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Overview of Regular Dialysis Treatment in Japan (as of 31 December 2008)

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Abstract: A nationwide statistical survey of 4124 dialysis facilities was conducted at the end of 2008 and 4081 facilities (99.0%) responded. The number of patients undergoing dialysis at the end of 2008 was determined to be 283 421, an increase of 8179 patients (3.0%) compared with that at the end of 2007. The number of dialysis patients per million at the end of 2008 was 2220. The crude death rate of dialysis patients from the end of 2007 to the end of 2008 was 9.8%. The mean age of the new patients begun on dialysis was 67.2 years and the mean age of the entire dialysis patient population was 65.3 years. For the primary diseases of the new patients begun on dialysis, the percentages of patients with diabetic nephropathy and chronic glomerulonephritis were 43.3% and 22.8%, respectively. Among the facilities that measured bacterial count in the dialysate solution in 2008, 52.0% of facilities ensured that a minimum dialysate solution volume of 10 mL was sampled. Among the patients treated by facility dialysis, 95.4% of patients were treated three times a week, and the average time required for one treatment was 3.92 ± 0.53 (SD) h. The average amounts of blood flow and dialysate solution flow were 197 ± 31 and 487 ± 33 mL/min, respectively. The number of patients using a polysulfone membrane dialyzer was the largest (50.7%) and the average membrane area was 1.63 ± 0.35 m^2. According to the classification of dialyzers by function, the number of patients using a type IV dialyzer was the largest (80.3%). The average concentrations of each electrolyte before treatment in patients treated with blood purification by extracorporeal circulation were 138.8 ± 3.3 mEq/L for serum sodium, 4.96 ± 0.81 mEq/L for serum potassium, 102.1 ± 3.1 mEq/L for serum chloride, and 20.7 ± 3.0 mEq/L for HCO_3^-; the average serum pH was 7.35 ± 0.05. Regarding the type of vascular access in patients treated by facility dialysis, in 89.7% of patients an arteriovenous fistula was used and in 7.1% an arteriovenous graft was used. The percentage of hepatitis C virus (HCV)-positive patients who were HCV-negative in 2007 was 1.04%; the percentage is particularly high in patients with a period of dialysis of 20 years or longer. The risk of becoming HCV-positive was high in patients with low serum creatinine, serum albumin, and serum total cholesterol levels, and/or a low body mass index before beginning dialysis. **Key Words:** Dialysis, Patient population, Endotoxin concentration, Hepatitis C virus antibody positivity rate, Survey, Survival rate, Vascular access.

The Japanese Society for Dialysis Therapy has been conducting a statistical survey of dialysis facilities across the country annually since 1968. To improve the efficiency of analyzing survey data accumulated thus far, in 2008 the Society concluded an agreement with The Institute of Japanese Union of Scientists and Engineers to entrust them with the business of data analysis, with the aim of establishing a new analytical system. Some of the analytical results obtained under this agreement were published in the report on the current status of chronic dialysis at the end of 2007 (CD-ROM) (1).

In 2008, the statistical survey committee was also reformed. Specifically, the subcommittees of

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statistical analysis and local cooperation were newly established under the statistical survey committee with the approval of the executive board. In addition, five members of the subcommittee of statistical analysis were selected from the public. Regular members of the Society proposed research topics, from among which five research topics were selected as public research projects. Two members from the subcommittee of statistical analysis were assigned to participate in each of these public research projects and the researchers selected for each project received support from them.

The verification of the Society's database (database cleaning) started in 2004 and was ongoing in 2008. In June 2009, the data files for which verification was completed were provided for the first time to the above-mentioned successful research applicants for public research projects.

A nationwide statistical survey of 4124 dialysis facilities was conducted at the end of 2008 and 4081 facilities (99.0%) responded. The number of patients undergoing dialysis at the end of 2008 determined on the basis of the survey results from dialysis facilities was 283 421, an increase of 8179 patients (3.0%) from 2007. The crude death rate of dialysis patients in 2008 was 9.8%, which is not significantly different from the rates in the last ten years.

