등록사업보고

우리나라 신대체요법의 현황

-인산 민병석교수 기념 말기신부전 환자 등록사업 2018-

대한신장학회 등록위원회

Current Renal Replacement Therapy in Korea

- Insan Memorial Dialysis Registry, 2018 -

ESRD Registry Committee, Korean Society of Nephrology*

=Abstracts=

The 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 2018 was as follows:

1) The total number of patients with renal replacement therapy (RRT) was 103,984 (hemodialysis: HD 77,617 peritoneal dialysis: PD 6,248, functioning kidney transplant: KT 20,119). Prevalence of RRT was 2006.4 patients per million population (pmp). The proportion of RRT was HD 75%, PD 6%, and renal transplant 19%. New RRT patients in 2018 were 17,621 (HD 14,779, PD 735, KT 2,107). Incidence rate was 340 pmp in 2018.

2) The most common primary cause of end stage renal diseases was diabetic nephropathy (48.8%), hypertensive nephrosclerosis (19.8%) and chronic glomerulonephritis (7.7%), in order.

3) The number of RRT centers was 983 and total number of HD machines was 28,355. Dialysis patients' individual data were collected from 46% of overall RRT centers.

4) Mean age of HD patient was 63.2 years old, of PD was 54.8 years old. Proportion of patients on HD more than 5 years' maintenance was 48%. Mean blood pressure was 98.7mmHg in HD and 97.2mmHg in PD patients. Mean hemoglobin of HD patient was 10.4 g/dL (hematocrit 31.5%), PD was 10.3 g/dL. Mean urea reduction ratio was 70.0% in male HD patients and 76.1% in female HD patients. Mean single pool Kt/V was 1.46 in male patient, 1.75 in female patients.

5) Common causes of death were ‘not uremia associated cardiac arrest’ (14.8%), ‘uremia associated cardiac arrest’ (12.4%), sepsis (10.6%), pulmonary infection (8.6%) and malignant disease (6.0%) in 2018.

6) Survey on rehabilitation status of dialysis patients showed that 23% of HD patients have full time job and 10% have part time job. 36% of PD patients have full time job, and 11% have part time job.

7) The number of kidney transplantation was 2,107 (deceased donor 807) in 2018.

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

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Part 1. Prevalence of ESRD

Table 1-1. Prevalence of renal replacement therapy.

	HD		PD		Transplant		Total	
1980	198	(4.9)	30	(0.7)	-	-	228	(6.0)
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)
2002	20,010	(412.4)	5,712	(117.7)	8,271	(170.5)	33,993	(700.6)
2004	25,335	(516.5)	7,569	(154.3)	8,987	(183.2)	41,891	(854.0)
2006	29,031	(585.0)	7,990	(161.0)	9,709	(195.7)	46,730	(941.7)
2008	33,427	(663.3)	7,840	(155.6)	10,722	(212.8)	51,989	(1031.6)
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	(935.4)	7,552	(145.6)	14,128	(272.3)	70,211	(1353.3)
2013	52,378	(1006.1)	7,540	(144.8)	15,124	(290.5)	75,042	(1441.5)
2014	57,256	(1115.3)	7,423	(144.6)	15,995	(311.6)	80,674	(1571.5)
2015	62,634	(1215.5)	7,352	(142.7)	17,028	(330.5)	87,014	(1688.6)
2016	68,853	(1331.9)	6,842	(132.4)	18,189	(351.8)	93,884	(1816.1)
2017	73,059	(1411.0)	6,475	(125.1)	19,212	(371.0)	98,746	(1907.1)
2018	77,617	(1497.6)	6,248	(120.6)	20,119	(388.2)	103,984	(2006.4)

( ): Number of patients per million population. Rep. of Korea's population at the end of 2018: 51,826,059.

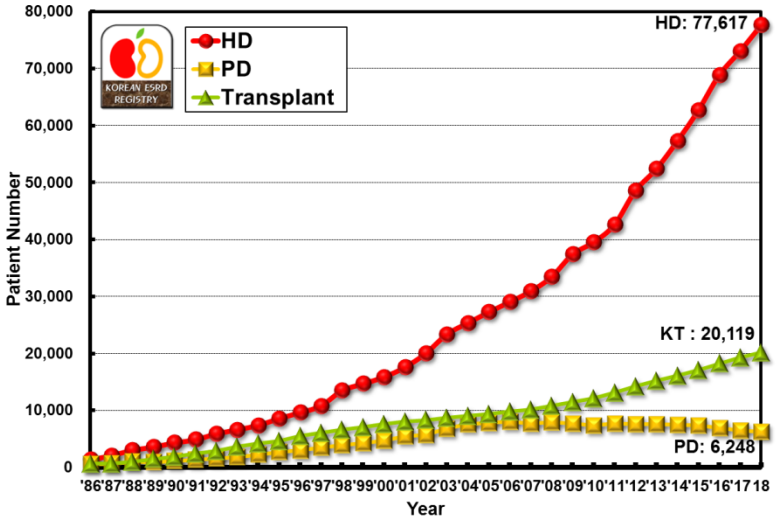

Fig.1-1. Patient numbers of renal replacement therapy at the end of each year.

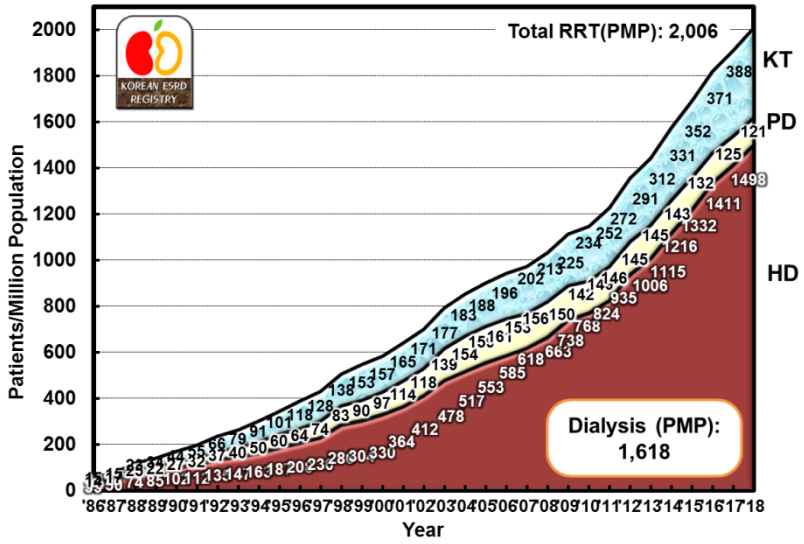

Fig.1-2. Point prevalence of renal replacement therapy (Patients numbers per million population, HD; hemodialysis, PD; peritoneal dialysis, KT; kidney transplantation).

Part 2. Incidence of ESRD

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

	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)
2002	3,878	(79.9)	1,666	(34.3)	739	(15.2)	6,283	(129.5)
2004	5,279	(107.6)	2,246	(45.8)	853	(17.4)	8,378	(170.8)
2006	5,694	(114.7)	2,568	(51.7)	935	(18.8)	9,197	(185.3)
2008	6,415	(127.3)	1,619	(32.1)	1,145	(22.7)	9,179	(182.1)
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)
2014	10,594	(206.4)	867	(16.9)	1,680	(32.7)	13,141	(256.0)
2015	12,011	(233.1)	854	(16.6)	1,891	(36.7)	14,756	(286.4)
2016	13,049	(252.4)	786	(15.2)	2,233	(43.2)	16,068	(310.8)
2017	13,754	(265.6)	742	(14.3)	2,163	(41.8)	16,659	(321.7)
2018	14,779	(285.2)	735	(14.2)	2,107	(40.7)	17,621	(340.0)

( ): Number of patients per million population. Rep. of Korea's population at the end of 2018: 51,826,059.

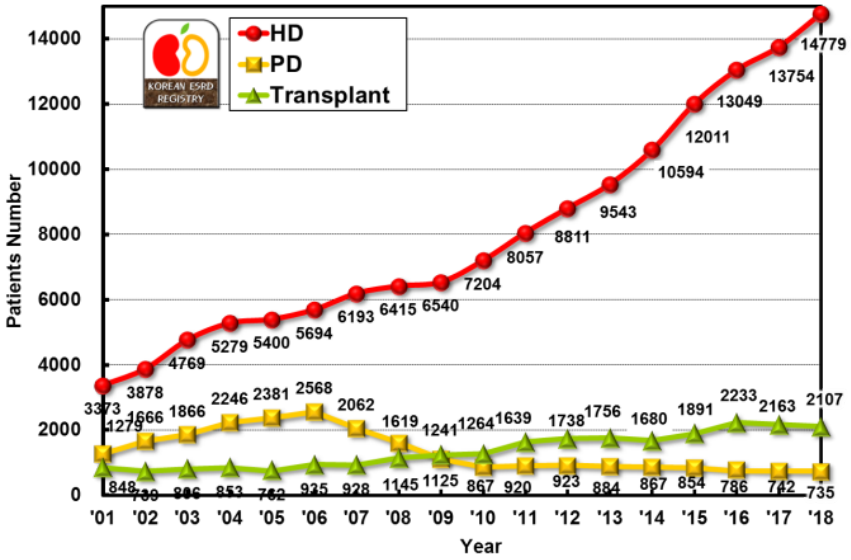

Fig.2-1. New renal replacement therapy patients number in each year.

