Starting with Home Dialysis

Budapest Nephrology School 2015

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Outline of the presentation

- Dialysis – why at home
- Home HD utilization in the developed countries
- Outcome of patients on HHD
- Starting HHD program in Hungary - achievements and difficulties

Dialysis –Why at home?

JAN MORROW

Taking back control of my life

Nephrology News Issues 2014.

„.... I was in the hospital with blood cancer and end-stage renal disease..... I was sent to an in-center dialysis clinic to begin treatment. I had no idea what dialysis was and didn't know at all how it worked. I had been active all my life, running for over 30 years and even completing a full marathon. Now I was told I needed to be on a strict, three day per week dialysis schedule. I felt I had lost all control over my life. I had a wonderful team of doctors and nurses, but I had become completely dependent on another person.

„I was miserable, exhausted, and I wanted my life back. After being in-center for two years, I knew I couldn't continue to live with that quality of life."

„It wasn't until I learned about more frequent home hemodialysis that I began to believe I didn't have to live like this, and maybe I could regain that sense of control I'd lost."

- The treatment has allowed me **to eat more normally**
- To **plan my days around my own schedule**
- I was even able to successfully **complete the Outer Banks Marathon**
- Take up biking and have ridden in two **250-mile bike rides**
- **I refuse to be a victim of my illness. I will never let it define me or control me.**

Why do patients choose HHD?

- **Freedom**
- **Lifestyle**
- **Control of their own life**

  - Flexible daily schedule
  - Free days in nocturnal HHD
  - No time consuming traveling
  - Better option for rehabilitation
  - Preserved privacy

Brief history of home hemodialysis

- HD was introduced as a home treatment in 1960s in Japan and USA
- 1963-64: Teaching centers established in USA and England
- 1970-80: Decreasing utilization of HHD
  - → increased availability of facility-based dialysis units
  - → patients with ESRD became older with more comorbidities
  - → successful Tx programs

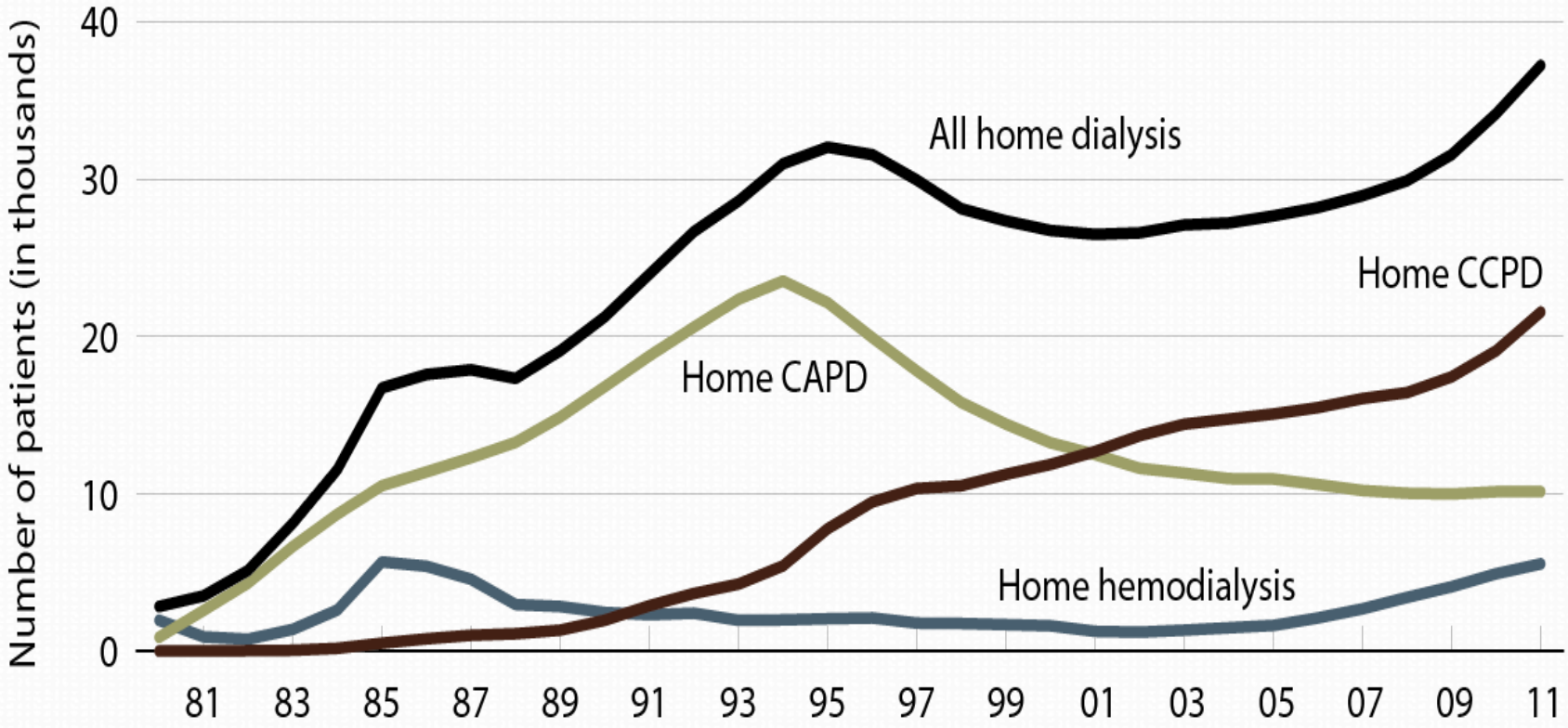
Brief history of home hemodialysis

- Toronto
  Dr. Robert Uldall created the first nocturnal HHD program
  First patient trained in 1994 - via U/C line
  Dr. Andreas Pierratos
  Dr. Christopher Chan