In the first part of this report, we summarize data obtained from the 2008 survey on the following items:

A. Basic demographics
B. Current status of dialysate quality control
C. Current status of dialysis conditions
D. Predialysis and postdialysis serum concentrations of electrolytes and pH
E. Current status of the use of vascular access.

The results of analyzing factors associated with the onset of femoral neck fracture are included in "The Illustrated, Current Status of Chronic Dialysis in Japan as of 31 December 2008" (2), which was published as a rapid report in June 2009. These results are not included in this report because they will be separately published in another paper.

In the 2006 and 2007 surveys, the hepatitis C virus (HCV) antibody was examined (1,3). In the second part of this report, the ratio of the number of patients who became HCV-antibody-positive in 2007 to that of patients who were HCV-antibody-negative in 2006 (hereafter called the HCV antibody positivity rate) was calculated on the basis of these survey results. Moreover, the relationships between various factors and the HCV antibody positivity rate for the patients treated by dialysis were clarified by multivariate analysis. Note that HCV antibody positivity does not always indicate HCV antigen positivity.

PATIENTS AND METHODS

I. Tabulation of results of the survey conducted at the end of 2008

This survey is conducted every year by sending questionnaires to target dialysis facilities. The 4124 facilities surveyed in this study consisted of member facilities of the Japanese Society for Dialysis Therapy as of 31 December 2008 and additional nonmember facilities offering dialysis for patients with chronic kidney disease. The number of facilities participating in this survey increased by 26 (0.6%) from the previous year.

The questionnaires were mainly sent and collected by mail; some were also faxed. Moreover, electronic media were used instead of the paper questionnaire for the facilities that had earlier indicated a preference for this method. For those utilizing electronic media, the 2008 survey adopted the use of USB memory sticks instead of conventional floppy discs.

This survey consisted of two questionnaires. One was a facility survey that investigated items related to the details of the dialysis facilities, such as the number of patients and staff members, and the number of dialyzers at individual facilities (using the questionnaire referred to as "Sheet I"). The other was a patient survey in which the epidemiological background, treatment conditions, and outcome of treatment of individual dialysis patients were investigated (using the questionnaires referred to as "Sheets II, III, and IV").

The collection rate of the facility survey (Sheet I) at the end of 2008 was 99.0% (4081 facilities), which was similar to that in the 2007 survey (98.9%). Moreover, the number of facilities from which both questionnaires, that is, the facility survey and the patient survey, were collected was 3995 (96.9%), which was significantly higher than in the 2007 survey (95.1%).

As mentioned above, in this survey USB memory sticks were used as the electronic media instead of the conventionally used floppy disks. As a result, the number of facilities that responded using electronic media was 3244 facilities (79.5%), a marked increase from the 2007 survey (72.4%). This increase in the number of facilities that responded using electronic media may have contributed to the above-mentioned increase in the number of facilities that cooperated in the patient survey.

The cumulative survival rates after introduction into dialysis were actuarially calculated (4).

II. Prevalence of HCV antibody positivity for dialysis patients

A. Tabulation of the HCV antibody positivity rate

The targets of the analysis of the prognosis of HCV antibody positivity were 122 377 chronic dialysis patients from among the patients registered in the database of patient surveys by the Japanese Society for Dialysis Therapy at the end of 2006 with the following features: (i) who were treated by blood purification therapy; (ii) who answered "negative" to the question about HCV antibody in the 2006 survey; and (iii) who also answered "negative" or "positive" to the same question in the 2007 survey. None of the following requirements for exclusion applied to these targets:

- Patients registered in facilities that answered the 2006 facility survey with unclear descriptions of the total numbers of patients, doctors, nurses, and clinical engineers
- Patients who answered the 2006 patient survey with unclear descriptions regarding gender, age, years on dialysis, and primary disease
- Patients who died or who changed treatment method or facility by the end of 2007.

