

The Relationship of More Frequent Dialysis Treatments per Week on Mortality and Hospitalization Rates in Nursing Home Patients

Alice Hellebrand MSN RN CNN, Steven Kaplan PhD,
Jordan Ledvina MSF, Eran Bellin MD, Nathan W Levin MD,
Allen M Kaufman MD



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Background

Dialysis patients residing in a skilled nursing facility (SNF) are characterized by advanced age, frailty, hemodynamic instability, and multiple comorbid conditions. Based on benefits related to more frequent dialysis (MFD) therapy in a dialysis population living at home (Frequent Hemodialysis Network Trial 2010), it was postulated that a dialysis population of SNF residents would also benefit from MFD therapy. Given the potential that MFD benefits were impacted by different MFD frequencies, we compared the effects of a range of MFD regimens, hemodialysis (HD) prescribed 5 times per week (MFD5) vs <5 times per week (MFD<5), on mortality and hospitalization rates in HD patients residing in a SNF.

Methods

Inclusion criteria were all patient-admissions admitted to nursing homes in OH, TX, FLA, NY, and PA serviced by Dialyze Direct from 6/29/2015 – 9/20/19 receiving staff-assisted, on-site dialysis and for whom intent to treatment could be ascertained. Intent was established by averaging dialysis prescriptions for the first two Sundays to Sunday weeks after the first nursing home dialysis. MFD was provided utilizing NxStage dialysis machines with community nephrologists ordering and Dialyze Direct staff executing the order. Organizational policy encourages a MFD5 prescription, but the nephrologists can make their own decisions. Weekly stdKt/V was ≥ 2.1 for MFD 5 and MFD<5. Excluded from analysis are those patients who do not stay at the nursing home for two Sunday to Sunday week intervals after the initial dialysis.

Target outcome endpoint include hospitalization, death in nursing home, and death in hospital with time to first outcome measured from the third Sunday going forward until 90 days elapsed from the first nursing home dialysis, thus creating a left truncated survival analysis interval. For exposure to be causal, it must precede the outcome hence we establish intent first and only thereafter look for outcome. This is analogous to the methodology of the randomized controlled trial that establishes assignment to exposure and only thereafter looks for outcome, eschewing “as treated dialysis received” as potentially confounded. For the purpose of this analysis, a patient could be admitted multiple times to the nursing home as the unit of analysis was the patient-admission which could be terminated for hospitalization, death, death in hospital, transfer to another facility, discharge to home, or assisted living facility. The last three outcomes are treated as censorship events in the survival analysis. Average treatment received is calculated by averaging treatment frequency in

every complete Sunday to Sunday interval in the first 90 days of the nursing home stay. Any partial week's dialysis frequency is ignored.

Statistics

All survival analyses statistics, time to outcome or relative incidence density were performed using STATA 16 and included Kaplan Meier, incidence density ratio, and Cox proportional hazard. Rejection of proportional hazard was tested.

Results

Of 2,691 dialysis admissions, 1,474 (55%) remained in the nursing home long enough to establish intent. 79% were MFD5, 21% were MFD<5. 90-day weekly average of treatments delivered was MFD5 4.6 +/-0.64, MFD<5 3.9 +/- 0.60. Demographics of the population with demonstrable intent was Male 778 (53%), mean age 67.7 +/-12. African American 30%, Caucasian 23%, Hispanic 4%, Asian 1%, unknown or other 42%.

Median survival without adverse outcome (death or hospitalization) was 55 days for MFD5 and 33 days for MFD<5. A detailed depiction of survival without adverse outcome is presented in Figure 2. Alternatively, data can be presented as the adverse outcome incidence per 100 days of patient time in the SNF: 1.39 for MFD5 and 1.76 for MFD<5. Therefore, the relative risk of an adverse outcome for MFD5 vs. MFD<5 is $1.39/1.76=0.789$.