- From 2000s – large nocturnal HHD programs in the high-income countries

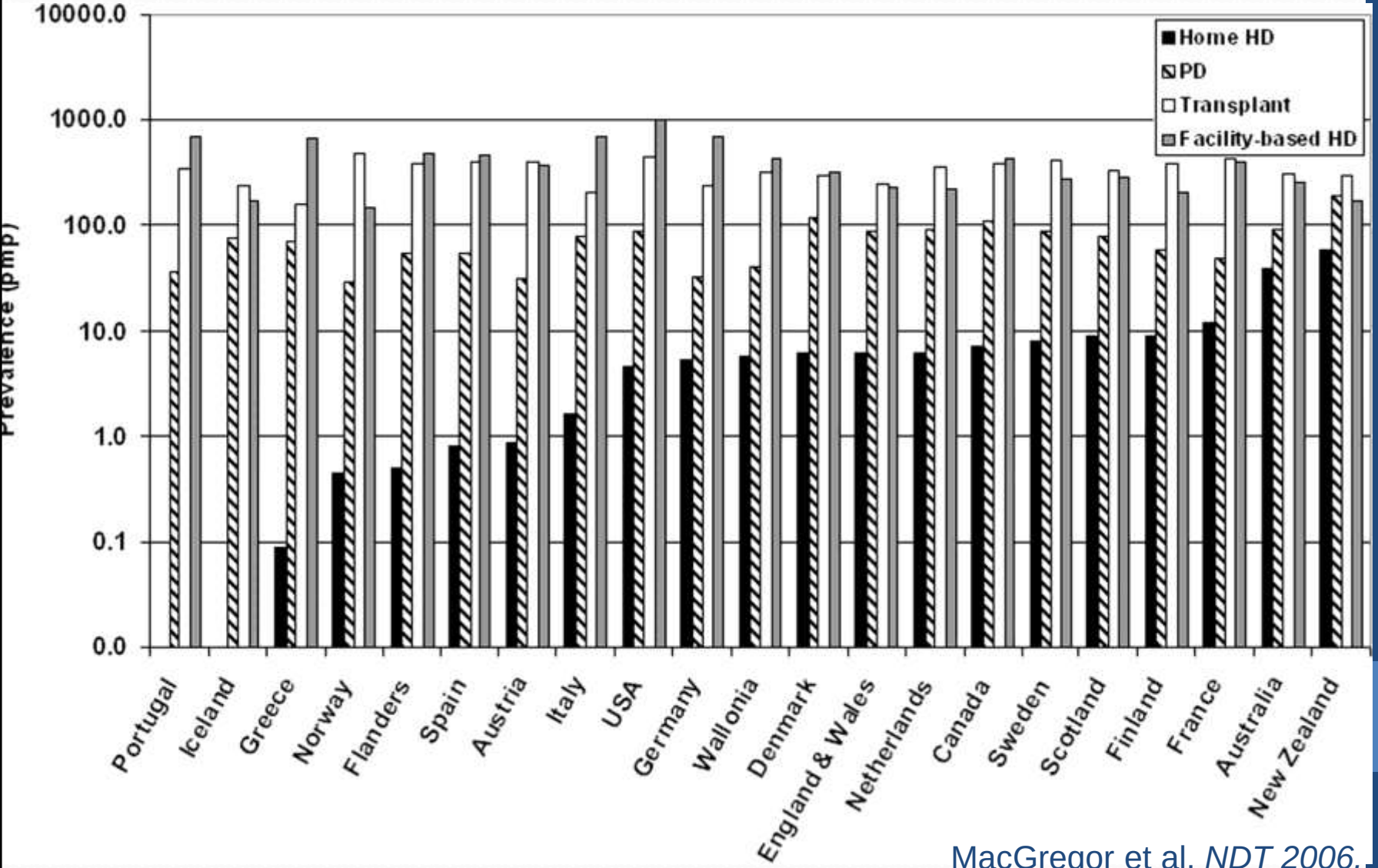
Prevalent dialysis patients on home based therapies in the USA

USRDS 2013



Prevalent dialysis patients.

Prevalence of HHD in the high-income countries



MacGregor et al. *NDT 2006.*

Intensive home HD

> 16 hours treatment/week

Nocturnal home HD 3-6 times/week, 7-8 hours treatment while the patient is sleeping

Short daily home hemodialysis

5 treatments/week, 2.5-3 hours

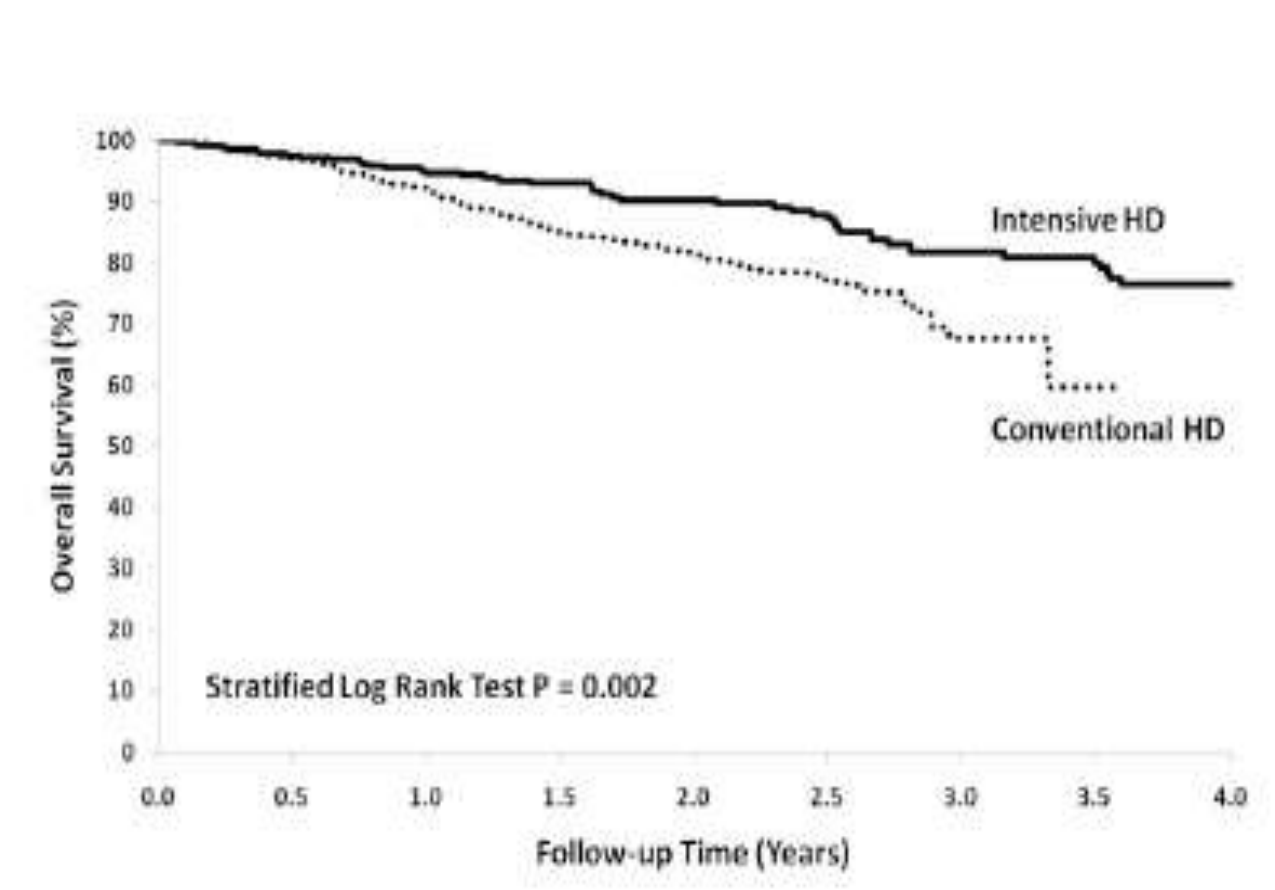
Intensification of HD

Improvements in

→ clearance of middle molecules
→ phosphate control
→ cardiovascular morbidity
→ BP control
→ endothelial function
→ left ventricular geometry
→ coronary calcification progression
→ sleep disorders
→ fertility
→ self-reported physical health and functioning
→ kidney specific domains of quality of life

Survival of patients on conventional and intensive hemodialysis

Nesrallah et al. IASN 2012.

