ASN DIALYSIS ADVISORY GROUP

ASN DIALYSIS CURRICULUM

Home/ Intensive Hemodialysis

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Affiliations and Disclosures

- **Dr. Chan has consulted with Baxter Global Inc and NxStage Inc**

Objective

To discuss and review the emerging body of literature regarding the benefits and risks of home frequent/ intensive hemodialysis

Better Clinical Outcomes?

A. Survival

B. CVS outcomes

C. Solute(s) Removal

D. QOL

E. Pregnancy

F: Vascular Access and Safety

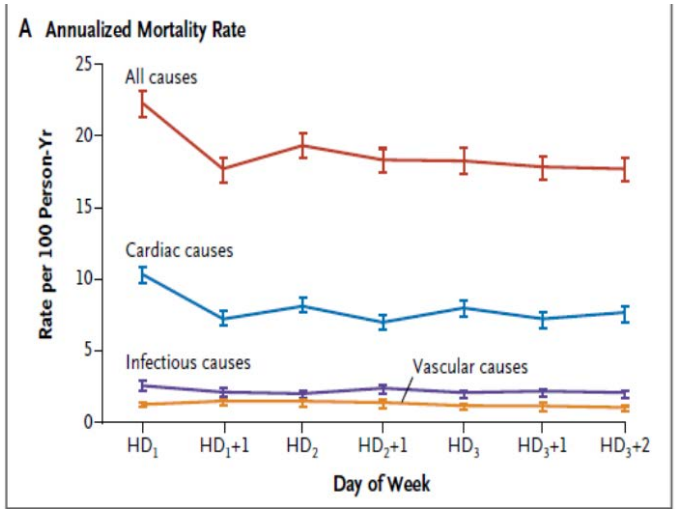
Selected Survival Studies
(Frequent Hemodialysis Vs. Conventional Hemodialysis)

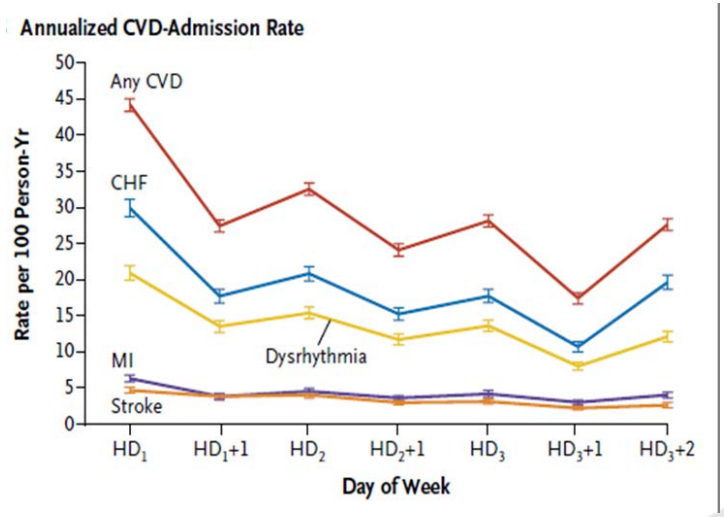
Study	Countries, Follow-up duration	Intensive HD	In-Center HD	Relative mortality in HHD population
Johansen (2009)	USA, 3 years	94, nocturnal HD (5.7 days per week)	940 matched from USRDS	HR = 0.36
Johansen (2009)	USA, 3 years	43, daily hemodialysis (5.4 days per week)	430 matched patients from USRDS	HR = 0.64
Lockridge (2011)	USA, 287 patient years	87, nocturnal HD (40 hours per week)	87121 incident patients from USRDS	SMR = 0.53
Marshall (2011)	Australia, New Zealand, 72052 patient years	865, extended home HD	21184 from ANZDATA	HR = 0.53
Weinhandl (2012)	USA, 1.8 years	1873, daily NxStage HD	9365 from USRDS	HR = 0.87

1.Johansen KL, Zhang R, Huang Y, *et al.: Kidney Int 76:984-990, 2009,* 2., Lockridge R, Ting G, Kjellstrand CM:. *Hemodial Int 16:351-362, 2011,*
3. Marshall MR, Hawley CM, Kerr PG, *et al.: Am J Kidney Dis 58:782-793, 2011,* 4. Weinhandl ED, Liu J, Gilbertson DT, *et al.: J Am Soc Nephrol 23:895-904, 2012*

