

Center based hemodialysis has to be the main modality

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Modality of Hemodialysis

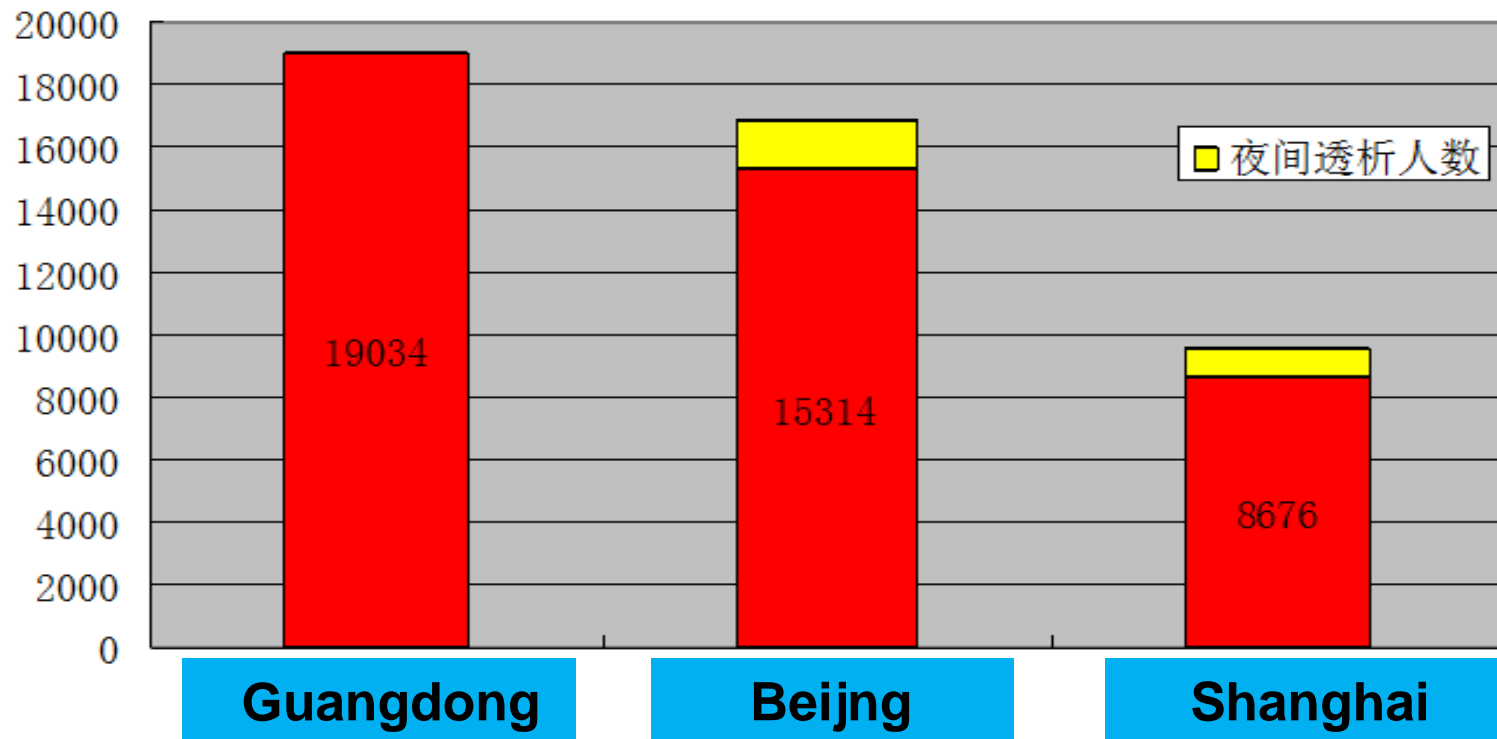


Home-based



Center-based

Center-based hemodialysis covers the majority ESRD patients in China—— CSN 2011



The popularity of Home hemodialysis (1960-1970, 2000-2011)



