



## 우리나라 신대체 요법의 현황

### -인산 민병석교수 기념 말기신부전 환자 등록사업 2013 -

대한신장학회 등록위원회

## Current Renal Replacement Therapy in Korea

### - Insan Memorial Dialysis Registry, 2013 -

### ESRD Registry Committee, Korean Society of Nephrology\*

#### =Abstracts=

Registry committee of Korean Society of Nephrology has collected data about dialysis in Korea through on-line registry program in KSN internet web site. The status of renal replacement therapy in Korea at the end of 2013 was as follows:

- 1) The total number of patients with renal replacement therapy (RRT) was 75,042 (hemodialysis : HD 52,378, peritoneal dialysis : PD 7,540, functioning kidney transplant: KT 15,124). Prevalence of RRT was 1,446.4 patients per million population (pmp). The proportion of RRT was HD 69.8%, PD 10.0%, and renal transplant 20.2%.
- 2) New RRT patients in 2013 were 12,183 (HD 9,543, PD 884, KT 1,756). Incidence rate was 234.0 pmp in 2013.
- 3) The most common primary cause of end stage renal diseases was diabetic nephropathy (48.0%), hypertensive nephrosclerosis (19.7%) and chronic glomerulonephritis (8.3%), in order.
- 4) The number of RRT centers was 709 and total number of HD machines was 19,917. Dialysis patients' individual data were collected from 65.2% of overall RRT centers.
- 5) Mean age of HD patient was 60.6 years old, of PD was 55.5 years old. Proportion of patients on HD more than 5 years' maintenance was 46%. Mean blood pressure was 100.1 mmHg in HD and 98.4 mmHg in PD patients. Pulse pressure was 64.5 mmHg in HD and 53.5 mmHg in PD patients. Mean hemoglobin of HD patient was 10.4 g/dL (hematocrit 31.4%), PD was 10.3 g/dL (Hct: 30.6%). Mean urea reduction ratio was 68.1% in male HD patients and 74.2% in female HD patients. Mean single pool Kt/V was 1.391 in male patient, 1.657 in female patients.
- 6) Common causes of death were unknown cause or not uremia associated cardiac arrest (14.2%), uremia associated cardiac arrest (also 14.2%), sepsis (11.9%), cerebrovascular accident (8.7%), pulmonary infection (8.4%) and myocardial infarction (7.5%) in 2013. Overall patient survival of male dialysis patient in 5 years was 71.7%, female patients was 74.2%. HD patient's 5 year survival was 73.7% and PD was 68.4%. Five year survival of diabetic dialysis patients was 63.2%, chronic glomerulonephritis patients 86.5%, hypertensive nephrosclerosis patients 78.1%, respectively.
- 7) Survey on rehabilitation status of dialysis patients showed that 22% of HD patients have full time job and 8% have part time job. 29% of PD patients have full time job, and 17% have part time job.
- 8) The number of kidney transplantation was 1,756 (deceased donor 750) in 2013.

**Key words:** renal replacement therapy, hemodialysis, peritoneal dialysis, prevalence, incidence, survival, dialysis adequacy

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Part 1. Prevalence & Incidence of ESRD (1)



Table 1-1. Prevalence of renal replacement therapy.

	HD	PD	Transplant	Total
1986	1,335 (32.6)	573 (13.9)	621 (15.1)	2,534 (61.7)
1988	3,012 (74.0)	1,058 (25.2)	982 (23.4)	5,142 (122.7)
1990	4,311 (101.8)	1,130 (26.7)	1,866 (44.1)	7,307 (172.6)
1992	5,890 (135.3)	1,599 (36.7)	2,862 (65.8)	10,351 (237.8)
1994	7,387 (162.7)	2,284 (50.3)	4,116 (90.6)	13,787 (303.6)
1996	9,635 (207.5)	2,976 (64.1)	5,461 (117.6)	18,072 (389.2)
1998	13,473 (285.6)	3,912 (82.9)	6,515 (138.1)	23,900 (506.7)
2000	15,853 (330.4)	4,671 (97.4)	7,522 (156.8)	28,046 (584.5)
2001	17,568 (363.8)	5,489 (113.7)	7,957 (164.8)	31,014 (642.3)
2002	20,010 (412.4)	5,712 (117.7)	8,271 (170.5)	33,993 (700.6)
2003	23,348 (478.2)	6,807 (139.4)	8,635 (176.9)	38,790 (794.5)
2004	25,335 (516.5)	7,569 (154.3)	8,987 (183.2)	41,891 (854.0)
2005	27,246 (553.0)	7,816 (158.6)	9,271 (188.2)	44,333 (899.8)
2006	29,031 (585.0)	7,990 (161.0)	9,709 (195.7)	46,730 (941.7)
2007	30,907 (617.7)	7,649 (152.9)	10,119 (202.2)	48,675 (972.8)
2008	33,427 (663.3)	7,840 (155.6)	10,722 (212.8)	51,989 (1031.6)
2009	37,391 (738.3)	7,618 (150.4)	11,387 (224.8)	56,396 (1113.6)
2010	39,509 (768.1)	7,309 (142.1)	12,042 (234.1)	58,860 (1144.4)
2011	42,596 (823.6)	7,694 (148.8)	13,051 (252.4)	63,341 (1224.8)
2012	48,531 (938.4)	7,552 (146.0)	14,128 (273.2)	70,211 (1357.6)
2013	52,378 (1009.6)	7,540 (145.3)	15,124 (291.5)	75,042 (1446.4)

( ): number of patients per million population, Population in Korea at the end of in 2013: 52,058,370.

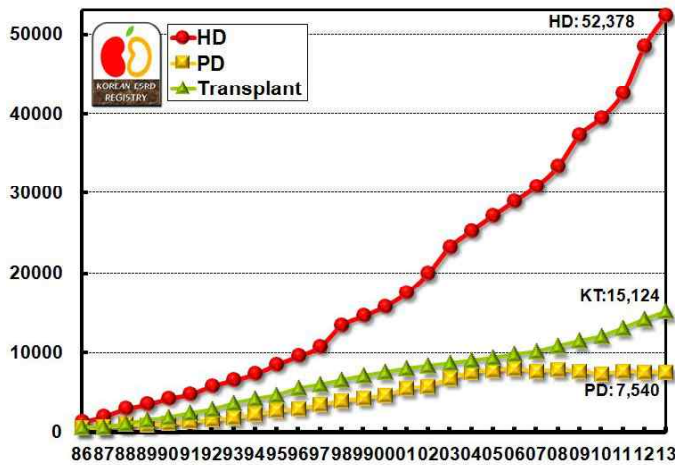


Fig. 1-1. Patient numbers of renal replacement therapy at the end of each year.

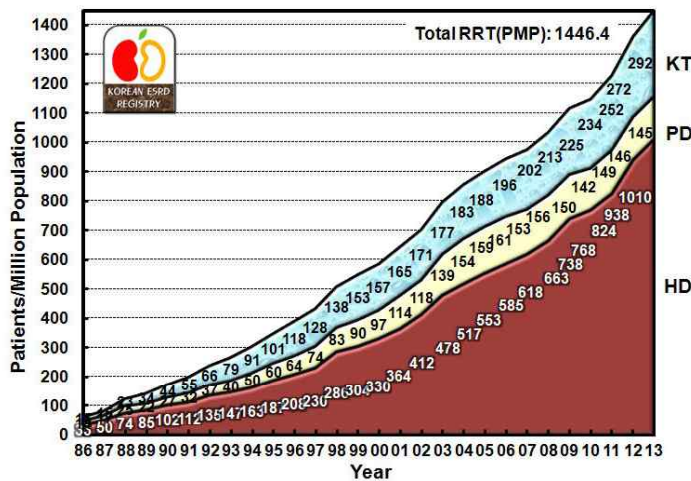


Fig. 1-2. Point prevalence of renal replacement therapy (Patients numbers per million population, HD: hemodialysis, PD: peritoneal dialysis, KT: kidney transplantation).

Part 1. Prevalence & Incidence of ESRD (2)



Table 1-2. Number of new renal replacement therapy patients.

Year	HD	PD	Transplant	Total
1986	670 (16.3)	287 (7.0)	221 (5.4)	1,173 (28.7)
1988	1,516 (36.2)	375 (8.9)	428 (10.2)	2,319 (55.3)
1990	2,418 (57.1)	530 (12.5)	624 (14.7)	3,572 (84.3)
1992	3,083 (70.8)	705 (16.2)	765 (17.6)	4,553 (104.6)
1994	2,999 (66.0)	907 (19.9)	685 (15.1)	4,591 (101.1)
1996	3,670 (79.0)	1,388 (29.9)	919 (19.8)	5,977 (128.7)
1998	2,463 (52.2)	753 (15.9)	994 (21.1)	4,210 (89.3)
2000	2,736 (57.0)	1,021 (21.3)	683 (14.2)	4,440 (92.5)
2001	3,373 (69.9)	1,279 (26.5)	848 (17.6)	5,500 (113.9)
2002	3,878 (79.9)	1,666 (34.3)	739 (15.2)	6,283 (129.5)
2003	4,769 (97.7)	1,866 (38.2)	806 (16.5)	7,441 (152.4)
2004	5,279 (107.6)	2,246 (45.8)	853 (17.4)	8,378 (170.8)
2005	5,400 (109.6)	2,381 (48.3)	762 (15.5)	8,543 (173.4)
2006	5,694 (114.7)	2,568 (51.7)	935 (18.8)	9,197 (185.3)
2007	6,193 (123.8)	2,062 (41.2)	928 (18.5)	9,183 (183.5)
2008	6,415 (127.3)	1,619 (32.1)	1,145 (22.7)	9,179 (182.1)
2009	6,540 (129.1)	1,125 (22.2)	1,241 (24.5)	8,906 (175.9)
2010	7,204 (140.1)	867 (16.9)	1,264 (24.6)	9,335 (181.5)
2011	8,057 (155.8)	920 (17.8)	1,639 (31.7)	10,616 (205.3)
2012	8,811 (169.8)	923 (17.8)	1,738 (33.5)	11,472 (221.1)
2013	9,543 (183.3)	884 (17.0)	1,756 (33.7)	12,183 (234.0)

( ): number of patients per million population. The population of Korea in 2013: 52,058,370.

