall (7 year cohort)	-60 to -12 months of prelude	Last 12 months of Prelude	During ESRD transition	First 6 months of vintage	+6 to +24 months of vintage
CHF	1	1	1	3	4	2
Dialysis access (Graft) complication	2	9	10	10	1	1
Hypertension	3	7	3	2	3	4
Acute renal failure (AKI)	4	3	2	1	8	
Septicemia	5	18	8	7	2	3
Diabetes	6	4	4	5	6	6
ASHD	7	2	9	12	15	10
Pneumonia	8	5	7	8	7	5
Acute MI	9	6	5	6	13	8
Cardiac dysrhythmias	10	8	12	13	10	11
Fluid Disorder (Fluid overload)	11	13	11	11	12	7
Rehabilitation	12	12	15	14	9	12
Surgical Complications	13	14	19	15	11	9
CKD	14		6	4	5	15
GI Hemorrhage	15	16	16	16	17	14
Chest Pain	16	10				16
Respiratory Failure	17		14	9	14	13
Skin Infection	18	11	18	18		18
COPD	19	15	17			17
CVD	20	17			19	19
Peripheral and visceral atherosclerosis		19				
Anemia			13			
UTI		20	20		18	20
Other circulatory disease					16	
Intestinal infection					20	
Aortic; periph., visceral artery aneurysm				19		
Multiple myeloma				20		

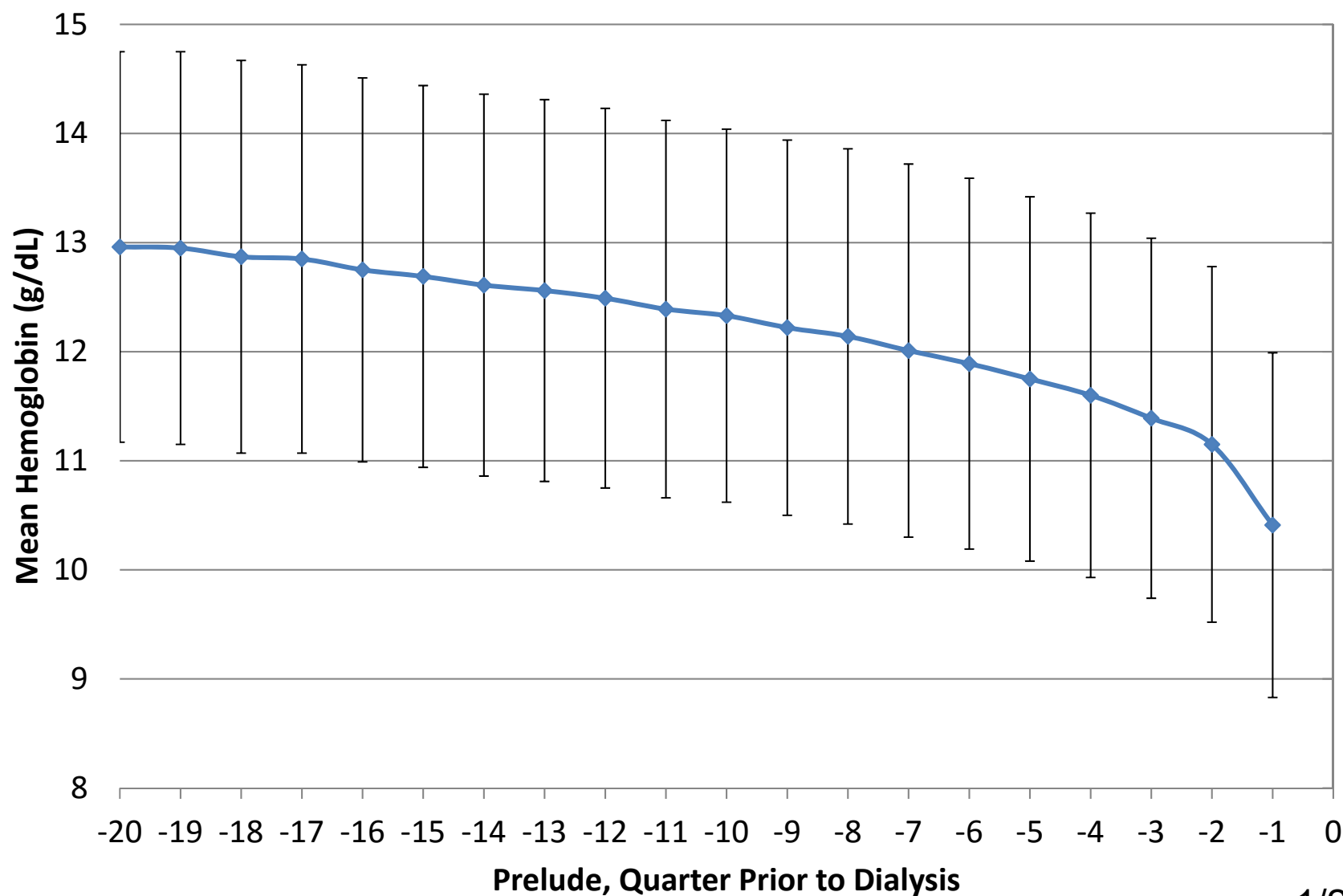
# Prelude Trends (pre-ESRD)

Prelude trend analyses provide important information about changes in clinical and laboratory measures over time during several years **prior to transition to ESRD**.



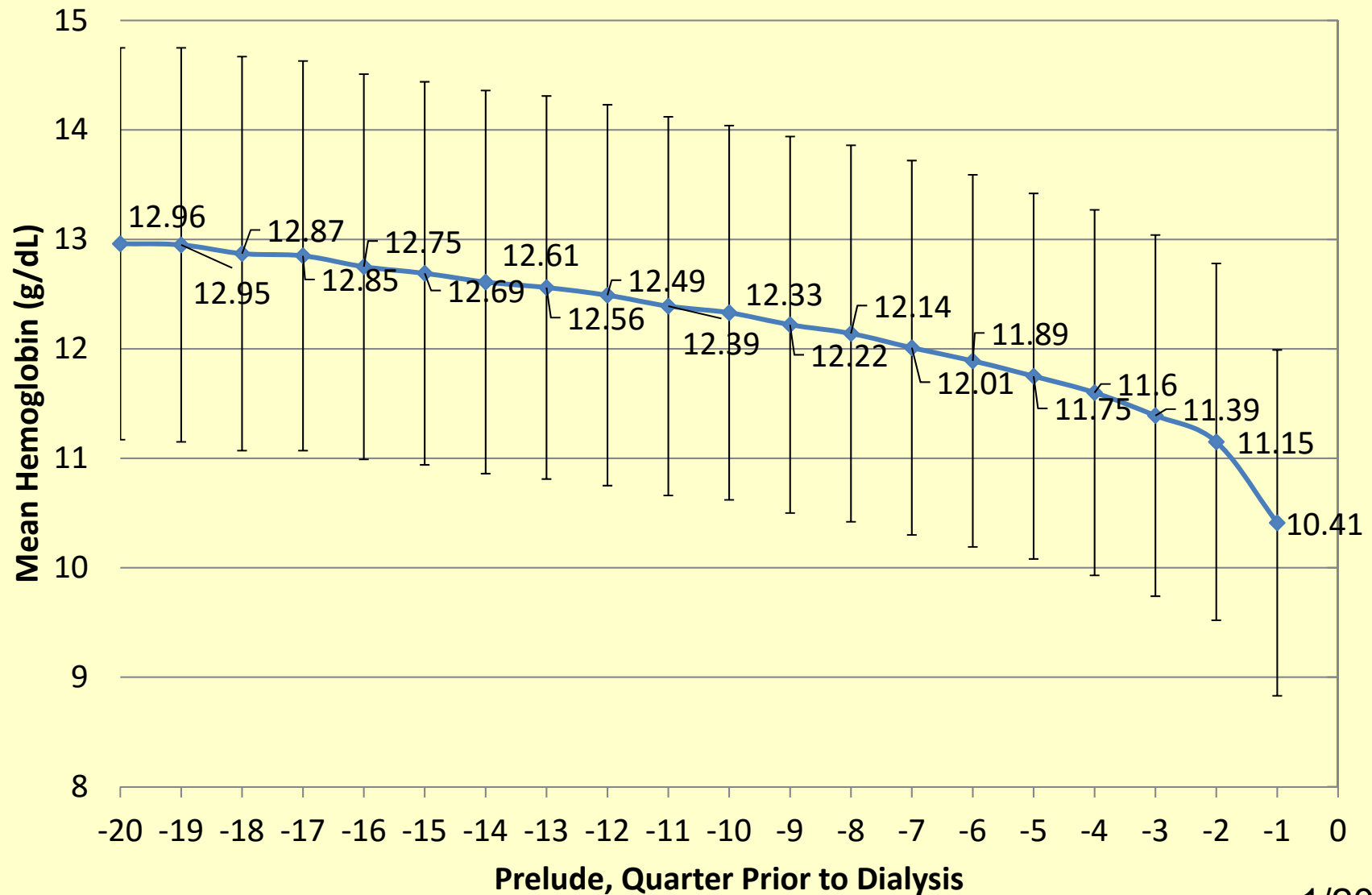
# Hemoglobin by Prelude Quarters

Mean Hemoglobin Over 20 Quarters Prior to Dialysis Start in  
28,717 TCCKD Patients



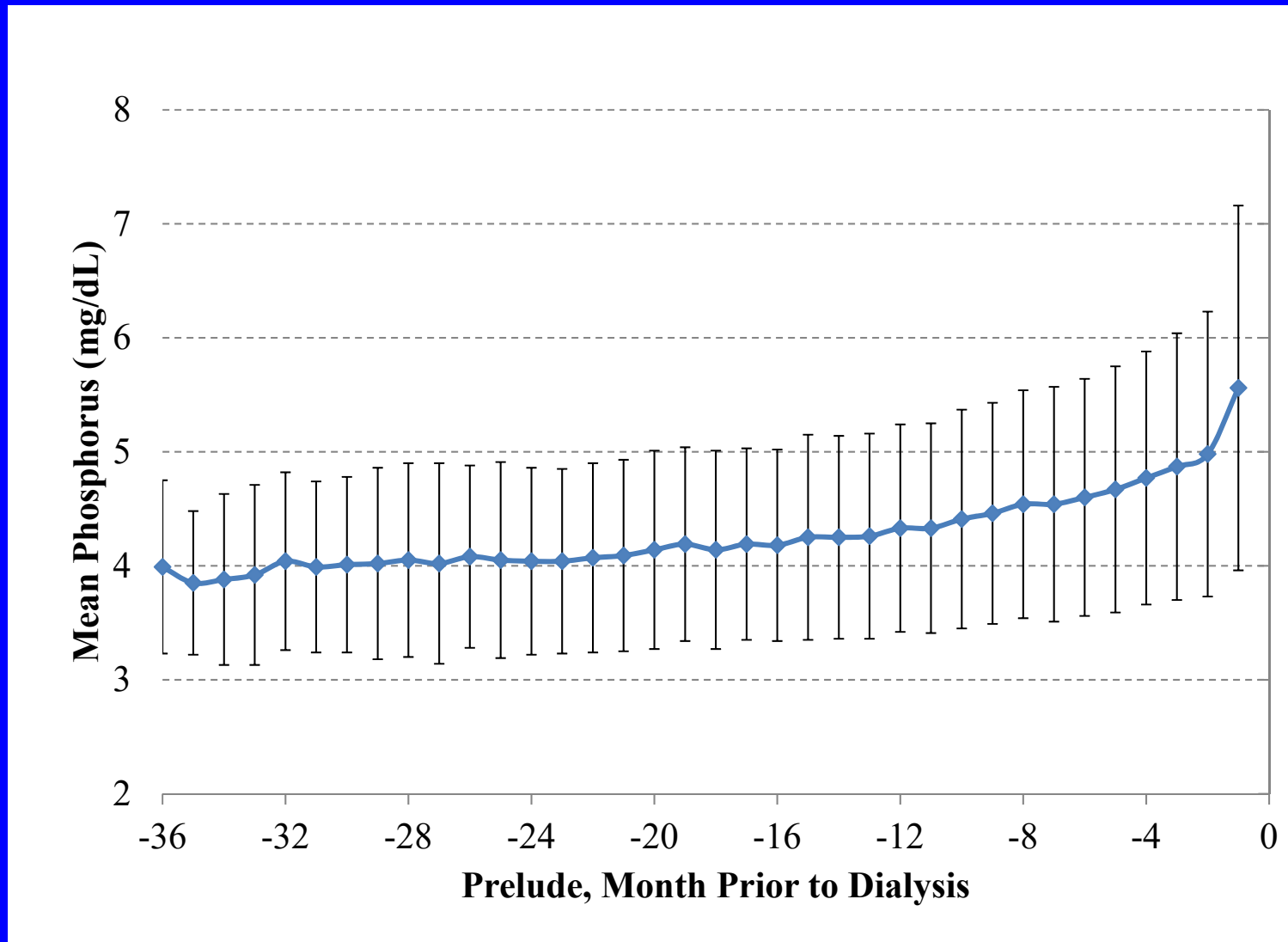
# Hemoglobin by Prelude Quarters

Mean Hemoglobin Over 20 Quarters Prior to Dialysis Start in  
28,717 TCKD Patients



# Phosphorus Trend during Prelude

Figure x.9. Trend in serum phosphorus level during the prelude (pre-ESRD) time over 36 months in 11,896 veterans who later transitioned to ESRD



**Table x.2. Status of 52,172 incident ESRD veterans on Day 1 and Day 90 after transition to ESRD, 10/1/2007-9/30/2011 (adapted from ADR 2014)**

	Day 1		Day 90	
	n	%	n	%
Dialysis Modality				
In-center	43,256	82.9	40,918	78.4
Home HD	260	0.5	258	0.5
CAPD	1,405	2.7	1,302	2.5
CCPD	1,174	2.2	1,395	2.7
Uncertain*	5287	10.1	447	0.9
Outcomes**				
Death	201	0.4	5,348	10.3
Transplant	589	1.1	701	1.3
Lost to follow-up			5	<0.1
Recovered			1,798	3.5
Total	52,172	100	52,172	100

# **TCKD Reports and Publications**

# TC-CKD ASN 2015 abstracts: 8 posters + 2 orals

## Thursday, Nov 5

1. **ORAL:** [TH-OR008] The Impact of Pre-ESRD **Glycemic Status** on Early Post-ESRD Mortality Among U.S. Veterans: A Transition of Care in CKD Study
2. [TH-PO536] Association Between **Vascular Access Creation** and Regression of eGFR Decline in Late-Stage CKD Patients Transitioning to ESRD
3. [TH-PO587] Serum **Triglyceride** Levels during Progression to ESRD and Early Dialysis Mortality among U.S. Veterans: A Transition of Care in CKD Study

