

**Title:** Health Outcomes In Nursing Home Patients on Dialysis

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**Short Biography (25-50 words each) for each author**

**Alex Yang MD MBA** leads Xelay Foundation, which conducted this independent analysis. Previously, Dr. Yang held senior management roles at Affymax, Nektar Therapeutics, and Amgen, and was a consultant at McKinsey. Dr. Yang received his BS in Biology from MIT, and his MD and MBA from the University of Chicago.

**Wen-Ya Lee MPH, PhD** is currently Senior Data Analyst at Xelay Foundation. She has a Master of Public Health in Epidemiology from University of California, Los Angeles and a PhD in Epidemiology from the University of Texas Health Science Center at Houston.

**Kathy Hocking RN, MBA** has been in Nephrology nursing for 36-years (management and administration). She has been Corporate Clinical Advisor at Affiliated Dialysis Centers for 6-years, leading program development, research, and clinical trials. Ms. Hocking is an active member of ANNA (chapter president, education coordinator, and legislative representative) and NRAA.

## **Abstract**

Nursing home patients on dialysis are higher-acuity compared to the broader ESRD population. The objective of this study was to evaluate health status and outcomes in patients on hemodialysis in a nursing home setting. Health status was evaluated for 3,943 patients between April 2007 and June 2013. Patients had poor initial health status, with an incident first month annualized mortality rate of 70%, mean serum albumin of 3.2 g/dL, and mean hemoglobin of 10.15 g/dL. Improvements were noted during months 4-12, with annualized mortality rates of 30%, serum albumin of 3.6 g/dL, and mean hemoglobin of 10.8 g/dL. Patient outcomes also improved year-over-year. These study results demonstrated poor initial health status, but improvements in patient outcomes over time in nursing home patients on dialysis.

## **Introduction**

Adults aged 75 years and older are the fastest-growing segment of the population initiating dialysis, and represented 24.5% of new end stage renal disease (ESRD) cases in 2011. At the end of 2011, the point prevalence of patients aged 75+ receiving dialysis was estimated at nearly 90,000 patients—20.8% of all patients on dialysis.<sup>1</sup> Because of the higher probability of comorbidities and disability in older adults, nursing home care for ESRD patients is becoming more common. In 1999, approximately 4.8% of ESRD patients resided in nursing homes;<sup>2</sup> however, relatively little research has been published regarding the health outcomes of this important patient population. In a recently published systematic review, Hall and colleagues concluded that information on the prevalence, characteristics, and outcomes of nursing home patients on dialysis is limited, and noted that further research is needed to provide a better understanding of modifiable predictors of survival and functional decline in this population.<sup>3</sup>

Population-based data from the United States Renal Data System Annual Data Report (USRDS ADR) demonstrates that nursing home patients on dialysis are higher acuity population compared to the broader ESRD population. In ESRD in general, mortality is highest in the first 3 months—ranging from approximately 300 to 450 deaths per 1,000 patient years at risk in the

2010 USRDS cohort.<sup>1</sup> By month 12, the rate fell to 201 per 1,000 patient years. In the 2006 USRDS cohort, adjusted survival rates were 85%, 76%, and 52% at 6, 12 and 36 months.<sup>1</sup> Notably, in patients aged 75+, these rates were 73%, 59%, and 31%, respectively.<sup>1</sup>

The USRDS ADR has shown that nursing home ESRD patients have high rates of comorbid disease: 77.5% cardiovascular disease, 62.9% diabetes, 36.5% depression, 19.9% Alzheimer's/dementia, and 15.5% COPD.<sup>2</sup> Furthermore, mortality is significantly higher in nursing home ESRD patients compared to all ESRD patients. In the USRDS 1998-2000 ESRD cohort, the mean death rate for nursing home patients with ESRD was 3.5 times that of the ESRD population in general.<sup>2</sup> In an independent study using data from the USRDS from June 1998 to October 2000, 3 and 12 month survival was 76% and 42% in nursing home patients initiating dialysis.<sup>4</sup> In addition, the study noted a substantial and sustained decline in functional status. In the 2004-2006 incident ESRD cohort, incident mortality was estimated even higher, with survival rates of 50%, 26%, and 14% at the 3, 6, and 12 month timepoints. Age had a strong impact on mortality with one-year survival of 18.5% in those aged 65-74 compared to 10% for patients aged 85+.<sup>5</sup>

The objective of this study was to evaluate health status and outcomes over time in a large population of patients on dialysis in a nursing home setting, confirm

higher acuity of nursing home dialysis population in a large patient population, and generate hypotheses about health status improvements or lack thereof in this population. This study, utilizing longitudinal data from a large independent dialysis provider, represents the largest database study of patients on dialysis in a nursing home setting.