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

Causes	Percent (%)															
	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2015	2016	2017	2018
Chronic Glomerulonephritis	25.3	25.5	21.6	17.9	14	13.9	12.5	13.0	12.1	11.3	8.1	8.2	8.5	8.4	7.5	7.7
Not Histologically confirmed	19.7	20.4	16.7	13.6	10.6	10.0	8.6	9.0	8.2	7.7	4.5	4.4	4.2	3.8	3.7	4.4
Histologically confirmed	5.6	5.0	4.9	4.3	3.4	3.9	3.9	3.9	3.8	3.6	3.6	3.8	4.3	4.5	3.8	3.3
Diabetic nephropathy	19.5	26.1	30.8	38.9	40.7	40.7	43.4	42.3	41.9	45.2	50.6	48.0	48.4	50.2	48.9	48.8
Hypertensive nephrosclerosis	15.4	20.8	18.3	17.8	16.6	16	16.2	16.9	18.7	19.2	18.5	21.2	20.2	20.3	21.4	19.8
Cystic kidney disease	2.1	2.2	1.8	1.7	2.2	1.6	1.4	1.7	1.7	1.7	1.8	1.8	1.9	1.5	1.7	1.6
Renal tuberculosis	1.1	1.5	1.2	0.5	0.4	0.5	0.3	0.3	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.0
Pyelo/interstitial nephritis	1.3	1.1	0.7	1.0	0.8	0.6	0.6	0.6	0.5	0.4	0.5	0.8	0.3	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	0.4	0.2	0.6	0.3	0.3	0.2
Lupus nephritis	0.8	0.7	1.0	0.5	0.9	0.8	0.6	0.6	0.6	0.5	0.6	0.5	0.3	0.5	0.5	0.5
Gouty nephropathy	0.7	0.7	0.6	0.5	0.7	0.4	0.5	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.2	0.2
Hereditary nephropathy	0.3	0.7	0.4	0.2	0.1	0.2	0.3	0.3	0.3	0.2	0.5	0.5	0.4	0.5	0.4	0.3
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	0.3	0.3	0.5	0.3
Other	4.1	2.7	2.8	3.9	3.0	5.6	5.9	6.0	5.8	5.1	6.8	6.1	6.3	5.5	5.9	4.5
Uncertain	28.6	17.8	15.9	16.6	20.2	19	17.8	17.5	17.6	15.3	11.4	12.1	12.3	11.7	12.1	15.7

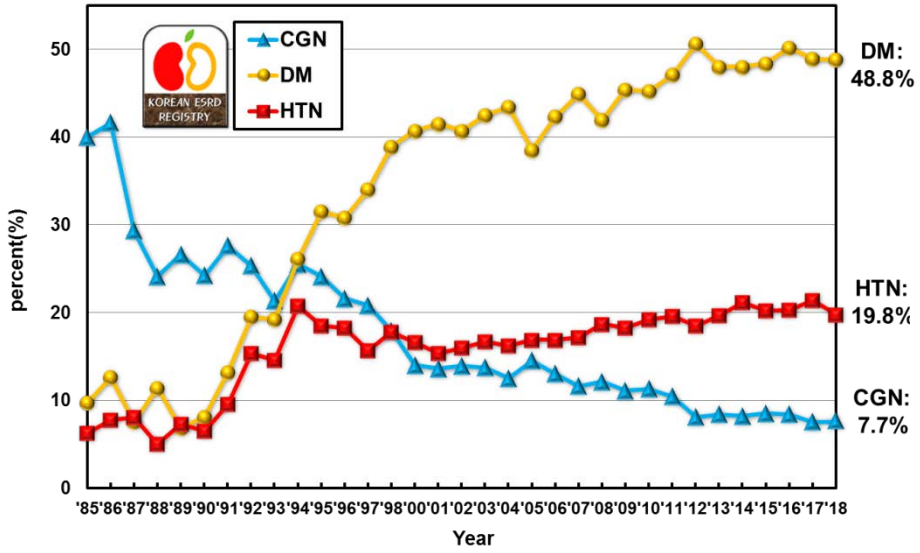

Fig.2-2. Three major causes of end stage renal disease patients who were initiated renal replacement therapy in each year. (DM: diabetic nephropathy, CGN: chronic glomerulonephritis, HTN: hypertensive nephrosclerosis). Note increase of DM and decrease of CGN.

Part 3. Renal Replacement Therapy Modalities

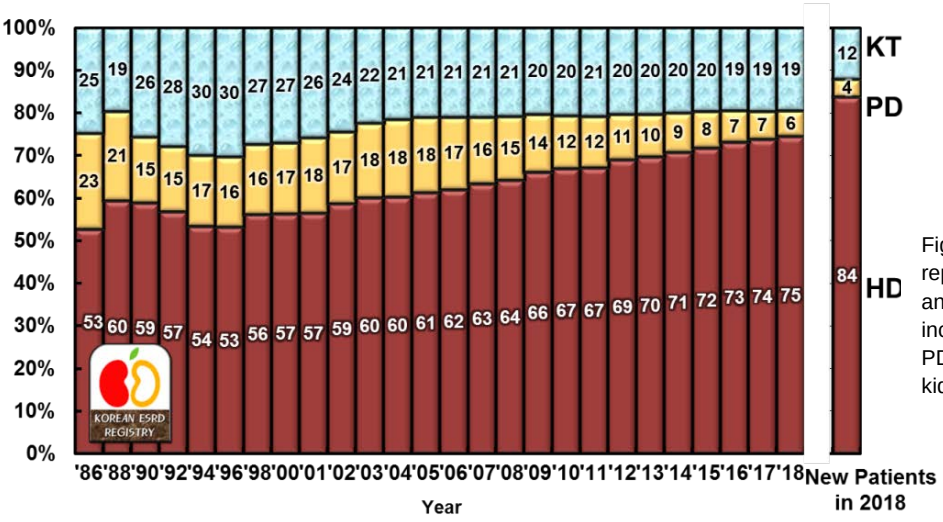

Fig.3-1. Proportion of renal replacement modalities, annual prevalence and incidence. HD: hemodialysis, PD: peritoneal dialysis, KT: kidney transplantation.

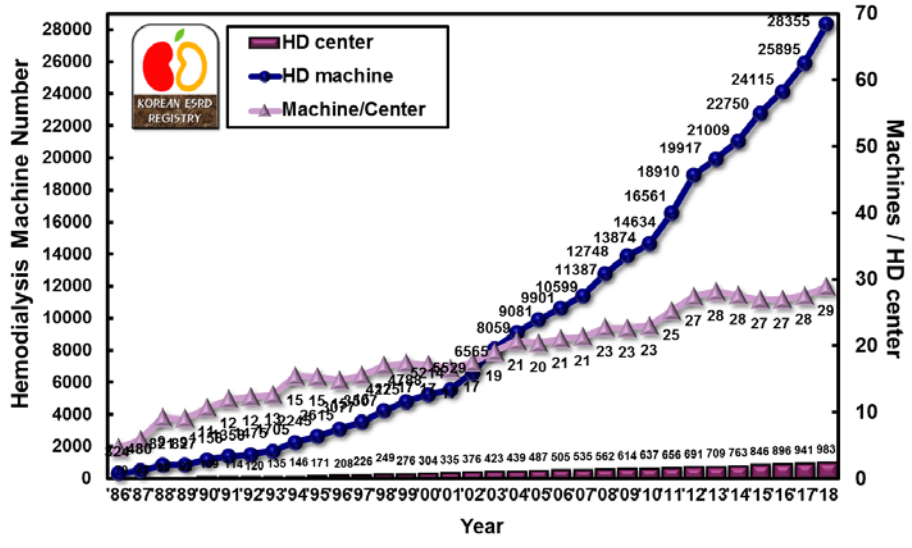

Fig. 3-2. Numbers of dialysis centers, hemodialysis (HD) machines and machine per each dialysis center in Korea.

Part 4. Dialysis Patients Demographics (1)

Table 4-1. Dialysis centers contributing individual patient data.

	총의료기관수 Dialysis Centers	인터넷 입력 Internet Registration	설문지응답 Paper Registration	등록의료기관 Contributed centers	응답률 Rate(%)
서울 Seoul	181	94	4	98	54.1
부산 Busan	59	28	1	29	49.2
대구 Daegu	42	17	2	19	45.2
인천 Incheon	50	12	1	13	26.0
광주 Gwangju	34	14	0	14	41.2
대전 Daejeon	20	10	0	10	50.0
경기 Gyeonggi	170	66	2	68	40.0
강원 Gangwon	27	17	0	17	63.0
충북 Chungbuk	31	15	1	16	51.6
충남 Chungnam	41	20	1	21	51.2
전북 Jeonbuk	28	10	0	10	35.7
전남 Jeonnam	37	14	0	14	37.8
경북 Gyeongbuk	46	22	1	23	50.0
경남 Gyeongnam	59	27	0	27	45.8
울산 Ulsan	18	9	0	9	50.0
제주 Jeju	13	5	1	6	46.2
세종 Sejong	3	1	0	1	33.3
전국 Total	859	381	14	395	46.0

* 투석의료기관 수에서 비윤리 의료기관 및 소수 환자 수 의료기관은 제외함.