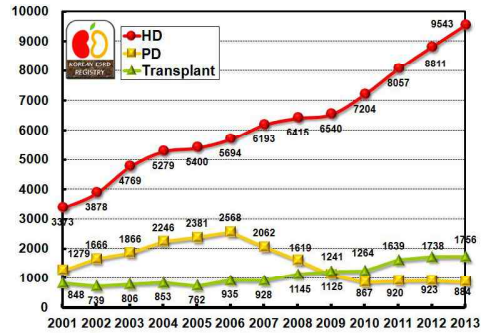
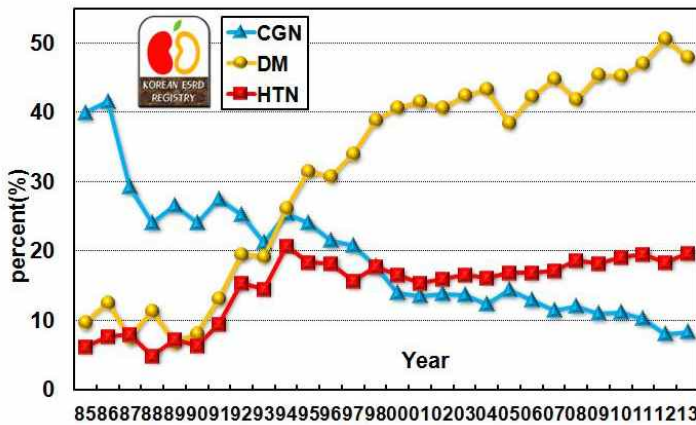


Fig. 1-3. New renal replacement therapy patients number in each year.



Table 1-3. Causes of end stage renal disease in new patients.

Causes	Percent (%)												
	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2011	2012	2013
Chronic Glomerulonephritis	26.3	25.5	21.6	17.9	14	13.9	12.5	13.0	12.1	11.3	10.4	8.1	8.3
Not Histologically confirmed	19.7	20.4	16.7	13.6	10.6	10	8.6	9.0	8.2	7.7	6.9	4.5	4.3
Histologically confirmed	5.6	5	4.9	4.3	3.4	3.9	3.9	3.9	3.8	3.6	3.5	3.6	4.0
Diabetic nephropathy	19.5	26.1	30.8	38.9	40.7	40.7	43.4	42.3	41.9	45.2	47.1	50.6	48.0
Hypertensive nephrosclerosis	15.4	20.8	18.3	17.8	16.6	16	16.2	16.9	18.7	19.2	19.6	18.5	19.7
Cystic kidney disease	2.1	2.2	1.8	1.7	2.2	1.6	1.4	1.7	1.7	1.7	1.6	1.8	1.5
Renal tuberculosis	1.1	1.5	1.2	0.5	0.4	0.5	0.3	0.3	0.2	0.2	0.2	0.0	0.1
Pyelo/interstitial nephritis	1.3	1.1	0.7	1	0.8	0.6	0.6	0.6	0.5	0.4	0.4	0.5	0.5
Drugs or nephrotoxic agents	1.3	0.1	0.6	0.3	0.3	0.4	0.2	0.3	0.3	0.3	0.5	0.4	0.3
Lupus nephritis	0.8	0.7	1	0.5	0.9	0.8	0.6	0.6	0.6	0.5	0.5	0.6	0.6
Gouty nephropathy	0.7	0.7	0.6	0.5	0.7	0.4	0.5	0.3	0.3	0.4	0.2	0.3	0.3
Hereditary nephropathy	0.3	0.7	0.4	0.2	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.5	0.4
Kidney tumor	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.5
Other	4.1	2.7	2.8	3.9	3	5.6	5.9	6.0	5.8	5.1	5.0	6.8	7.2
Uncertain	28.6	17.8	15.9	16.6	20.2	19	17.8	17.5	17.6	15.3	14.3	11.4	12.7



DM: Fig. 1-4. Three major causes of end stage renal disease patients who were initiated renal replacement therapy in each year. (DM: diabetic nephropathy, CGN: chronic glomerulonephritis, HTN: hypertensive nephrosclerosis). Note increase of DM and decrease of CGN.



Part 2. Renal Replacement Therapy Modalities

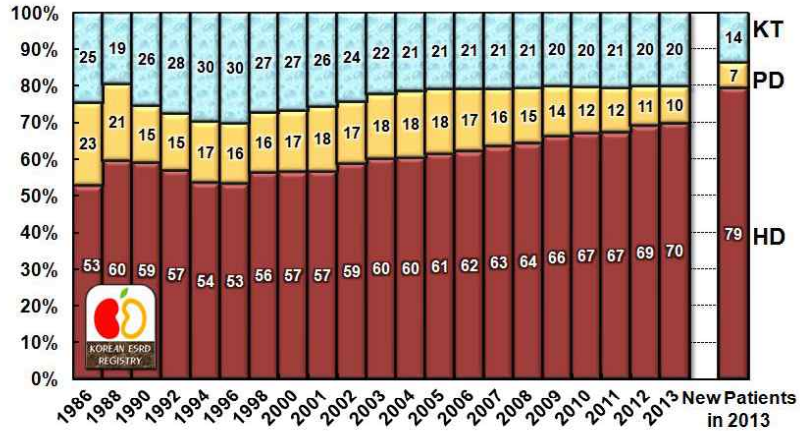


Fig. 2-1. Proportion of renal replacement modalities, annual prevalence and incidence. HD: hemodialysis, PD: peritoneal dialysis, KT: kidney transplantation.

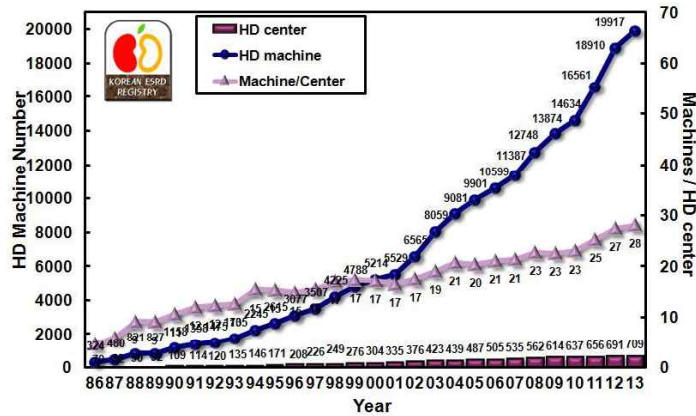


Fig. 2-2. Numbers of dialysis centers, hemodialysis machines and machine per each dialysis center in Korea.

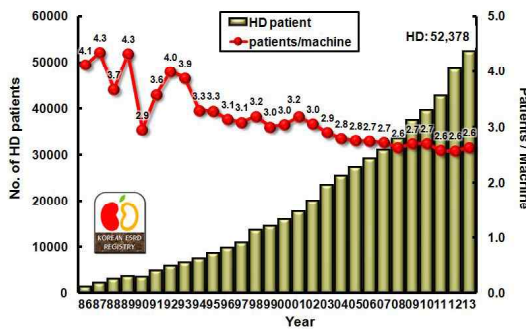


Fig. 2-3. Number of hemodialysis patients and hemodialysis patients per hemodialysis machine.

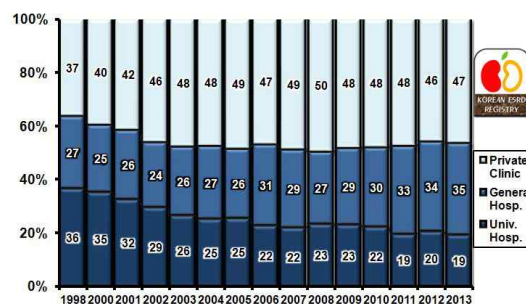


Fig. 2-4. Percentage of hemodialysis patients number according to dialysis center.

Part 3. Regional Distribution of Patients & Facilities

Table 3-1. Administrative regional distribution of dialysis patients & hemodialysis machines .

	HD pts	PD pts	Total Dialysis pts	Dialysis pts. / Million pop.	Dialysis Centers	HD machines	HD pts / HD machine
서울 Seoul	10,438	2,352	12,790	1,232	166	3,983	2.6
부산 Busan	4,245	877	5,122	1,439	46	1,496	2.8
대구 Daegu	3,529	707	4,236	1,678	36	1,101	3.2
인천 Incheon	2,850	315	3,165	1,079	32	1,040	2.7
광주 Gwangju	1,532	236	1,768	1,185	33	703	2.2
대전 Daejeon	1,388	364	1,752	1,131	14	593	2.3
울산 Ulsan	864	56	920	781	13	327	2.6
경기 Gyeonggi	12,416	1,323	13,739	1,096	145	4,728	2.6
강원 Gangwon	1,675	364	2,039	1,311	26	671	2.5
충북 Chungbuk	1,676	87	1,763	1,102	28	658	2.5
충남 Chungnam	2,128	90	2,218	1,023	33	769	2.8
전북 Jeonbuk	1,842	162	2,004	1,055	22	813	2.3
전남 Jeonnam	1,768	160	1,928	999	34	798	2.2
경북 Gyeongbuk	2,272	157	2,429	885	36	874	2.6
경남 Gyeongnam	3,017	214	3,231	950	45	1,115	2.7
제주 Jeju	738	76	814	1,355	10	248	3.0
<b>Total</b>	<b>52,378</b>	<b>7,540</b>	<b>59,918</b>	<b>1,151</b>	<b>709</b>	<b>19,917</b>	<b>2.6</b>

Table 3-2. Distribution of dialysis patients and machines according to life zone\*.

	Population (%)	HD patients	PD patients	Total Dialysis patients	Dialysis pts / Million pop.	Dialysis centers	Dialysis machine	HD pts / HD machine
<b>수도권 Capital area</b>	<b>25,854,554</b>	<b>25,704</b>	<b>3,990</b>	<b>29,694</b>	<b>1,149</b>	<b>333</b>	<b>9,751</b>	<b>2.6</b>
(Seoul, Incheon, Gyeonggi)	49.7%	49.1%	52.9%	49.6%		47.0%	49.0%	
<b>충청권 Chungchung</b>	<b>5,318,005</b>	<b>5,192</b>	<b>541</b>	<b>5,733</b>	<b>1,078</b>	<b>75</b>	<b>2,020</b>	<b>2.6</b>
(Daejeon, Chungnam, Chungbuk)	10.2%	9.9%	7.2%	9.6%		10.6%	10.1%	
<b>호남권 Honam</b>	<b>5,321,135</b>	<b>5,142</b>	<b>558</b>	<b>5,700</b>	<b>1,071</b>	<b>89</b>	<b>2,314</b>	<b>2.2</b>
(Gwangju, Jeonnam, Jeonbuk)	10.2%	9.8%	7.4%	9.5%		12.6%	11.6%	
<b>영남권 Youngnam</b>	<b>13,408,952</b>	<b>13,927</b>	<b>2,011</b>	<b>15,938</b>	<b>1,189</b>	<b>176</b>	<b>4,943</b>	<b>2.8</b>
(Busan, Daegu, Gyeongnam, Gyeongbuk, Ulsan)	25.8%	26.6%	26.7%	26.6%		24.8%	24.7%	
<b>강원권 Gangwon</b>	<b>1,554,984</b>	<b>1,675</b>	<b>364</b>	<b>2,039</b>	<b>1,311</b>	<b>26</b>	<b>671</b>	<b>2.5</b>
	3.0%	3.2%	4.8%	3.4%		3.7%	3.4%	
<b>Total</b>	<b>52,058,370</b>	<b>52,378</b>	<b>7,540</b>	<b>59,918</b>	<b>1,151</b>	<b>709</b>	<b>19,917</b>	<b>2.6</b>

\* 제주 표시 제외 Data of Jeju-do is not shown.