The morbidity and mortality of intermittent hemodialysis

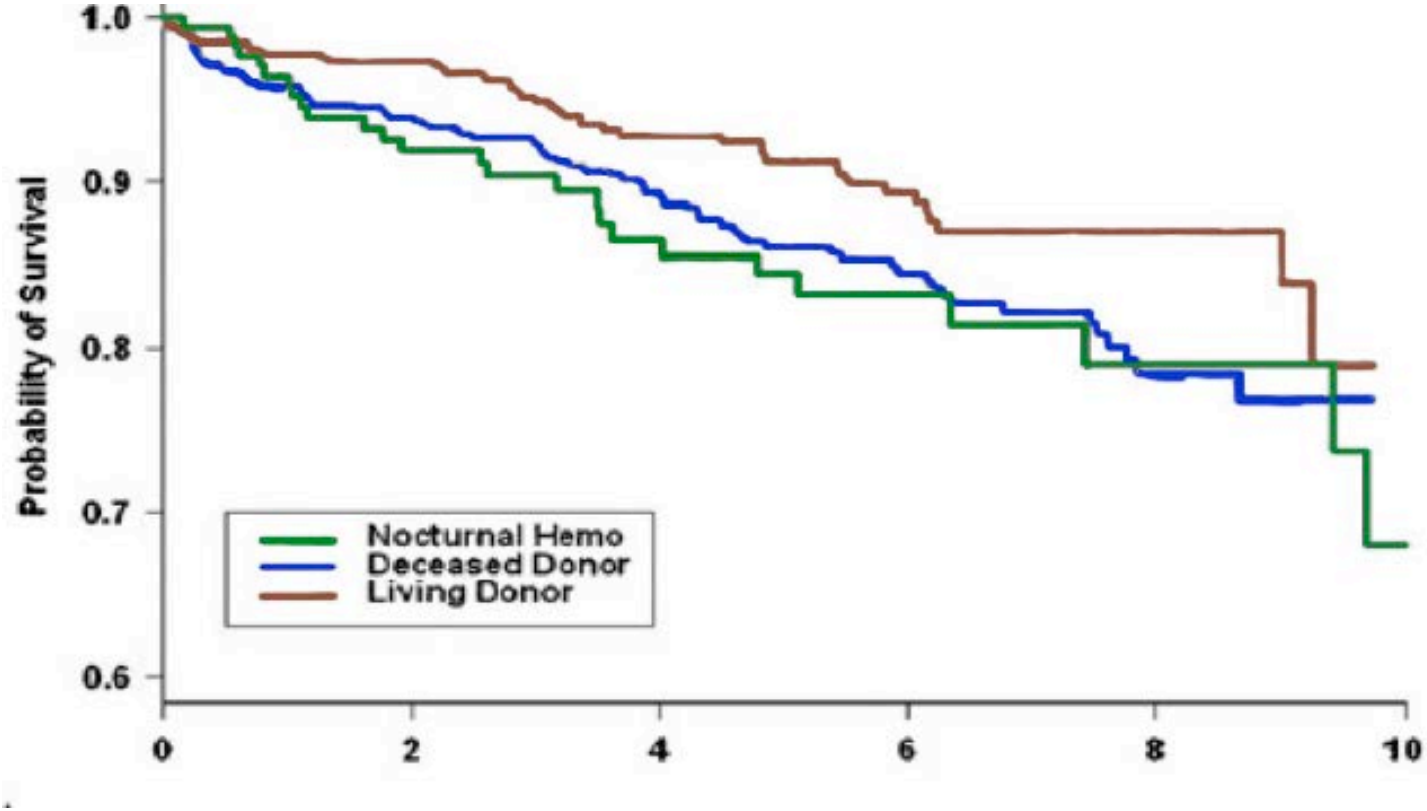
Multiple reports have documented the association between long interdialytic interval and morbidity / mortality of conventional HD patients.