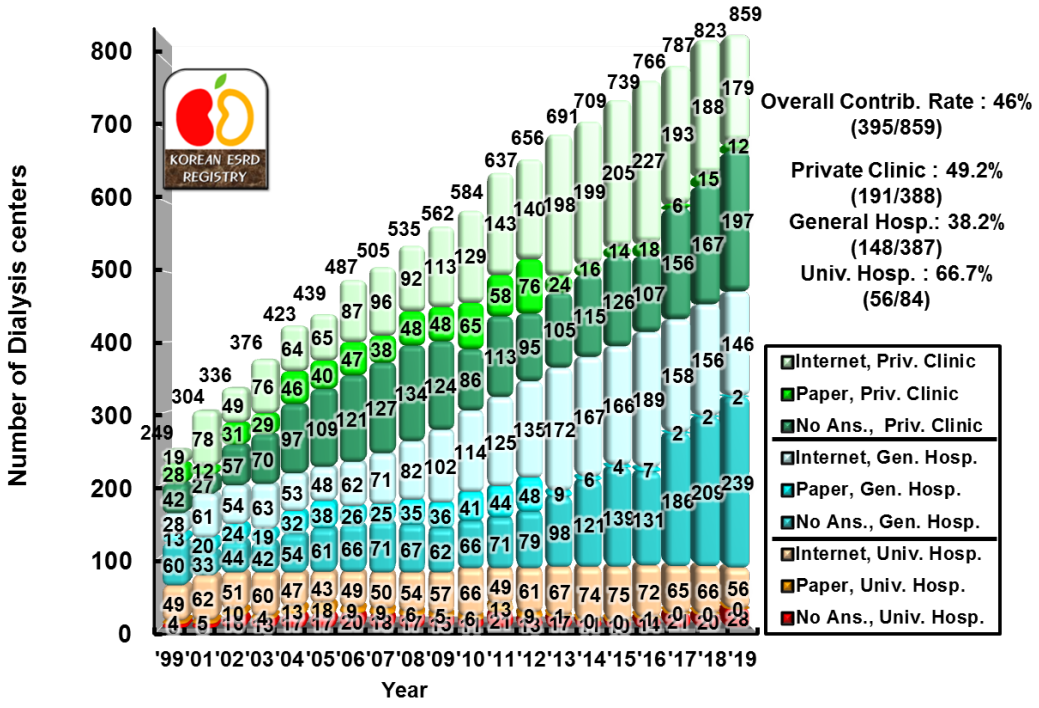

Fig.4-1. Individual patients data contributing rate of dialysis centers according to hospital classification in each year.

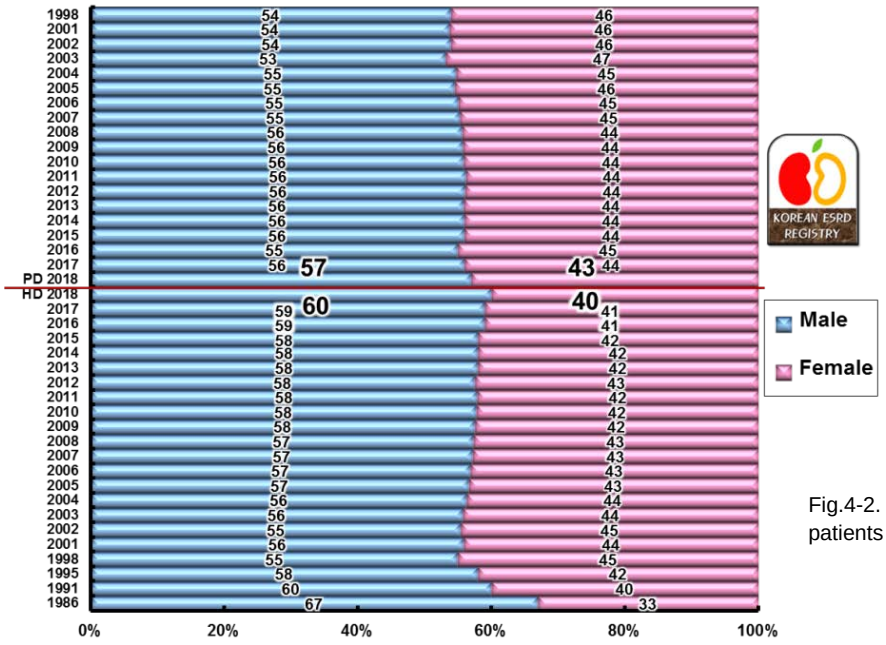

Fig.4-2. Gender ratio of HD & PD patients according to years.

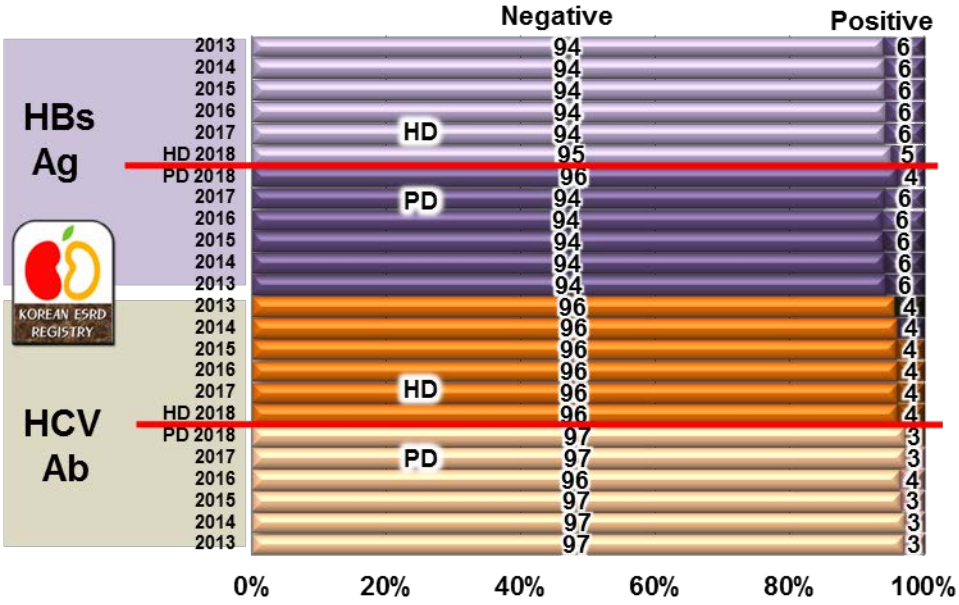

Fig.4-3. ABO blood type and hepatitis virus, medical insurance of HD & PD patients.

Fig.4-4.Medical insurance of HD & PD patients.

Part 4. Dialysis Patients Demographics (2) – Age & Dialysis Duration

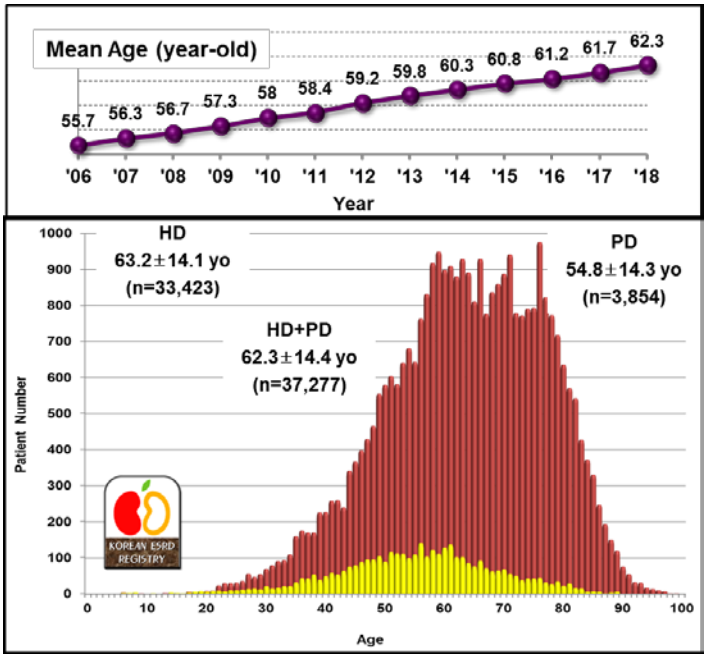

Fig.4-4. Age distribution of dialysis patients according to dialysis modalities.

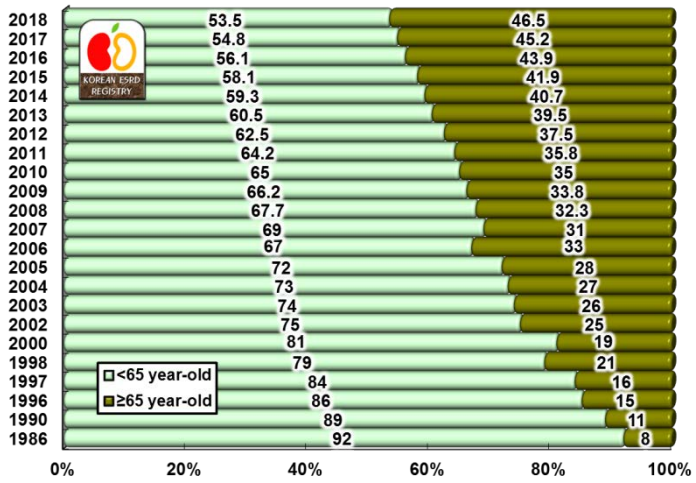

Fig.4-5. Elderly dialysis patient (over 65 year-old) proportion according to year.