## Friday, Nov 6

1. [FR-PO795] Association of **Dialysis Provider Assignment** with Early Dialysis Mortality in U.S. Veterans: A Transition of Care in CKD Study
2. [FR-PO845] Associations of Prelude (Pre-ESRD) **BMI** and **Weight Change** with Early Dialysis Mortality Among U.S. Veterans: A Transition of Care in CKD Study
3. [FR-PO900] Serum **Phosphorous** Levels prior to Transition to Dialysis and Early Dialysis Mortality Among U.S. Veterans: A Transition of Care in CKD Study

## Saturday, Nov 7

1. **ORAL:** [SA-OR010] Association of **eGFR Decline** with Post Dialysis Mortality in Late-Stage CKD Patients Who Transitioned to ESRD
2. [SA-PO790] Identifying Advanced Chronic Kidney Disease Patients with Same Survival Under **Conservative Care** versus Dialysis
3. [SA-PO796] Association of Pre-ESRD **Hemoglobin** with Early Post-ESRD Mortality Among U.S. Veterans: A Transition of Care in CKD Study
4. [SA-PO922] Association of 6-Month Pre-ESRD **Potassium** with Immediate Post-ESRD Survival: A Transition to CKD Study

The United States Renal Data System  
(USRDS)  
Special Study Center  
Transition of Care in CKD (TC-CKD)

# KPSC Report

Steven J. Jacobsen, John J. Sim, Hui Zhou,  
Jiaxiao Shi, David K. Yi, Jose Pio

Oct 9, 2015

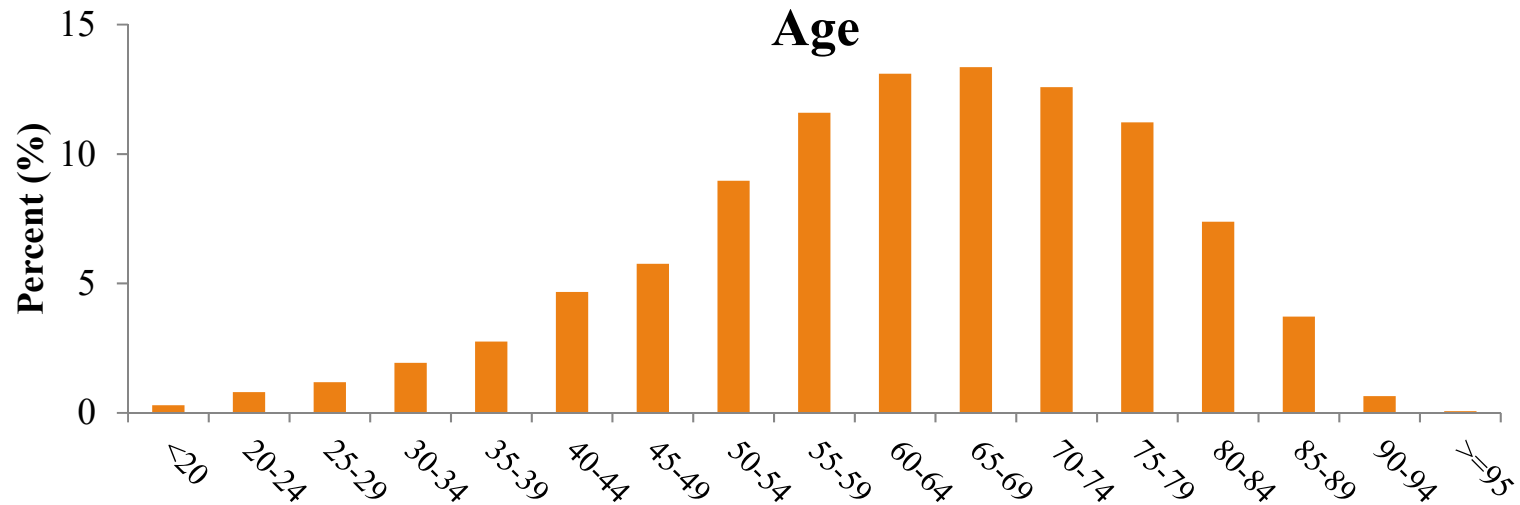
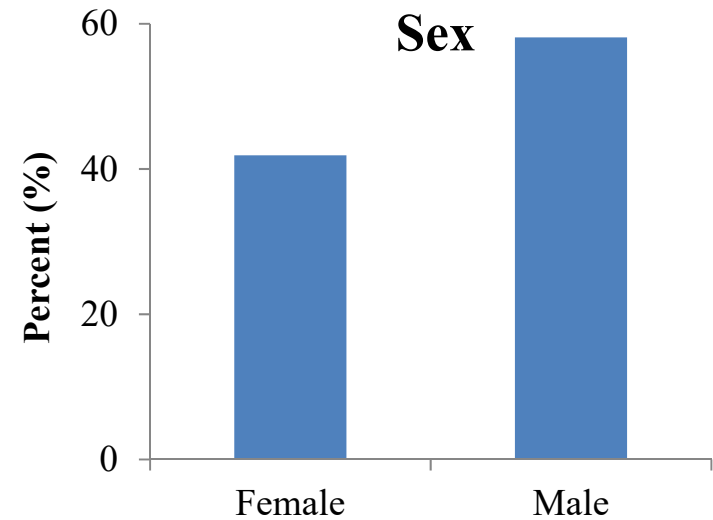
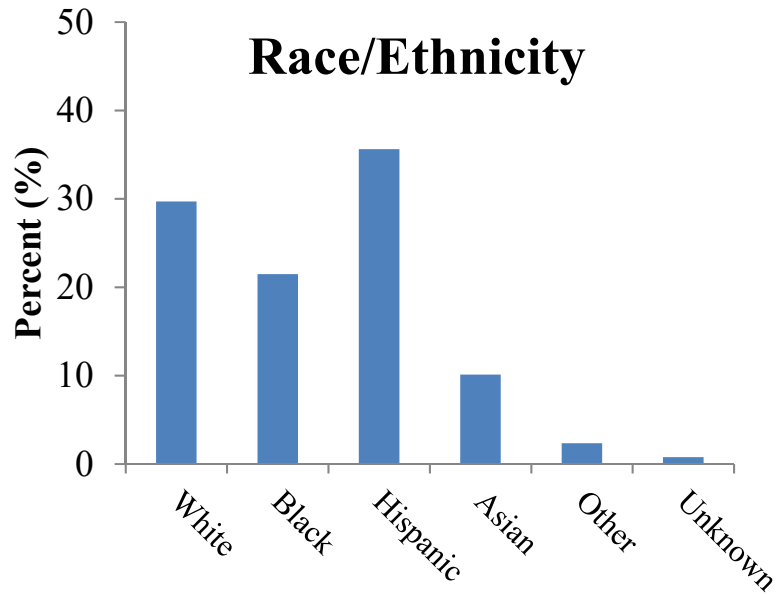
# Linkage Results with USRDS

	Total Number	Sent for linkage	Matched persons	Unmatched
2007	1,189	1,182	1,143	39 (3.36%)
2008	1,169	1,163	1,125	38 (3.35%)
2009	1,311	1,293	1,246	47 (3.67%)
2010	1,306	1,293	1,231	62 (4.79%)
2011	1,239	1,228	1,159	69 (5.79%)
2012	1,219	1,216	1,120	106 (8.72%)
2013	1,260	1,253	1,161	92 (7.34%)
2014	1,372	1,365	562	803 (58.83%)
Total	10,065	9,993	8,747	1,246

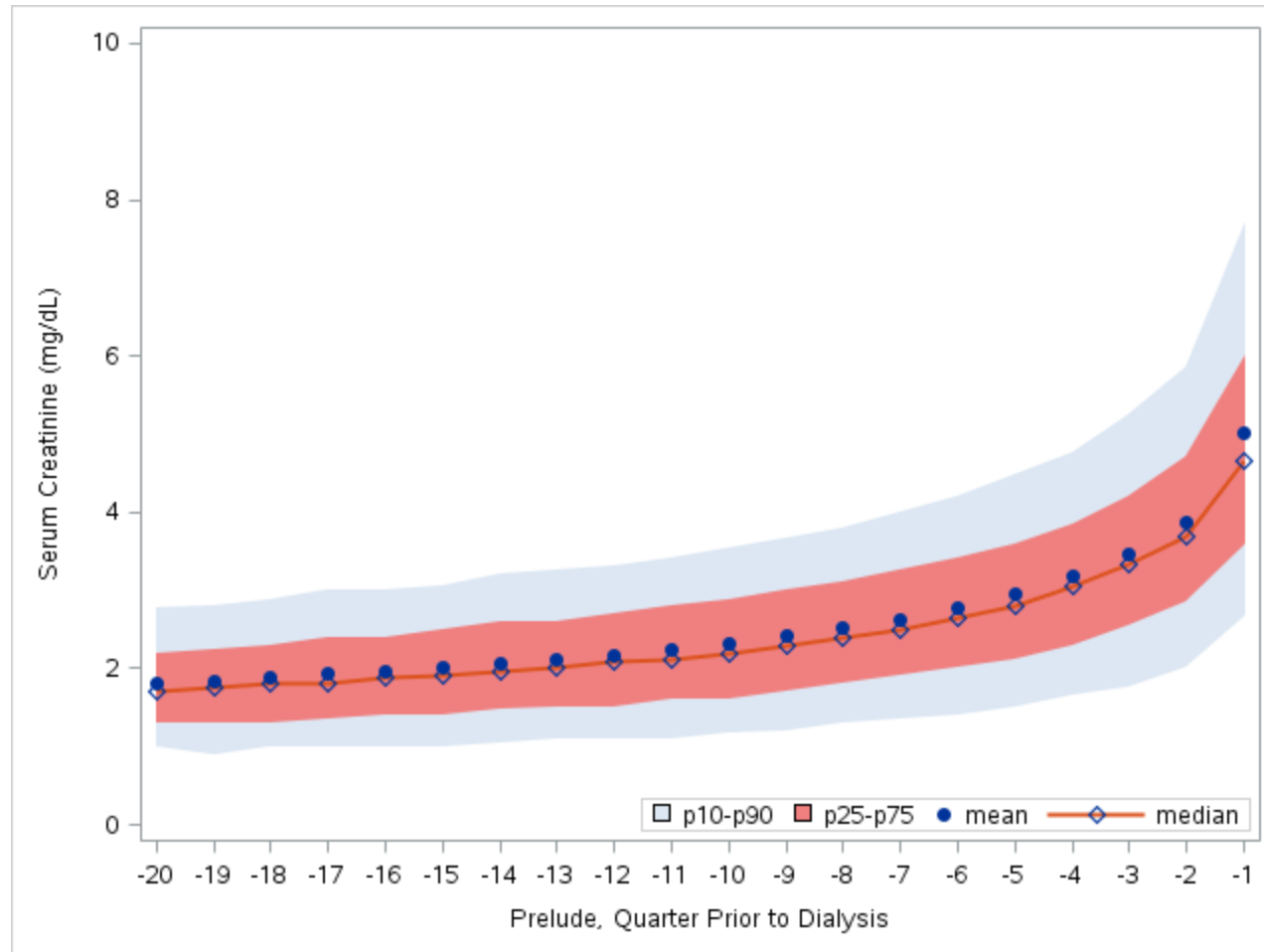
**Note:** Considering possible delay in the reporting system, if exclude number from 2014, unmatched rate between 2007 and 2013 was 443 (**5.13%**).



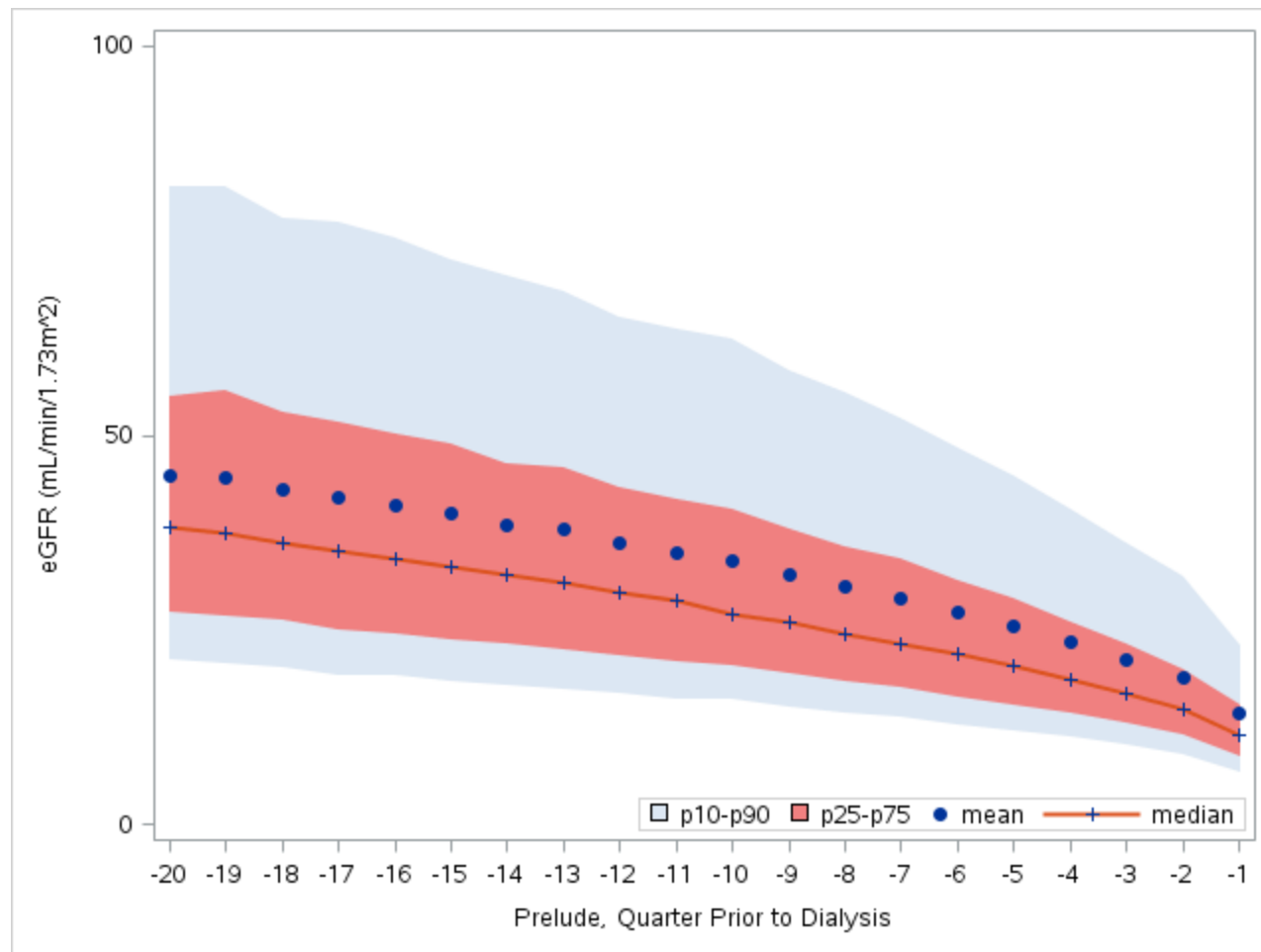
# Demographic Distribution of KPSC 7,885 Dialysis Patients Between 2007-2013