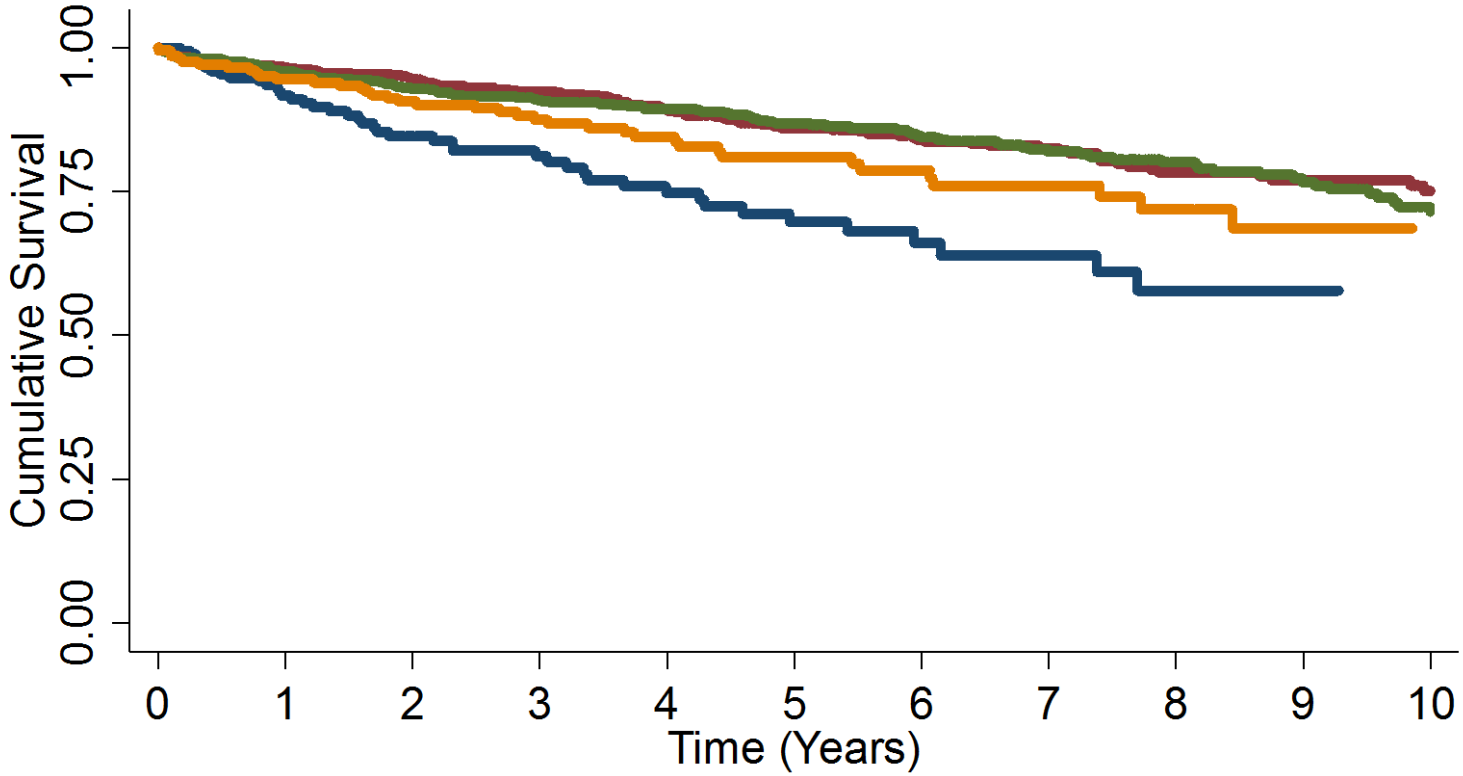


Foley et al – NEJM 2011

Survival: Intensive Hemodialysis Versus Kidney Transplant



Pauly et al. Survival among nocturnal home hemodialysis patients compared to kidney transplant recipients. Nephrol Dial Transplant 2009.