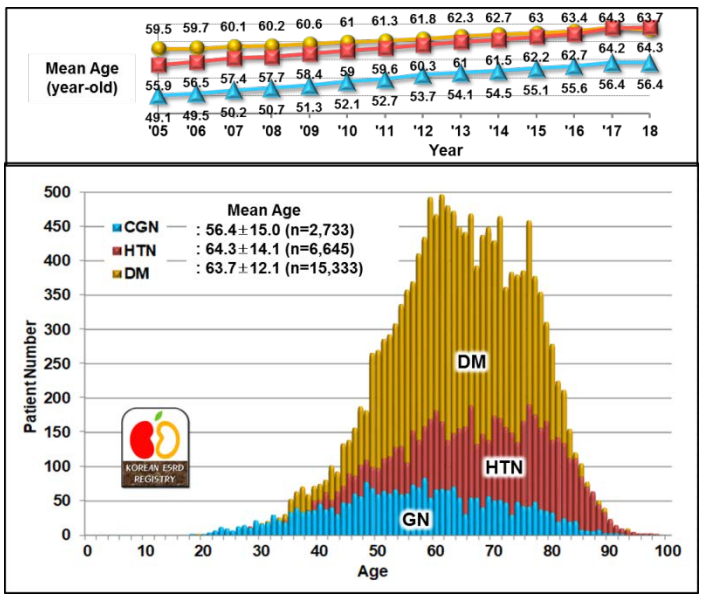

Fig.4-6. Age distribution of dialysis patients according to underlying diseases, diabetic patients (DM), hypertensive nephrosclerosis (HTN) and glomerulonephritis (GN). Note the difference of peak age between GN

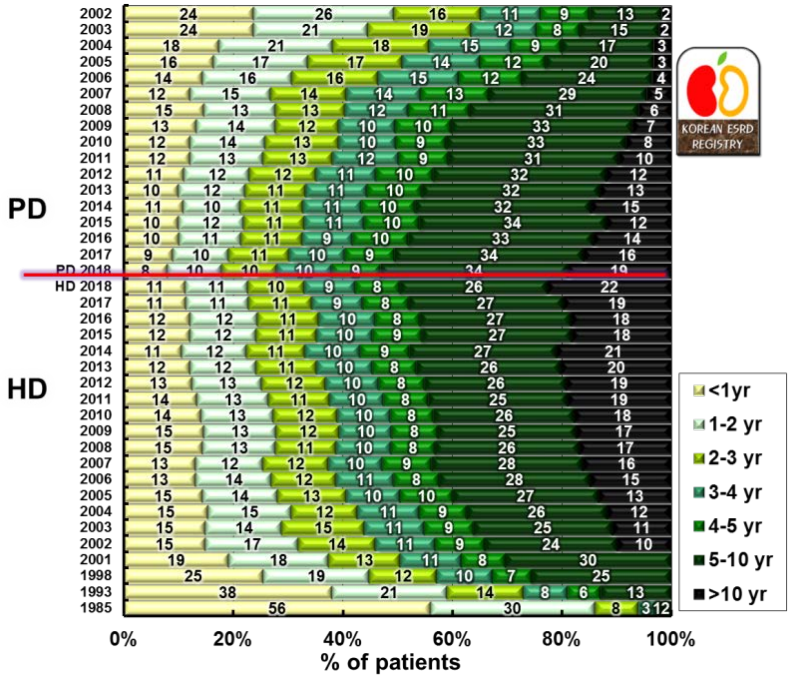

Fig.4-7. Duration of maintenance hemodialysis and peritoneal dialysis. Percent of estimated patient number according to year.

Part 4. Dialysis Patients Demographics (3) – BP

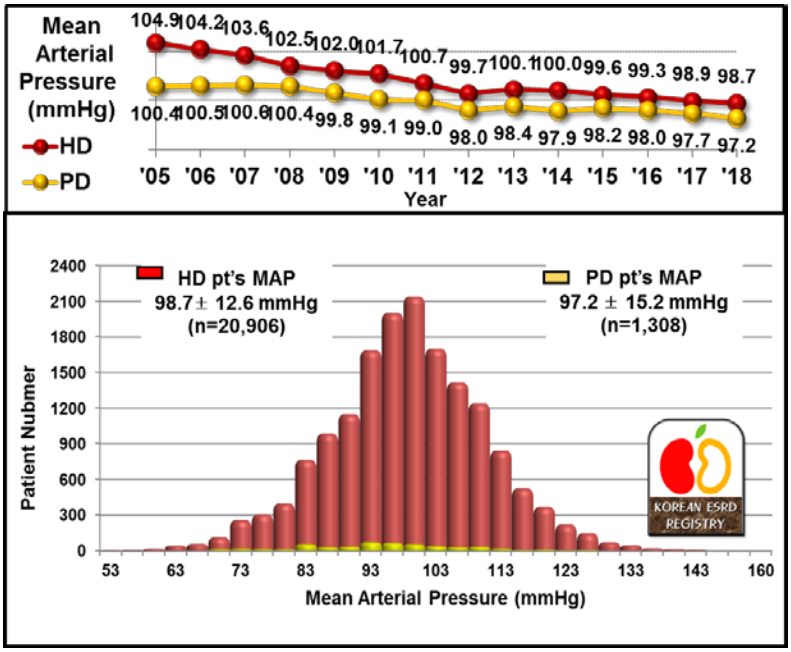

Fig.4-9. Distribution of mean blood pressure (MBP) in hemodialysis and peritoneal dialysis patients. Blood pressure was higher in HD patients than in PD patients.

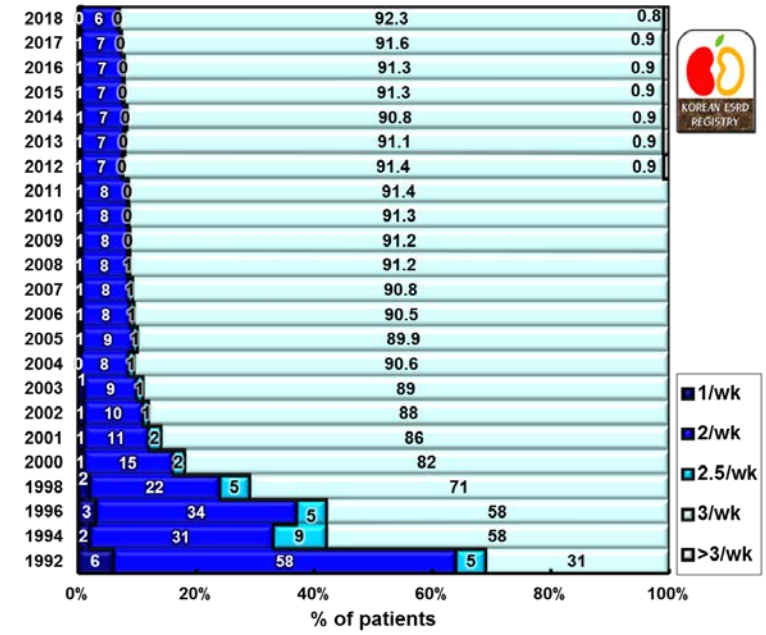

Fig.5-1. Frequency of HD per week.

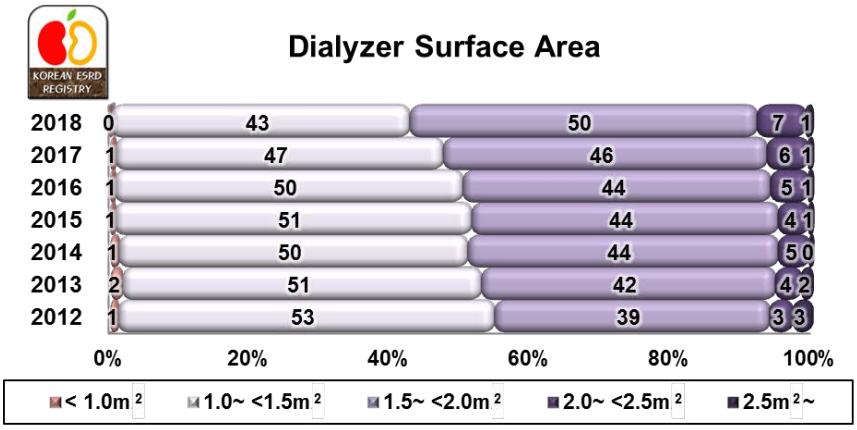

Fig. 5-2. Percent of patients according to the using dialyzer membrane surface area.