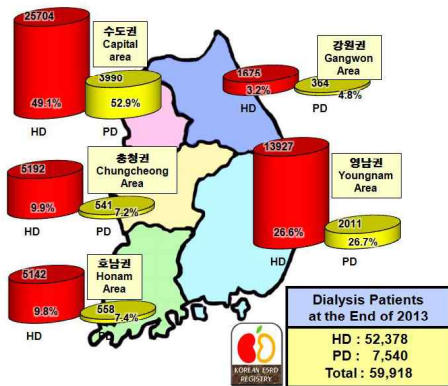


Fig. 3-1. Distribution of dialysis patients and machines according to life zone.

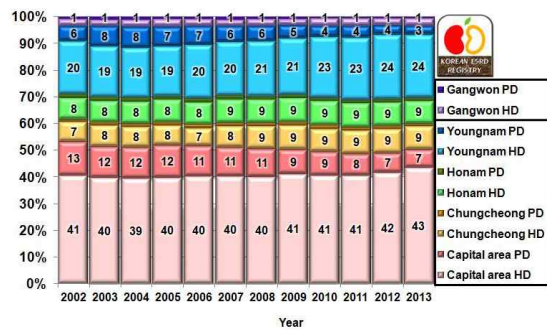


Fig. 3-2. Regional proportion of dialysis patient number in each year.

Part 4. Dialysis Patients Demographics (1)

Table 4-1. Percent of dialysis centers contributing individual patient data.

	Dialysis centers*	Internet Input	Paper data	Total contributed center	Contributing rate (%)
서울 Seoul	130	105	5	110	70.5
부산 Busan	46	26	2	28	60.9
대구 Daegu	36	23	1	24	66.7
인천 Incheon	32	21	1	22	68.8
광주 Gwangju	33	21	0	21	63.6
대전 Daejeon	14	10	0	10	71.4
울산 Ulsan	13	6	1	7	53.8
경기 Gyeonggi	145	84	6	90	62.1
강원 Gangwon	26	14	1	15	57.7
충북 Chungbuk	28	19	0	19	67.9
충남 Chungnam	33	18	1	19	57.6
전북 Jeonbuk	22	12	0	12	54.5
전남 Jeonnam	34	21	0	21	61.8
경북 Gyeongbuk	36	20	3	23	63.9
경남 Gyeongnam	45	32	1	33	73.3
제주 Jeju	10	8	0	8	80.0
<b>Total</b>	<b>709</b>	<b>440</b>	<b>22</b>	<b>462</b>	<b>65.2</b>

\* 투석의료기관 수에서 비윤리 의료기관(약 50개소)은 제외함.

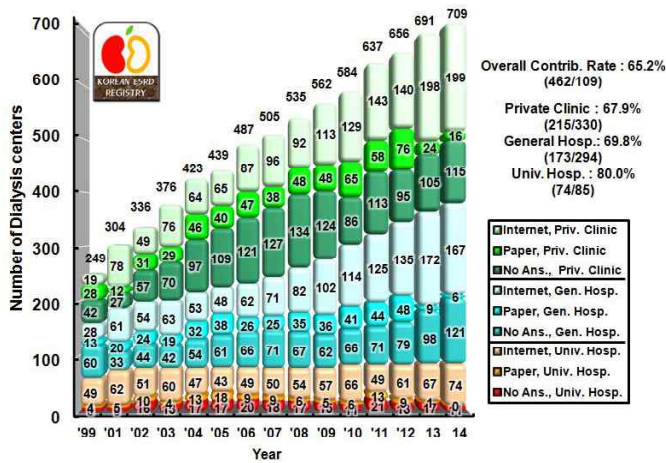


Fig. 4-1. Individual patients data contributing rate of dialysis centers according to hospital classification.

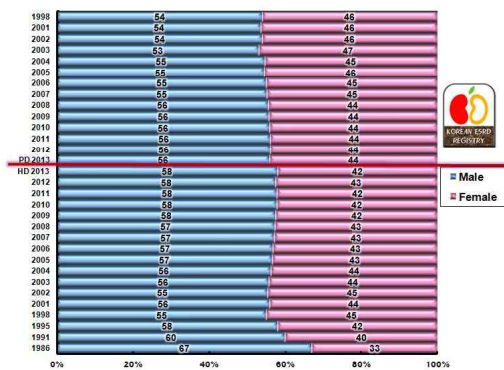


Fig. 4-2. Gender ratio of HD & PD patients according to years.

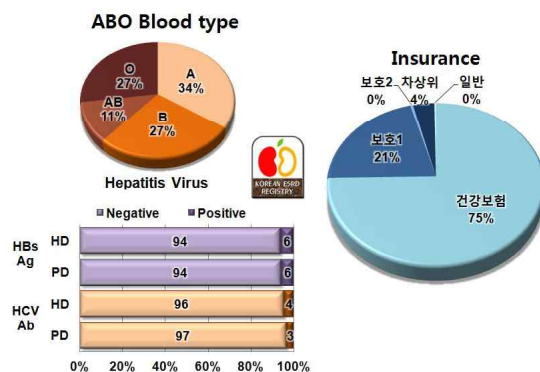


Fig. 4-3. ABO blood type and hepatitis virus, health insurance of HD & PD patients.

Part 4. Dialysis Patients Demographics (2) - Age

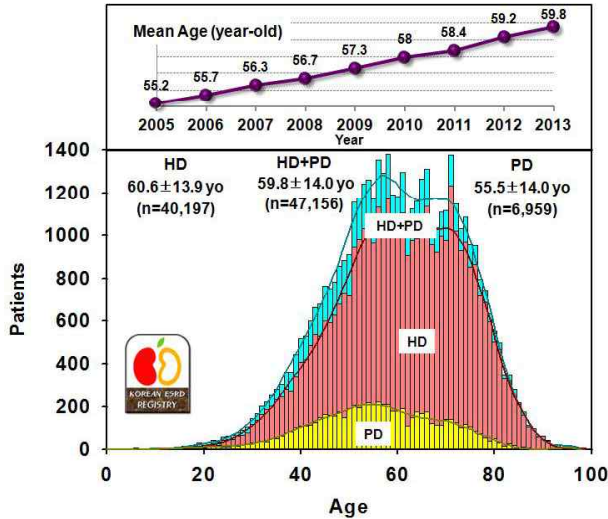


Fig. 4-4. Age distribution of dialysis patients according to dialysis modalities.

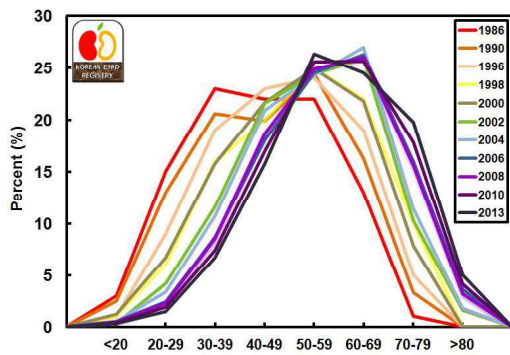


Fig. 4-5. Age distribution of dialysis patients according to years. Note the peak age was shift to old age.

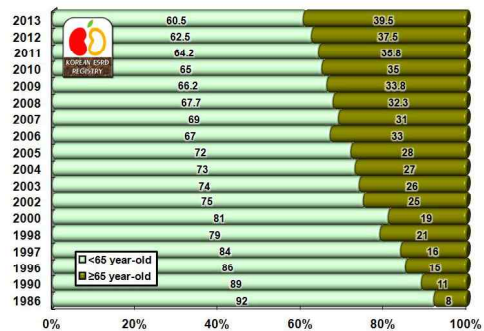


Fig. 4-6. Elderly dialysis patient (over 65 year-old) proportion according to year.

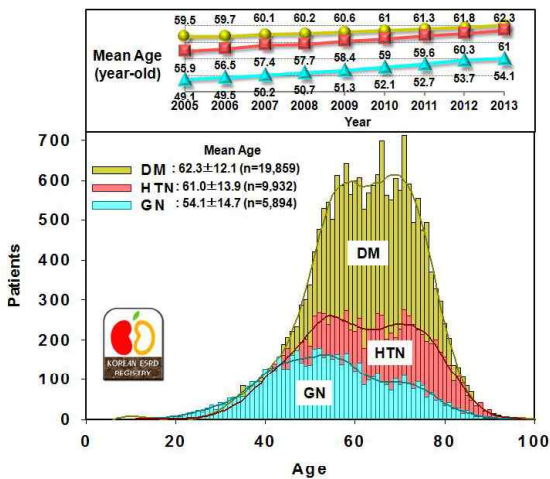


Fig. 4-7. Age distribution of dialysis patients according to underlying diseases, diabetic patients (DM), hypertensive nephrosclerosis (HTN) and glomerulonephritis (GN). Note difference of peak age between GN and DM.



Part 4. Dialysis Patients Demographics (3) - Dialysis Duration

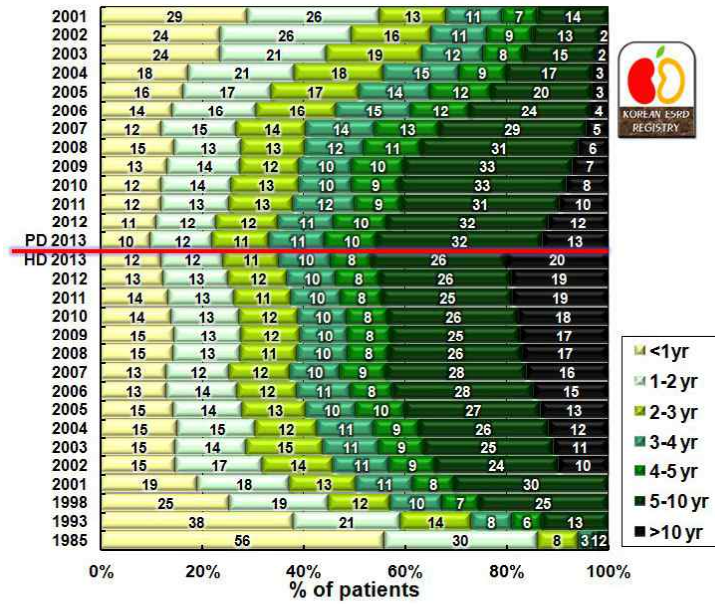


Fig. 4-8. Duration of maintenance hemodialysis and peritoneal dialysis. Percent of estimated patient number according to year.