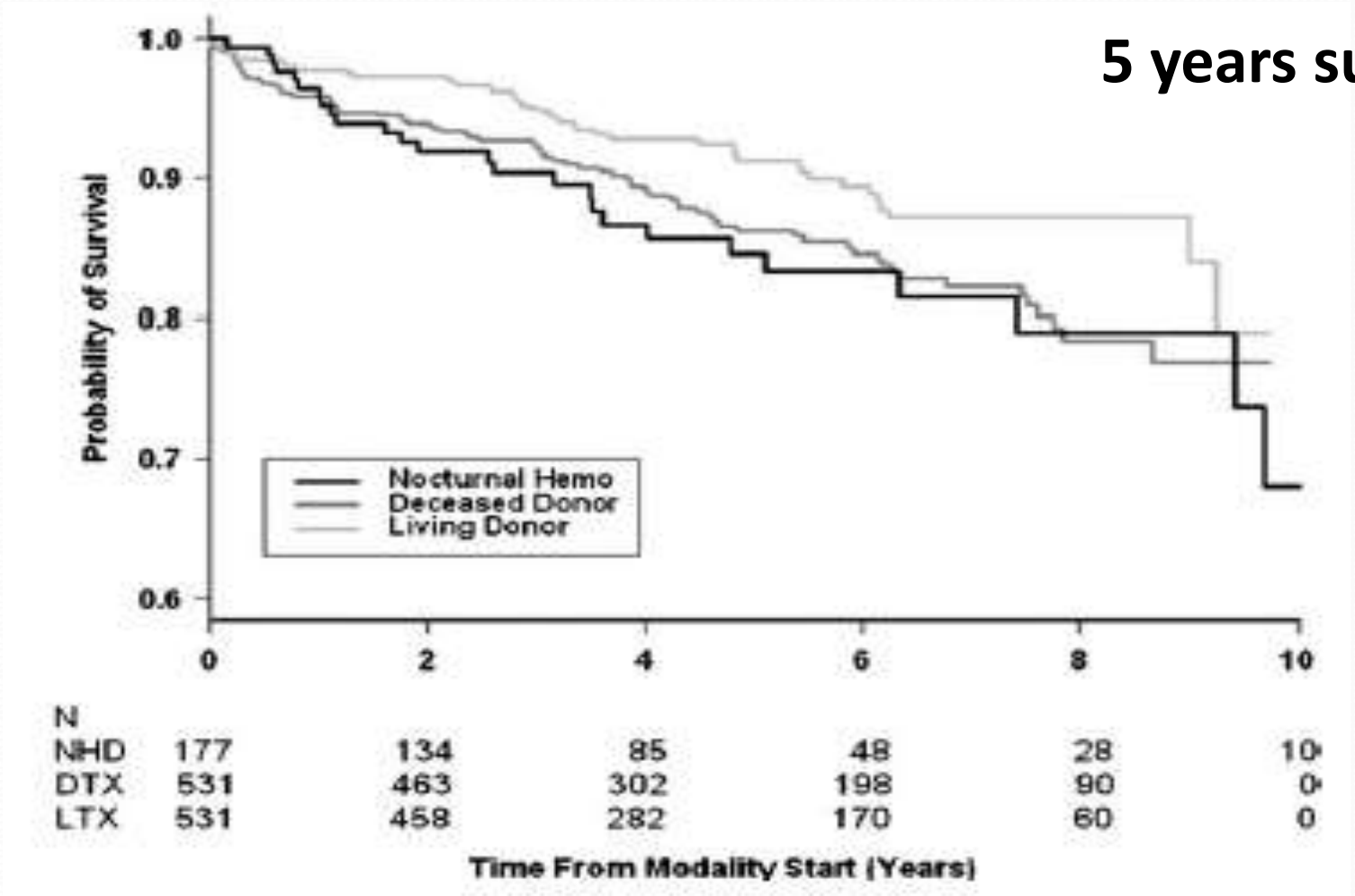


Conventional HD – mortality 21%

Intensive HD (weekly 35 hours) – mortality 13%

Survival of patients treated with nocturnal HHD, deceased and living donor kidney Tx

Pauly et al. NDT 2009



5 years survival

84,5%

86,2%

91,3%

Regression of left ventricular hypertrophy after conversion to nocturnal HD

Chen et al. 2002. KI

Variables	NHD ($N = 28$)		CHD ($N = 13$)	
	Initial	Final	Initial	Final
LVMI g/m^2	147 ± 42	114 ± 40^a	142 ± 33	150 ± 56^b
SBP *mm Hg*	146 ± 20	122 ± 13^a	136 ± 25	131 ± 20
DBP *mm Hg*	84 ± 15	74 ± 12^a	82 ± 13	80 ± 15