Number at risk

IHHD	173	144	107	82	64	48	30	23	16	10	8
LD	673	598	520	439	350	291	242	192	148	110	77
SCD	642	590	508	441	384	325	262	206	160	123	80
ECD	202	179	160	126	101	77	61	45	30	19	14

Tennankore et al JASN 2014 IHHD: Intensive Home Hemodialysis, LD: living donor transplant, SCD: Standard Criteria Transplant, ECD: Extended Donor Transplant

Survival data suggest:

Frequent HD is better than in-center HD

BUT:

- **Not all frequent HD is equal**
- **Intermittency of HD OR Frequency of HD?**
- **Duration of HD is important**

Cardiovascular Outcomes

Parameter	Number of Studies	Effect Size
Left Ventricular Mass Index (g/m2)	23 studies, 524 patients	-31.2 (-39.8 to -22.5)
Left Ventricular Mass (g)	13 studies, 335 patients	-60.5 (-90.8 to -30.2)
Left Ventricular Mass (g) [in RCTs only]	3 studies	-13.4 (-19.5 to -7.4)
Left Ventricular Ejection Fraction (%)	4 studies, 137 patients	6.7 (1.6 to 11.9)

Susantitaphong et al AJKD 2012

Blood Pressure Outcomes

Parameters	Studies	Effect Size
Systolic BP (mmHg)	35 studies, (928 patients)	-14.1 (-17.2 to -11.0)
Diastolic BP (mmHg)	35 studies, (928 patients)	-7.1 (-9.2 to -4.9)
Antihypertensive Medications	35 studies, (928 patients)	-0.8 (-1.2 to -0.5) number of medications

Susantitaphong et al AJKD 2012

Cardiovascular data summary

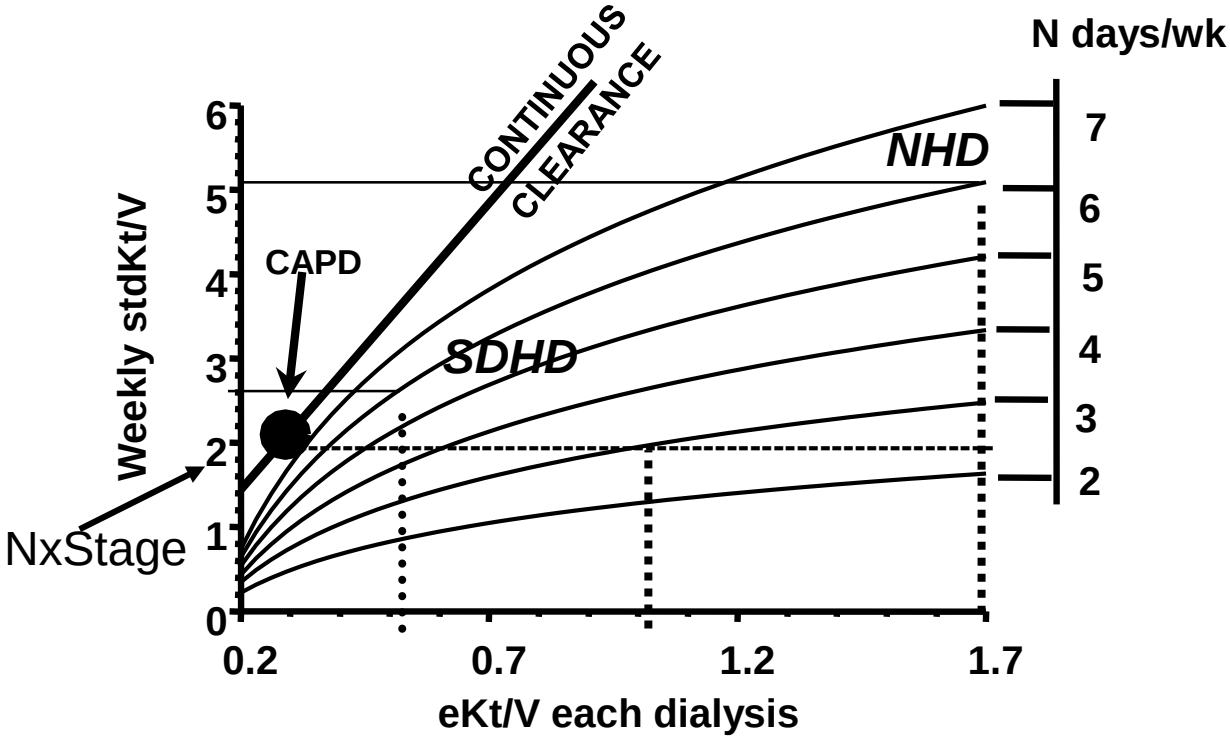
Frequent HD

- **BP control**
- **LV mass decreases**

Remaining Questions:

- **Does LVM change leads to improvement in survival?**
- **Implications for mechanistic pathways?**

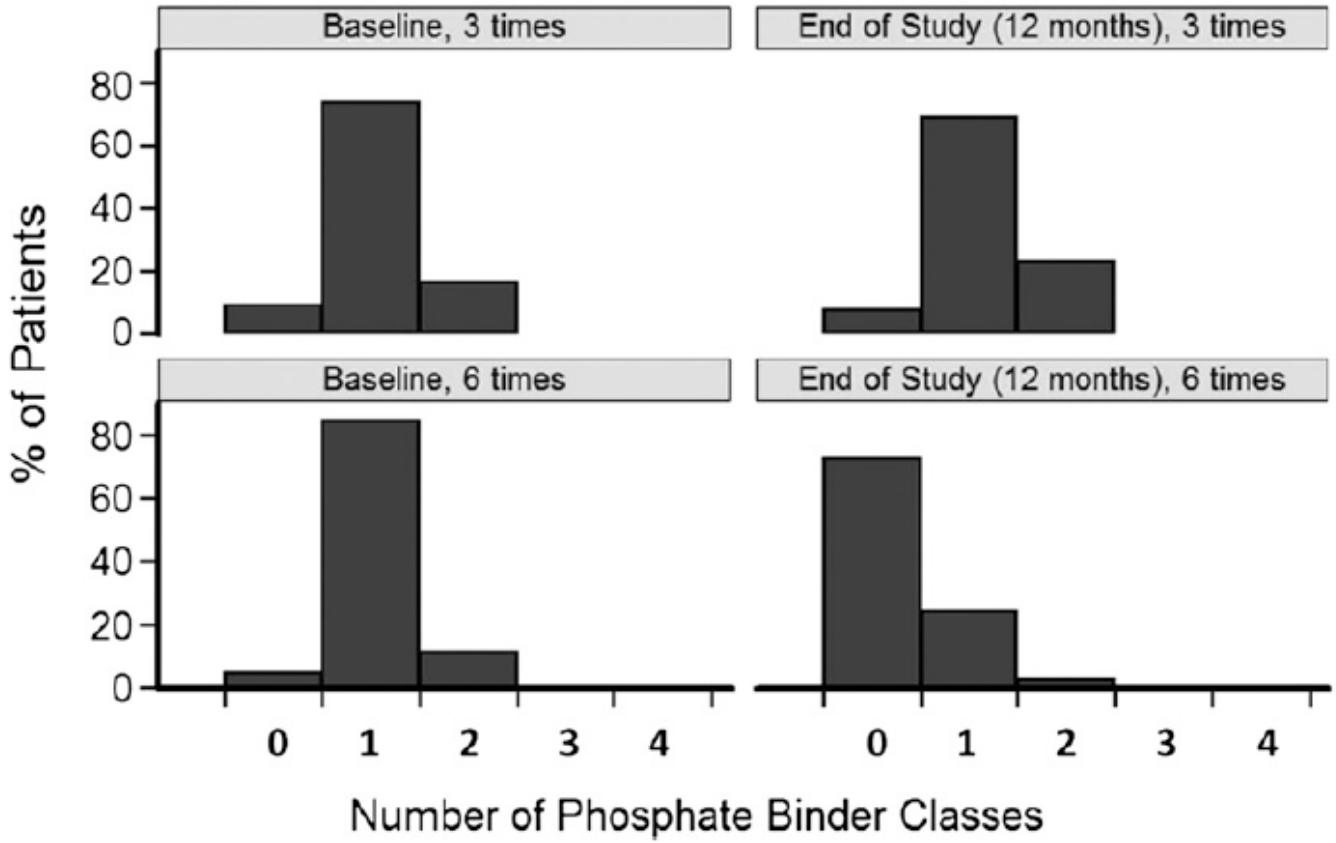
Weekly stdKt/V for different eKt/V and dialysis frequency / modality