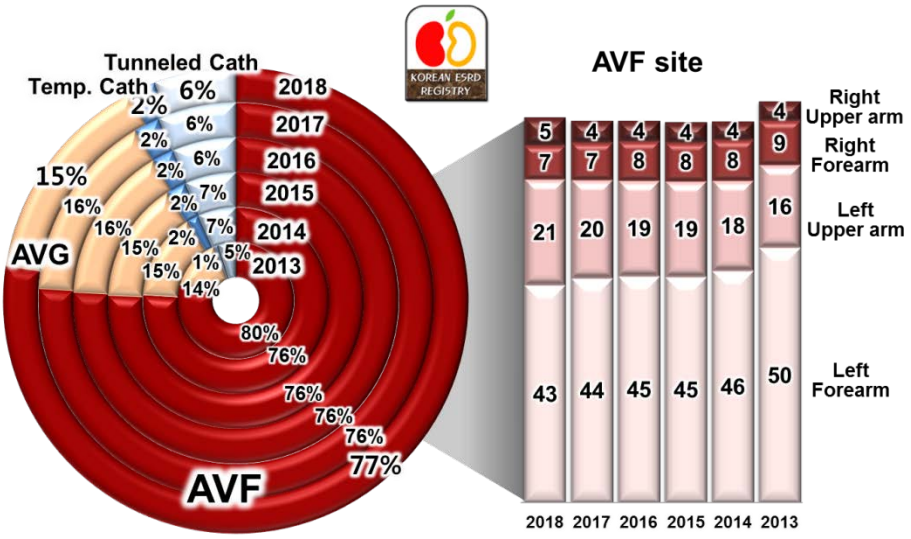

Fig.5-4. Percent of patients according to the vascular access for HD.

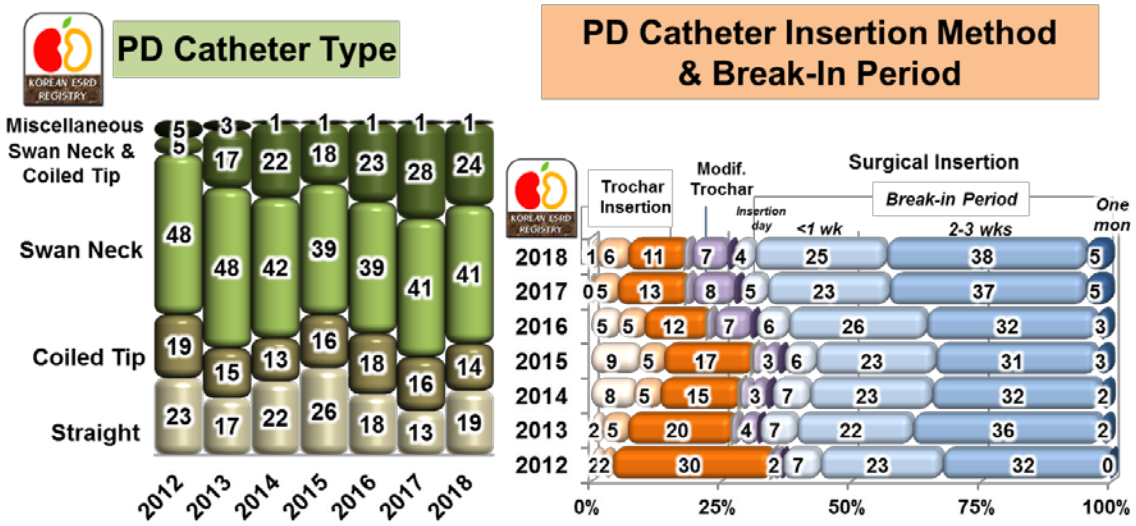

Fig.5-5. PD catheter type and PD catheter insertion methods.

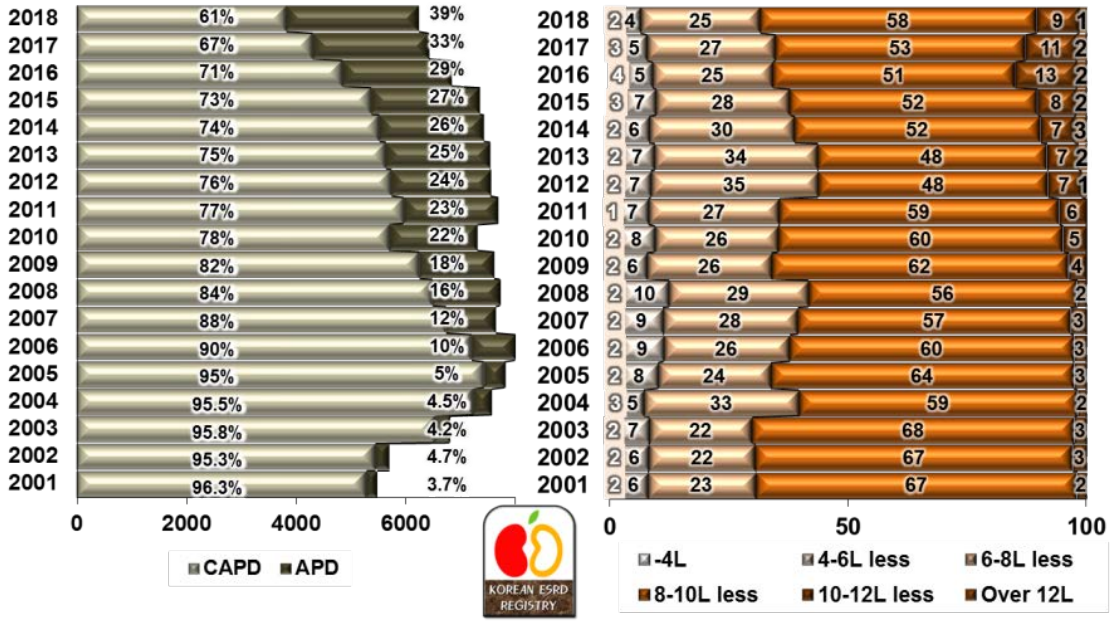

Fig.5-6. Percent of patients according to the PD type and daily PD solution volume. APD, Automated peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis.

Part 6. Laboratory Data & Drugs (1) – Anemia & Erythropoietin

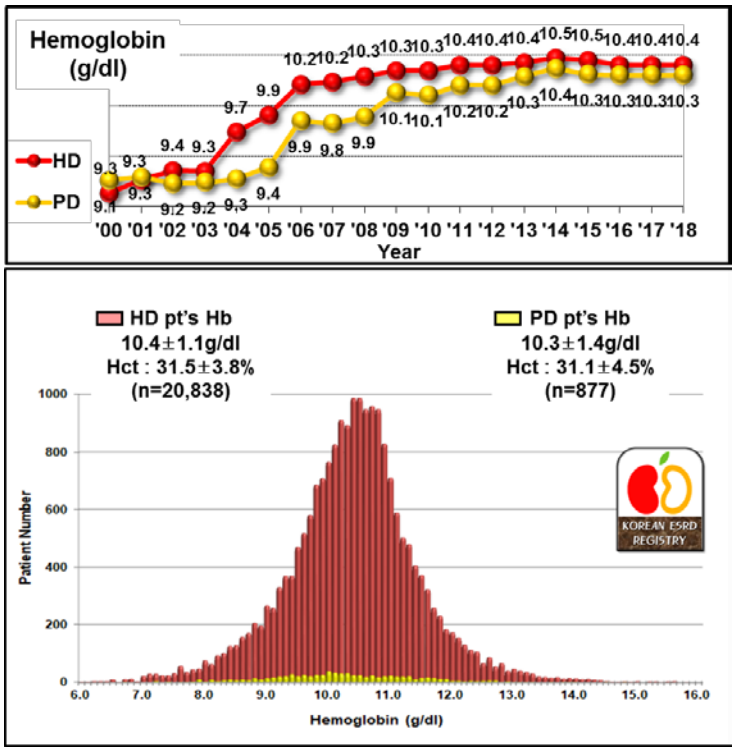

Fig.6-1. Distribution of hemoglobin levels in HD and PD patients.

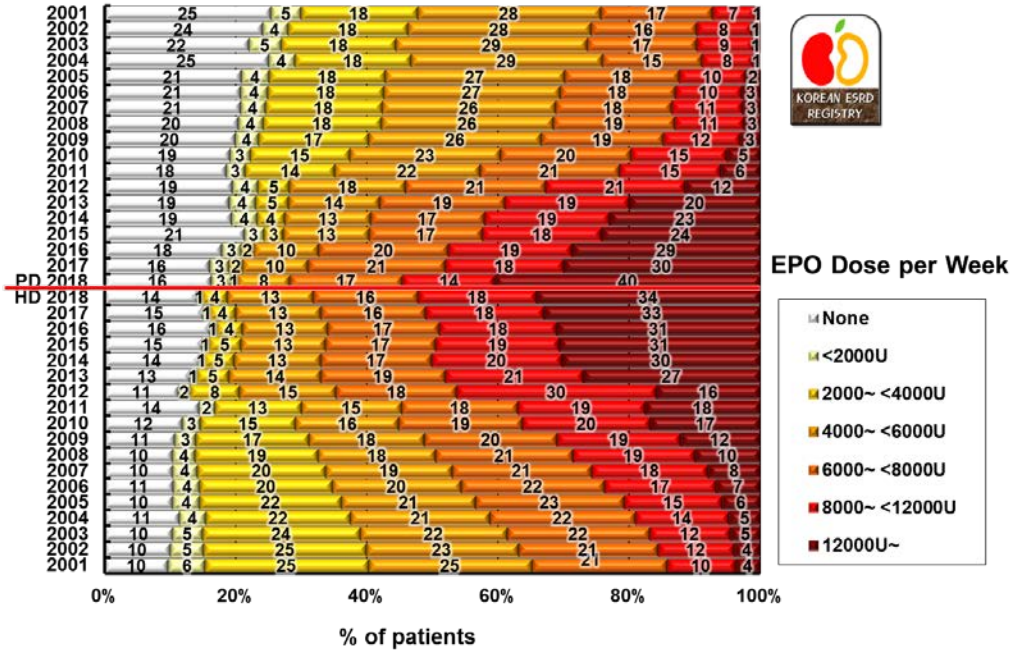

Fig.6-2. Percent distribution of erythropoietin doses prescribed for HD and PD patients.