Successful pregnancies of patients on nocturnal HHD

Barua M et al. CJASN 2008

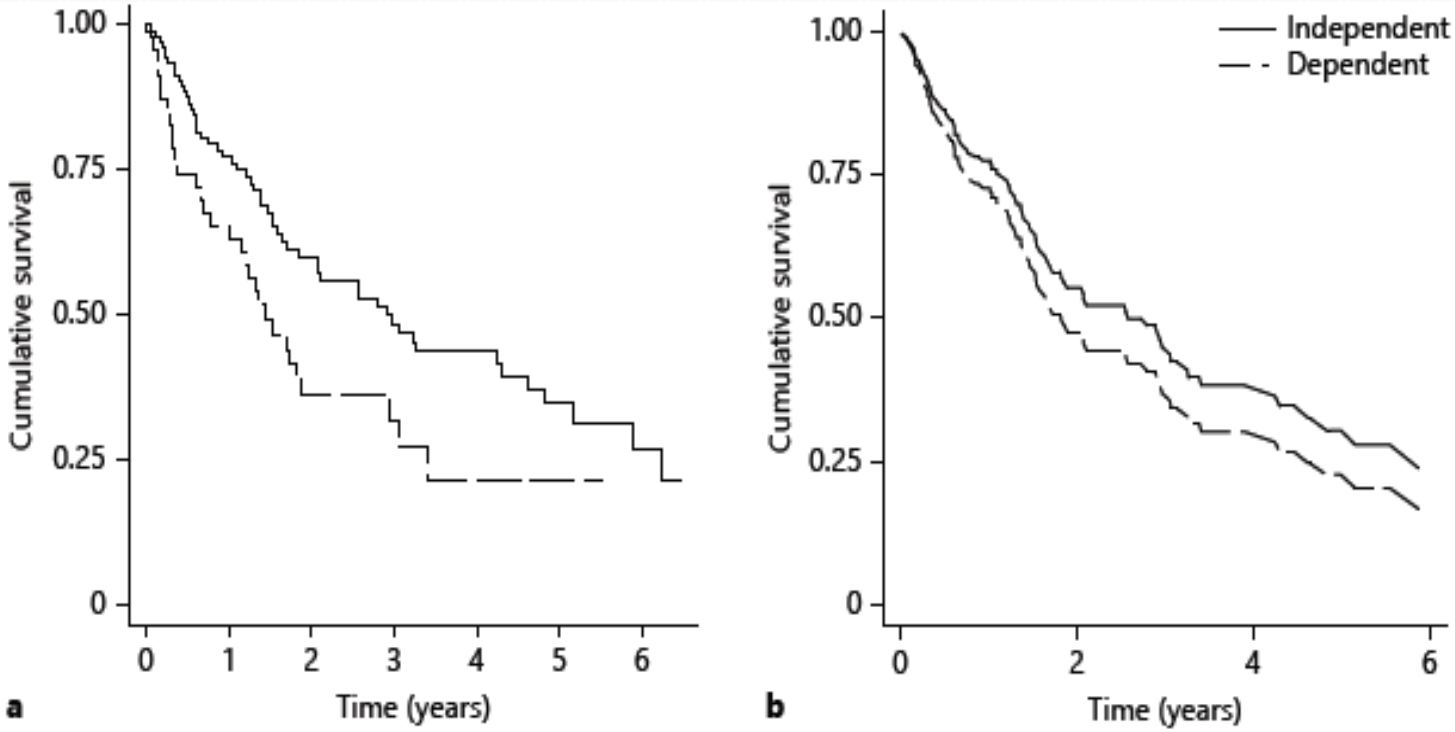
Table 1. Pregnancy outcomes[a]

	Number of Weeks at Delivery	Mode of Delivery	Baby's Birth Weight (g)	Baby's APGAR Scores at 1 and 5 min
Patient 1	36	C/S	2020	9/9
Patient 2: Pregnancy 1	38	SVD	3000	5/8
Patient 2: Pregnancy 2	37^{4}	SVD	2785	9/9
Patient 3	36^{5}	Induced labor, vacuum extraction	2690	6/9
Patient 4	38^{5}	C/S	2750	8/9
Patient 5	30	SVD	1260	5/7

[a]C/S, cesarean section; SVD, spontaneous vaginal delivery. Superscript numerals indicate days.

Caregiver-assisted nocturnal HHD

Tennankore et al. Nephron Clin Pract 2012.

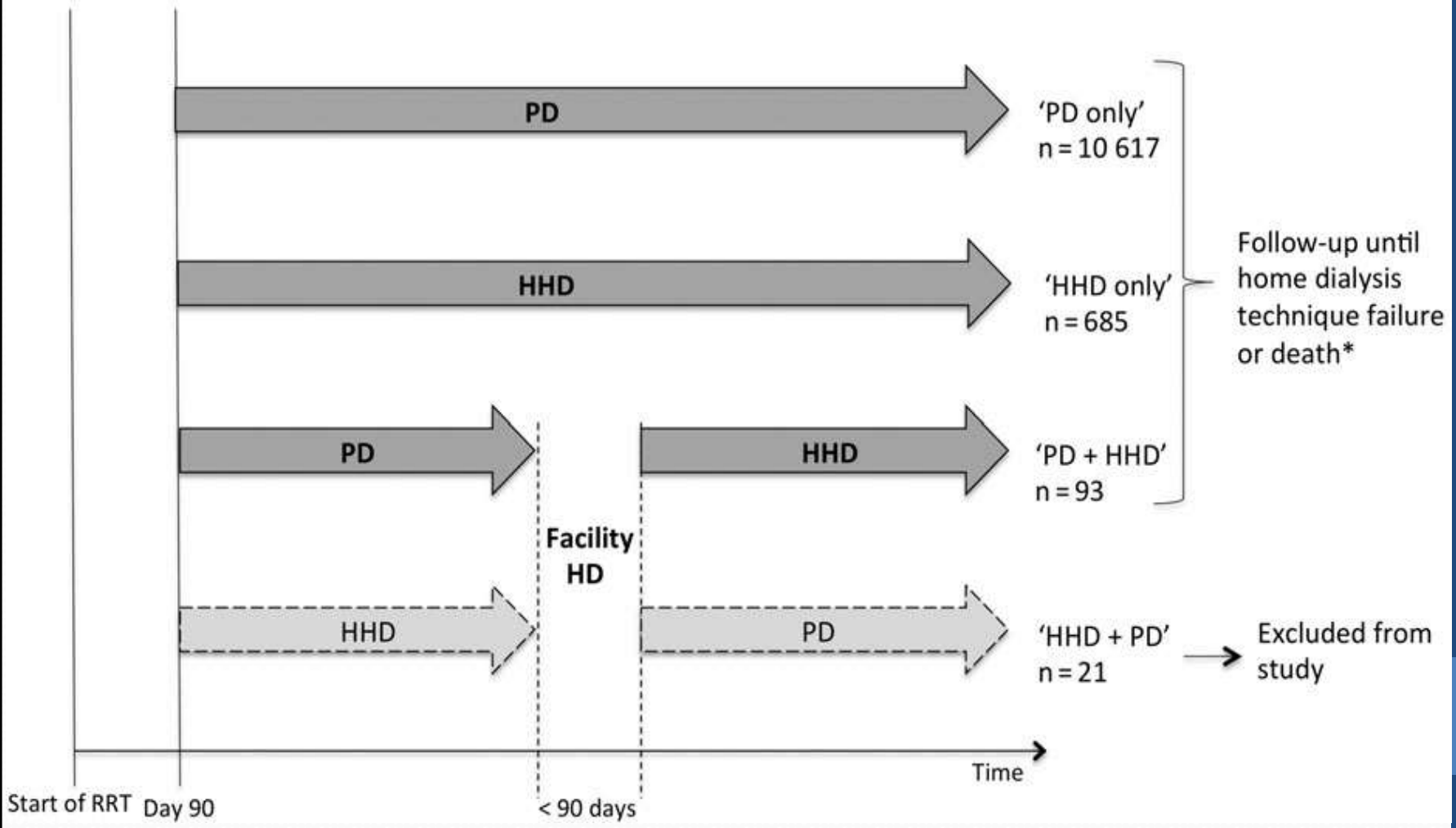


Number at risk							
Independent	105	73	45	32	21	11	5
Dependent	47	29	13	7	3	2	1