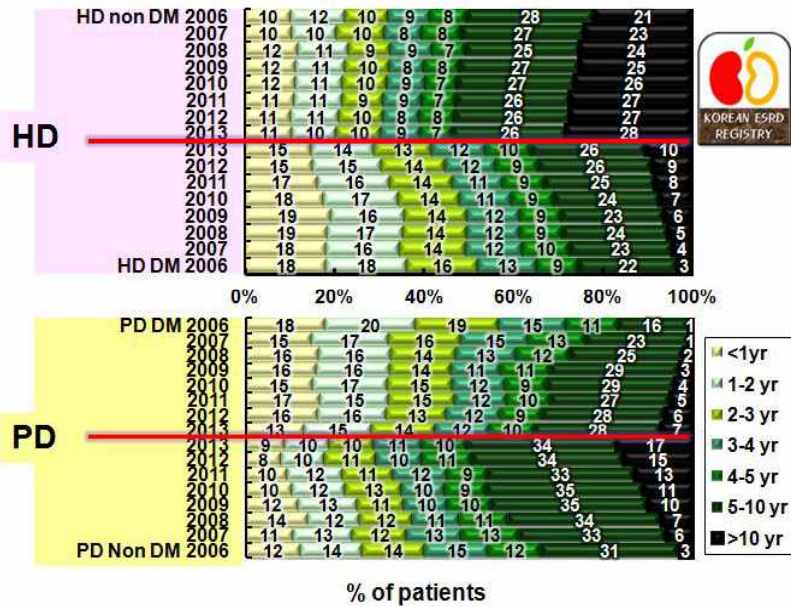


Fig 4-9. Diabetic and non-diabetic patient's duration of dialysis maintenance.



Part 4. Dialysis Patients Demographics (4) - BMI & BP

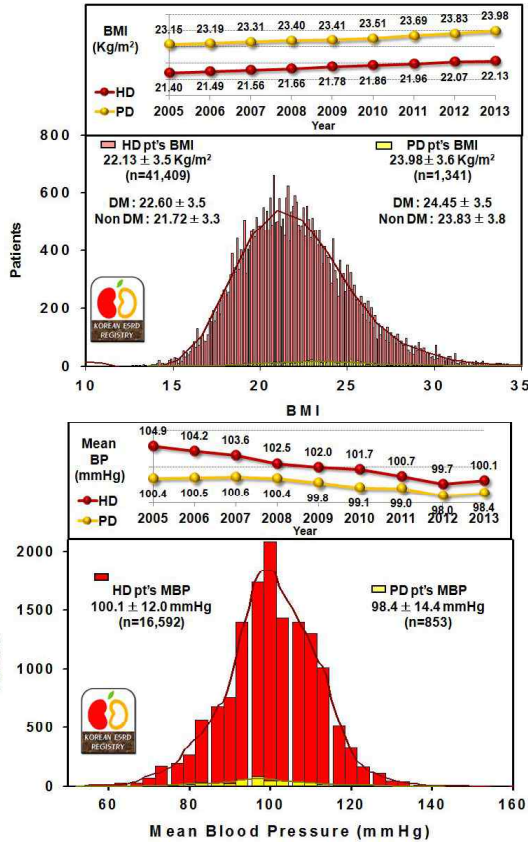


Fig. 4-10. Distribution of body mass index (BMI) in hemodialysis (HD) and peritoneal dialysis (PD) patients

Fig. 4-11. Distribution of mean blood pressure (MBP) in hemodialysis and peritoneal dialysis patients. Blood pressure of HD patients was higher than PD patients BP.

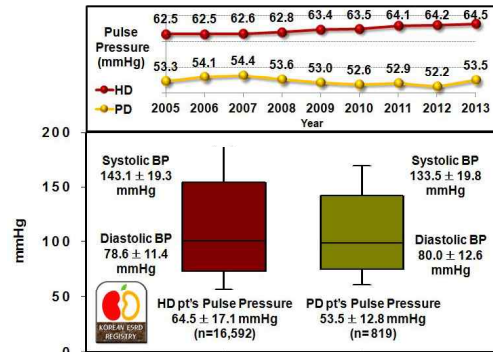


Fig. 4-12. Systolic and diastolic blood pressure with pulse pressure in HD and PD patients. Note difference of pulse pressure between HD and PD patients.

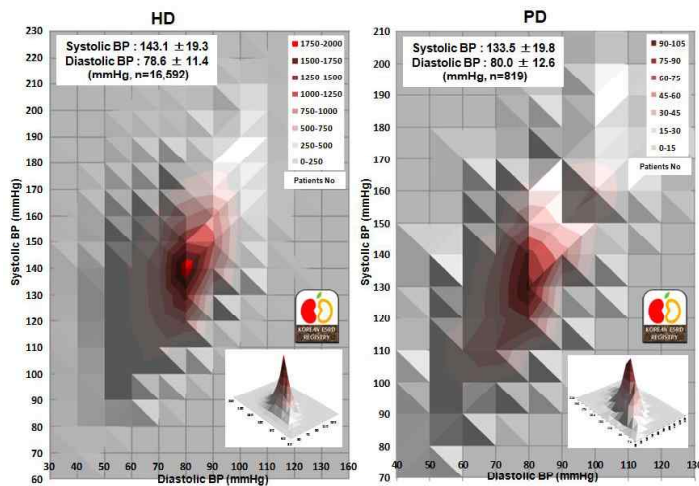


Fig. 4-13. HD and PD patients' number distribution according to systolic and diastolic blood pressure.

Part 5. Dialysis Therapy (1) - HD & Vascular Access

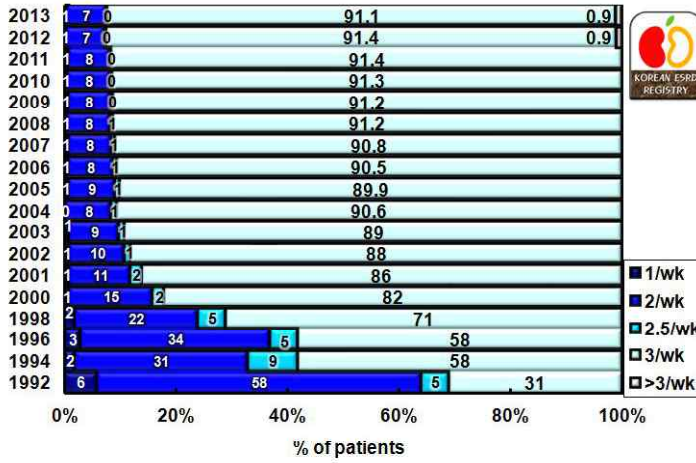


Fig. 5-1. Frequency of HD per week (n=29,289).

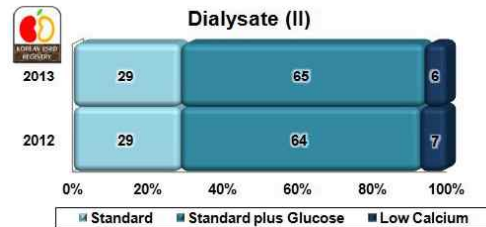
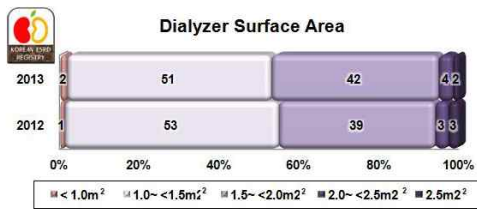
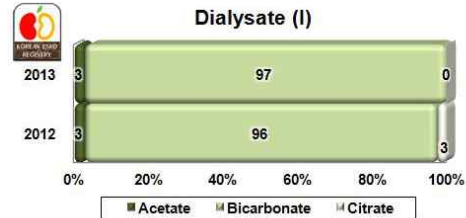
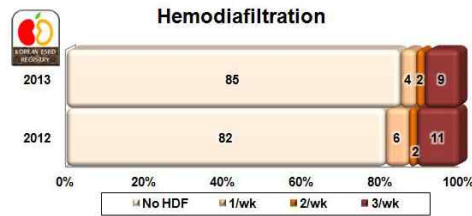


Fig. 5-2. Percent of hemodiafiltration (HDF) applied patients and dialyzer membrane surface area.

Fig. 5-3. HD dialysate.

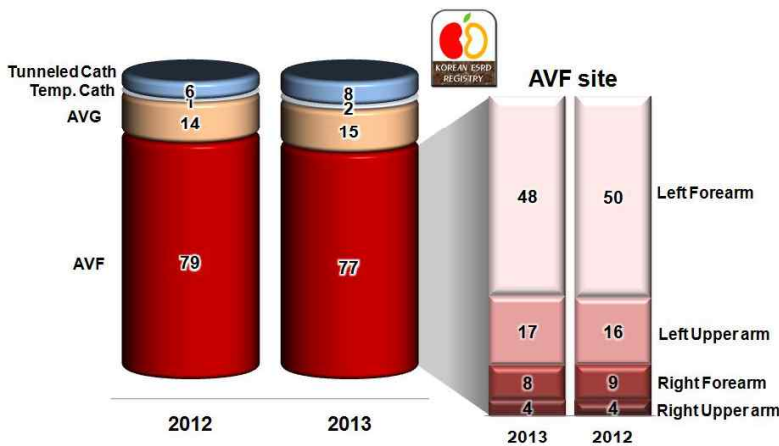


Fig. 5-4. Vascular access for HD in 2012.