The development of Nocturnal Home HD during 2006-2008 in United States

USRDS 2010

	Incident (2006–2008)		Prevalent (2008)	
	Total	Column %	Total	Column %
Age	0-19	*	25	1
	20-44	139	851	22.2
	45-64	530	1,784	46.6
	65-74	280	677	17.7
	75+	430	489	12.8
Sex	Male	805	2,302	60.2
	Female	577	1,524	39.8
Race	White	893	2,491	65.1
	African American	432	1,146	30.0
	Native American	*	28	0.7
	Asian	40	139	3.6
	Other/Unknown	12	22	0.6
	Hispanic	118	265	6.9
Cause	Non-Hispanic	1,264	3,561	93.1
	Diabetes	443	1,177	30.8
	Hypertension	544	929	24.3
	Glomerulonephritis	71	720	18.8
	Cystic kidney	50	224	5.9
	Other urologic	11	108	2.8
	Other cause	147	516	13.5
	Unknown/missing	116	152	4.0
All	1,382	100.0	3,826	100.0

Only 1% of RRT pats

Nocturnal hemodialysis, (NHD)— — optimal Home HD modality



- Nocturnal hemodialysis: 6-8 hours every time, 6-7 times every week.
- History:
 - **1994: Canada: Uldall started long time nocturnal dialysis**
 - **1998: Canada: Pierratos first raised the concept of NHD**
 - **2000: All over the world began to NHD, Lockridge's (United States) was the largest**
 - **2007: the first RCT study published (compared with CHD)**

Adv Ren Replace Ther, 1996,3:133-136

Am J Kidney Dis, 1993,21:270-277

J Am Soc Nephrol, 1998,9:859-868

Nephrol News Issues, 1999,13:16-23

JAMA, 2007,298:1291-1299

The advantages of NHD

- **Stability Hemodynamic**
- **Slowly remove liquid without symptoms of reduced effective intravascular Capacity**
- **Good blood pressure control**
- **Increase the clearance of middle-molecular toxins**
- **Reduce toxic levels fluctuations, more physiology**
- **Allow free taking food and water**
- **Have the common advantages of short-term daytime dialysis and long time dialysis (3 X8h/w)**

JAMA,2007,298:1291-1299

Am J Kid Dis, 2009,54(6):1171-1184

Nocturnal Home HD for Chinese is not suitable

Problems:

- **Survival rate (need RCT evidence)**
- **Safety**
- **Training**
- **Social and economic factors**
- **The factors of Patients**

The most key parameters of a treatment quality evaluation model



- **The quality of life**
- **Survival rate**

The existing research shows that NHD can improve the quality of life

Nocturnal Hemodialysis

<u>Blood pressure control</u>	+++ (↓ total peripheral resistance)
<u>Left ventricular hypertrophy</u>	+++ (↓ afterload)
Left ventricular systolic function	+++
Arterial compliance	+++
Sleep apnea	Correction
Cardiac autonomic nervous system abnormalities	Restoration
<u>Phosphate control</u>	+++
Anemia	++ (↓ erythropoietin resistance)
Malnutrition	++
Inflammation	↓ C-reactive protein, interleukin 6
Cognition	+
Fertility	++
Quality of life	++ ^a

But still lack RCT research about NHD improve survival

JAMA, 2007, 298:1291-1299

Am J Kid Dis, 2009, 54(6):1171-1184

Curr Opin Nephrol Hyper, 2011, 20: 182-188

NHD modality still with high incidence of access infection



Bergman A, Fenton SS, Richardson RM, Chan CT. Reduction in cardiovascular related hospitalization with nocturnal home hemodialysis. Clin Nephrol 2008; 69:33-9.