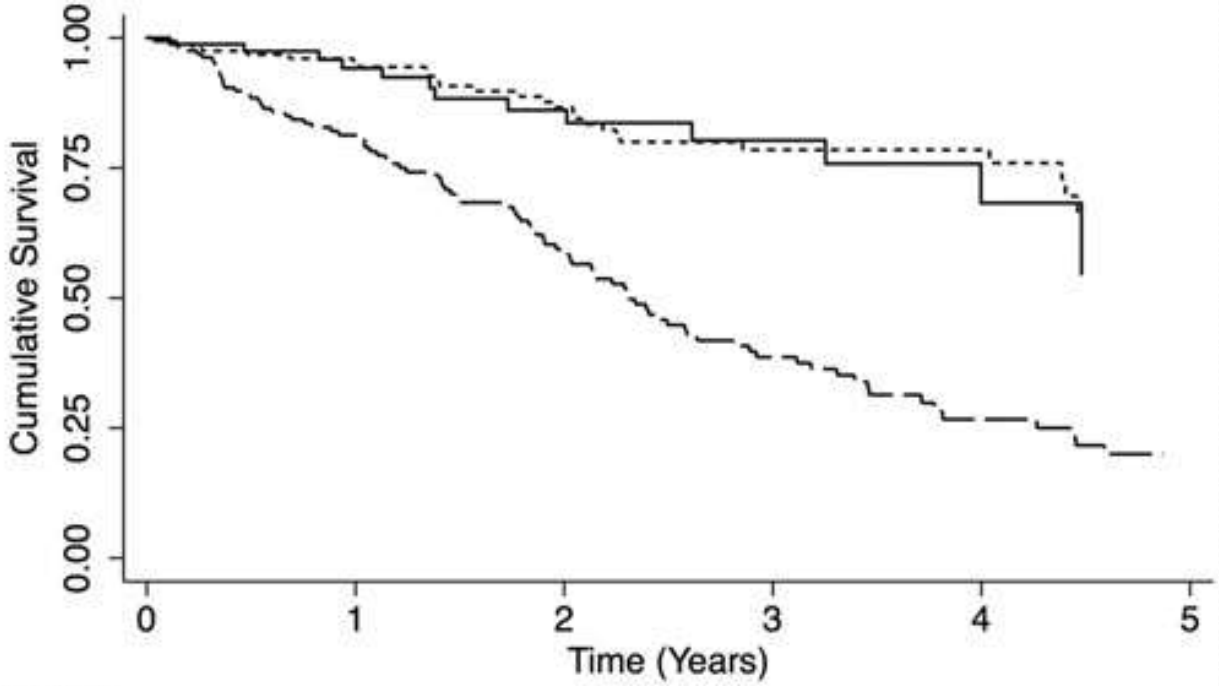
Fig. 3. Kaplan Meier (**a**) and adjusted Cox (**b**) survival curves for time to composite outcome (hospitalization, technique failure or death).

