

*The effect of hemodiafiltration
versus conventional dialysis on
severity of sleep apnea*

Kateri Champagne, Paul Barré, Sameena Iqbal,
Navdeep Tangri, John Kimoff
CUSM - Divisions of Respiriology/Nephrology

Introduction

- Sleep apnea is common in renal failure
- Frequency & severity of sleep apnea appears to increase with severity of renal failure
- Sleep apnea improves with nocturnal hemodialysis, renal transplantation and cyclical assisted peritoneal dialysis
- Hemodiafiltration has many probable advantages but RCT are lacking

Research Question

Population	15 patients on hemodialysis with documented sleep apnea
Intervention	Hemodiafiltration (HDF) versus hemodialysis (HD)
Outcome	Apnea/hypopnea index
Duration	Three months on each therapy
Design	Randomized cross-over trial

Hemodiafiltration

Possible Advantages

- Increased survival
- Fewer hospitalizations
- Lower risk of carpal tunnel syndrome
- Improved lean body mass
- Superior quality of life
- Improved hemoglobin
- Regression of left ventricular hypertrophy
- Improved blood pressure
- Better intradialytic stability

Toxin Removal

Diffusion

Convection

Hemodialysis

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Hemodiafiltration

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Hemofiltration

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Uremic Toxins

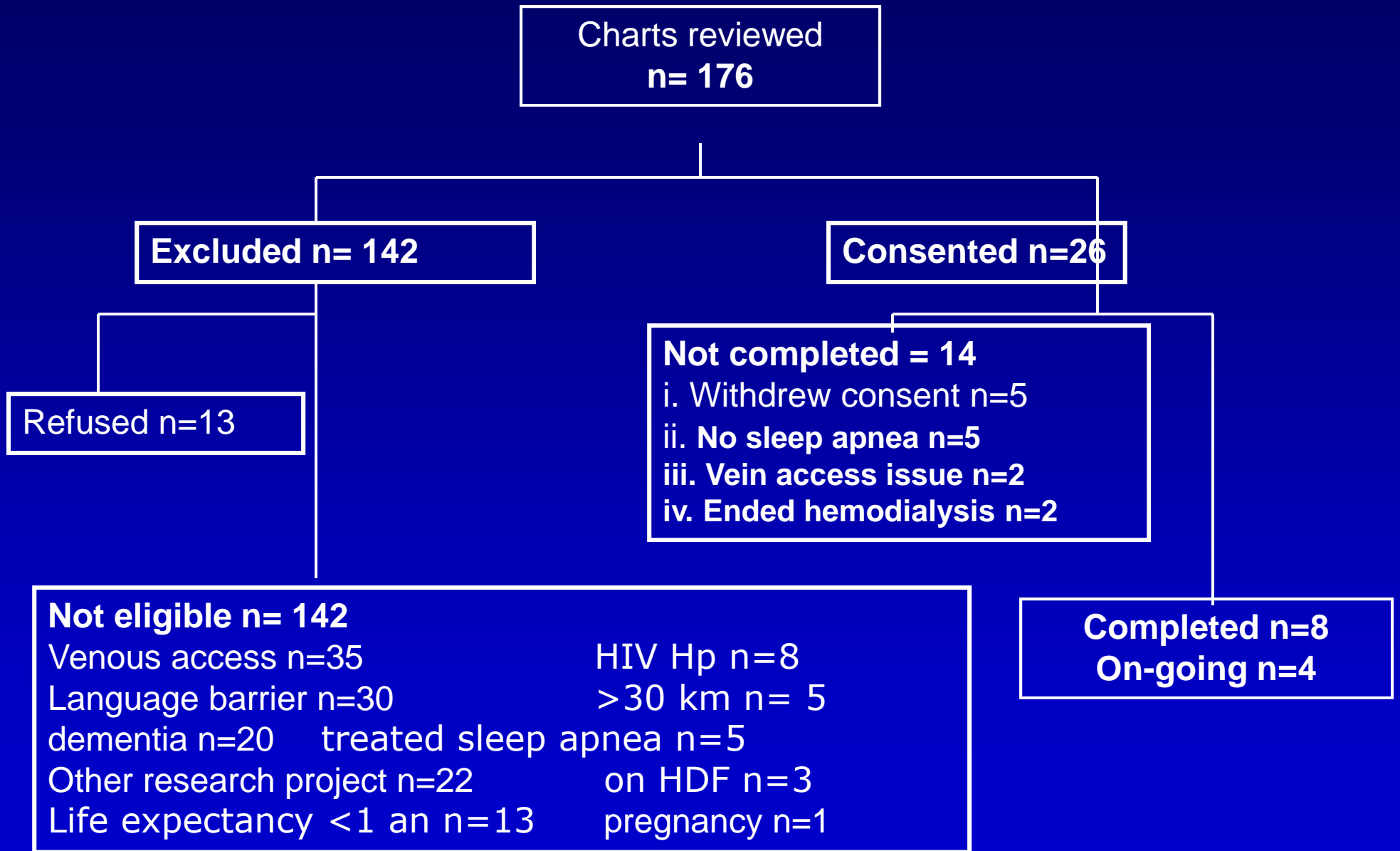
	Molecular Weight (MW) (daltons)
Low molecular weight toxins eg. urea	< 500
Middle MW toxins eg. β -2-M, PTH	500-15,000
Large solutes	> 15,000