Part 5. Dialysis Therapy (2) - PD

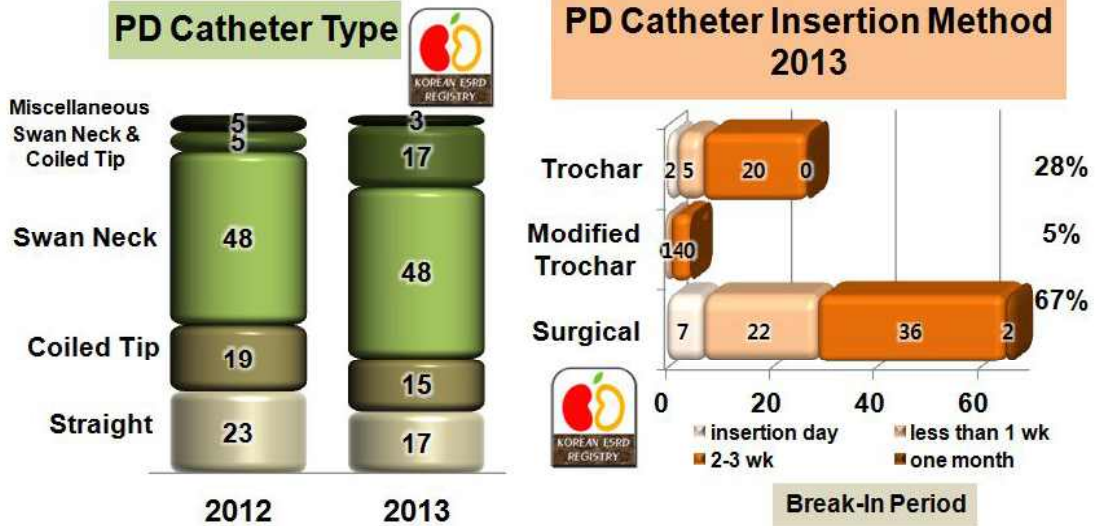


Fig. 5-5. PD catheter type and PD catheter insertion methods in 2012.

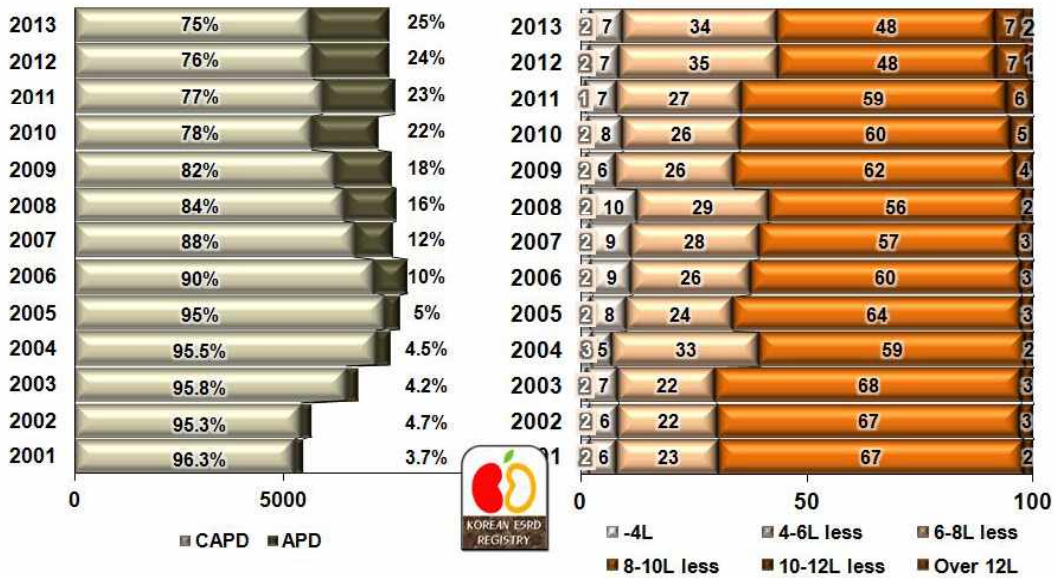


Fig. 5-6. Percent distribution of PD type and dialysate doses according to year.



Part 6. Lab data & Drugs (1)

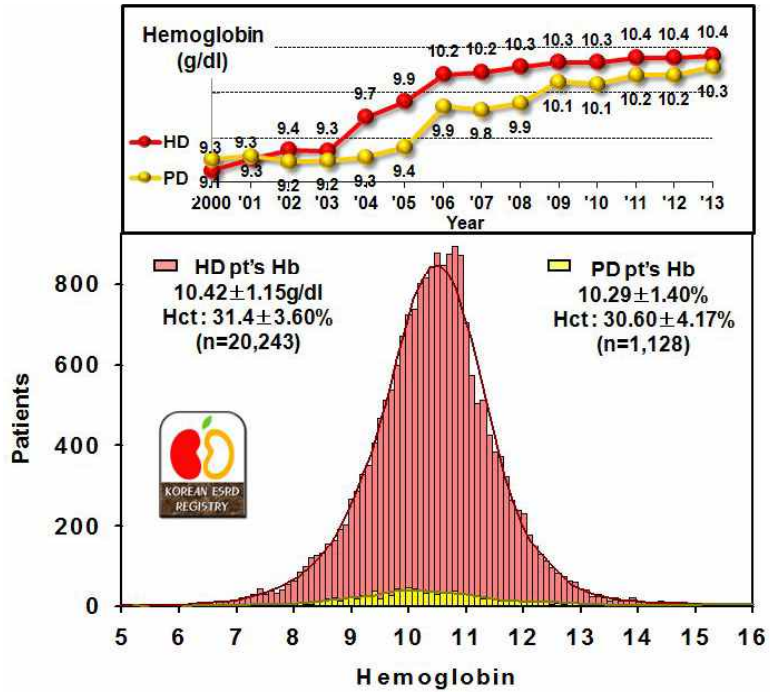


Fig. 6-1. Distribution of hemoglobin levels in HD and PD patients.

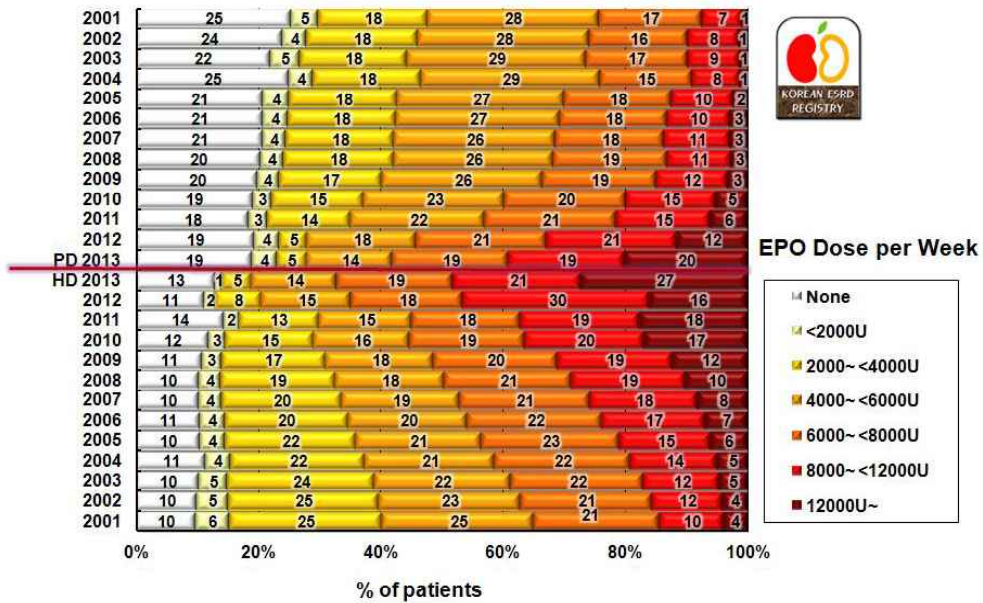


Fig. 6-2. Percent distribution of prescribed erythropoietin doses for hemodialysis and peritoneal dialysis patients.

Part 6. Lab data & Drugs (2)

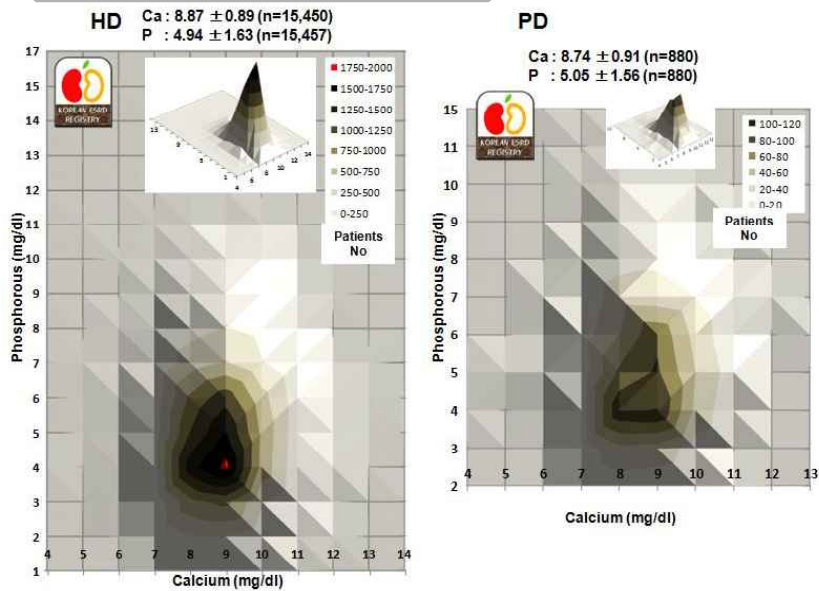


Fig. 6-3. Distribution of patients numbers according to calcium and phosphorous level.

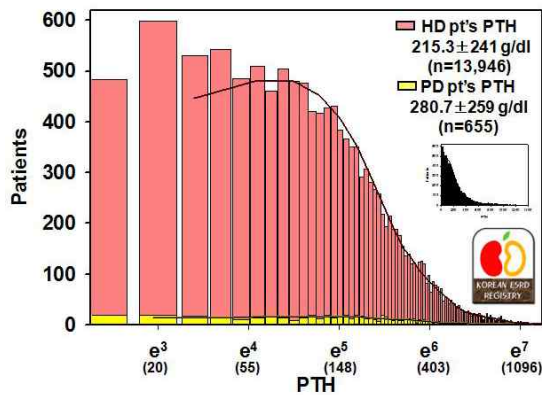


Fig. 6-4. PTH level of HD and PD patients. (x-axis is on nature logarithmic scale.)

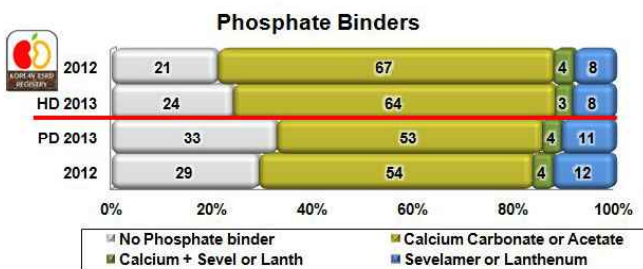


Fig. 6-5. Phosphate binders.