Part 6. Laboratory Data & Drugs (2) – Calcium & Phosphorus

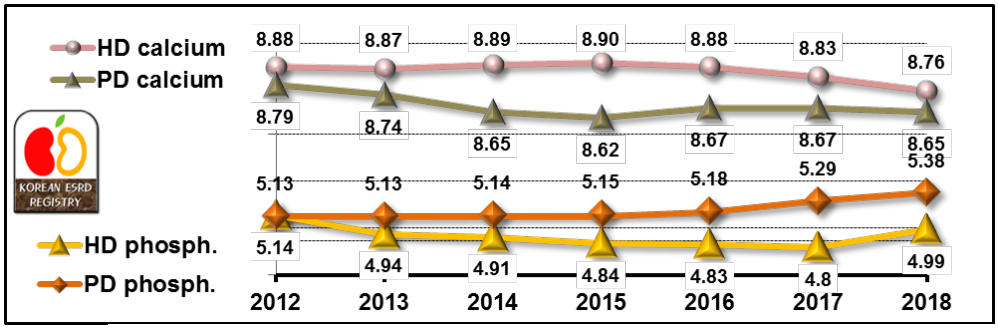

Fig.6-3. Mean value of calcium and phosphorus level according to years.

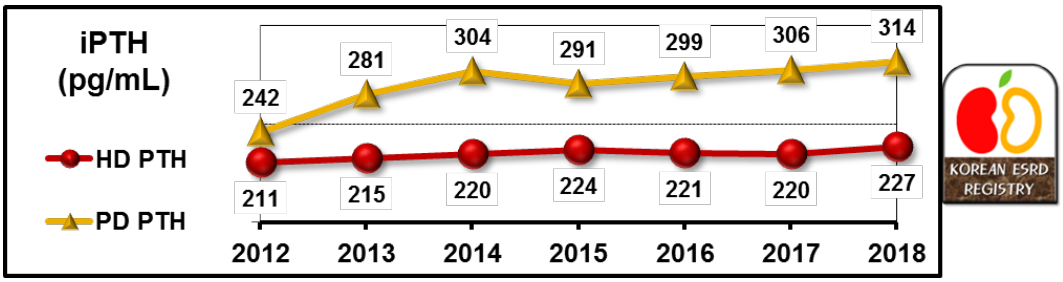

Fig.6-4. Mean value intact parathyroid hormone (iPTH) level according to years.

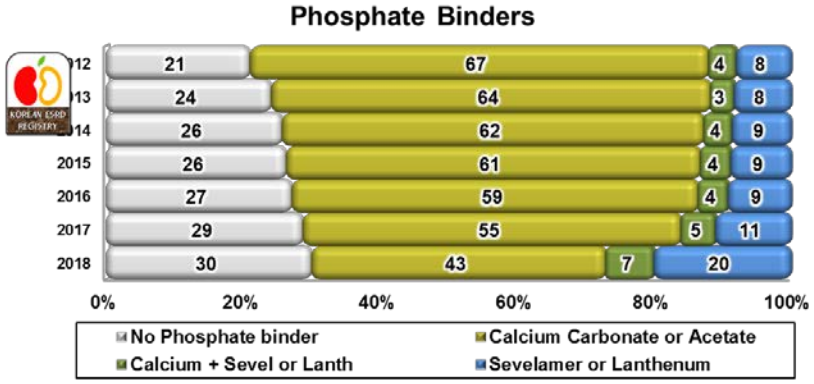

Fig.6-5. Phosphate binders.

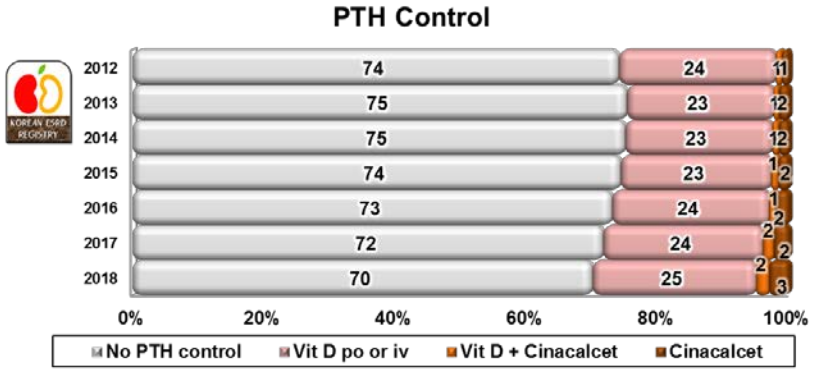

Fig.6-6. Medications for PTH control.

Part 6. Laboratory Data & Drugs (3) – Miscellaneous Lab Data

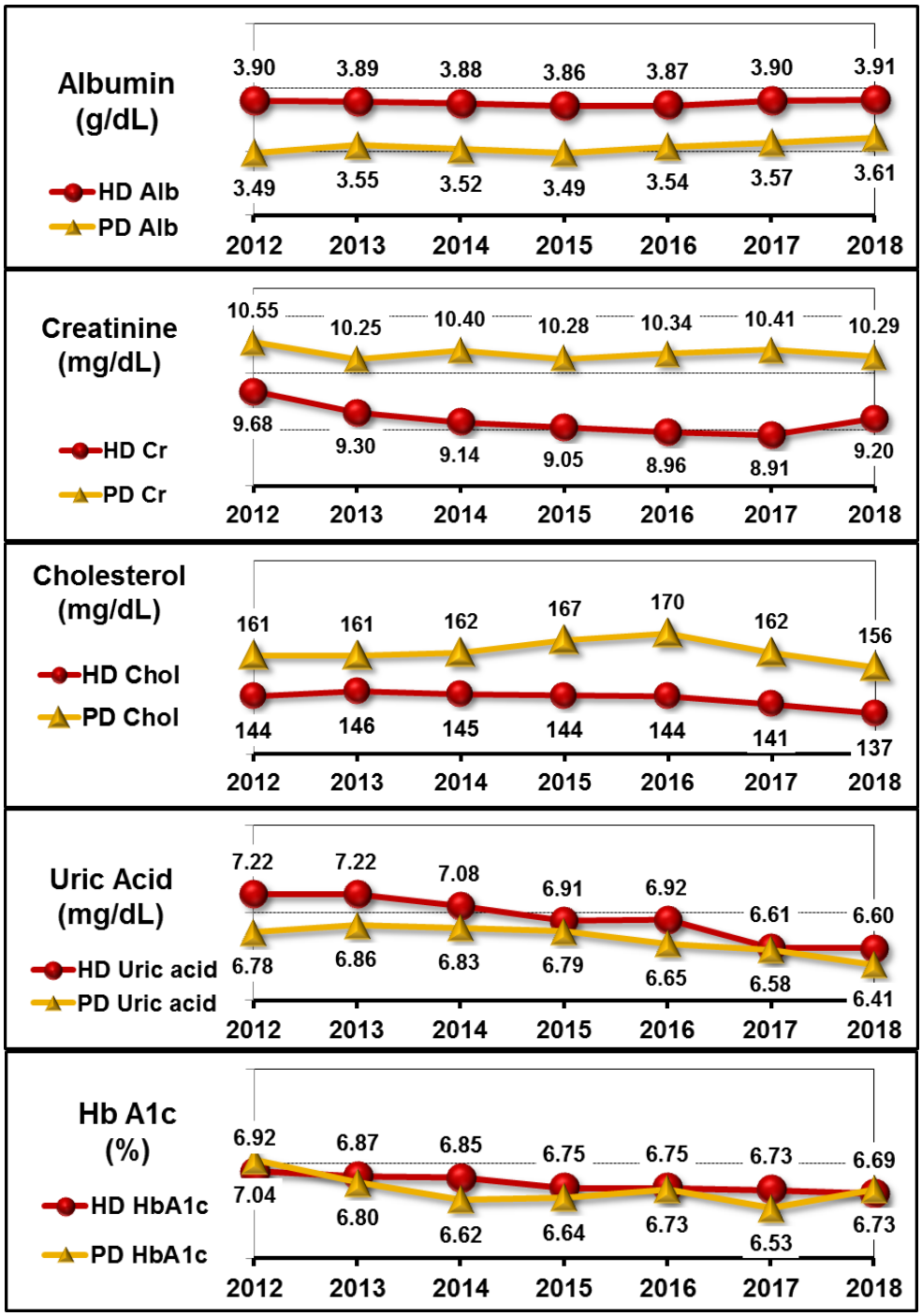

Fig. 6-7. Mean albumin, creatinine, cholesterol, uric acid and hemoglobin A1c level of HD and PD patients according to year.