## Methods

### *Study Population*

The study population included 3,926 patients treated by Affiliated Dialysis Centers (Peoria, IL) in the nursing home setting between Apr 2007 and June 2013. Patients were excluded from analysis if there was no record of dialysis treatment, laboratory values, or medications in the database. Patients received either conventional hemodialysis (TIW) or daily home hemodialysis (daily 5 times/week).

### *Analyses*

Evaluation of health status included analysis of mortality, laboratory values (albumin, hemoglobin, ferritin), and drug utilization (epoetin alfa, iron sucrose, and iron gluconate). Analyses were performed on both incident and prevalent populations. Monthly mortality rates were annualized. Mean lab values were calculated for each patient, and then averaged across all patients during time-frame of analysis.

## Results

Patient baseline characteristics are presented in Table 1, and demonstrate the high acuity of this nursing home dialysis population. The mean age was 67 years, and the study cohort had a similar numbers of men (52%) and women (48%). Most patients (86.4%) were receiving conventional (TIW) dialysis, 13.4% daily home hemodialysis (5 times/week), and 0.2% continuous cycler-assisted peritoneal dialysis (CCPD).

Annualized monthly mortality rates in the prevalent population declined over time, from 75% in 2008 to 35% in 2012 (Figure 1A). Incident mortality rates were highest in the initial 3 months of dialysis, with

approximately 60-70% annualized monthly mortality rates (Figure 1B). Year-over-year mortality rates improved for the incident 2 months: 65% to 51%, 63% to 33%, 60% to 25%, 45% to 8%, in 2009, 2010, 2011, and 2012, respectively.

Laboratory values were generally stable in prevalent population analyses. Mean monthly albumin was stable between 2010 and 2013, at approximately 3.4 and 3.6 g/dL (Figure 2A). Mean monthly hemoglobin was stable from Jan 2010 through mid-2011 (between 10.8 and 11.2 g/dL), then declined starting in mid 2011 (consistent with the timing of the ESRD bundle and decline in epoetin alfa dosing), then stabilized between approximately 10.2 and 10.4 g/dL (Figure 2C). Incident population analyses indicated improvement in health status. Monthly mean albumin improved from 3.2 to 3.6 over the incident 10 months, and remained stable thereafter (Figure 2B). Mean monthly hemoglobin increased from 10.15 to 10.8 g/dL in the first 3 months, and was stable thereafter (Figure 2D).

Medication utilization was examined in the prevalent population. Monthly mean IV epoetin alfa declined from mid-2011 to the start of 2012 (consistent with the timing of the ESRD bundle), and was consistent thereafter at between 5,000-6,000 IU/month (Figure 3A). Monthly mean iron sucrose and iron gluconate were consistent between 2011 and 2013 at approximately 100-120 mg/month (Figure 3B).

## Discussion

We believe that this study represents the largest database and reporting of patients dialyzed in the nursing home setting to date. The results of this study contribute to understanding of the health status and outcomes in this important and growing patient population. As expected, nursing home patients on dialysis had poor initial health status, with an incident first month annualized mortality rate of 70%, mean serum albumin of 3.2 g/dL, and mean hemoglobin of 10.15 g/dL. However, improvements in health status during months 4-12 indicated a high level of quality

care being delivered, with annual mortality rates of 30%, serum albumin of 3.6 g/dL, and mean hemoglobin of 10.8 g/dL. In addition, patient outcomes improved year-over-year and in the incident 3 months on dialysis, consistent with the trend and quality of care provided to the US dialysis population in general.