# Creatinine trajectory in 20 quarters prior to Dialysis among 7,885 Incident Patients



# eGFR trajectory in 20 quarters prior to Dialysis among 7,885 Incident Patients



# Transition of Care in CKD (TC-CKD): What can investigators study using the TCCKD data?

*The **post-ESRD** impact of **pre-ESRD** comorbid conditions and events (**up to -3 years prior to transition**):*

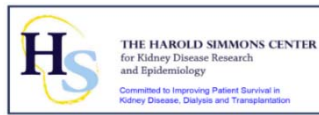
- NDD-CKD-related events:
  - Speed of CKD progression (eGFR slope)
  - Episodes of acute kidney injury (AKI)
  - Need for prior temporary dialysis therapy
  - dialysis access placement and type
  - nephrologist care & case-load
- NDD-CKD-specific comorbidities:
  - Mineral and bone disorders [MBD]
  - Metabolic acidosis
  - Protein-energy wasting and malnutrition,
  - Anemia
- Non-renal conditions:
  - Glycemic control
  - Treatment of hypertension
  - Hypercholesterolemia
  - Obesity and frailty
  - Management of heart failure, liver disease and hypothyroidism

## Summary and conclusions: **TRANSITION of Care in CKD (TC-CKD)**

- In patients with very-late-stage NDD-CKD (eGFR <25 ml/min/1.73 m<sup>2</sup>) the optimal transition of care to kidney replacement therapy (ESRD) is not known.
- Major uncertainty and significant knowledge gaps have persisted pertaining to differential or individualized transitions of care across different age, race and other demographics and different pre-Transition conditions and events as well as dialysis format (frequency, mode, timing, etc.).
- The use of pre-Transition (PRELUDE) data to assess the approach to ESRD transition decisions including timing and modality selection to achieve the best outcomes will be the focus of the 2014-2019 USRDS Special Study Center IC-CKD.
- The National **Veterans** Data and the **Kaiser** Permanente of Southern California data will serve for the first time for pre-ESRD analyses and annual reports 2014-2019.

# Acknowledgement

## *The Harold Simmons Center for Kidney Disease Research & Epidemiology*



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- Steven Brunelli, MD, MS

# Appendix A

- TCCKD Data 2014/2015

# Appendix B

- USRDS TCCKD ADR Chapter 2015/16

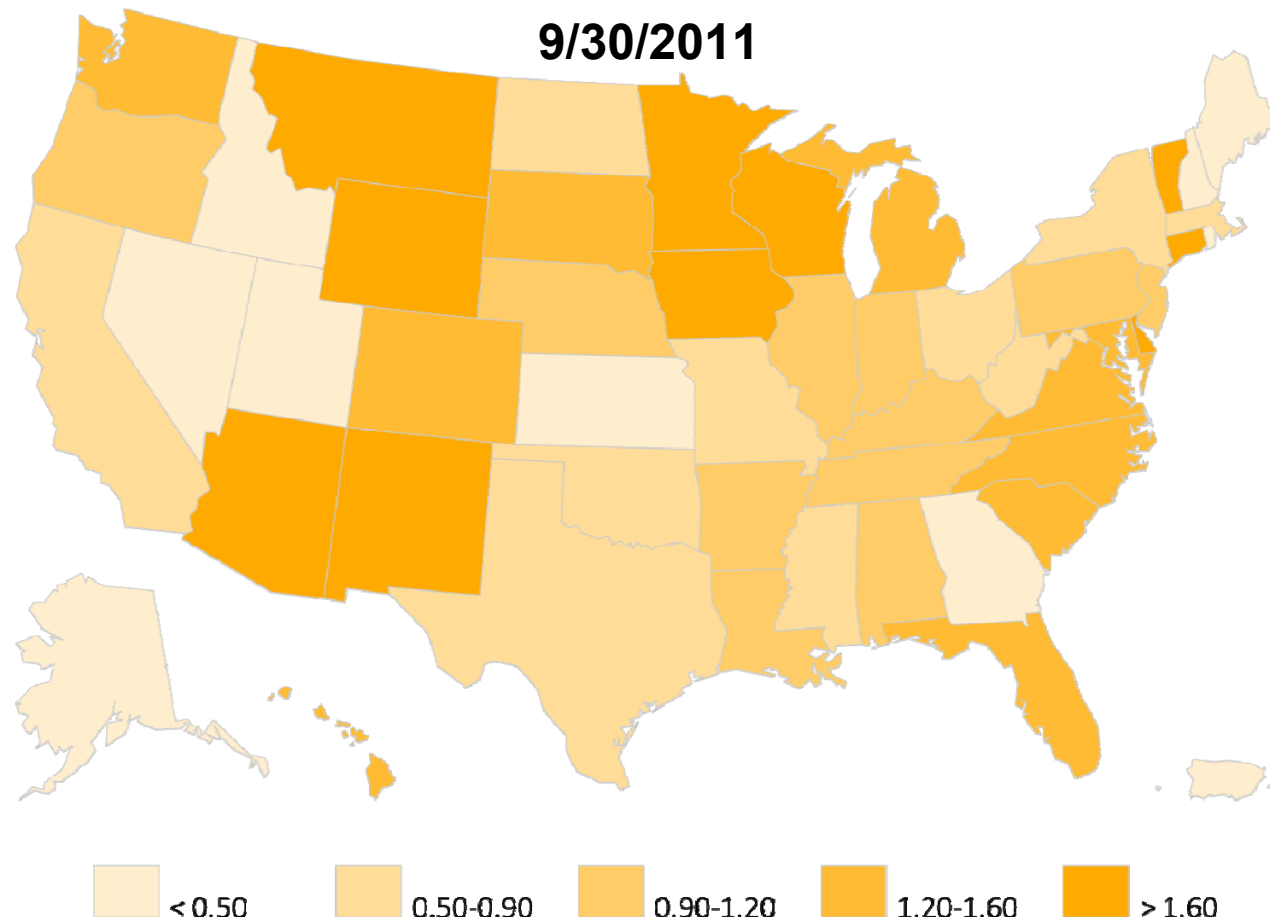




2015 ANNUAL DATA REPORT  
VOLUME 1: CHRONIC KIDNEY DISEASE

**Chapter 8: Transition of Care  
in Chronic Kidney Disease**

**Figure 8.1 Distribution of preemptive kidney transplant rates among 52,172 incident ESRD veterans across the states and territories of the United States, 10/1/2007-**



*Data source: VHA Administrative data, USRDS ESRD Database. States and territories of the United States of America. Abbreviations: ESRD, end-stage renal disease.*

**Table 8.1 Rates and ratios of incident ESRD among veterans and in U.S. adults,  
10/1/2007-9/30/2011**

	55-64 years			65-74 years			75 years or older		
	2008	2009	2010	2008	2009	2010	2008	2009	2010
<b>Incident ESRD veterans</b>	3180	3292	3115	3054	3187	3080	5924	5787	5740
<b>All veterans</b>	5718302	5441739	5340529	4148572	4152331	4294221	4911012	4851671	4839173
<b>ESRD rate in veterans, per million</b>	<b>556</b>	<b>605</b>	<b>583</b>	<b>736</b>	<b>768</b>	<b>717</b>	<b>1206</b>	<b>1193</b>	<b>1186</b>
<b>ESRD rate in the U.S., per million</b>	773	778	752	1297	1311	276	545	1559	1582
<b>ESRD rate ratio (Vet: U.S.)<sup>a</sup></b>	<b>0.72</b>	<b>0.78</b>	<b>0.78</b>	<b>0.57</b>	<b>0.59</b>	<b>0.56</b>	<b>0.78</b>	<b>0.76</b>	<b>0.75</b>

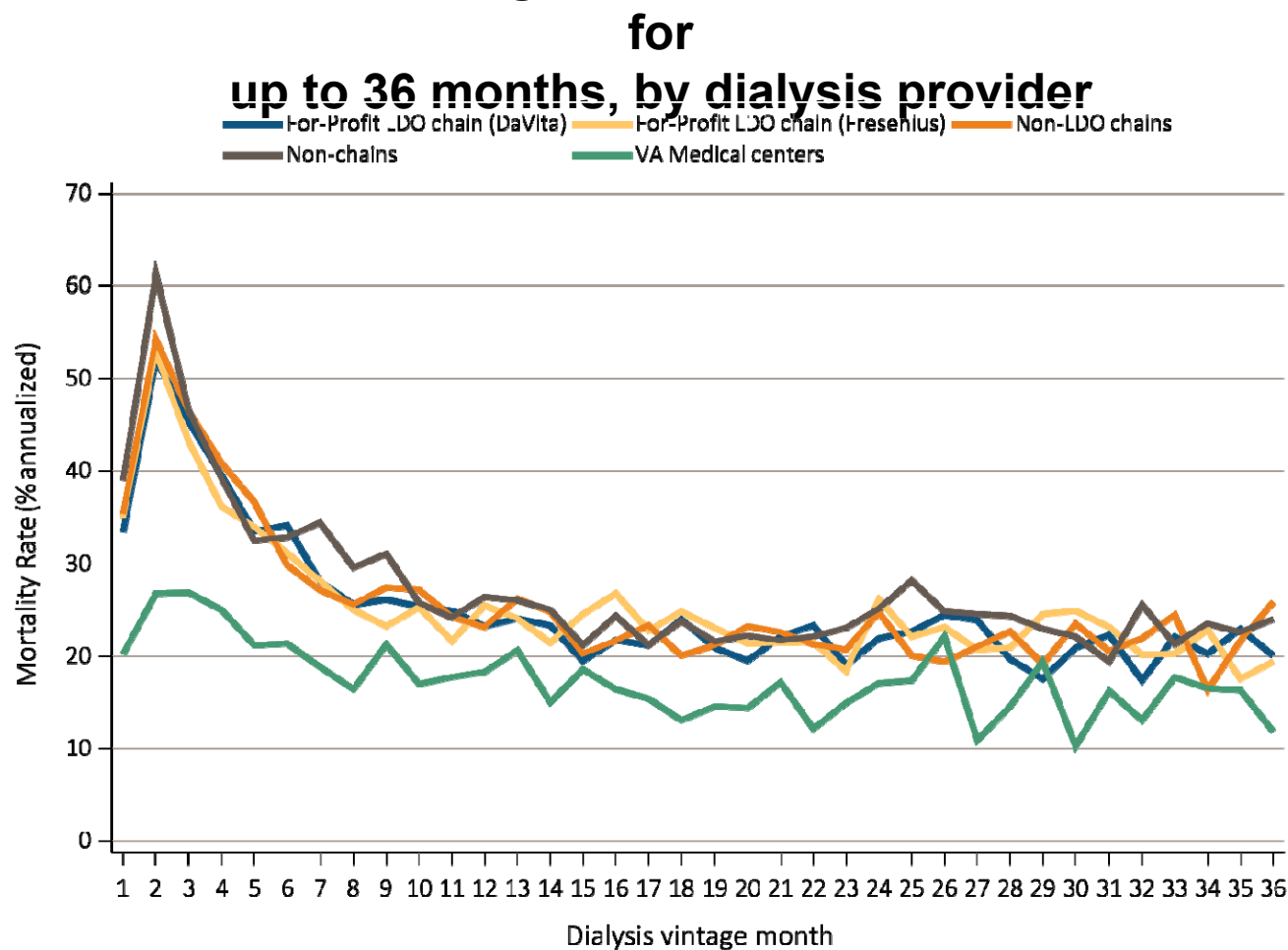
*Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data, U.S. Census Bureau; data derived from U.S. veteran incident dialysis patients. <sup>a</sup> Veterans to U.S. rate ratios. Abbreviations: ESRD, end-stage renal disease; PM; per million; Vet, veterans.*

**Table 8.2 Status of 52,172 incident ESRD veterans on Day 1 and Day 90 after transition to ESRD, 10/1/2007-9/30/2011**

	Day 1		Day 90	
	n	%	n	%
<b>Dialysis Modality</b>				
In-center	43,256	82.9	40,918	78.4
Home HD	260	0.5	258	0.5
CAPD	1,405	2.7	1,302	2.5
CCPD	1,174	2.2	1,395	2.7
Uncertain <sup>a</sup>	5287	10.1	447	0.9
<b>Outcomes<sup>b</sup></b>				
Death	201	0.4	5,348	10.3
Transplant	589	1.1	701	1.3
Lost to follow-up			5	<0.1
Recovered			1,798	3.5
<b>Total</b>	<b>52,172</b>	<b>100</b>	<b>52,172</b>	<b>100</b>

*Data source: USRDS ESRD Database. Table adapted from the 2014 USRDS Annual Data Report. <sup>a</sup> Uncertain groups have no know dialysis modality, <sup>b</sup> n for outcomes is cumulative for subsequent periods after Day 1. Abbreviations: CAPD, continuous ambulatory peritoneal dialysis; CCPD, continuous cycling peritoneal dialysis; ESRD, end-stage renal disease; HD hemodialysis.*

**Figure 8.2 Annualized monthly unadjusted mortality of incident ESRD veterans who transitioned to ESRD during 10/1/2007-9/30/2011 and who were followed**



*Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data.  
Abbreviation: DaVita, DaVita Kidney Care; ESRD, end-stage renal disease; LDO, large dialysis organization;  
VA, Veterans' Affairs.*

**Table 8.3 Annualized month-by-month unadjusted mortality in 52,172 incident ESRD veterans during the first 24 months after transition to ESRD by dialysis provider, 10/1/2007-9/30/2011**

Month	DVT			FMC			Other Chains			Non-Chain			VHA		
	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %
1	355	12763	33.38	418	14376	34.89	202	6847	35.4	358	11005	39.04	86	5100	20.24
2	538	12408	52.03	615	13958	52.87	300	6645	54.18	543	10647	61.2	112	5014	26.8
3	449	11870	45.39	480	13343	43.17	246	6345	46.52	392	10104	46.56	110	4902	26.93
4	377	11421	39.61	388	12863	36.2	208	6099	40.92	318	9712	39.29	100	4792	25.04
5	308	11044	33.47	353	12475	33.96	180	5891	36.67	254	9394	32.45	83	4692	21.23
6	306	10736	34.2	315	12122	31.18	142	5711	29.84	250	9140	32.82	82	4609	21.35
7	244	10430	28.07	277	11807	28.15	126	5569	27.15	255	8890	34.42	71	4527	18.82
8	217	10186	25.56	240	11530	24.98	116	5443	25.57	213	8635	29.6	61	4456	16.43
9	217	9969	26.12	219	11290	23.28	122	5327	27.48	218	8422	31.06	78	4395	21.3
10	206	9752	25.35	233	11071	25.26	118	5205	27.2	176	8204	25.74	61	4317	16.96
11	198	9546	24.89	196	10838	21.7	103	5087	24.3	162	8028	24.22	63	4256	17.76
12	181	9348	23.23	226	10642	25.48	96	4984	23.11	173	7866	26.39	64	4193	18.32
13	184	9167	24.09	209	10416	24.08	107	4888	26.27	167	7693	26.05	71	4129	20.63
14	175	8983	23.38	183	10207	21.51	99	4781	24.85	157	7526	25.03	51	4058	15.08
15	143	8808	19.48	205	10024	24.54	79	4682	20.25	130	7369	21.17	62	4007	18.57