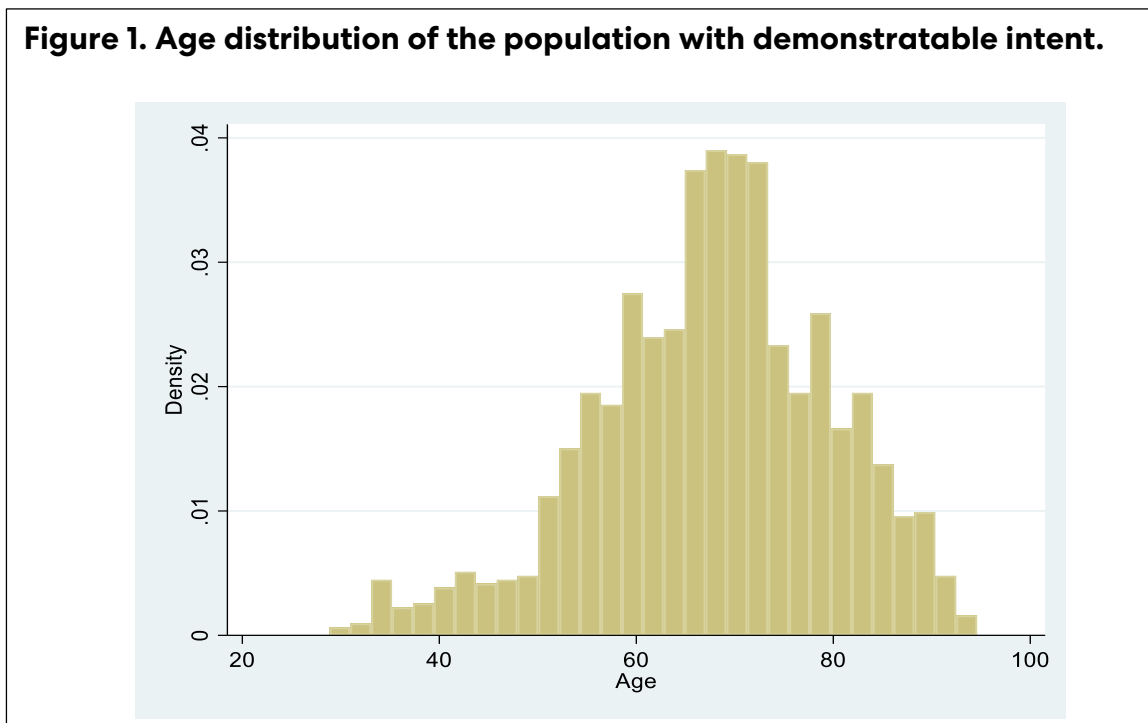
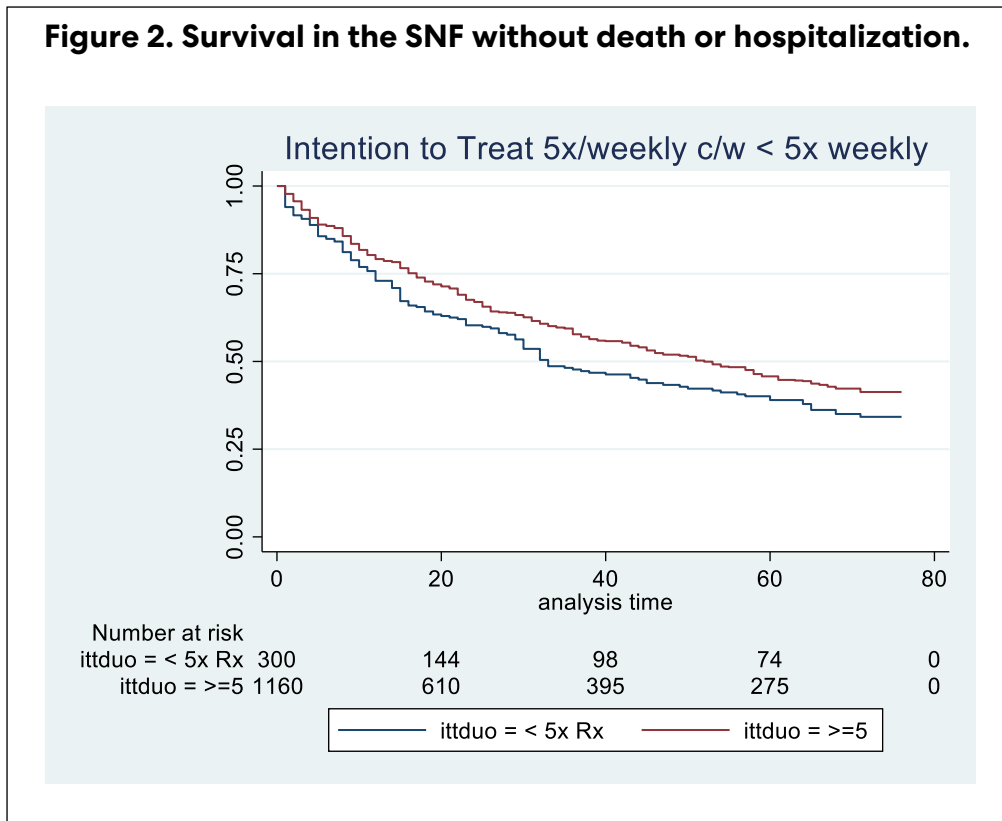


Figure 2. Survival in the SNF without death or hospitalization.



Summary

MFD5 was statistically superior to MFD<5 in terms of survival without hospitalization, death in hospital, or death in SNF. All analyses showed a KM curve without crossover violation. Incidence rate ratio of higher-to-lower showed a protective effect of higher dialysis .80 (95% confidence interval .70, .92). The cox also showed protective effect without evidence of violation of proportional hazard.

Conclusions

With respect to MFD therapies in elderly dialysis patients admitted to the SNF for subacute rehabilitation, the risk of all-cause hospitalization, hospitalization with death and death in the SNF is lower patients prescribed MFD5. MFD5's relative success may relate to more effective and gentler fluid management which may improve blood pressure control, mitigate intradialytic hypotension and protect vital organ systems. Further studies are needed in the post-acute care period in HD patients residing in SNFs to fully explore the impact of enhanced fluid management strategies.