Lack of large RCT study: the effect of NHD on survival

➤ Most studies are retrospective observational studie (fives years survival rate of NHD is 81%)

- No control group
- Treatment groups are different from traditional hemodialysis groups, such as age is younger, etc
- The same group of patients in the study of multiple reports

Kidney Int, 1999, 55:2467-2476

Kidney Int, 2004, 65:1975-1986

Kidney Int, 2006, 69:1229-1236

➤ Less Prospective studies, or small sample sizes or without controlled and duration of follow-up is limited

- Canada (n=12), follow-up three years;
- Canada (n=247), follow-up twelve years;
- America (n=655), follow-up **one year** (hemodialysis center NHD);

JASN,1998,9:859-868

CJASN,2010,5:1815-1820

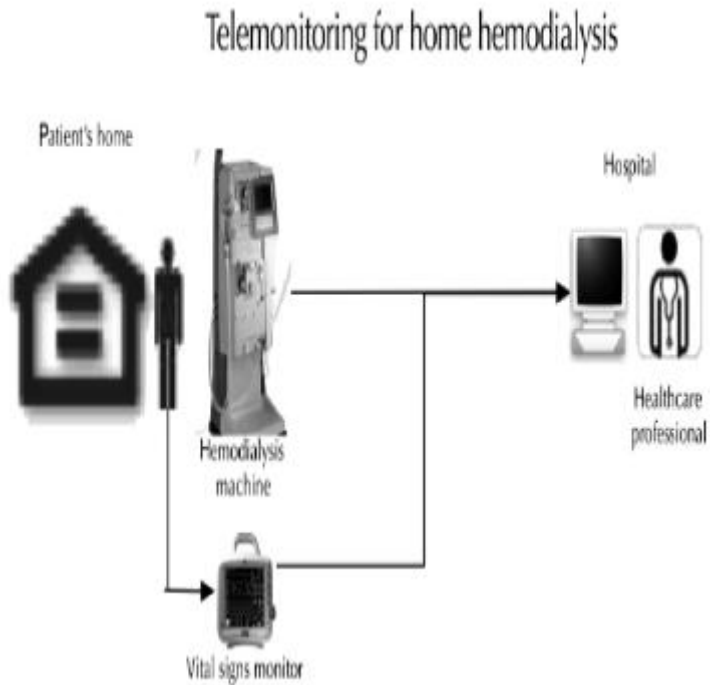
CJASN,2010,5:220-226

Safety problems remain to be solved



- Remote monitoring
- The emergency treatment during the course
- Training issues

Remote monitoring is sure to be sensitive and security



- **Dialysis machine has data output interface, through the telephone or network connection dialysis monitoring center;**
- **Monitoring system update data every 20 seconds;**
- **Remote monitoring system alarm:**
 - **Monitoring personnel wake-up call patients**
 - **Monitoring personnel contacts nurses, doctors, the police or the local ambulance**

Hemodialysis International, 2010,

Patients need to deal with in time after the system alarm

- **Blood pressure**
- **Fluctuations arrhythmia**
- **Ascular access problems**
 - **Catheter blood coagulation**
 - **Catheter fall off at night**
 - **fistula hemorrhage**
- **Dialysis process accidentally interrupt**
- **Dialyzer leaking**

Training costs

The training costs on average : \$ 13415 = ¥ 89880

Table 2 | Total startup, training, and maintenance cost components (excluding costs of dialysis runs) from the BCPRA perspective of home hemodialysis program

Fiscal year	2004–2005		2005–2006	
No. of entry patients (total–exits)	53		69 (122–9 = 113)	
No. of exits	0		9	
<u>New entry patient training costs</u>	NA		<u>\$804,865</u>	
Startup costs ^a	\$510,000		\$20,000	
Home renovations	\$150,000		\$107,500	
Equipment warranty	\$36,000		\$443,000	
HHD/RO machine costs ^b	N=53	\$185,500	N=60	\$395,500
Hospitalization ^c (PYs/costs)	0.36	\$116,500	0.77	\$282,500
T			13,365	
Total cost/PT	\$18,830		\$17,306	