*(Continued on next slide)*

**Table 8.3 Annualized month-by-month unadjusted mortality in 52,172 incident ESRD veterans during the first 24 months after transition to ESRD by dialysis provider, 10/1/2007-9/30/2011 (Continued)**

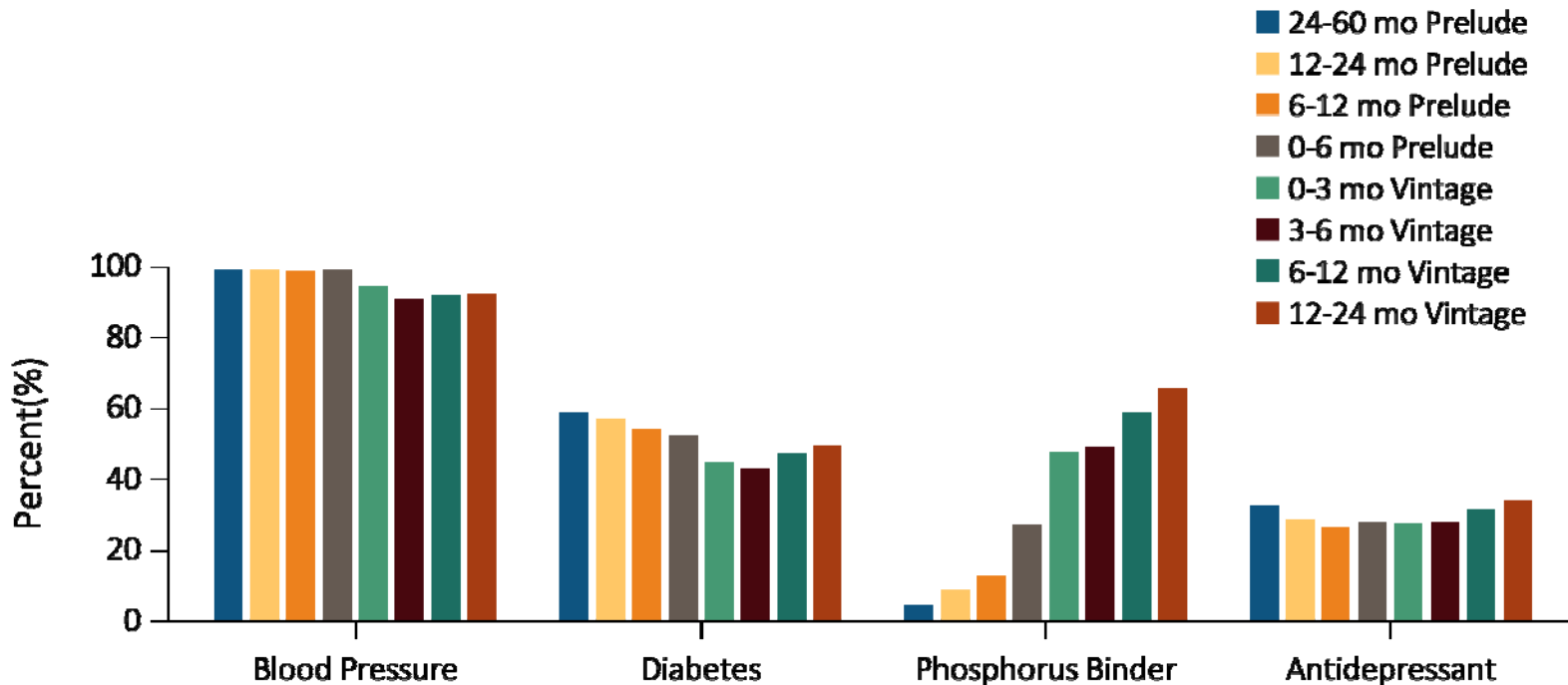
Month	DVT			FMC			Other Chains			Non-Chain			VHA		
	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %	Died	Alive	Rate %
<b>16</b>	157	8665	21.74	219	9819	26.76	83	4603	21.64	147	7239	24.37	54	3945	16.43
<b>17</b>	150	8508	21.16	182	9600	22.75	88	4520	23.36	125	7092	21.15	50	3891	15.42
<b>18</b>	167	8358	23.98	195	9418	24.85	74	4432	20.04	138	6967	23.77	42	3841	13.12
<b>19</b>	143	8191	20.95	177	9223	23.03	77	4358	21.2	123	6829	21.61	46	3799	14.53
<b>20</b>	131	8048	19.53	161	9046	21.36	83	4281	23.27	124	6706	22.19	45	3753	14.39
<b>21</b>	146	7917	22.13	159	8885	21.47	79	4198	22.58	119	6582	21.7	53	3708	17.15
<b>22</b>	151	7771	23.32	157	8726	21.59	73	4119	21.27	119	6463	22.1	37	3655	12.15
<b>23</b>	121	7620	19.06	131	8569	18.35	70	4046	20.76	122	6344	23.08	45	3618	14.93
<b>24</b>	137	7499	21.92	184	8438	26.17	82	3976	24.75	130	6222	25.07	51	3573	17.13

*Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data.*

*Provider is based on the patient's provider on Day 1. Rates represent the 12-month annualized rate.*

*Abbreviations: DVT, DaVita Kidney Care; ESRD, end-stage renal disease; FMC, Fresenius Medical Care; VHA, Veterans' Health Administration.*

**Figure 8.3 Medications prescribed to 52,172 incident ESRD veterans who transitioned to ESRD from 10/1/2007-9/30/2011**

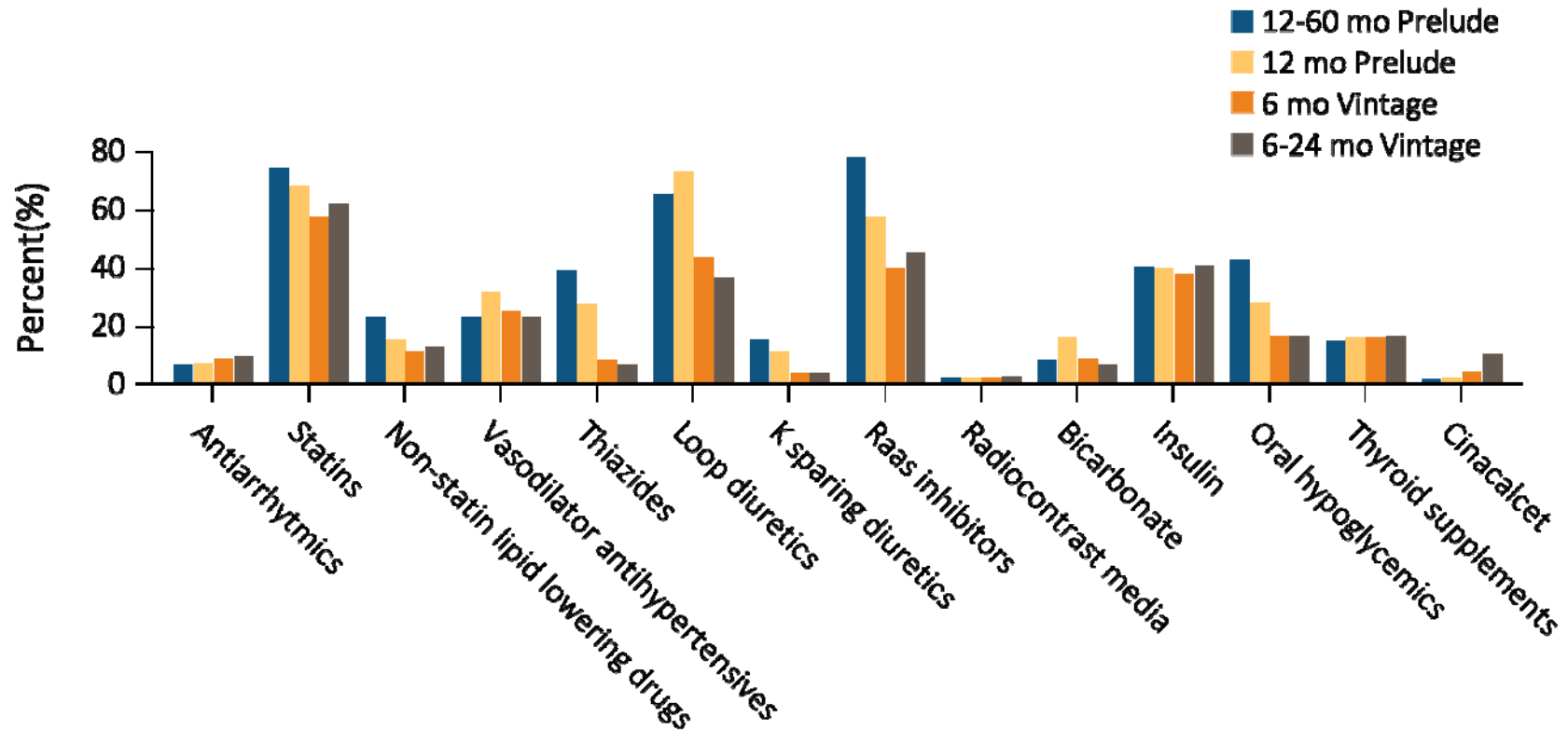


*Data source: VHA Administrative data, CMS Medicare Inpatient and Outpatient data. An individual's data includes the period from 60 months prior to transition (prelude) to 24 months following transition (vintage).*

*Abbreviations: ESRD, end-stage renal disease; mo, month.*

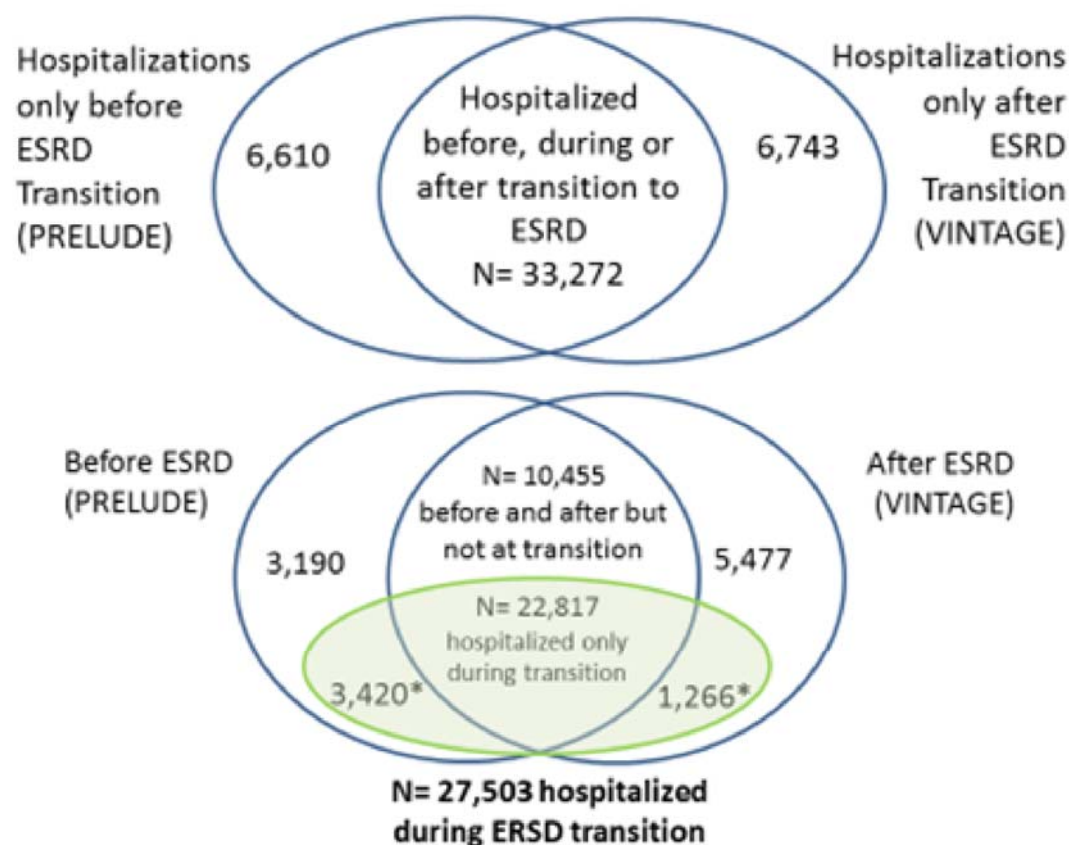


**Figure 8.4 Detail of the medications prescribed to 52,172 incident ESRD veterans who transitioned to ESRD during 10/1/2007-9/30/2011**



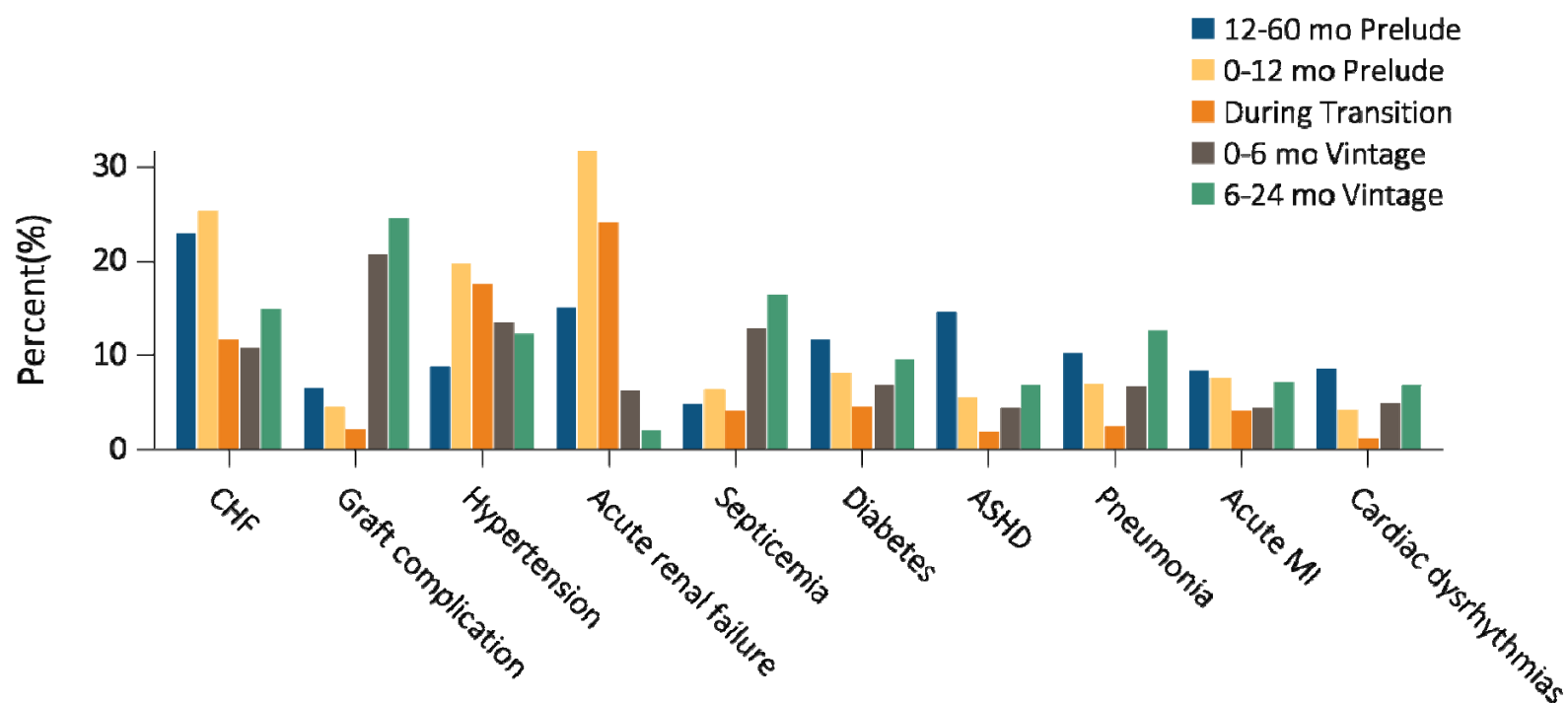
Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data. An individual's data includes the period from 60 months prior to transition (prelude) to 24 months following transition (vintage). Abbreviations: ESRD, end-stage renal disease; K, potassium; mo, month.