There are relatively few real-world studies investigating patients undergoing dialysis in the nursing home setting, and most have reported on relatively small patient cohorts. For example, two studies investigated outcomes in nursing home patients on peritoneal dialysis.<sup>6,7</sup> In these cohorts (N=109 and N=93), 6-month and 12-month survival rates ranged from 50% to 52% and 37% to 40%, respectively. Reddy and colleagues reported patient characteristics and outcomes in a cohort of 271 patients undergoing staff-assisted hemodialysis in the nursing home setting. Patients initiating dialysis in the nursing home setting had survival rates of 77% at 1 month, 57% at 3 months, 30% at 6 months and 20% at 12 months, with a median survival of 3.4 months.<sup>8</sup>

The strengths of the present study include the large population and long follow-up, allowing for extended prevalent and incident population analyses in a nursing home

dialysis population. A key limitation of the study is that the analysis population was obtained from a single dialysis provider; thus, the results may not be generalizable to the population in general. However, analyzing a single-provider database may provide a more reliable dataset due to consistency and continuity of care. A second limitation of this study is the retrospective, descriptive design, which allows for the characterization of health status and outcomes, but does not allow for assessing the impact of a given intervention on outcomes, or a comparison of interventions.

As the average age of the US population increases, the number of older patients on dialysis, and—in particular—nursing home patients on dialysis is likely to continue to increase. Understanding the health status and outcomes in this population is a necessary step in assessing and improving delivery of care, quality of life and health outcomes. Future studies in this dataset will include periodic updates. In addition, analyses will investigate whether different baseline characteristics or changes in clinical practice (e.g., conventional TIW vs daily home hemodialysis) correlate with improving mortality rate and health status.

## References

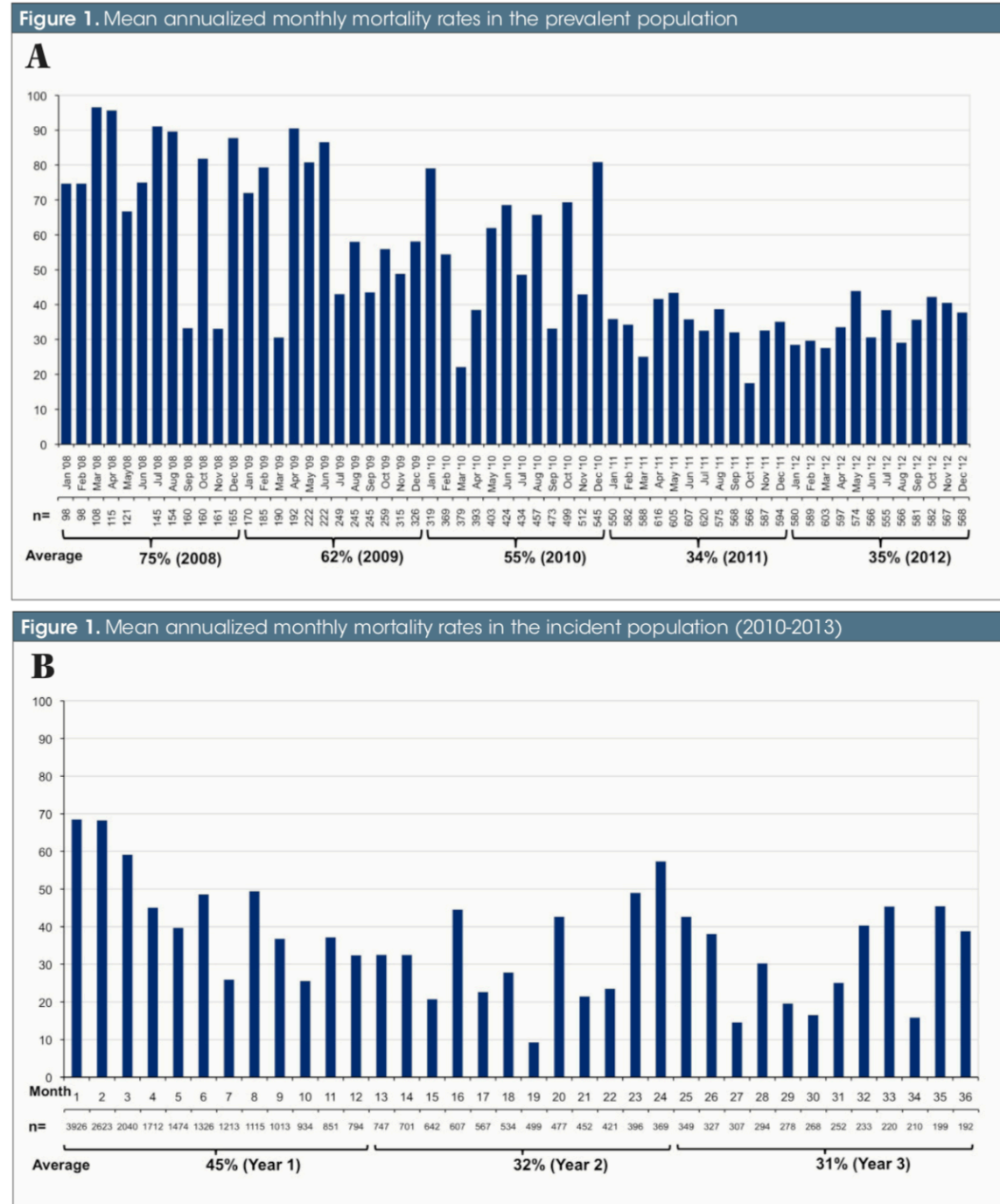
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## Table and Figure Captions