Integrated home dialysis model

Nadeau-Fredette et al. NDT 2015



Patient and home dialysis technique survival

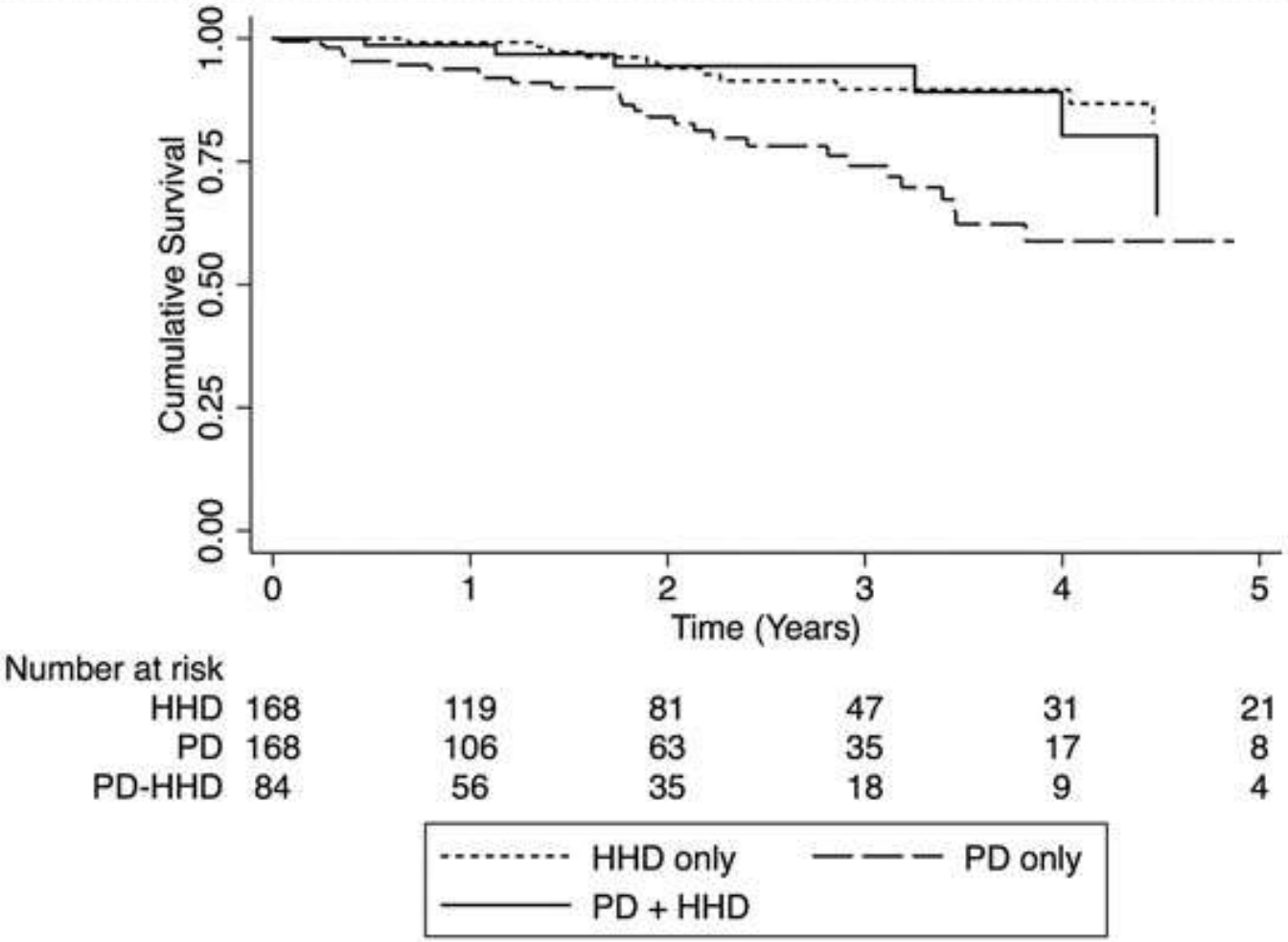


Number at risk

HHD	168	119	81	47	31	21
PD	168	106	63	35	17	8
PD-HHD	84	56	35	18	9	4

HHD only
PD only
PD + HHD

Patient survival on home dialysis



Post-dialysis recovery time for patients on daily HD

Freedom Study Group AJKD 2010

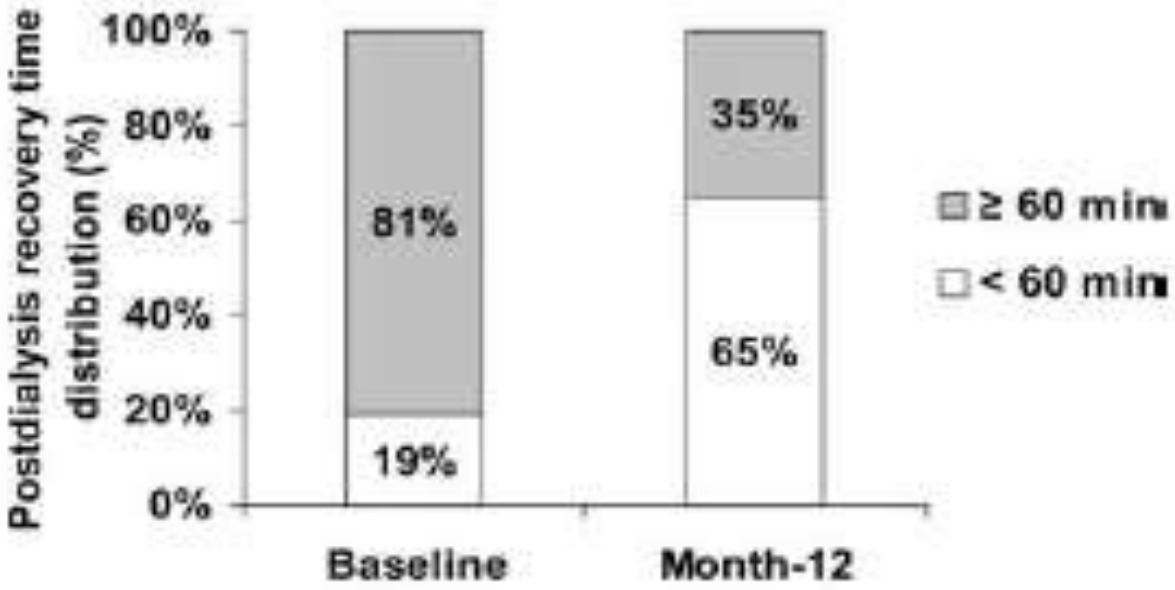


Figure 3. Distribution of postdialysis recovery time for study participants who completed 12 months of daily hemodialysis (per-protocol cohort; n = 128). $P < 0.001$ using McNemar test.

Adverse Technical Events in Home HD
Tennankore et al. AJKD 2015.

Event	No.	Fistula Access	Patient Error	Symptomatic or Requiring Intervention
Needle dislodge	18	17 (94%)	14 (78%)	Bleeding leading to anemia (n = 4) and need for transfusion (n = 3)
Air embolism	6	4 (67%)	6 (100%)	Chest pain and dyspnea (n = 6)
Cut AVF cannulation catheter[b]	2	2 (100%)	2 (100%)	0
Cut dialysis catheter[c]	1	0	1 (100%)	Complicated by line sepsis, leading to line change (n = 1)
Dislodged dialysis catheter[d]	1	0	0	Line changed (n = 1)
RO connection error (by technician) leading to severe hypercalcemia	1	0	0	Acute dialysis and ICU admission (n = 1)

All HHD patients in Toronto 1999-2011.
22 patients had adverse evens out of 202 participants
1 severe event/26 316 HD, 1 symptomatic event/ 16 667 HD, no death