**Figure 8.5 Hospitalization events in 46,625 incident ESRD veterans who transitioned to ESRD during 10/1/2007-9/30/2011**

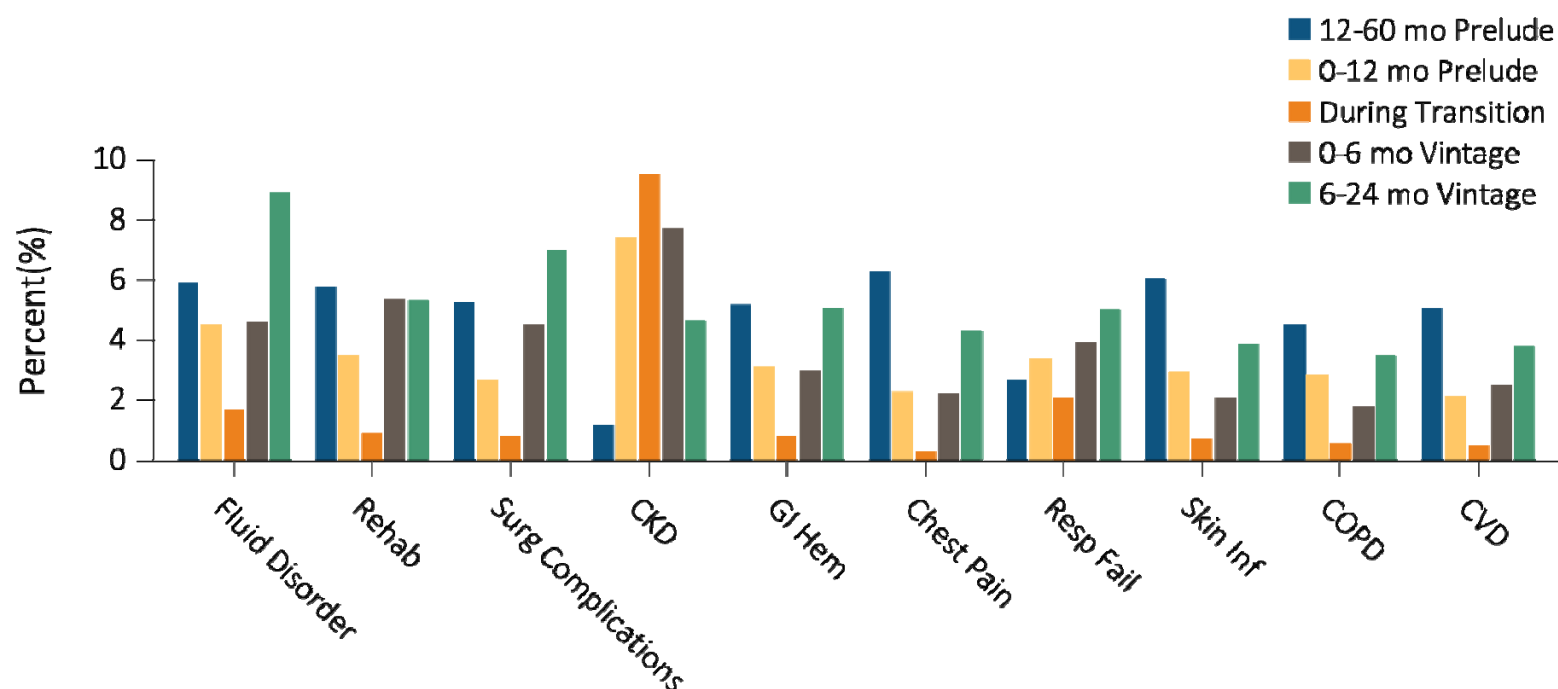


*Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data. An individual's data includes the period from 60 months prior to transition (prelude) to 24 months following transition (vintage). Upper Venn diagram: three major hospitalization categories; Lower Venn diagram: focus of hospital events during transition to ESRD. Abbreviations: ESRD, end-stage renal disease.*

**Figure 8.6 The top 20 causes of hospitalizations in 46,625 incident ESRD veterans who were hospitalized at least once during the period between 60 months prior to ESRD transition (prelude) and 24 months following ESRD transition (vintage)**  
**(a) 10 of the top 20 causes of hospitalizations**



**Figure 8.6 The top 20 causes of hospitalizations in 46,625 incident ESRD veterans who were hospitalized at least once during the period between 60 months prior to ESRD transition (prelude) and 24 months following ESRD transition (vintage)**  
**(b) 10 of the top 20 causes of hospitalizations**



Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data.  
 Abbreviations: ASHD, atherosclerotic heart disease; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CVD, acute cerebrovascular disease; GI Hem, gastrointestinal hemorrhage; MI, myocardial infarction; mo, month; Resp Fail, respiratory failure; Skin Inf, skin infection; surg, surgical.

**Table 8.4 Ranking of the top 20 causes of hospitalization in 46,625 incident ESRD veterans who were hospitalized at least once during the period between 60 months prior to ESRD transition (prelude) and 24 months following ESRD transition (vintage)**

Hospitalization Event	Overall (7 year cohort)	-60 to -12 months of prelude	Last 12 months of prelude	During ESRD transition	First 6 months of vintage	+6 to +24 months of vintage
Congestive heart failure	1	1	1	3	4	2
Dialysis access (graft) complication	2	9	10	10	1	1
Hypertension	3	7	3	2	3	4
Acute renal failure	4	3	2	1	8	
Septicemia	5	18	8	7	2	3
Diabetes	6	4	4	5	6	6
Atherosclerotic heart disease	7	2	9	12	15	10
Pneumonia	8	5	7	8	7	5
Acute myocardial infarction	9	6	5	6	13	8
Cardiac dysrhythmias	10	8	12	13	10	11
Fluid disorder/fluid overload	11	13	11	11	12	7
Rehabilitation	12	12	15	14	9	12
Surgical complications	13	14	19	15	11	9
Chronic kidney disease	14		6	4	5	15

*(Continued on next slide)*

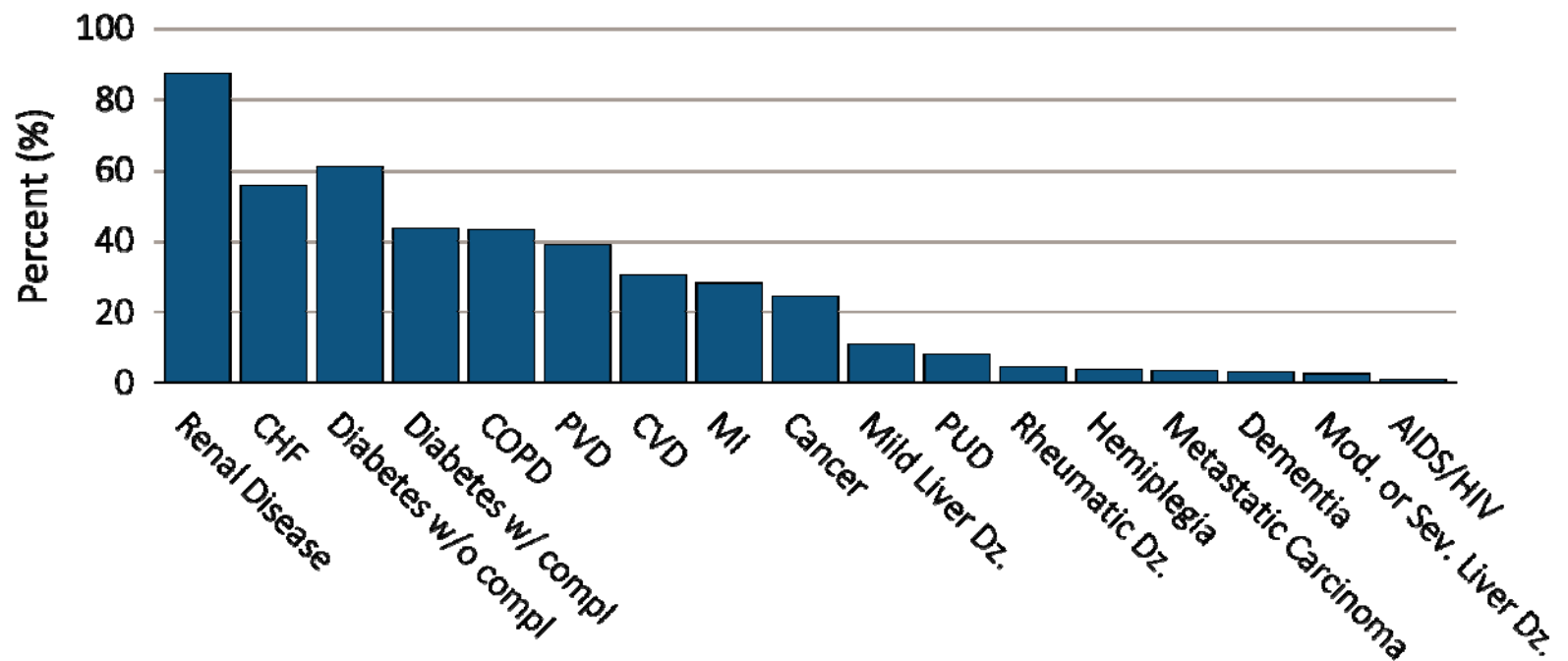
**Table 8.4 Ranking of the top 20 causes of hospitalization in 46,625 incident ESRD veterans who were hospitalized at least once during the period between 60 months prior to ESRD transition (prelude) and 24 months following ESRD transition (vintage) (Continued)**

Hospitalization Event	Overall (7 year cohort)	-60 to -12 months of prelude	Last 12 months of prelude	During ESRD transition	First 6 months of vintage	+6 to +24 months of vintage
Gastrointestinal hemorrhage	15	16	16	16	17	14
Chest pain	16	10				16
Respiratory failure	17		14	9	14	13
Skin infection	18	11	18	18		18
Chronic obstructive pulmonary disease	19	15	17			17
Acute cerebrovascular disease	20	17			19	19
Peripheral and visceral atherosclerosis		19				
Anemia			13			
Urinary tract infection		20	20		18	20
Other circulatory disease					16	
Intestinal infection					20	
Aortic; peripheral, visceral artery aneurysm				19		
Multiple myeloma				20		

*Data source: VHA Administrative data, USRDS ESRD Database, CMS Medicare Inpatient and Outpatient data.  
Abbreviation: ESRD, end-stage renal disease.*

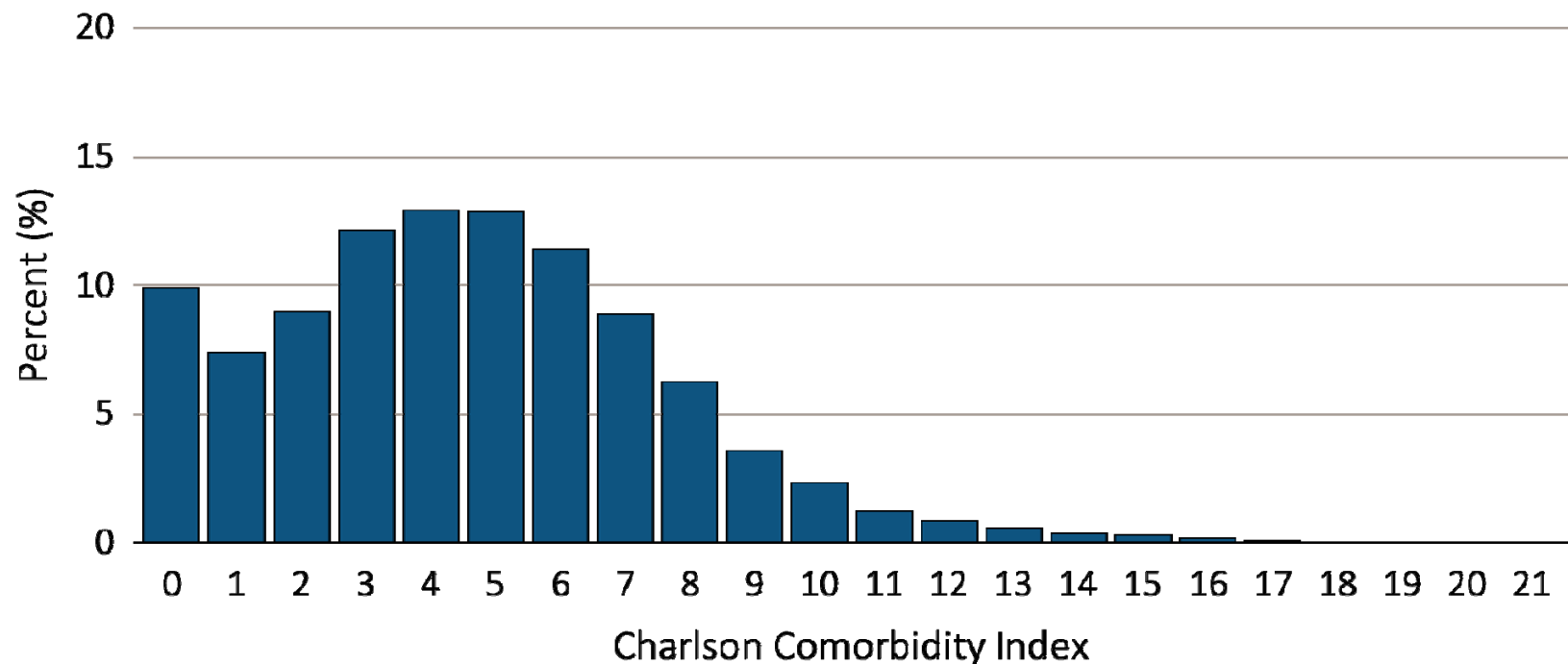
**Figure 8.7 Selected comorbid conditions for calculation of the Charlson Comorbidity Index prior to transition to ESRD in 47,555 incident ESRD veterans**