Part 7. Hemodialysis Adequacy

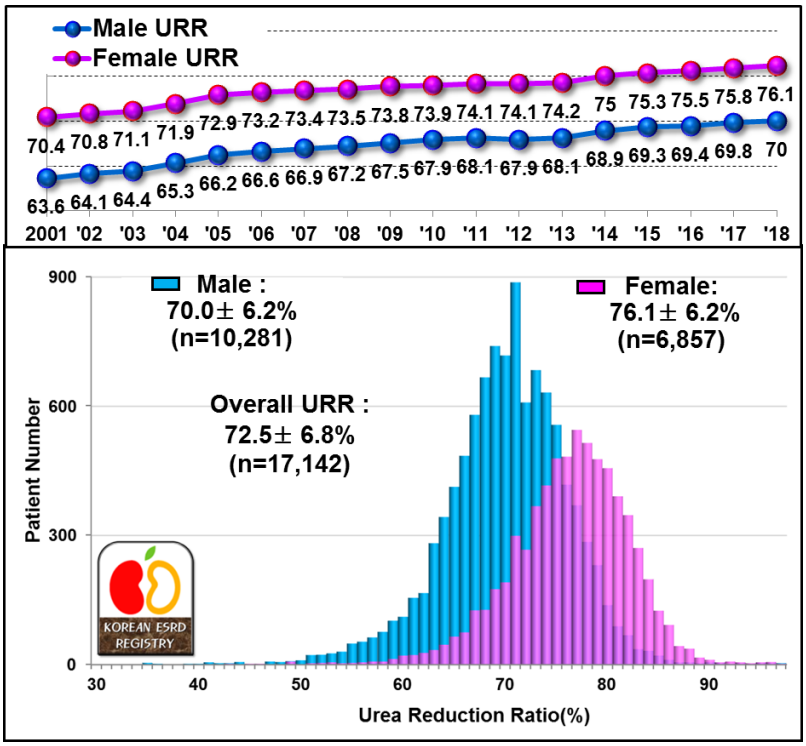

Fig.7-1. Distribution of urea reduction ratio (URR) of hemodialysis patients. Note the difference between male and female.

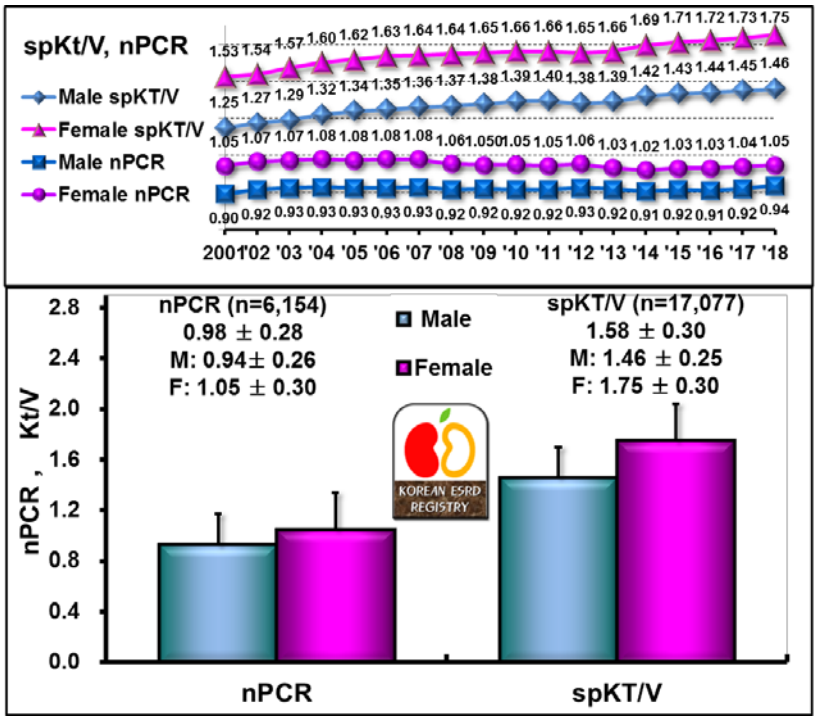

Fig.7-2. Dialysis adequacy parameters (nPCR & KT/V) of hemodialysis patients.

Part 8. Rehabilitation Status of Dialysis Patients

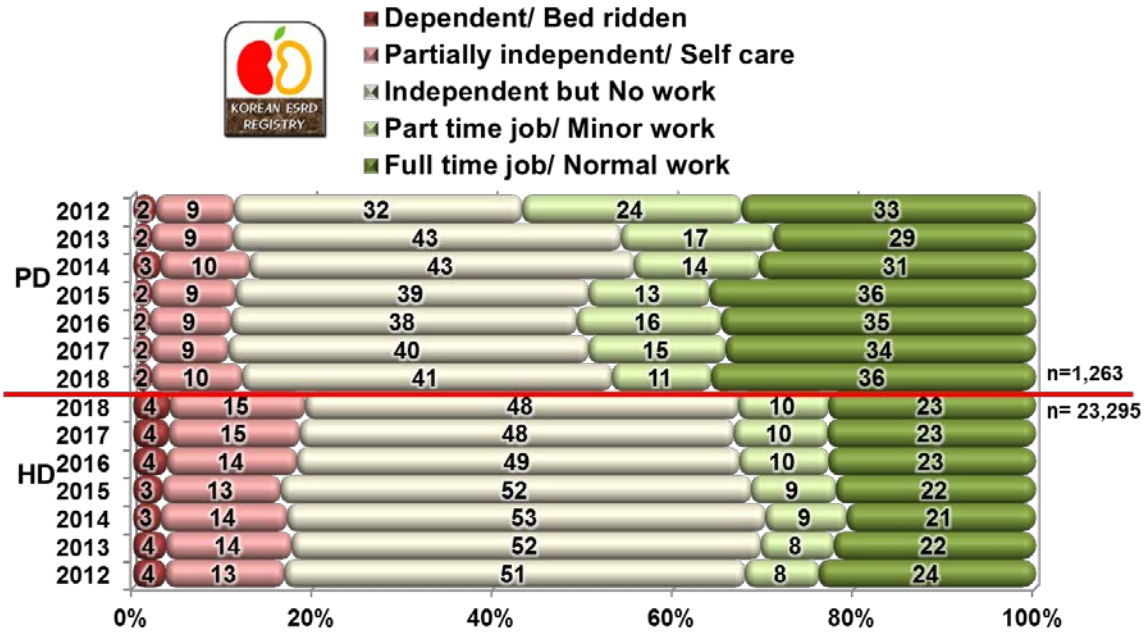

Fig.8-1. Rehabilitation status of HD and PD patients.

Part 9. Co-morbidity of Dialysis Patients

Table 9-1. Co-morbidity of dialysis patients in 2018. Relative percent of reported comorbidity.

	HD (%, n=40,929)		PD (%, n=1,484)	
Cardiac	**18.8**		**12.2**	
Coronary Artery Disease		9.3		6.4
Congestive Heart Failure		4.9		4.1
Pericardial Effusion		0.4		0.2
Arrythmia		4.3		1.4
Vascular	**46.2**		**56.3**	
Cerebrovascular accident		3.8		3.1
Hypertension		39.8		51.7
Other vascular disease		2.6		1.5
Infection	**5.9**		**12.8**	
Pneumonia		1.8		1.7
Tuberculosis		0.5		0.9
Peritonitis		0.2		7.1
Herpes zoster		0.3		0.2
Access/ exit site infection		0.7		1.2
Other Infection		2.3		1.8
Liver disease	**4.5**		**3.6**	
Hepatitis B		2.5		2.9
Hepatitis C		1.4		0.5
Congestive Liver		0.1		0.0
Hemochromatosis		0.0		0.0
Other liver diseases		0.4		0.2
Gastrointestinal	**15.6**		**10.1**	
Gastric Ulcer		2.4		0.9
Duodenal Ulcer		0.3		0.1
Constipation		5.2		3.9
Other Gastrointestinal Diseases		7.7		5.3
Miscellaneous	**8.9**		**5.0**	
Malnutrition (Alb<2.5g/dl)		0.2		0.2
Malignancy		1.5		0.7
Hypertensive Retinopathy		0.4		0.0
Uremic Dermatitis		2.1		1.1
Uremic Neuritis		0.7		0.2
Uremic Dementia		0.2		0.2
Uremic Ascites / Pleural Effusion		0.3		0.0
Osteodystrophy		0.7		0.9
COPD & other pulm disease		0.6		0.4
Decubitus ulcer/ DM foot		2.2		1.3