Annual per-patient costs of in-center and home hemodialysis treatments

McFarlane and Komenda, Semin Dial 2011

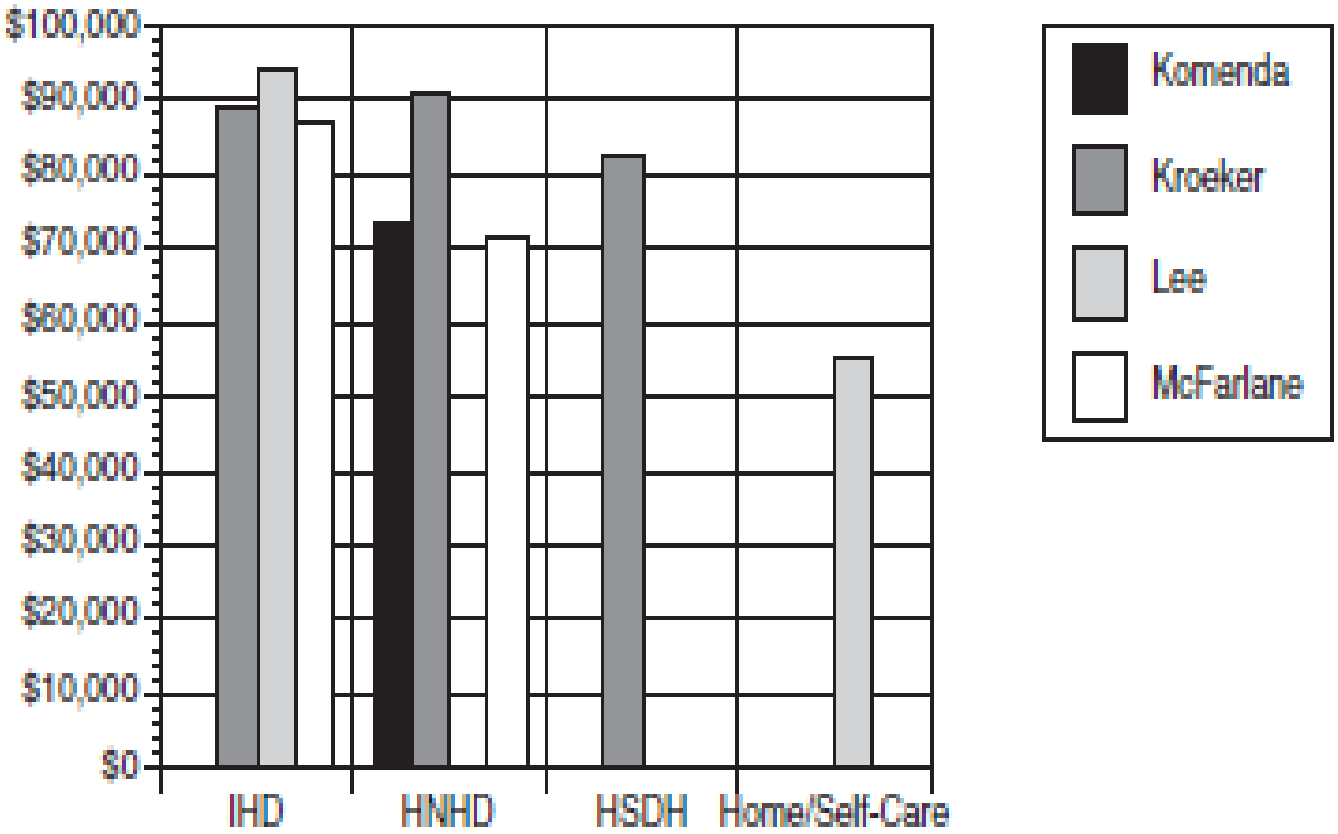


FIG. 1. Annual per-patient costs of various forms of hemodialysis from selected studies (Canadian 2011 dollars).

Starting home HD program in Hungary

- Advanced dialysis technology available
- No lack of HD capacity
- In spite of these, no home HD utiliziation in Hungary
- Similar situation in the Eastern European countries
- Surprisingly large interest of both the patients and physicians

Why do we want to start this program?

- To provide the choice of modalities for our patients with ESRD, ensure the best modality
- To impove our patients' quality of life
- To facilitate rehabilitation, enable them to keep jobs
- To improve their psychosocial circumstances
- To support patients who are well educated and wish to be independent

First steps

- We asked for help of Dr. Christopher Chan and the Home HD Team in Toronto
- Visited the Home HD Unit in TGH for two weeks in December 2014 → lots of experiences
  - translated the Canadian Patient' Manual and the Standards of Operations to Hungarian
- Organized a Hungarian Committe of Nephrologists to work together
- Obtained full support of the Hungarian Society of Nephrology

What do we need?

- **Patients**

  - well motivated

  - optimally earlier had good predialysis care

  - compliant

  - willing to learn all the necessary knowledge

  - (optimally) have good social background, living in family

What do we need?

- **Training program**

  - Dedicated training nurse, who provides good education for the patients

  - Detailed teaching material - Patient's manual

  - Quiet enviroment for learning - 6-12 weeks

  - Written and practical test before qualifying the patients for self-treatment

What do we need?

- Dedicated **nephrologist**
- Dialysis **technicians** providing technical support for 24 hours daily

What do we need?

Dialysis access

- Good fistula – best choice
- Graft – self-cannulation is more difficult
- Permanent (tunneled) HD line with Tego connector (reduces the risk of air embolism and infection)
  - easier for the patients, but more frequent catheter related infections compared to fistula
  (risk of infections similar between CHD and NHD)

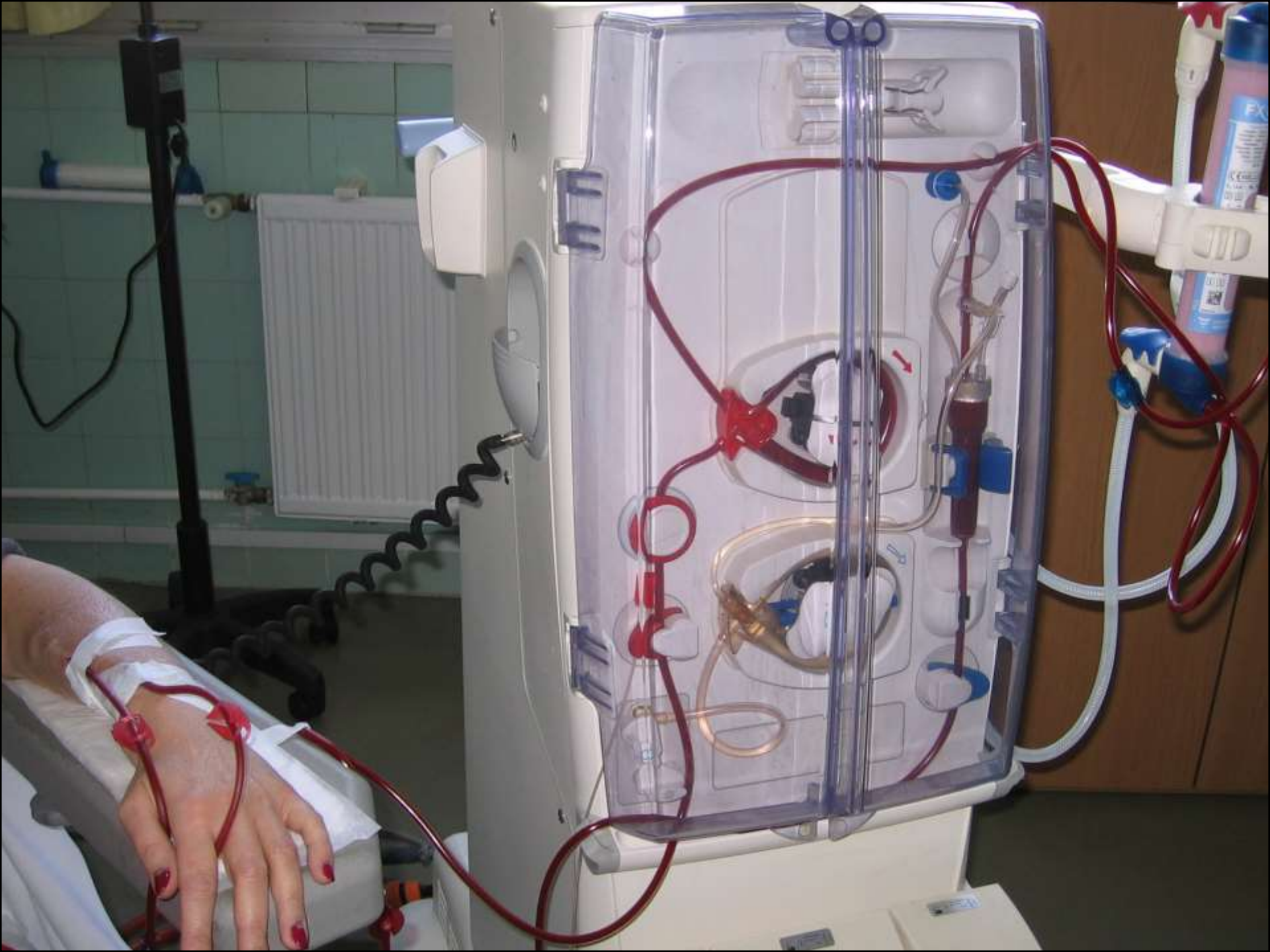
Tego connector

What do we need?