Hemodiafiltration

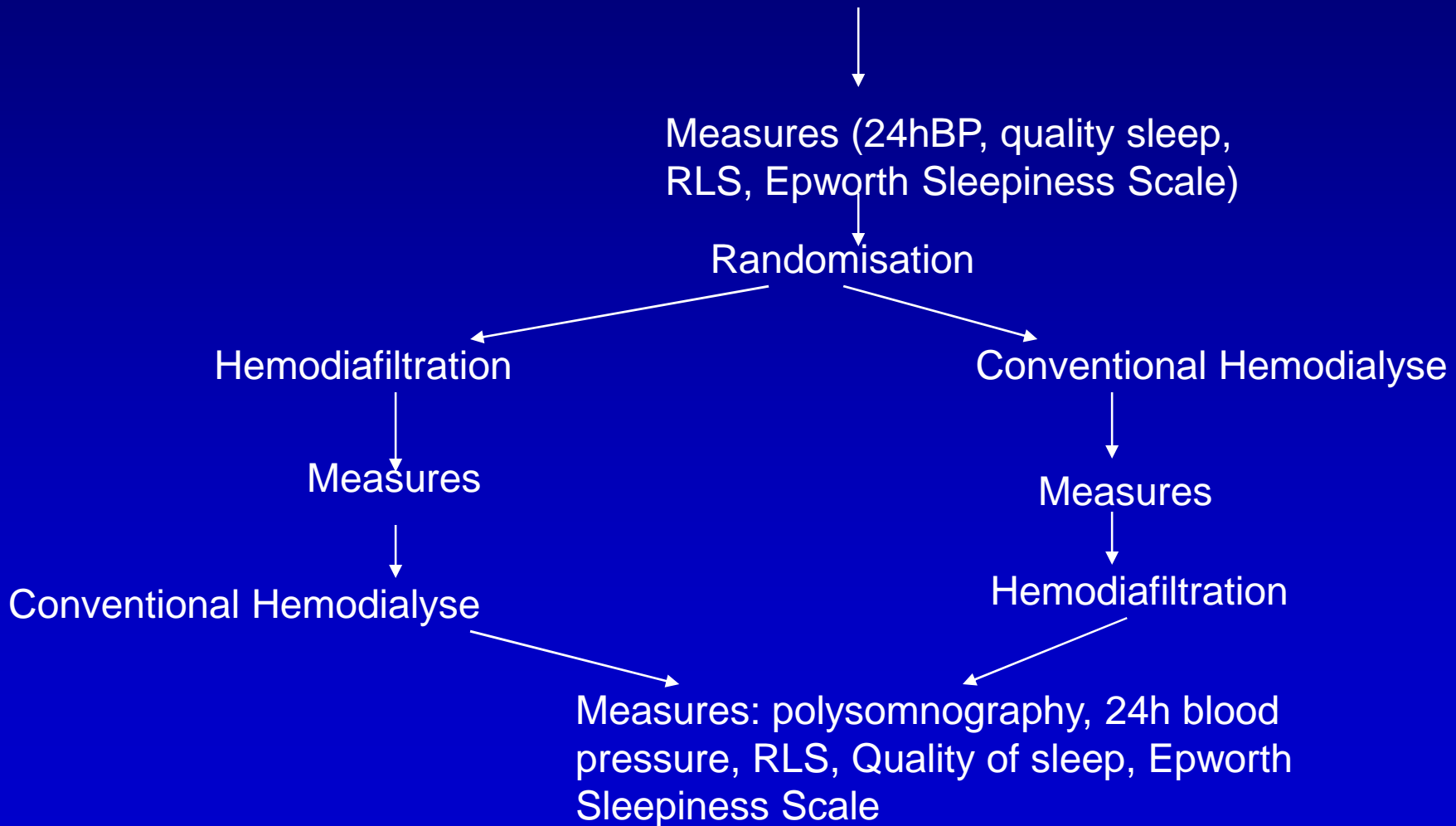
- Post dilution mode
- On-line substitution
- AK 200 Ultra
- Pressure control for ultrafiltration
- Dialyzer
 - Polyflux 17 or 21
 - same in hemodialysis