(a) Common comorbidities among veterans prior to transition to ESRD



**Figure 8.7 Selected comorbid conditions for calculation of the Charlson Comorbidity Index prior to transition to ESRD in 47,555 incident ESRD veterans**

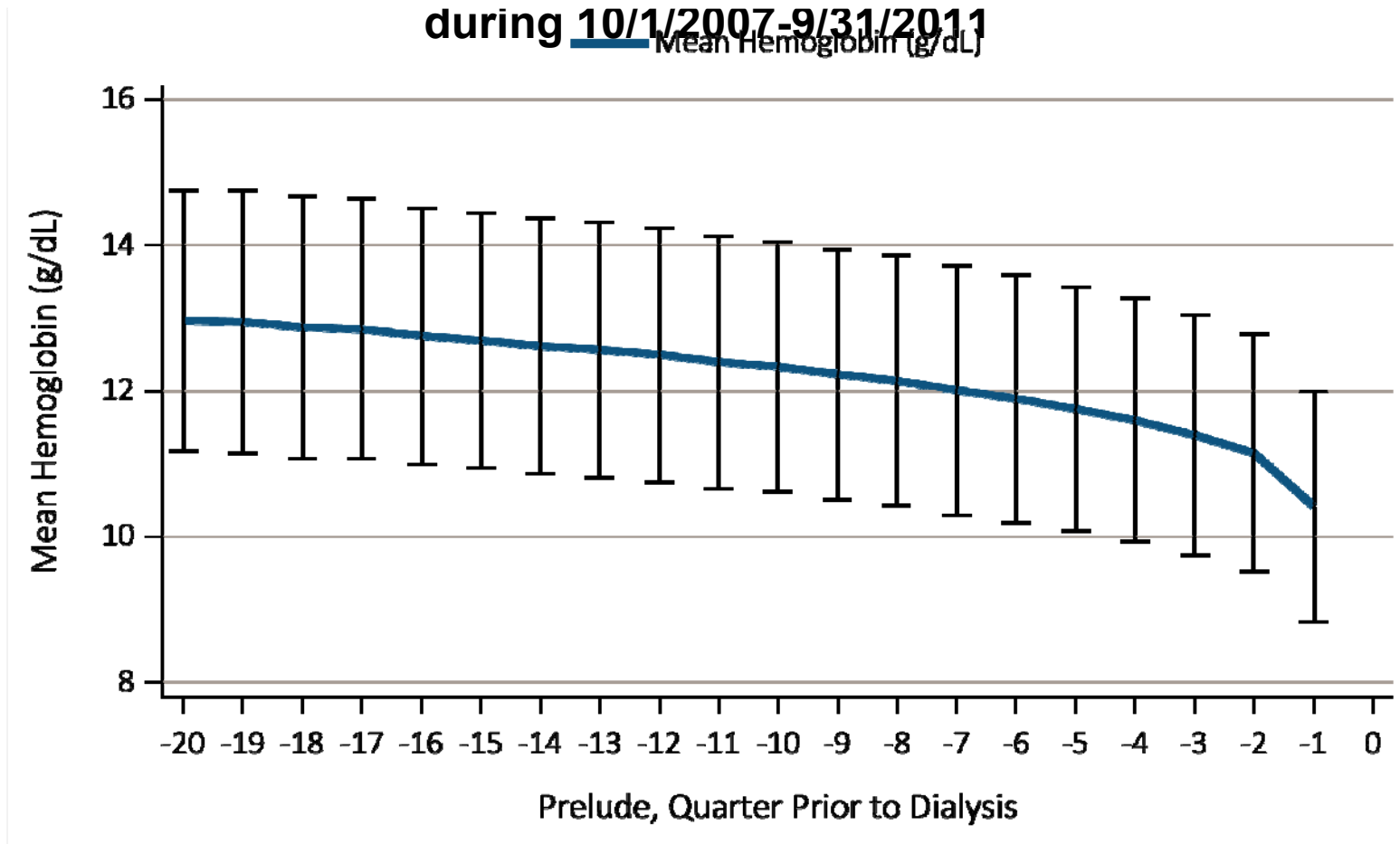
**(b) Charlson Comorbidity Index Score**



*Data source: VHA Administrative data, USRDS ESRD Database. Abbreviations: CHF, congestive heart failure; compl, complications; COPD, chronic obstructive pulmonary disease; CVD, cerebrovascular disease; Dz, disease; ESRD, end-stage renal disease; MI, myocardial infarction; Mod, moderate; PVD, peripheral vascular disease; PUD, peptic ulcer disease; Sev, Severe.*



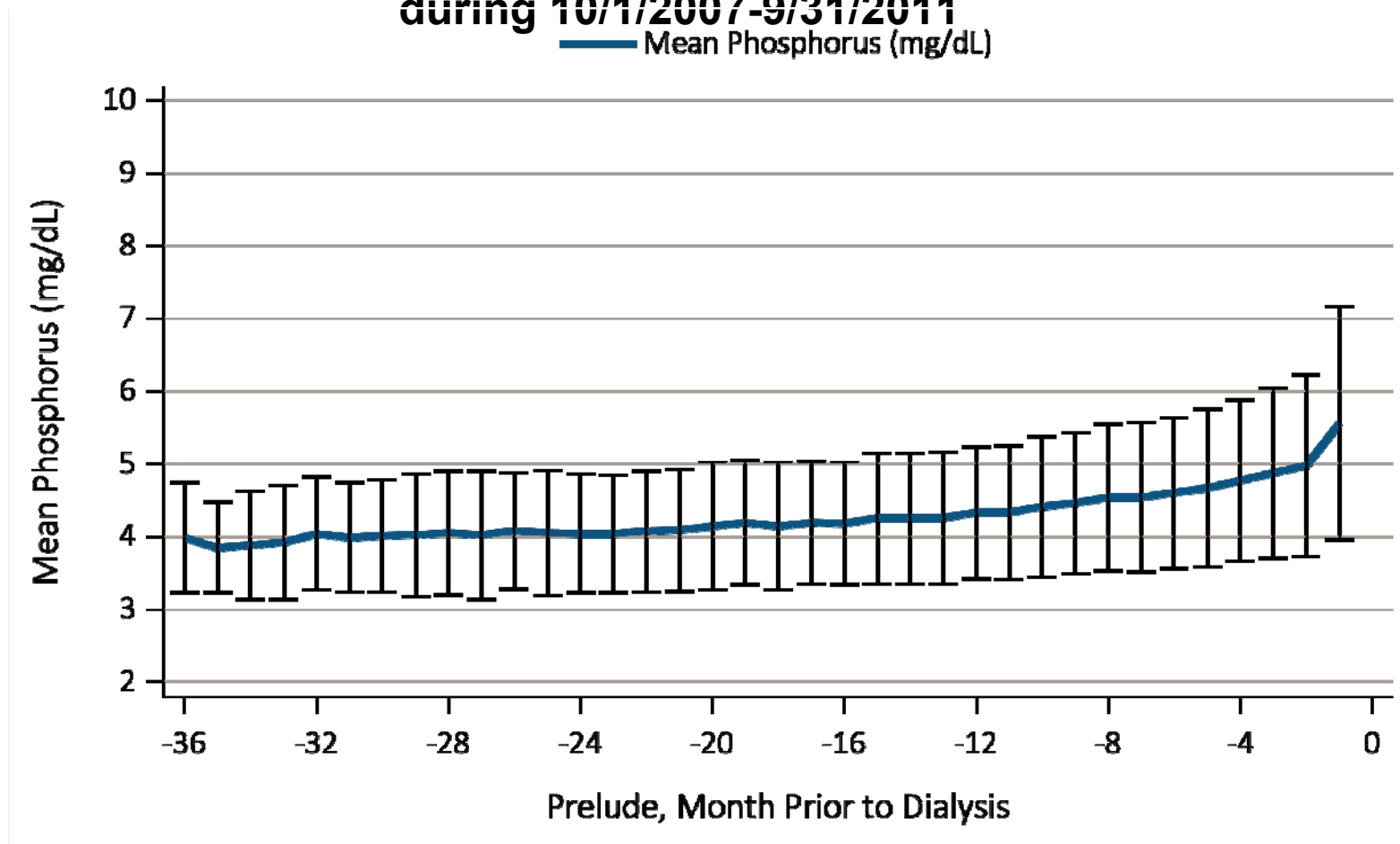
**Figure 8.8 Trend in blood hemoglobin levels during the prelude (pre-ESRD) period, over 20 calendar quarters in 28,717 veterans who later transitioned to ESRD during 10/1/2007-9/31/2011**



*Data source: VHA Administrative data, USRDS ESRD Database. Abbreviations: ESRD, end-stage renal disease; g/dL, grams per deciliter.*

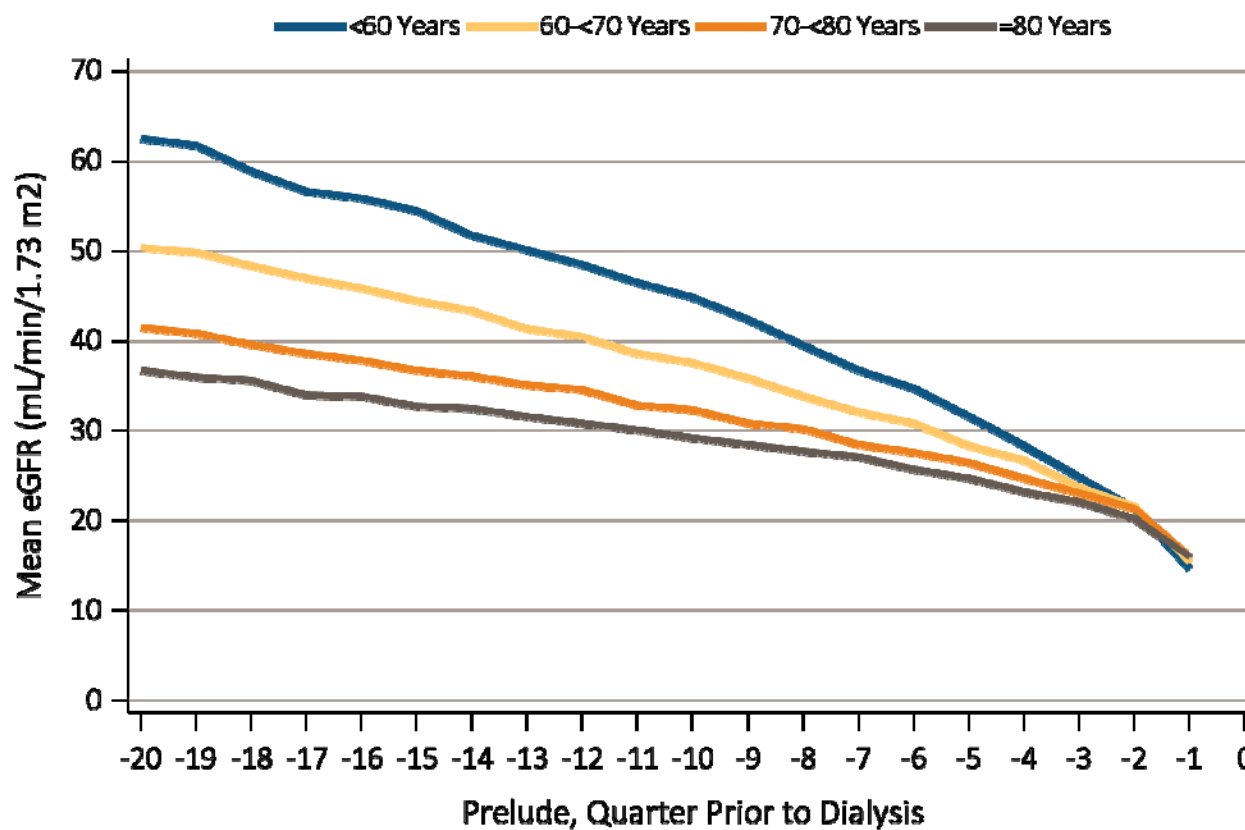
**Figure 8.9 Trend in serum phosphorus level during the prelude (pre-ESRD) period,  
over 36 months in 11,896 veterans who later transitioned to ESRD  
during 10/1/2007-9/31/2011**

— Mean Phosphorus (mg/dL)



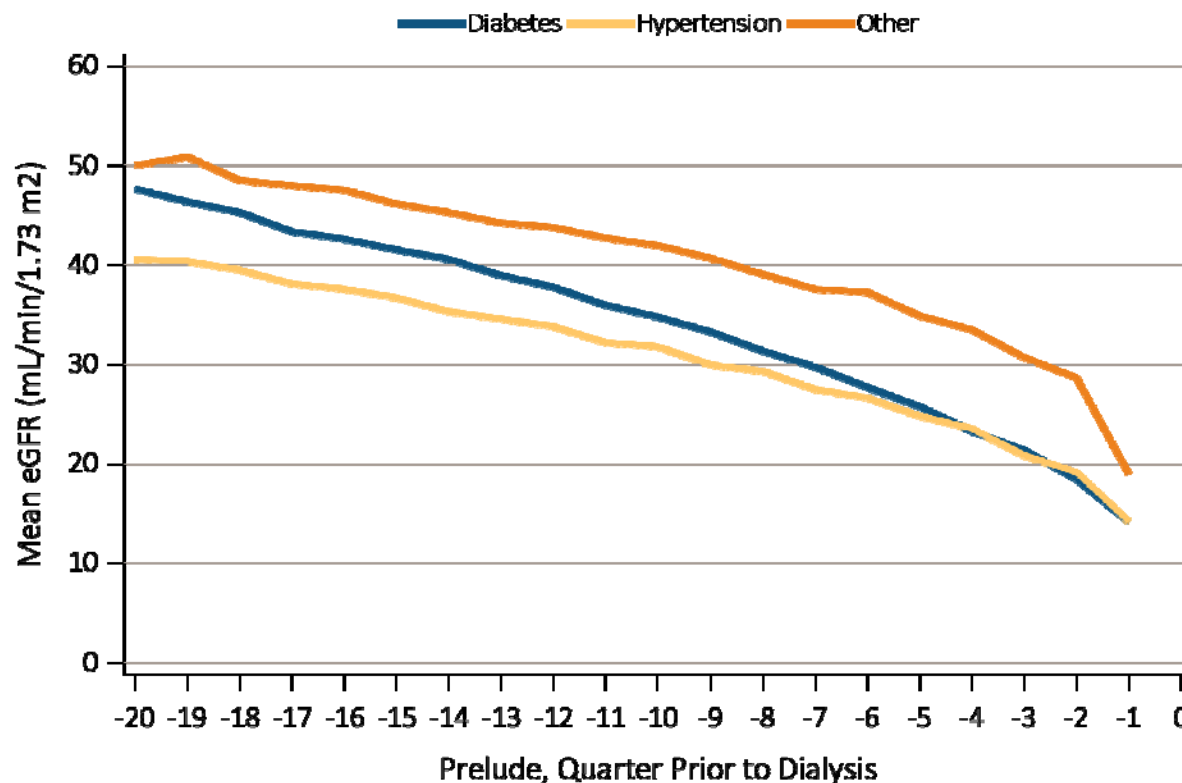
*Data source: VHA Administrative data, USRDS ESRD Database. Abbreviations: ESRD, end-stage renal disease; g/dL, grams per deciliter.*