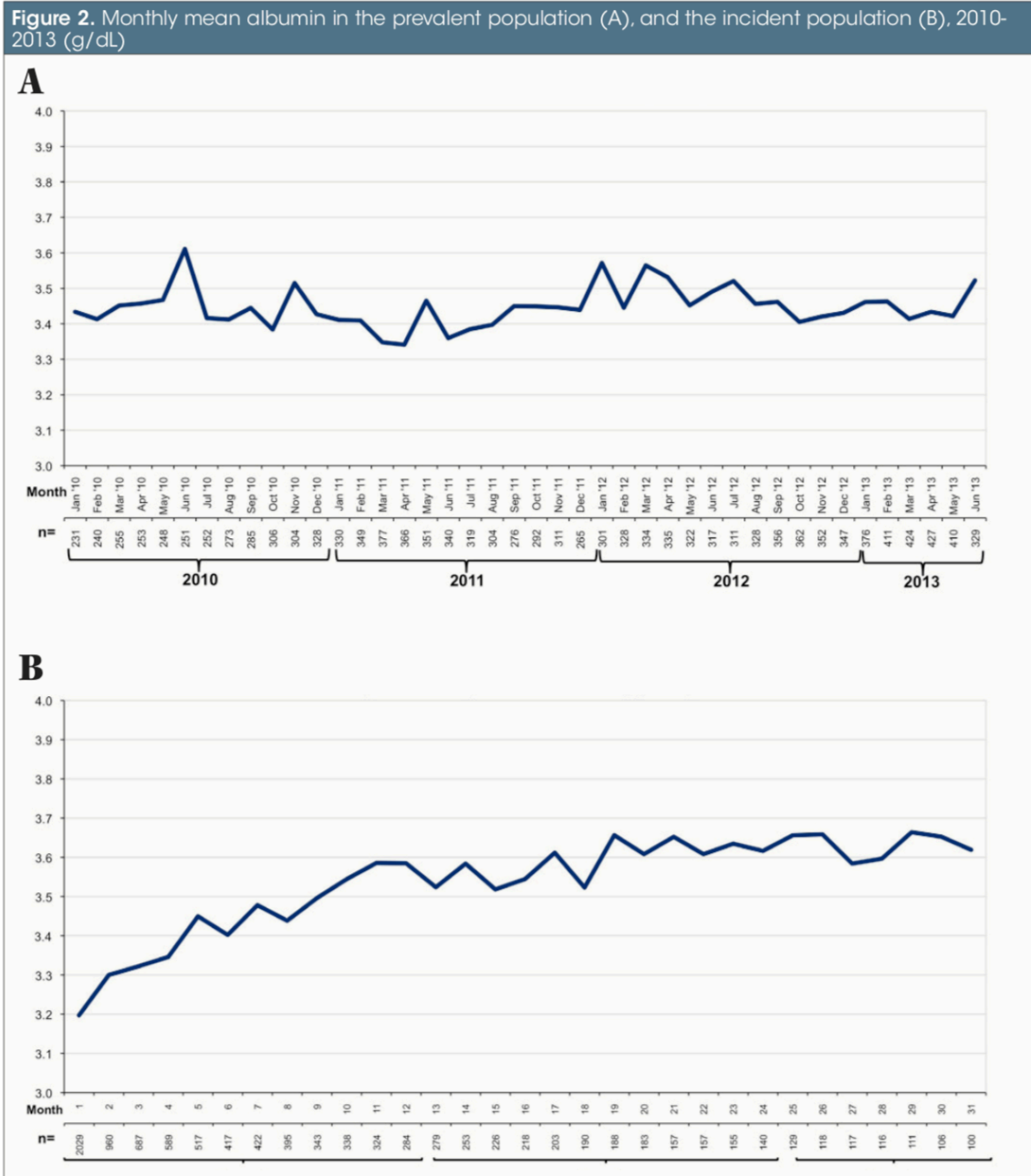
**Table 1:** Baseline Characteristics.