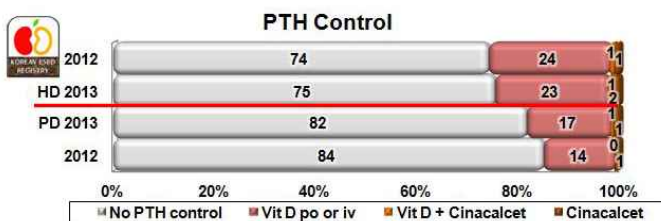


Fig. 6-6. PTH control medications.

Part 6. Lab data & Drugs (3)

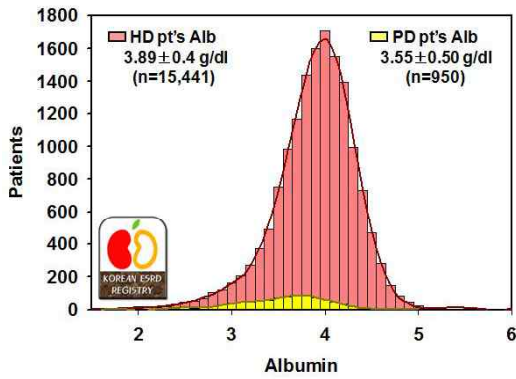


Fig. 6-7. Albumin level of HD and PD patients.

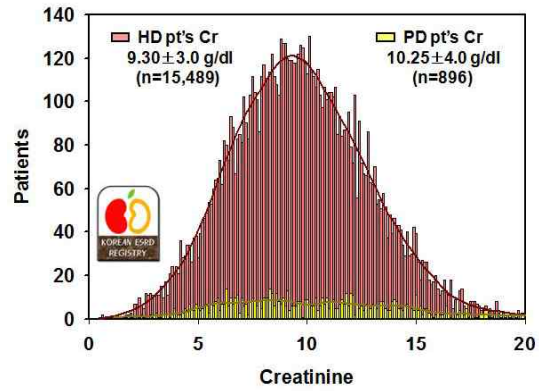


Fig. 6-8. Creatinine level of HD and PD patients.

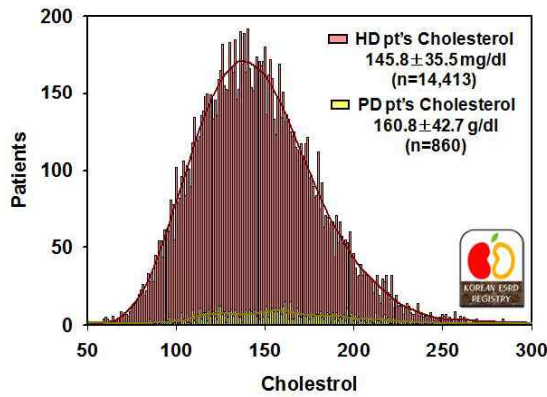


Fig. 6-9. Total cholesterol level of HD and PD patients.

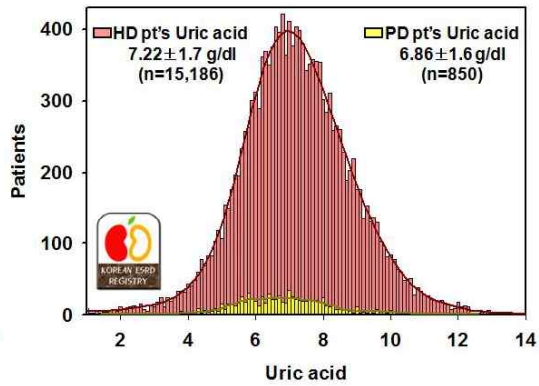


Fig. 6-10. Uric acid level of HD and PD patients.

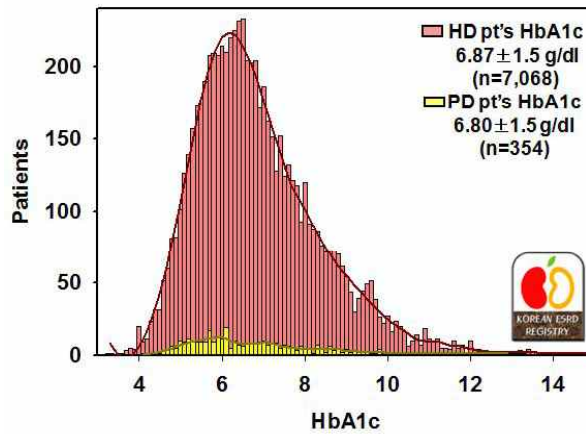


Fig. 6-11. HbA1c level of diabetic HD and PD patients.



Part 7. Dialysis Adequacy (1)

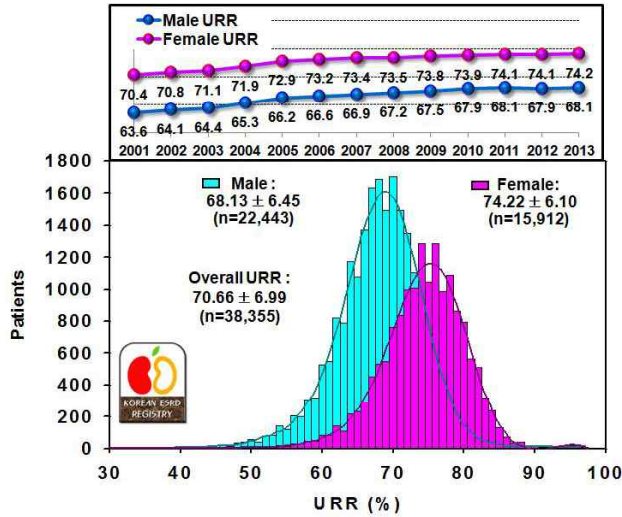


Fig. 7-1. Distribution of urea reduction ratio (URR) of hemodialysis patients. Note the difference between male and female.

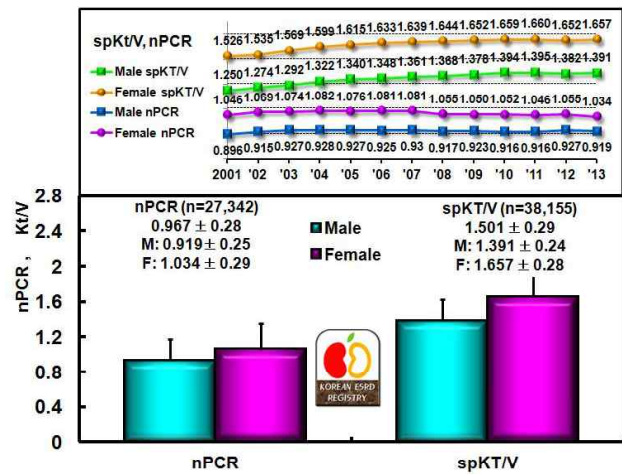


Fig. 7-2. Dialysis adequacy parameters (nPCR & Kt/V) of hemodialysis patients.

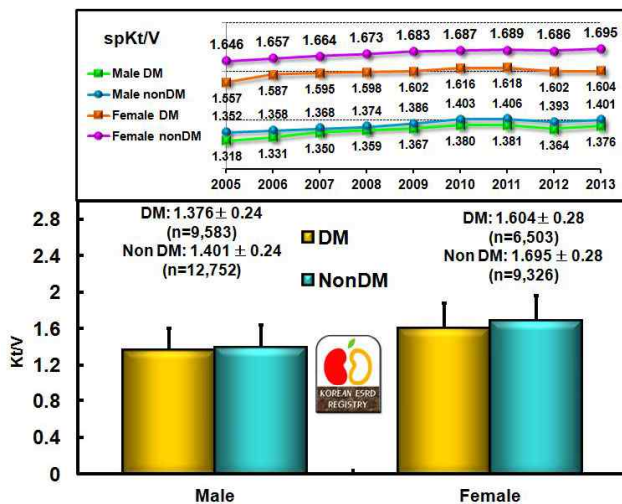


Fig. 7-3. Dialysis adequacy parameters (Kt/V) of diabetic and non-diabetic hemodialysis patients.

**Part 7. Dialysis Adequacy (2)**

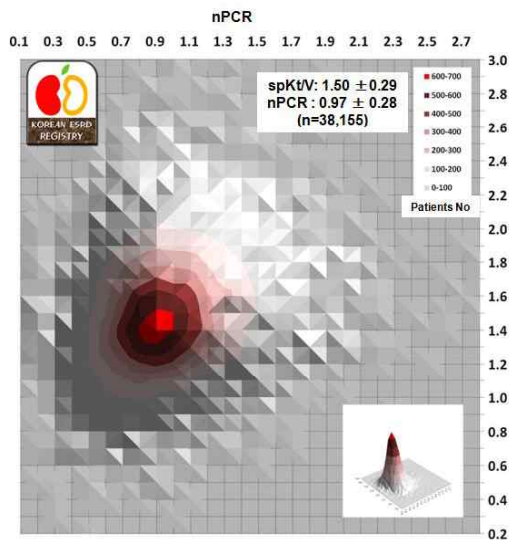


Fig. 7-4. Distribution of patients number according to nPCR and single pool Kt/V in HD patients.

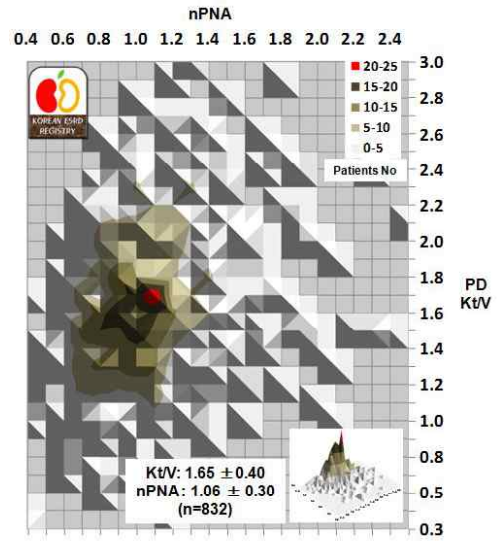


Fig. 7-5. Distribution of patients number according to nPNA and PD Kt/V in PD patients.