Gotch FA 1998 (modified)

Effects of Frequent Hemodialysis on Measures of CKD Mineral and Bone Disorder

John T. Daugirdas,* Glenn M. Chertow,† Brett Larive, Andreas Pierratos,§ Tom Greene,‖ Juan Carlos Ayus,¶ Cynthia A. Kendrick,‡ Sam H. James,** Brent W. Miller,†† Gerald Schulman,‡‡ Isidro B. Salusky,§§ Alan S. Kliger,‖‖ and the Frequent Hemodialysis Network (FHN) Trial Group¶¶



JASN 2012

Solute Removal and Outcomes…

Frequent HD will enhance remove of uremic toxins

- **Extent by which this may be accomplished depends on the molecule**
- **Frequency and duration are important**
- **Surrogate marker versus Outcomes?**

Quality of Life

Parameter	Studies	Effect Size (CI)
Physical Component Score – RAND 36	FHN – Daily Trial (n = 245)	2.9 (0.8 , 5.1)
Physical Component Score – RAND 36	FHN – Nocturnal Trial (n = 87)	0.6 (-3.4, 4.7)
EuroQol 5-D index	Culleton et al (n = 52)	0.05 (-0.07, 0.17)

Hall et al – CJASN 7: 782 – 794, 2012
Culleton et al – JAMA 298: 1201-9, 2007

Quality of Life Summary

Heterogeneous results from observational and RCTs

Overall, there seems to be an improvement of perceived physical health but not necessarily overall quality of life

Other studies have indicated an improvement in Kidney-Disease related quality of life

- E.g. Recovery time from dialysis

Pregnancy Outcomes

22 pregnancies in the Toronto Pregnancy and Kidney Disease Clinic Registry (2000 to 2013)

Compared with 70 pregnancies from the American Registry for Pregnancy in Dialysis Patients (1990 – 2011)

Primary Outcome = Live Birth Rate

- **Intensive HD = 86.4%**
- **Comparator = 61.4%**

} P = 0.03

Pregnancy Outcomes

Secondary Outcomes

- **Duration of Pregnancy**
  - 36 weeks – Intensive HD
  - 27 weeks – Comparator

P = 0.002

Pregnancy complications were few and manageable

Pregnancy may be safe and feasible in women with ESRD receiving intensive HD

Adverse Events

Studies	Population	Variables	Risk
FHN trial group (2010, 2013)	RCT, 245 patients	First vascular event (repair, loss or access-related hospitalization)	HR 1.90 (1.11–3.25), P = 0.017
FHN trial group (2011, 2013)	RCT, 87 patients	First vascular event (repair, loss or access-related hospitalization)	HR1.81 (0.94–3.48), P = 0.076
Jun et al. (2013)	Retrospective observational study, 286 patients	Survival free of vascular access-related events (infections and interventions) Vascular access-related events	Unadjusted KM curve: shorter survival for intensive group, P < 0.001 HR 2.85 per dialysis session (1.14–7.15), P = 0.04

Modified from Tennankore et al NDT 29: 1342 – 1349, 2014

Buttonhole Infection

Studies	Population	Variables	Risk
Van Eps et al. (2010)	Retrospective observational study, 235 patients	Septic dialysis-related events: BH in NHD compared with CHD	IRR 3.0 (1.04–8.66), P = 0.04
Nesrallah et al. (2010)	Retrospective observational pre–post study	Rates of S. aureus bacteremia: Pre/post topical mupirocin Post-mupirocin compared with CHD patients	OR 6.4 (1.3–32.3) P = 0.02 2–0.03/1000 AVF-days versus 0.005/1000 AVF-days

Modified from Tennankore et al NDT 29: 1342 – 1349, 2014

Other Considerations

1. **FHN nocturnal trial suggests that residual kidney function (urine output) may be impacted by frequent hemodialysis.**

2. **Additional RCT data will also be available in this area (e.g. ACTIVE)**

Summary

Data suggest that augmented hemodialysis modifies:

- **Survival**
- **CVS endpoints**
- **Solutes removal**
- **Pregnancy outcomes**

Adverse signals:

- **Dialysis access**
  - Vascular Access Infections
- **Perception of burden**