Part 10. Causes of Death in Dialysis Patients

Table 10-1. Causes of death (%) in dialysis patients, 1994-2018*

	1994-96	1998	2001	2003	2005	2007	2009	2011	2013	2014	2015	2016	2017	2018
Cardiac	27.4	27.4	26.9	31.7	30.7	31.7	29.5	32.7	35.8	32.5	36.1	38.1	33.7	33.7
Myocardial infarction	6.4	6.4	7.7	7.4	8	7.5	8.0	6.6	7.5	5.7	8.0	5.5	6.5	6.5
Cardiac arrest, uremia associated	13.7	13.7	11.2	11.7	10.4	10.8	8.5	11.0	14.2	14.1	13.1	13.3	12.7	12.4
Cardiac arrest, other cause	7.2	7.2	8.1	12.5	12.4	13.3	13	15.0	14.2	12.6	15.0	19.3	14.5	14.8
Vascular	17.2	17.2	22.7	19.5	17	17.8	15.9	14.1	13.3	13.2	11.8	10.8	11.4	11.5
Cerebrovascular accident	14.3	14.3	15.1	14.5	12.3	13	11	8.7	8.7	8.5	6.5	6.2	6.2	5.6
Pulmonary embolus	0.2	0.2	0.5	0.1	0.6	0.5	0.2	0.2	0.2	0.2	0.9	0.4	0.3	0.3
Gastrointestinal hemorrhage	1.7	1.7	2.7	3.2	1.7	2.7	2.3	2.2	1.2	1.7	1.4	2.0	0.8	1.7
Gastrointestinal embolism	0.1	0.1	0.1	0	0.5	0.1	0.5	0.1	0.2	0.2	0.7	0.3	0.3	0.2
Other vascular disease	0.9	0.9	4.3	1.6	1.9	1.6	1.9	3.0	3.0	2.6	2.4	1.9	3.7	3.7
Infection	13.5	13.5	17.8	20.5	20.1	20.2	21.9	23.1	23.5	26.8	24.6	24.5	25.2	22.6
Pulmonary infection	2.5	2.5	4.5	3.6	4.5	4.4	5.9	8.4	8.4	9.0	8.9	9.3	7.7	8.6
Septicemia	6.6	6.6	6.9	9.7	9.6	11.7	10.4	9.7	11.9	13.6	11.0	10.2	12.2	10.6
Tuberculosis	0.3	0.3	0.8	0.2	0.3	0.2	0.3	0.1	0.1	0.1	1.1	0.1	0.2	0.0
Peritonitis	2.1	2.1	1.1	2	1.4	1.1	0.8	1.0	0.5	0.7	1.1	1.2	0.7	0.6
Other Infection	2	2	4.5	4.9	4.3	2.9	4.5	4.0	2.7	3.4	2.4	3.6	4.5	2.7
Liver disease	3.4	3.4	2.6	2.8	2.7	2.2	3.1	2.1	2.4	2.2	2.6	2.3	2.0	1.6
Liver failure due to hepatitis B	1.8	1.8	1.6	1.8	1.5	1.3	2.2	1.0	1.3	1.0	1.1	0.9	1.1	0.6
Liver failure due to other cause	1.6	1.6	1	1	1.2	0.8	0.9	1.1	1.1	1.2	1.5	1.5	1.0	1.0
Social	6.2	6.2	6.3	4.4	5.4	3.3	2.5	3.3	2.8	2.5	2.0	2.5	1.5	1.3
Patient refused further treatment	2.9	2.9	2.1	1	1.1	1.1	0.5	0.4	0.3	0.3	0.3	0.5	0.1	0.0
Suicide	2.5	2.5	3.3	2.3	3.3	1.5	1.3	1.4	1.3	1.6	1.0	1.5	0.8	0.8
Therapy ceased for other reason	0.8	0.8	0.9	1	1	0.7	0.8	1.5	1.2	0.7	0.8	0.5	0.6	0.5
Miscellaneous	32	32	23.7	21.3	24	24.8	27.1	24.7	22.2	22.9	23.0	21.8	26.2	29.3
Cachexia	2.9	2.9	8.1	6.6	4	4.4	3.3	2.7	1.6	1.5	1.4	0.9	1.0	1.0
Malignant disease	2.1	2.1	4.4	3.5	6.4	5.7	5.7	6.0	5.7	6.0	5.8	6.5	6.6	6.0
Accident	1.2	1.2	0.9	1.1	1.4	1.2	1.3	1.6	1.4	2.0	1.0	1.0	1.1	1.3
Uncertain	25.8	25.8	10.3	10.1	12.3	13.4	16.8	14.5	13.4	13.4	14.8	13.4	17.6	21.0

*Number of patients :1994-1996=981, 1998=911, 2001=761, 2003=894, 2005=1,256, 2007=1,531, 2009=1,727, 2011=1,828, 2013=1,604, 2014=1,534, 2015=891, 2016=1,849, 2017=1,771, 2018=2,432.

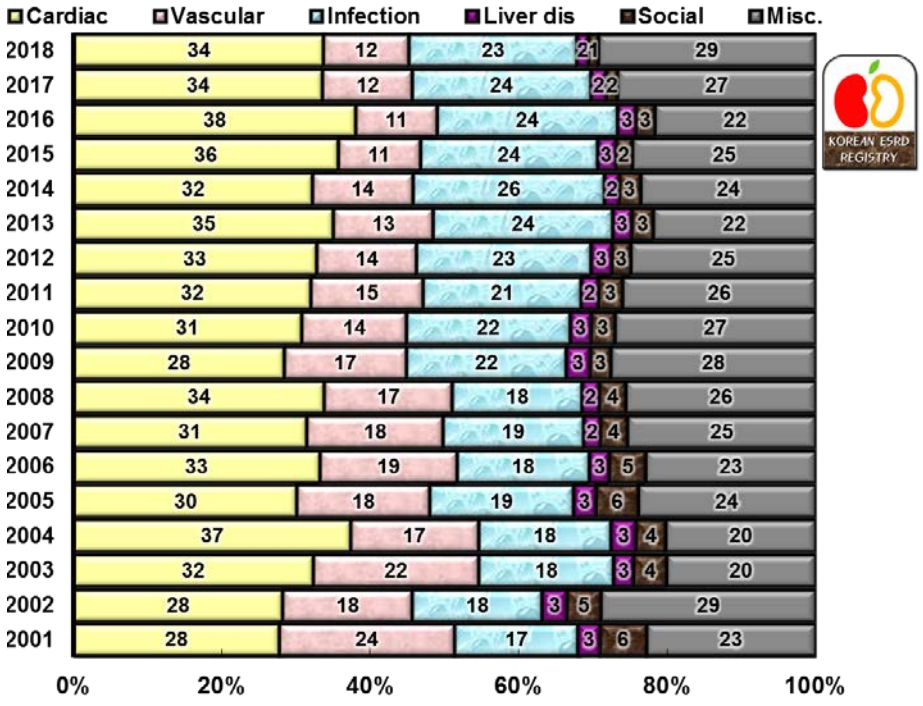

Fig.10-1. Comparison of death causes, hemodialysis versus peritoneal dialysis patients

Part 11. Kidney Transplantation

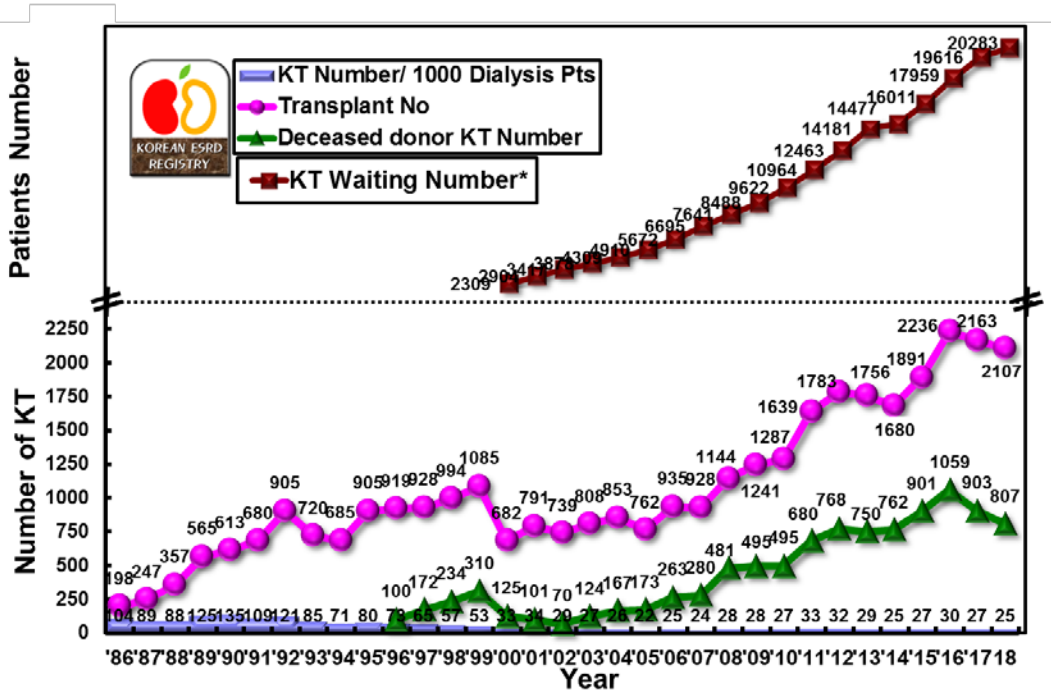

Fig.11-1. Annual number of kidney transplantation in Korea (including data from KONOS: Korean Network for Organ Sharing). *Survived kidney transplantation waiting patient number at the end of each year.

◆ Acknowledgements: We, ESRD registry committee of Korean Society of Nephrology, would like deeply thank to every dialysis centers' medical doctors and nurses for participation in this survey. The dialysis facility sales department of Baxter Korea and Fresenius Medical Care Korea were also shared their data.