**Part 8. Rehabilitation Status of Dialysis Patients**

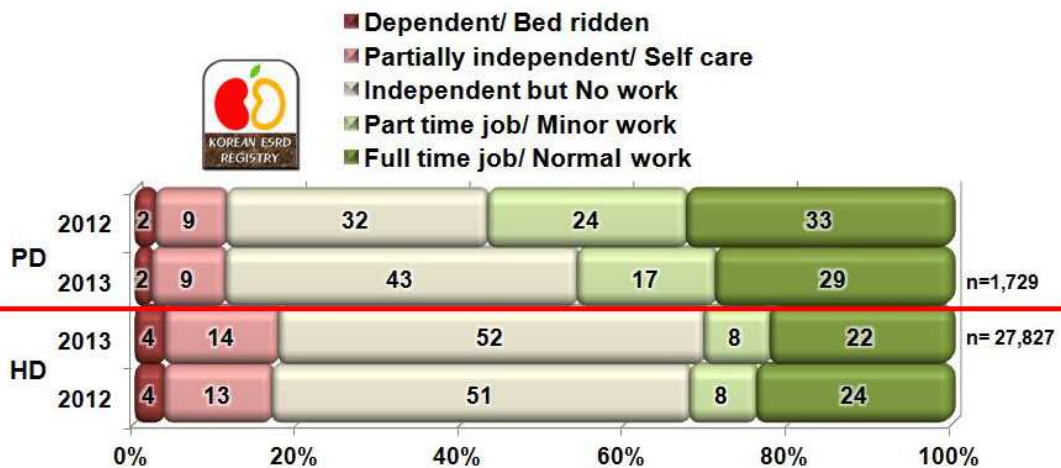



Fig. 8-1. Rehabilitation status of HD and PD patients.


## Part 9. Co-morbidity of Dialysis Patients

Table 9-1. Co-morbidity of dialysis patients in 2013.

	HD (% , n=53,454)	PD (% , n=4,636)
 <b>Cardiac</b>	<b>17.4</b>	<b>13.9</b>
Coronary Artery Disease	9.5	8.0
Congestive Heart Failure	4.1	4.2
Pericardial Effusion	0.4	0.2
Arrhythmia	3.3	1.5
<b>Vascular</b>	<b>49.4</b>	<b>61.9</b>
Cerebrovascular accident	3.6	4.0
Hypertension	44.3	56.8
Other vascular disease	1.5	1.1
<b>Infection</b>	<b>5.1</b>	<b>8.8</b>
Pneumonia	1.5	1.5
Tuberculosis	0.5	0.2
Peritonitis	0.3	4.5
Herpes zoster	0.3	0.2
Access/ exit site infection	0.7	1.1
Other Infection	1.8	1.2
<b>Liver disease</b>	<b>6.6</b>	<b>5.3</b>
Hepatitis B	3.9	3.8
Hepatitis C	2.3	0.9
Congestive Liver	0.1	0.2
Hemochromatosis	0.0	0.0
Other liver diseases	0.3	0.4
<b>Gastrointestinal</b>	<b>13.4</b>	<b>5.2</b>
Gastric Ulcer	2.0	0.6
Duodenal Ulcer	0.3	0.0
Constipation	4.6	0.8
Other Gastrointestinal Diseases	6.5	3.8
<b>Miscellaneous</b>	<b>8.1</b>	<b>5.0</b>
Malnutrition (Alb<2.5g/dl)	0.2	0.2
Malignancy	1.2	1.1
Hypertensive Retinopathy	0.7	0.2
Uremic Dermatitis	1.6	0.4
Uremic Neuritis	0.8	0.2
Uremic Dementia	0.3	0.2
Uremic Ascites / Pleural Effusion	0.2	0.2
Osteodystrophy	0.7	0.1
COPD & other pulm disease	0.4	0.3
Decubitus ulcer/ DM foot	2.0	2.1

## Part 10. Causes of Death in Dialysis Patients

Table 10-1. Causes of death (%) in dialysis patients, 1994-2013.

	1994-96	1998	2001	2003	2005	2007	2008	2009	2010	2011	2012	2013
 <b>Cardiac</b>	<b>27.4</b>	<b>27.4</b>	<b>26.9</b>	<b>31.7</b>	<b>30.7</b>	<b>31.7</b>	<b>35.1</b>	<b>29.5</b>	<b>31.1</b>	<b>32.7</b>	<b>33.9</b>	<b>35.8</b>
Myocardial infarction	6.4	6.4	7.7	7.4	8	7.5	9.7	8.0	8.3	6.6	6.8	7.5
Cardiac arrest, uremia associated	13.7	13.7	11.2	11.7	10.4	10.8	11	8.5	8.7	11.0	11.1	14.2
Cardiac arrest, other cause	7.2	7.2	8.1	12.5	12.4	13.3	14.4	13	14.2	15.0	16.0	14.2
<b>Vascular</b>	<b>17.2</b>	<b>17.2</b>	<b>22.7</b>	<b>19.5</b>	<b>17</b>	<b>17.8</b>	<b>16</b>	<b>15.9</b>	<b>13.3</b>	<b>14.1</b>	<b>13.0</b>	<b>13.3</b>
Cerebrovascular accident	14.3	14.3	15.1	14.5	12.3	13	12.2	11	8.2	8.7	7.9	8.7
Pulmonary embolus	0.2	0.2	0.5	0.1	0.6	0.5	0.1	0.2	0.1	0.2	0.3	0.2
Gastrointestinal hemorrhage	1.7	1.7	2.7	3.2	1.7	2.7	1.9	2.3	2.6	2.2	2.3	1.2
Gastrointestinal embolism	0.1	0.1	0.1	0	0.5	0.1	0.1	0.5	0.4	0.1	0.6	0.2
Other vascular disease	0.9	0.9	4.3	1.6	1.9	1.6	1.7	1.9	2.2	3.0	1.9	3.0
<b>Infection</b>	<b>13.5</b>	<b>13.5</b>	<b>17.8</b>	<b>20.5</b>	<b>20.1</b>	<b>20.2</b>	<b>19.5</b>	<b>21.9</b>	<b>22.6</b>	<b>23.1</b>	<b>24.5</b>	<b>23.5</b>
Pulmonary infection	2.5	2.5	4.5	3.6	4.5	4.4	4.4	5.9	7.5	8.4	10.8	8.4
Septicemia	6.6	6.6	6.9	9.7	9.6	11.7	9	10.4	10.7	9.7	8.9	11.9
Tuberculosis	0.3	0.3	0.8	0.2	0.3	0.2	0.1	0.3	0.2	0.1	0.7	0.1
Peritonitis	2.1	2.1	1.1	2	1.4	1.1	2	0.8	1.2	1.0	1.0	0.5
Other Infection	2	2	4.5	4.9	4.3	2.9	4	4.5	2.9	4.0	3.0	2.7
<b>Liver disease</b>	<b>3.4</b>	<b>3.4</b>	<b>2.6</b>	<b>2.8</b>	<b>2.7</b>	<b>2.2</b>	<b>1.9</b>	<b>3.1</b>	<b>2.7</b>	<b>2.1</b>	<b>2.8</b>	<b>2.4</b>
Liver failure due to hepatitis B	1.8	1.8	1.6	1.8	1.5	1.3	1	2.2	1.2	1.0	1.4	1.3
Liver failure due to other cause	1.6	1.6	1	1	1.2	0.8	0.8	0.9	1.6	1.1	1.3	1.1
<b>Social</b>	<b>6.2</b>	<b>6.2</b>	<b>6.3</b>	<b>4.4</b>	<b>5.4</b>	<b>3.3</b>	<b>3.3</b>	<b>2.5</b>	<b>2.9</b>	<b>3.3</b>	<b>2.2</b>	<b>2.8</b>
Patient refused further treatment	2.9	2.9	2.1	1	1.1	1.1	0.6	0.5	0.3	0.4	0.6	0.3
Suicide	2.5	2.5	3.3	2.3	3.3	1.5	1.6	1.3	1.9	1.4	1.4	1.3
Therapy ceased for other reason	0.8	0.8	0.9	1	1	0.7	1	0.8	0.7	1.5	0.3	1.2
<b>Miscellaneous</b>	<b>32</b>	<b>32</b>	<b>23.7</b>	<b>21.3</b>	<b>24</b>	<b>24.8</b>	<b>24.3</b>	<b>27.1</b>	<b>27.3</b>	<b>24.7</b>	<b>23.6</b>	<b>22.2</b>
Cachexia	2.9	2.9	8.1	6.6	4	4.4	3.8	3.3	2.8	2.7	2.1	1.6
Malignant disease	2.1	2.1	4.4	3.5	6.4	5.7	4.6	5.7	5.9	6.0	6.7	5.7
Accident	1.2	1.2	0.9	1.1	1.4	1.2	1	1.3	0.6	1.6	1.4	1.4
Uncertain	25.8	25.8	10.3	10.1	12.3	13.4	14.9	16.8	18	14.5	13.3	13.4

\*Number of patients :1994-1996=981, 1998=911, 2001=761, 2003=894, 2005=1,256, 2007=1,531, 2008=1,563, 2009=1,727, 2010=1,802, 2011=1,828, 2012=1,745, 2013=1,604.



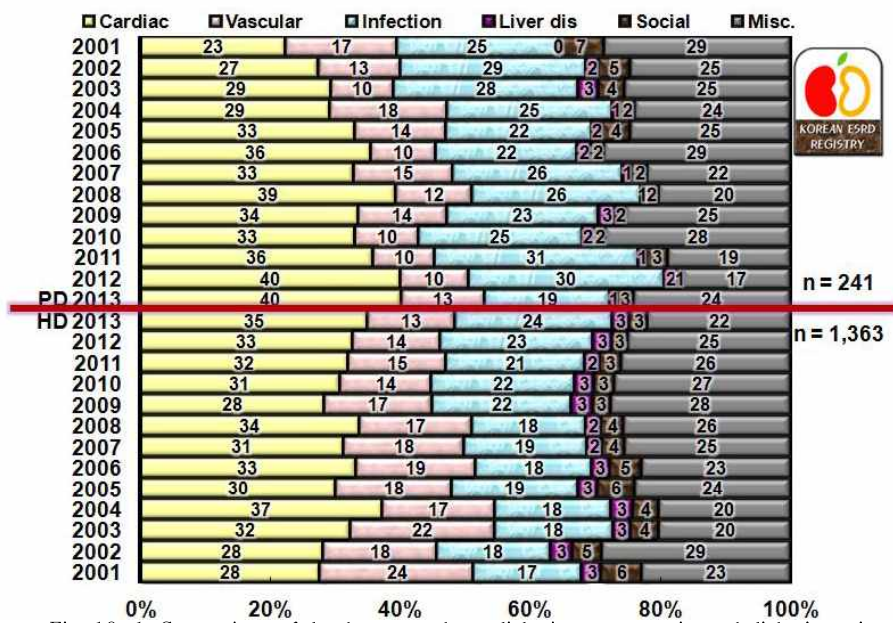


Fig. 10-1. Comparison of death causes, hemodialysis versus peritoneal dialysis patients in 2001-2013.