Training problems

- Require developed education network
- Lack of education content system at present
- Relevant regulations and accident responsibility of problems
- Require strict planning before dialysis
- Request a high enthusiasm multidisciplinary experts team
- **Long training time (3-6 months)** include: water processor operation, machine operation, fistula puncture , anticoagulant injection, etc.
- **High cost of training in China**
- The low rate of qualified training **(15–20%) , more less in China .**

NHD launched and training costs in the first year

content	cost (yuan)	note
hemodialysis machine	130,000	High security
Water supply equipment	110,000	Including former processing
Monitoring equipment	20,000	Including scanning, alarm and communication
Family decoratement	10,000	Conduit, circuit laid
The training for patient and family	30,000	8,9880 yuan/Canada
Total	300,000	

Treatment costs

Table 3. Summary of costs

	Measured weekly costs			Projected annual costs	
	IHD	HNHD	<i>P</i> value	IHD	HNHD
Staff	\$423	\$210	<0.001	\$22,056	\$10,932
Direct hemodialysis materials	\$126	\$318	<0.001	\$6,575	\$16,587
Drug	\$231	\$172	0.082	\$12,029	\$8,989
Overhead and support	\$238	\$80	<0.001	\$12,393	\$4,178
Physician fees	\$128	\$128	N/A	\$6,650	\$6,650
Admits/procedures	\$134	\$23	0.355	\$6,997	\$1,173
Depreciation	\$17	\$118	<0.001	\$871	\$6,139
Lab tests/imaging	\$26	\$33	0.004	\$1,364	\$1,744
Total	\$1,322	\$1,082	0.006	\$68,935	\$56,394

All costs are expressed in year 2000 Canadian dollars.

NHD dialysis treatment costs

(without contain depreciation cost)

Table 4 | Dialysis costs for patients in home program from payer perspective (excluding training)

	2004–2005		2005–2006	
	Patient years	Cost	Patient years	Cost
HHD maintenance costs ^a	12.36	513,769	65.58	1,948,816
Inpatient runs ^b	9.51	368,656	17.52	655,661
Total	21.87	882,425	83.1	2,604,477
Cost/patient year	\$40,349		\$31,342	

¥27,3380

¥20,9910

Cost in China

Treatment Cost

- 90000 RMB
- Drug: 10000 RMB

10,000 RMB/y

Transport Cost

- Shuttle Bus
- Taxi
- Subway
- Family private car

3000-4000 RMB/y

Government medicare insurance support : ¥7,500/y

Patients paid : ¥ 20000-30000/y

Family income of patients: ¥ 70000/y

¥ 30,000

The patients factors

- The longer patients on CHD, the less likely they transfer to NHD
- **Lack of confidence in self-cannulation**
- **Worry about the quality of family monitoring**
- Lack of well evaluation in self-performing the therapy
- Fear of a catastrophic event during treatment
- Worry about aggravating the burden on family

Other factors from patients themselves

- Patients have low interest in adopting NHD
- Patients feel more comfortable, more at ease and safer in dialysis center
- **Limited culture quality in China**
- Patients with low agility hand and visual impairment
- Patients worry needles or line fall off
- Patients worry NHD alarm affect sleep

Other factors from patients themselves

- Patients have fear on NHD machines (worry can't deal with by themselves)
- Patients worry about the difficulties during studying
- Patients worry about handle the blood pressure changes during NHD
- **Patients feel anxious about the safety of remote monitoring**
- Patients worry about the effectively anticoagulant treatment
- Bad compliance, low rate qualified training
- The loneliness isolated from social

The related factors of family environment

- **Family room is not enough**
- **Need family computers and hospital network**
- **Medical waste disposal are limited**
- **Increasing utilities, telephone calls**
- **Water treatment facilities (conduct installation of facilities)**

The options of time and place for long time dialysis

Daytime **or** night

The nurse operation
or patient operation

Hospital **or** family



Currently Situation in China:

Patients willing to choose

Center-based HD treatment

frequent HD

NHD in center

Home-based hemodialysis modality has long way to go in our country.....





Happy Mid-Autumn Moon Festival !

Thank You

For your attention !