Table 1. Baseline characteristics	
Characteristic	N=3926
Age (y), mean (range)	67 (18-100)
Gender, n (%)	
Female	1869 (48%)
Male	2057 (52%)
Race, n (%)	
White	1749 (45%)
African American or Black	1383 (35%)
Other (Asian; Pacific Islander; American Indian/Alaska Native)	125 (3%)
Mix Race	20 (1%)
Unknown	649 (16%)
Comorbidities, n (%)	
Pneumonia	259 (6.6%)
GI Bleed	103 (2.6%)
Myelodysplastic syndrome	10 (0.3%)
Monoclonal Gammopathy	10 (0.3%)
Pericarditis	7 (0.2%)
Hereditary hemolytic & Sickle cell anemia	4 (0.1%)
Drainage tube exit site infection	1 (0.03%)
Length of Stay in Nursing Home	
Mean, mo	6.7
Median, mo	2.0
≤ 90d, n (%)	2240 (57.1%)
>90d and <1y, n (%)	952 (24.2%)
<1y, n (%)	734 (18.7%)
Albumin (g/dL), mean	3.2
Hemoglobin (g/dL), mean	10.15
Ferritin (g/dL), mean	989
Dialysis type, n (%)	
Conventional hemodialysis (3 days/week)	3391 (86.4%)
Daily home hemodialysis (5 days/week)	528 (13.4%)
Home continuous peritoneal dialysis (CCPD)	7 (0.2%)
First Access type, n (%)	
Catheter	2407 (61.3%)
Fistula	901 (22.9%)
Graft	297 (7.6%)
Other	2 (0.1%)
Unknown	319 (8.1%)

**Figure 1:** Mean annualized monthly mortality rates in the prevalent population (A) and the incident population (B).



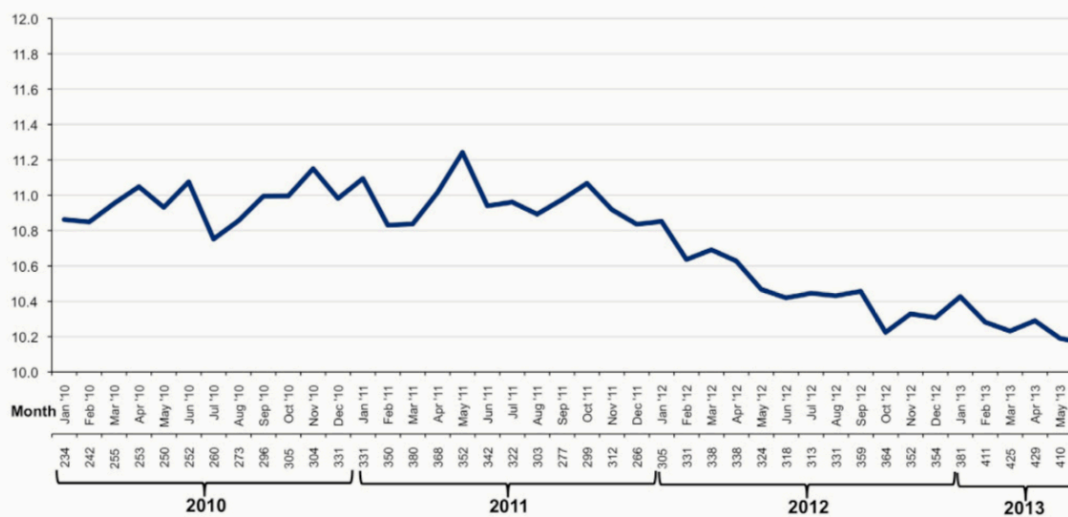
**Figure 2:** Monthly mean albumin (A, B) and hemoglobin (C, D) in the prevalent and incident populations.





**Figure 2.** Monthly mean hemoglobin in the prevalent (C) and incident (D) populations, 2010-2013 (g/dL)

**C**



**D**