Part 11. Survival of Dialysis Patients (1) - Overall

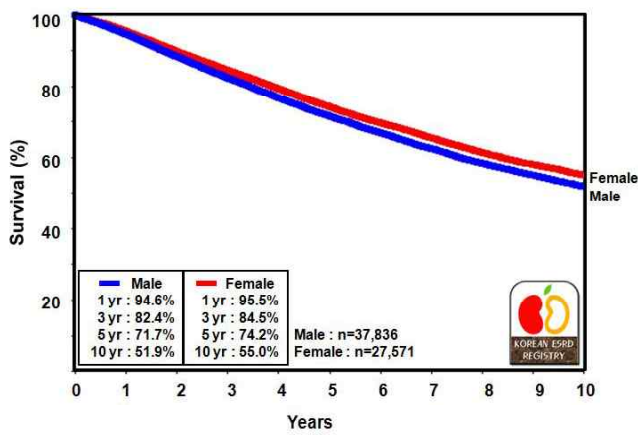


Fig. 11-1. Overall registered dialysis patient survival since 2001.

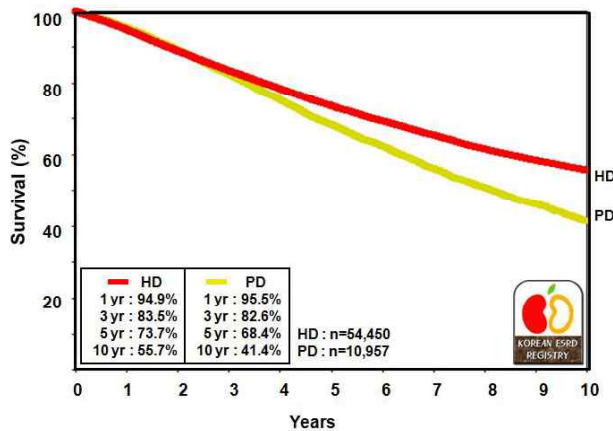


Fig. 11-2. HD and PD patient survival since 2001.

Part 11. Survival of Dialysis Patients (2) - Diseases & Modalities

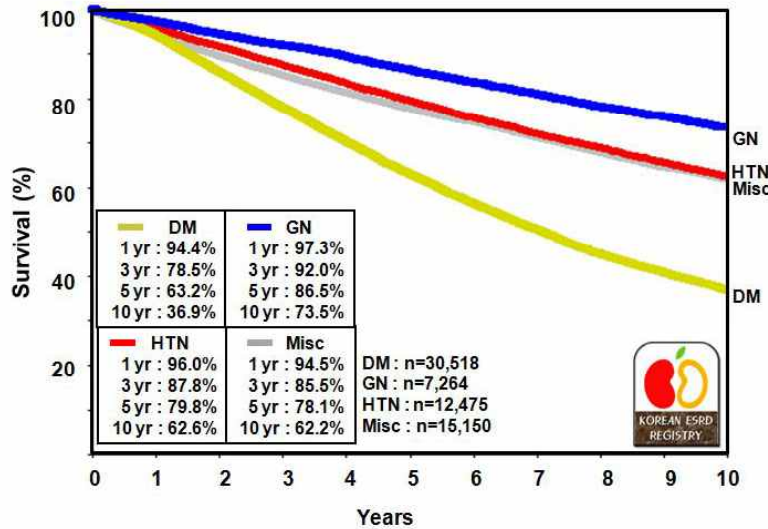


Fig. 11-3. Patient survival according to underlying diseases since 2001 (DM: diabetic nephropathy, GN: chronic glomerulonephritis, HTN: hypertension Misc: miscellaneous).

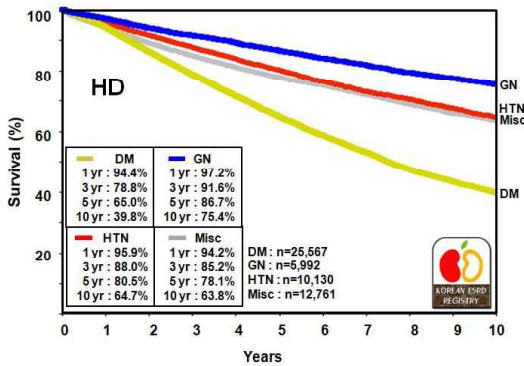


Fig. 11-4. Patient survival according to underlying diseases in hemodialysis patients since 2001.

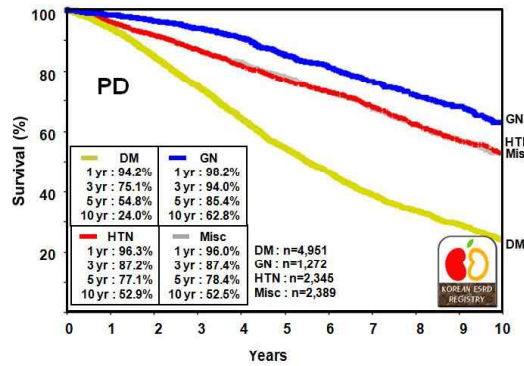


Fig. 11-5. Patient survival according to underlying diseases in peritoneal dialysis patients since 2001.

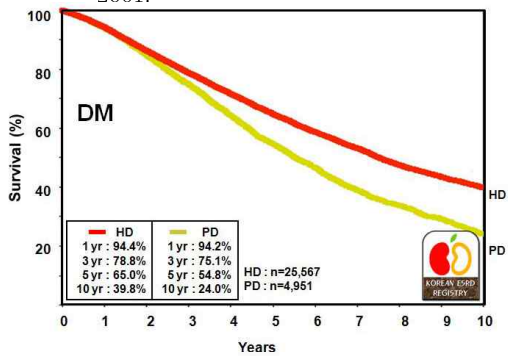


Fig. 11-6. Survival of diabetic dialysis patient according to dialysis modalities since 2001.

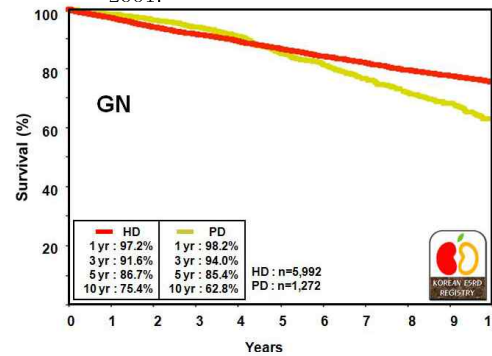


Fig. 11-7. Survival of dialysis patient with underlying glomerulonephritis according to dialysis modalities since 2001.

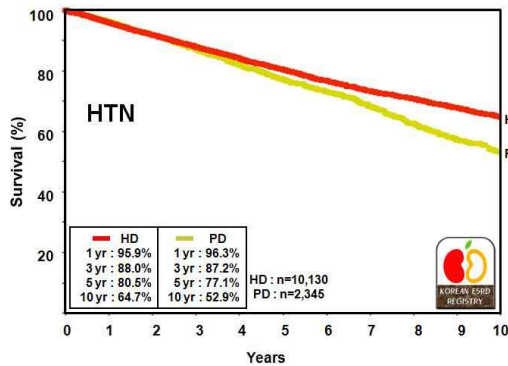


Fig. 11-8. Survival of dialysis patient with underlying hypertensive sclerosis according to dialysis modalities since 2001.

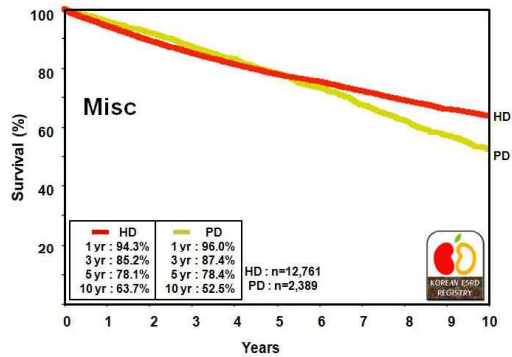


Fig. 11-9. Survival of dialysis patient with miscellaneous underlying diseases according to dialysis modalities since 2001.

## Part 12. Kidney Transplantation

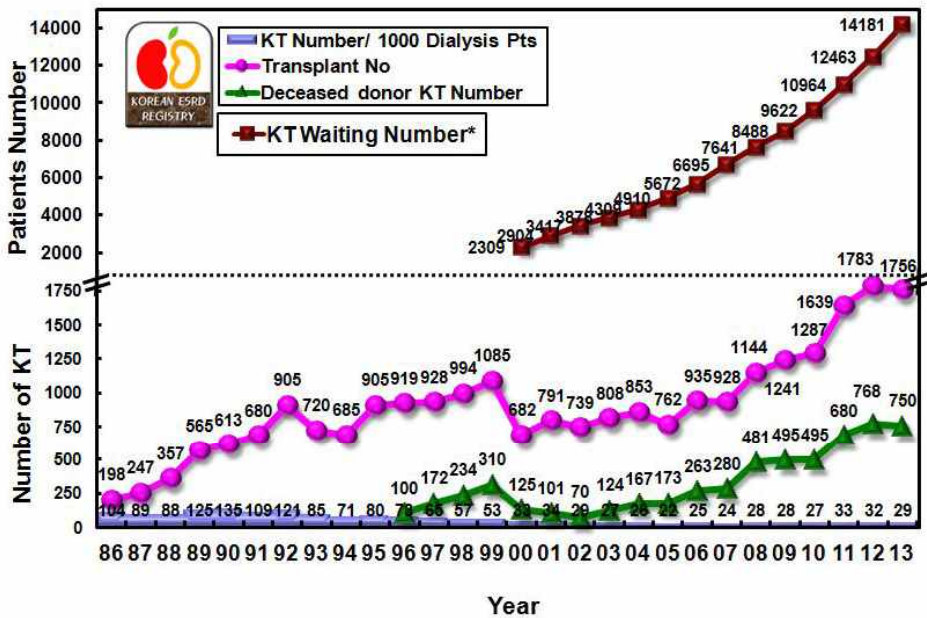


Fig. 12-1. Annual number of kidney transplantation in Korea (including data from KONOS: Korean Network for Organ Sharing). \*Survived KT waiting patient number at the end of each year.

◆ Acknowledgements : We, ESRD registry committee of Korean Society of Nephrology, would like deeply thank to every dialysis center medical doctors and nurses in Korea for participation in this survey. Gambro Korea, FMC Korea, Baxter Korea and Boryung Pharm were also share their data for confirmation.