**Figure 8.10 Trend in eGFR during the prelude (pre-ESRD) period, over 20 calendar quarters in 30,245 veterans who later transitioned to ESRD during 10/1/2007-9/31/2011**  
**(a) Stratified by age**



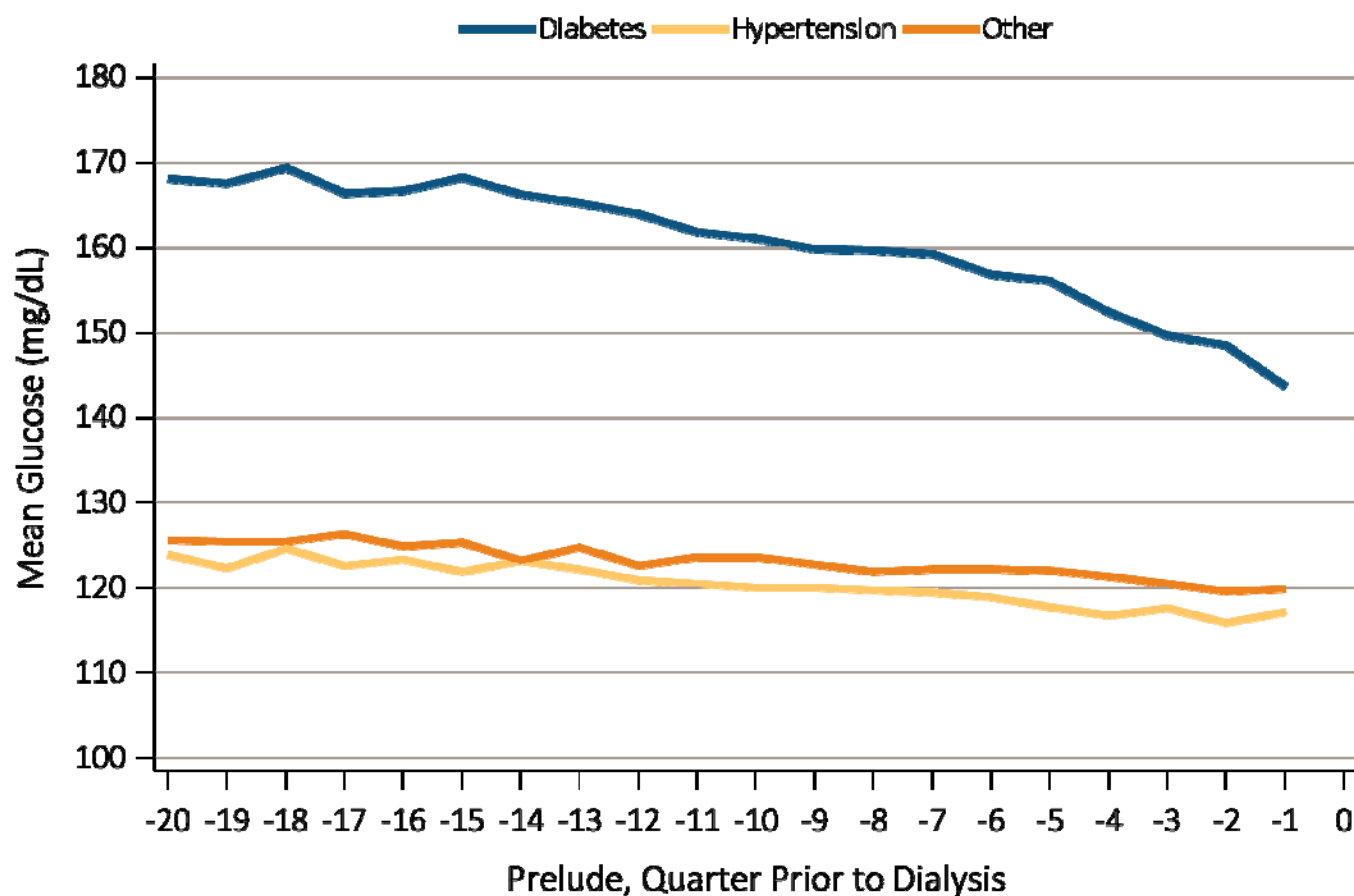
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**Figure 8.10 Trend in eGFR during the prelude (pre-ESRD) period, over 20 calendar quarters in 30,245 veterans who later transitioned to ESRD during 10/1/2007-9/31/2011**  
**(b) Stratified according to ESRD etiology**



*Data source: VHA Administrative data, USRDS ESRD Database. Abbreviations: eGFR, estimated glomerular filtration rate; ESRD, end-stage renal disease.*

**Figure 8.11 Trend in blood glucose level during the prelude (pre-ESRD) period, over 20 calendar quarters in 29,920 veterans who later transitioned to ESRD during 10/1/2007-9/31/2011**



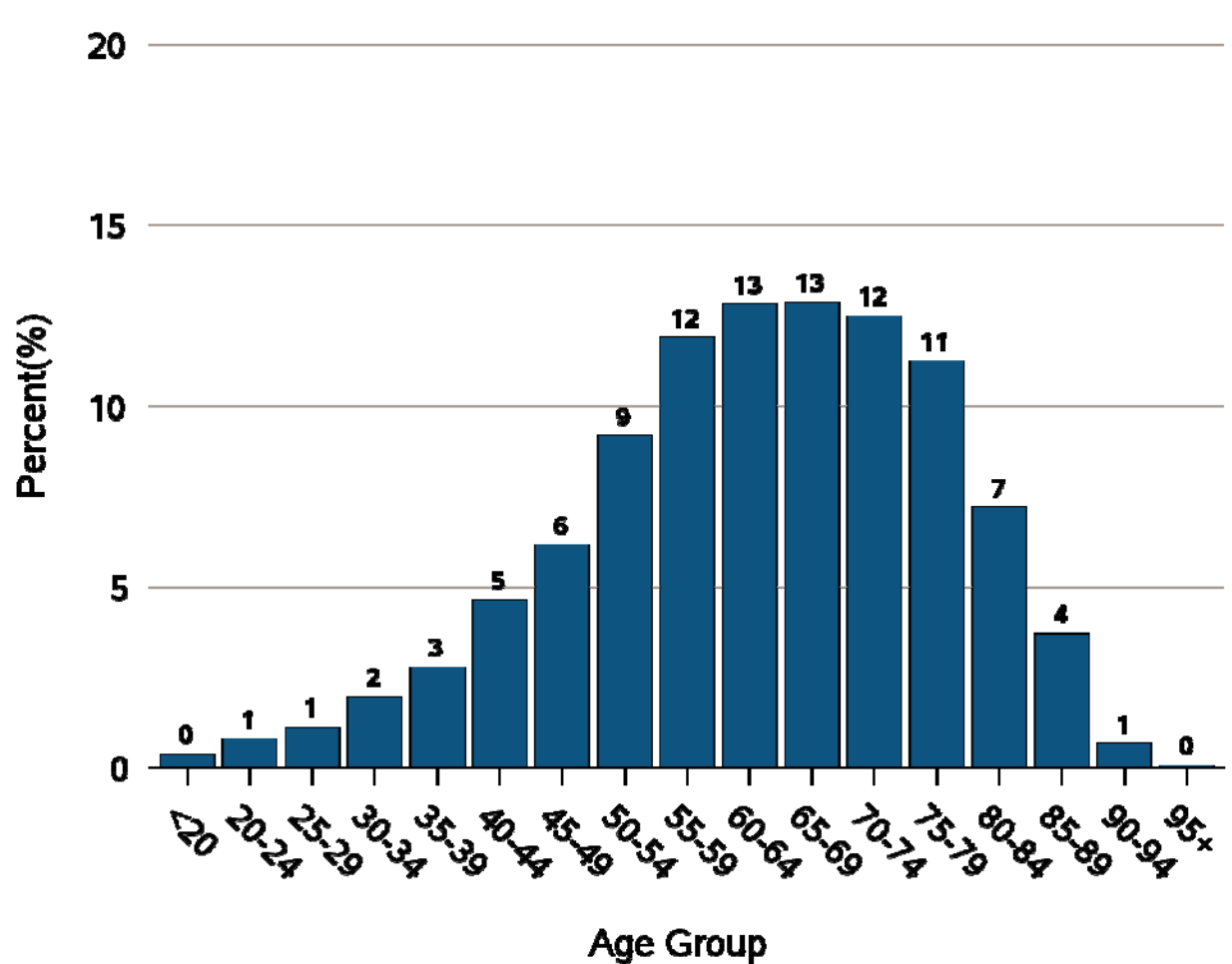
*Data source: VHA Administrative data, USRDS ESRD Database. Abbreviations: ESRD, end-stage renal disease.*

**Table 8.5 Age distribution of 5,989 KP-SC patients who transitioned to ESRD,  
1/1/2007-12/31/2011**

Age group	Frequency	Percent (%)
<20	23	0.38
20-24	48	0.8
25-29	67	1.12
30-34	117	1.95
35-39	167	2.79
40-44	278	4.64
45-49	369	6.16
50-54	550	9.18
55-59	712	11.89
60-64	767	12.81
65-69	770	12.86
70-74	748	12.49
75-79	673	11.24
80-84	432	7.21
85-89	222	3.71
90-94	41	0.68
95+	5	0.08

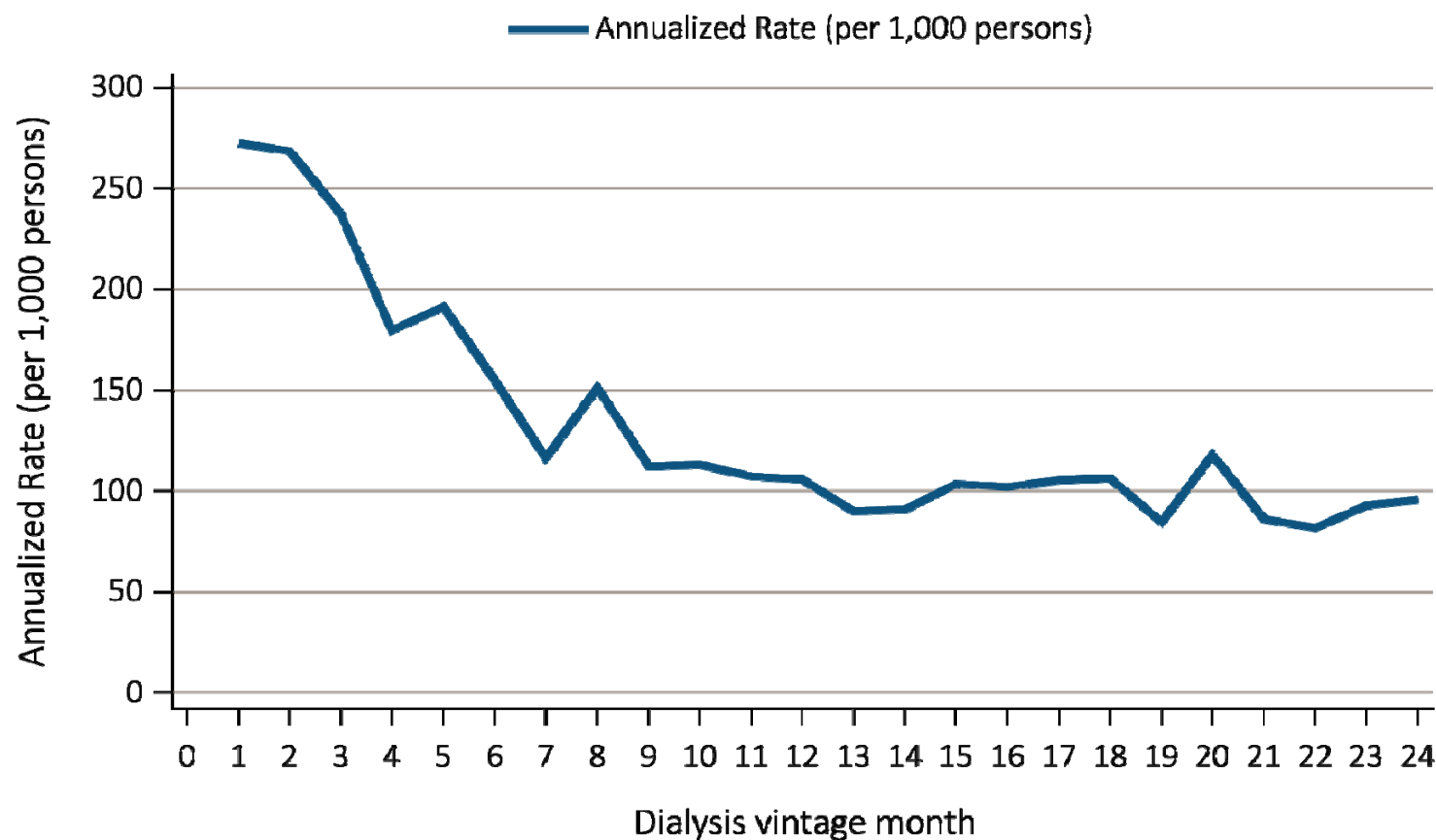
*Data source: Kaiser Permanente Southern California Electronic Health Records. Also see Figure 8.12.  
Abbreviations: ESRD, end-stage renal disease; KP-SC, Kaiser Permanente Southern California.*

**Figure 8.12 Age distribution of 5,989 KP-SC patients who transitioned to ESRD, 1/1/2007-12/31/2011**



Data source: Kaiser Permanente Southern California Electronic Health Records. Also see Figure 8.6.  
Abbreviations: ESRD, end-stage renal disease; KP-SC, Kaiser Permanente Southern California.