Subject Characteristics

	Participants (n= 8)
Age (years)	61 ± 12
Sex	7 men, 1 woman
Body Mass Index	25.4 ± 3.8
Years on hemodialysis	2 ± 2.1
Mean arterial pressure	96 ± 14
Apnea-hypopnea index (#/hour of sleep)	28.4 ± 10.8



Polysomnography with EEG



Respiratory characteristics on polysomnography

	HDF	HD standard	p-values
AHI	40.1 ± 17	41.5 ± 20	0.90
OxyDesat/h	7.24 ± 4.4	10.15 ± 11.5	0.47
Mean SaO ₂	94.3 ± 2.5	93.9 ± 2.3	0.53
Nadir SaO ₂	82.9 ± 8.25	79.8 ± 9.25	0.27
% night with SaO ₂ <90%	2.66 ± 2.7	6.4 ± 7.3	0.23
Days on therapy	136 ± 43	184 ± 47.4	0.042

Sleep-wakefulness Quality

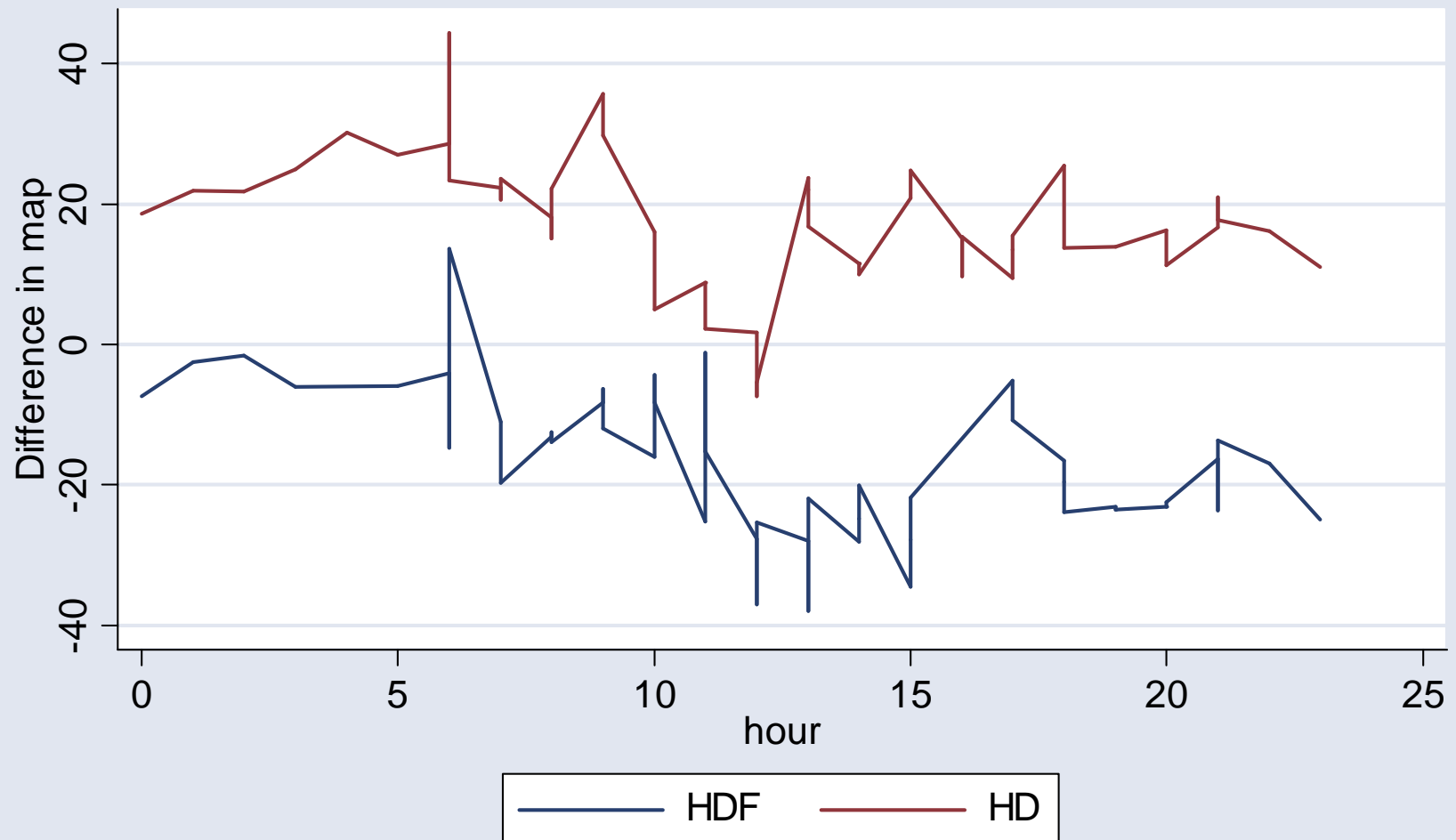
	HDF (n=8)	HDstandard (n=8)	P values
Epworth Sleepiness	7.6 ± 4.2	6.0 ± 3.8	0.28
Int'l Restless Leg Score	5.9 ± 9.2	7 ± 9.8	0.56
Quebec Sleep Q	193 ± 19	185 ± 22	0.3

Blood pressure differences, adjusted for circadian rhythm, (HDF-HD)

Δ MAP	-13.6 (95% CI -15.6, -11.5)	p <0.0001
Δ Syst BP	-20.6 (95%CI -23.7, -17.5)	p <0.0001
Δ Diast BP	-10.03 (95% CI -11.8, -8.3)	p <0.0001

Effect of treatment on mean arterial pressure adjusted for circadian rhythm and patient effects

Patient 14



Effect of treatment on mean arterial pressure adjusted for circadian rhythm and patient effects Patient 2



Conclusions

- Hemodiafiltration used for 3 months decreases significantly 24h blood pressure measured between dialysis, -13.6 mmHg (95% CI -15.6, -11.5) $p < 0.0001$ compared to conventional dialysis.
- We believe that no other randomized controlled trial had demonstrated an improvement on blood pressure control over 24 hours with 3 months of hemodiafiltration over conventional dialysis.

Conclusions

- So far, Online Hemodiafiltration is not associated with in an overall reduction in the severity of sleep apnea
- 72% of the hemodialysis participants had unrecognized sleep apnea in our dialysis unit

Thank you

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Ms. Charlene Barber, Coordinator and Research Nurse

Ms. Kathryn Riches, Research Nurse

Mr. Jeffrey Golden, Research Nurse

Ms. Marion Golden, Research Nurse

Mr. Christopher Brookes, Hemodiafiltration Technician

Mr. Gerry Stabile, Hemodiafiltration Technician

Ms. France Pelligrini, Sleep Technologist, Respiratory Therapist

Mr. Naftaly Naor, Sleep Technologist

Ms. Rina Luciano, Sleep Technologist

Dr Peter Barriga, Biostatistics and Epidemiology consultant