- **Dialysis machine**

  - All kind of dialysis machines may be used
  - More safety features if designed for home treatment
  - More simple to operate if designed for home treatment
  - Own experience: Fresenius 5008 S HHD
  - Other types of HHD machines e.g. Baxter HHD, NxStage System One, etc.


5008




5008


OK
C
F1
F2


5008S
ART
Hgmm
-165
300
-100
-200
-300
UF cél
ml
2500
UF idő
ó:perc
1:36
UF időzítő
I/O
250
ml/perc
Véráfolyás
Ø 5.0mm
12
9
1:36
3
6
VEN
Hgmm
115
500
200
100
-100
Vérrendsz.
I/O
Vérnyomás
142 / 84
I/O
UF ráta
ml/ó
715
UF volumen
ml
1362

What do we need?

- **Water treatment system**
  - small size, using tap water from bathroom or kitchen


AquaUNO

Technical background and support

Home assessment in advance by dialysis technician
- suitable house/appartement

- Water system/plumbing
- Draining system
- Electricity
- Storage room/space
- Technicians provide regular check-ups for the dialysis machine and water quality

Technical background and support

- Remote monitoring of the dialysis machine/treatment – is not, but **telephone/internet availability** for the patients is mandatory
- Patients have increased cost of electricity and water

Our achievements

- We have gathered experiences by training four patients so far
  - two of them have fistulas
  - one patient has permanent central line
  - one patient will likely get caregiver-assisted home HD by her wife (dialysis nurse)

Further steps

- We need guidelines accepted by the Hungarian Health Care Authorities
- Detailed standards of operations
  - e.g. storage and transportation of the biohazard waste
- Sufficient reimbursement

ACKNOWLEDGEMENTS

We are very thankful for the help of
Dr. Christopher Chan and the Home HD Team
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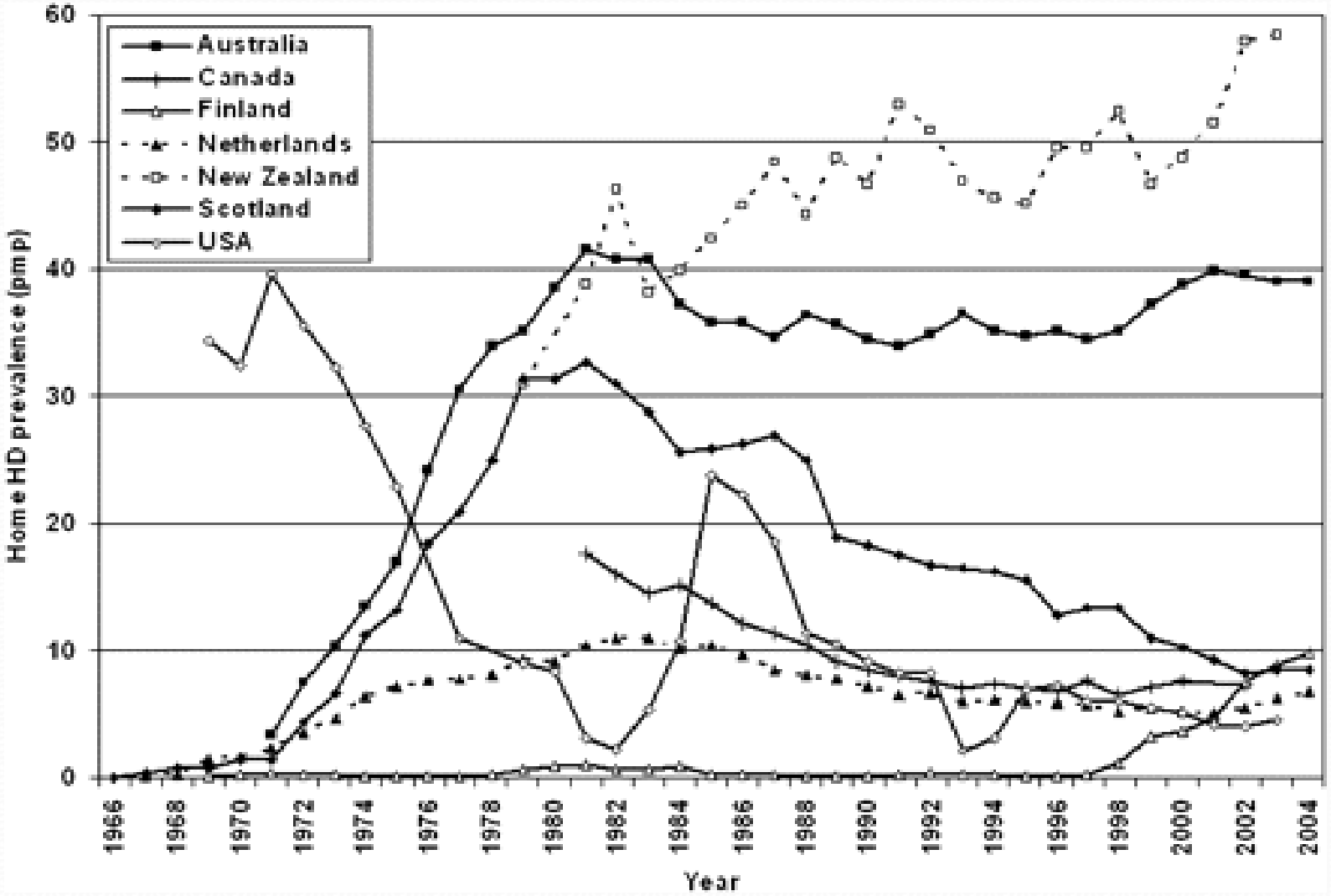
University of Toronto, Canada

Prevalence of home HD from 1966-2004



MacGregor et al. *NDT 2006.*