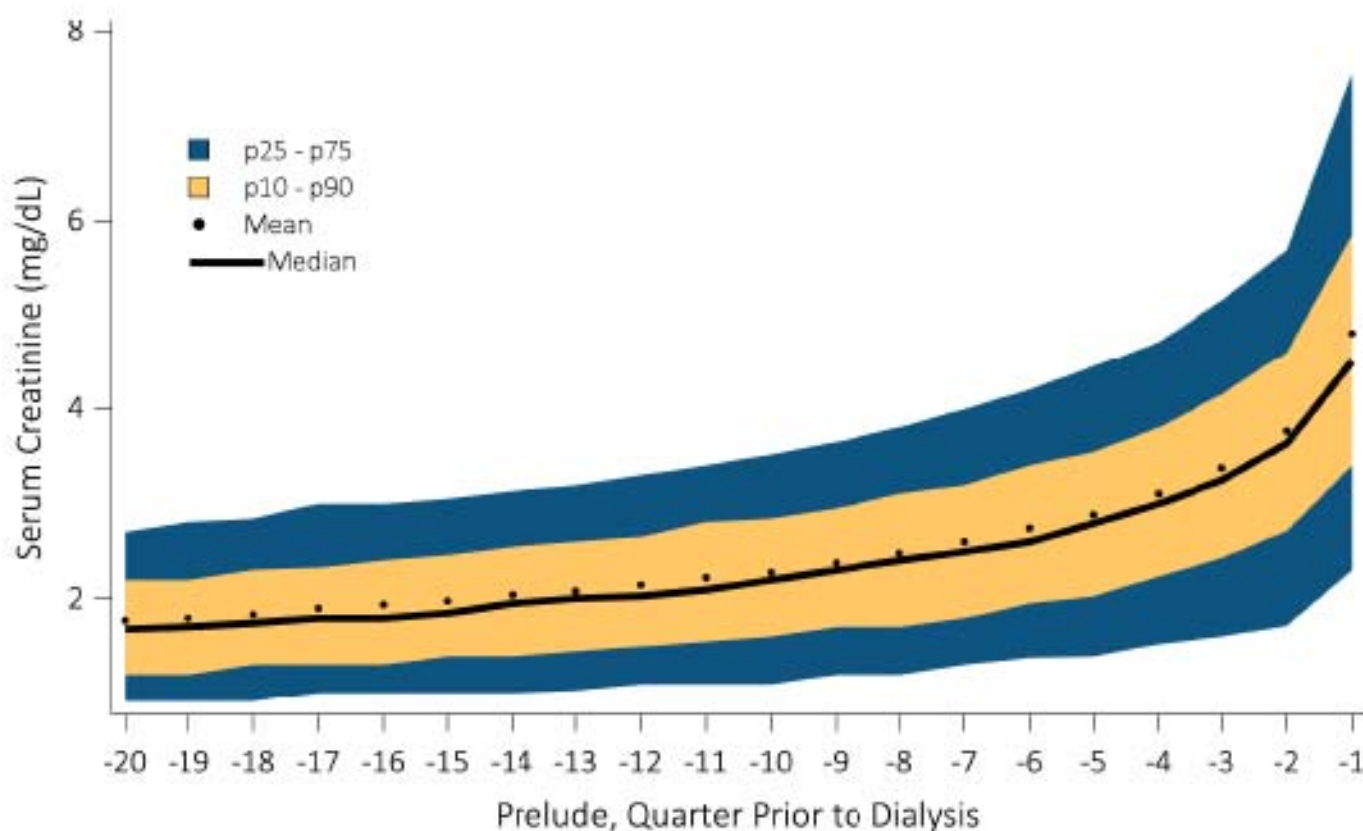
**Figure 8.13 Annualized mortality rate of the 5,989 incident dialysis patients over the first 24 months after ESRD transition (vintage)**



*Data source: Kaiser Permanente Southern California Electronic Health Records. Abbreviation: ESRD, end-stage renal disease.*

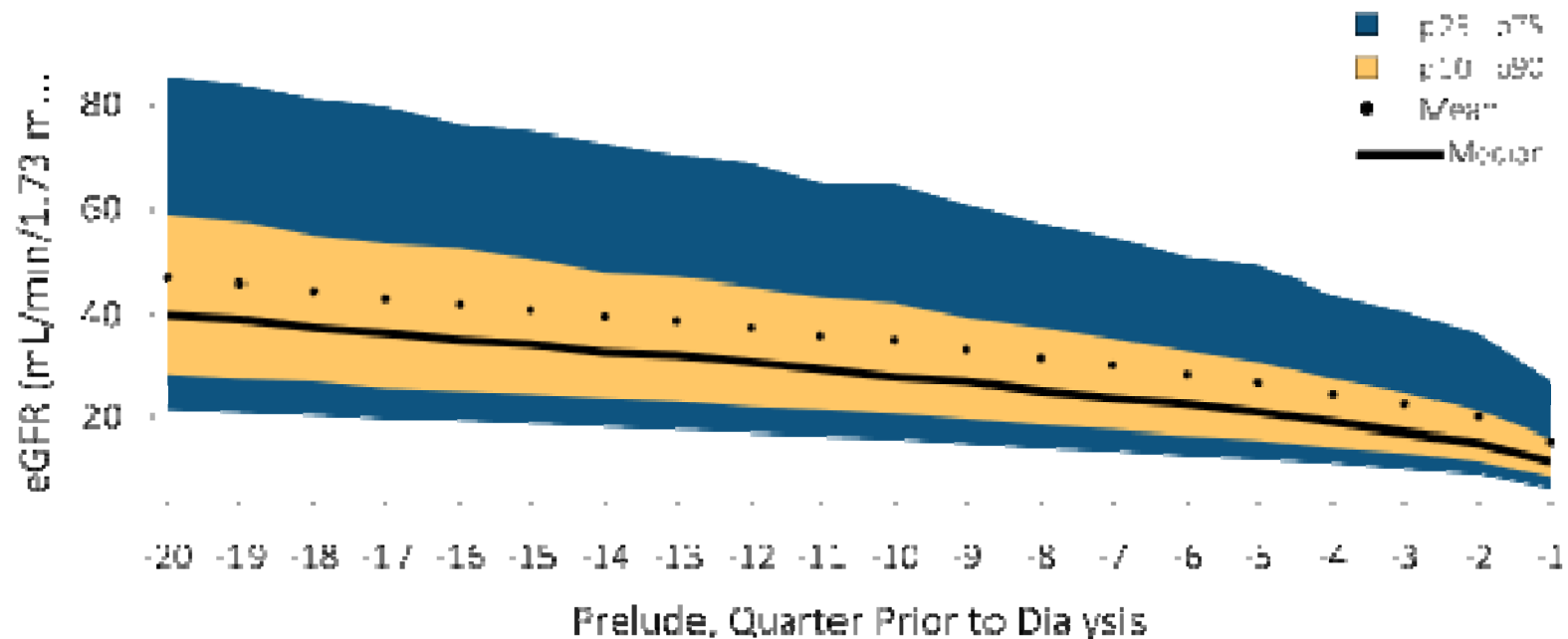


**Figure 8.14 Gradual rise in serum creatinine level during the period prior to ESRD transition (prelude) of 20 calendar quarters, among 5,989 patients who would transition to dialysis**



*Data source: Kaiser Permanente Southern California Electronic Health Records. Abbreviation: ESRD, end-stage renal disease; mg/dL, milligrams per deciliter.*

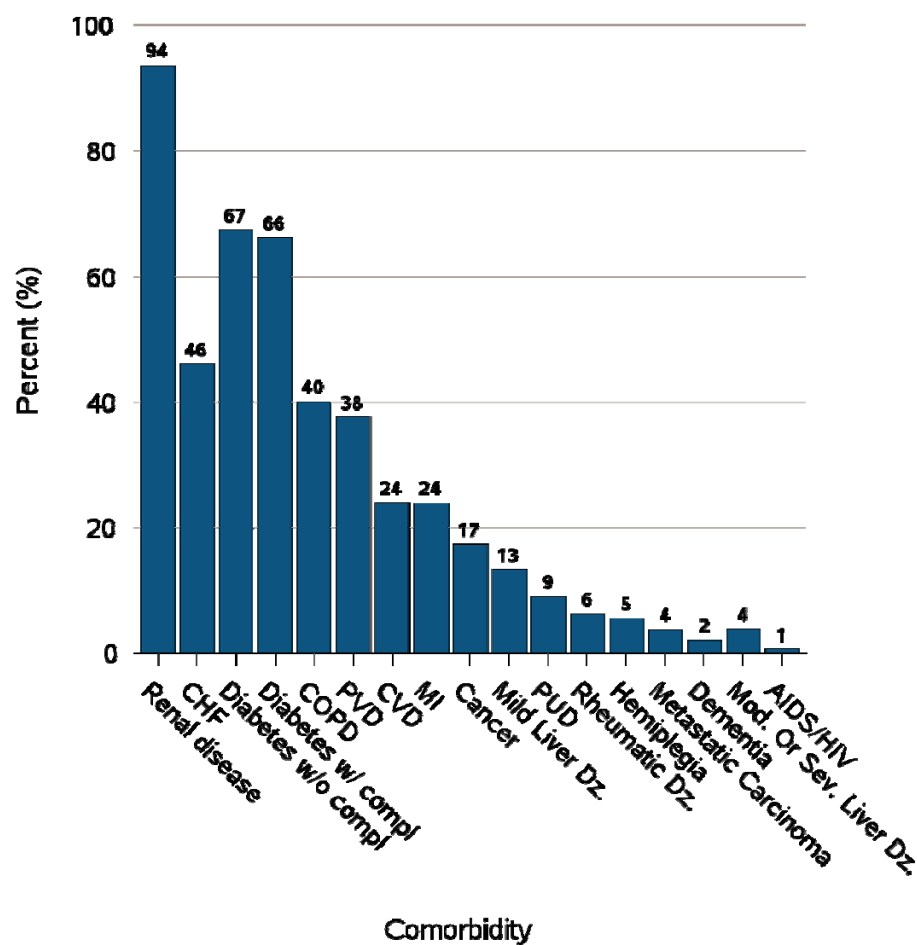
**Figure 8.15 eGFR during the period prior to ESRD transition (prelude) of 20 calendar quarters, among 5,989 patients who would transition to dialysis**



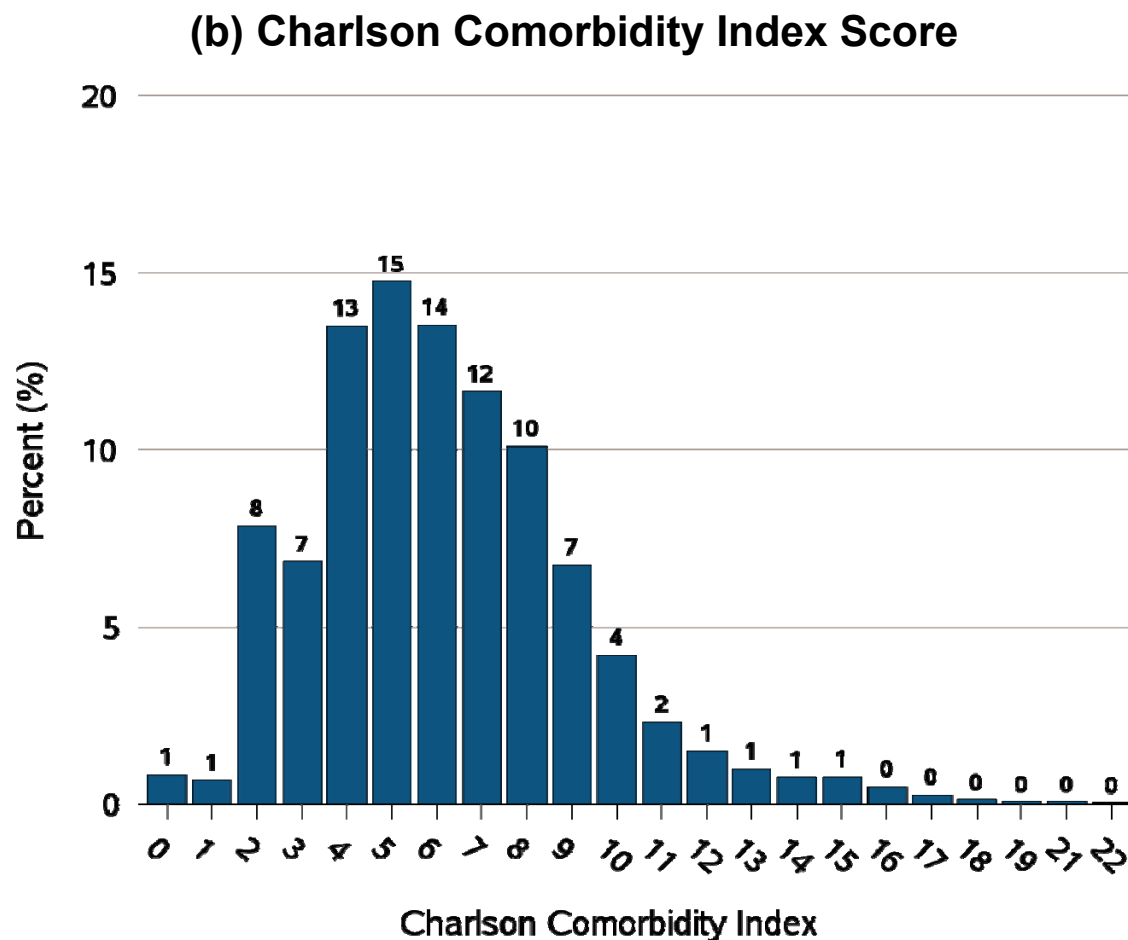
Data source: Kaiser Permanente Southern California Electronic Health Records. Abbreviation: eGFR, estimated glomerular filtration rate; ESRD, end-stage renal disease; mL/min, milliliters per minute.

**Figure 8.16 Selected comorbid conditions for calculation of the Charlson Comorbidity Index prior to transition to ESRD in 5,858 KP-SC patients**

**(a) Common comorbidities among veterans prior to transition to ESRD**



**Figure 8.16 Selected comorbid conditions for calculation of the Charlson Comorbidity Index prior to transition to ESRD in 5,858 KP-SC patients**



*Data source: Kaiser Permanente Southern California Electronic Health Records. Abbreviations: CHF, congestive heart failure; compl, complications; COPD, chronic obstructive pulmonary disease; CVD, cerebrovascular disease; Dz, disease; ESRD, end-stage renal disease; KP-SC, Kaiser Permanente Southern California; MI, myocardial infarction; Mod, moderate; PVD, peripheral vascular disease; PUD, peptic ulcer disease; Sev, Severe.*