In this report, HCV-RNA positivity was not taken into consideration. For the background of the target patients of the analysis, readers can refer to Tables 42–47, in which the prognosis of HCV antibody positivity is summarized according to each background factor. The HCV antibody positivity rate was calculated using the following equation:

$$\text{HCV antibody positivity rate (\%)} = (\text{Number of patients who were HCV-antibody-negative at the end of 2006 and became HCV-antibody-positive at the end of 2007}) \div (\text{Number of patients who were HCV-antibody-negative at the end of 2006}) \times 100$$

B. Analysis of factors associated with HCV antibody positivity for dialysis patients

From among the above-mentioned target patients of the analysis, 107 693 patients who were treated by facility hemodialysis three times per week at the end of 2006 were extracted. For these target patients, the relationships of the prognosis of HCV antibody positivity with the results of various examinations and indices related to the dialysis dose were analyzed by logistic regression analysis (5). The end point of the follow-up of their prognosis was set to being HCV-antibody-positive by the end of 2007. Gender, age, years on dialysis, and primary disease (categorized into three: chronic glomerulonephritis, diabetic nephropathy, and others) were incorporated as the basic correction factors into the analytical models of all the factors associated with HCV antibody positivity. Single-pool Kt/V (Kt/V_{sp}) and normalized protein catabolic rate (nPCR) were calculated using the method proposed by Shinzato et al. (6). In the analyses of predialysis serum creatinine level and nPCR, only the patients on dialysis for two years or longer at the end of 2006 were considered as targets, to avoid the effects of residual kidney function.

RESULTS AND DISCUSSION

I. Tabulation of results of the survey conducted at the end of 2008

A. Basic demographics

1. Number of patients. Table 1 shows a summary of the dynamics of the dialysis patient population in Japan at the end of 2008 obtained from the present survey. Only the data on the years on dialysis and the longest period on dialysis were obtained from the patient survey, whereas all other results were obtained from the facility survey.

The total number of dialysis patients in Japan at the end of 2008 was 283 421, as determined from the facility survey. The number of dialysis patients in Japan at the end of 2007 was 275 242, an increase of 8179 patients (3.0%) from the end of 2007 to the end of 2008.

The number of facilities that responded to the questionnaire at the end of 2008 was 4081, an increase of 29 (0.7%) from the previous year. The number of bedside consoles at the end of 2008 was 111 998, an increase of 3415 (3.1%) from the previous year. The rates of increase in the number of bedside consoles and the number of dialysis patients were higher than the increase in the number of dialysis facilities, similar to the previous years. This finding indicates that the average number of patients treated at each facility has been increasing. The total number of patients for whom dialysis can be simultaneously provided at all the facilities was 110 598 and the maximum capacity of all facilities for the provision of dialysis was 374 782 patients, both of which increased in 2008.

The percentage of patients who received dialysis during the daytime increased slightly to 81.7%, whereas that of those receiving nighttime dialysis decreased to 15.0%. The trends of the increasing percentage of daytime dialysis patients and the decreasing percentage of nighttime dialysis patients have been continuously observed over the last ten years.

TABLE 1. *Current status of chronic dialysis therapy in Japan (as of 31 December 2008)*

Number of facilities	4 081	Increase of 29 (0.7%)
Equipment		
Number of patient stations	111 998	Increase of 3415 (3.1%)
Capacity		
Simultaneous dialysis (people)	110 598	Increase of 3132 (2.9%)
Maximum accommodation capacity (people)	374 782	Increase of 10 496 (2.9%)
Chronic dialysis patients†	283 421	Increase of 8179 (3.0%)
Daytime dialysis	231 517	(81.7%)
Nighttime dialysis	42 405	(15.0%)
Home dialysis	193	(0.1%)
Peritoneal dialysis	9 300	(3.3%)
Patients per million	2 219.6	Increase of 65.4
Number of patients newly introduced to dialysis	38 180	Increase of 1246 (3.4%)
Number of deceased patients	27 266	Increase of 2013 (8.0%)

Duration of dialysis‡ (years)	Male	Female	Unknown	Total	
0–4	86 054	47 773	0	133 827	(49.0%)
5–9	42 055	26 562	0	68 617	(25.1%)
10–14	19 777	13 919	0	33 696	(12.3%)
15–19	9 589	7 676	0	17 265	(6.3%)
20–24	5 306	4 509	0	9 815	(3.6%)
≥25	5 567	4 450	0	10 017	(3.7%)
Total	168 348	104 889	0	273 237	(100.0%)
Longest dialysis history	40 years and 8 months				

†The total number of chronic dialysis patients is the total of the column for the number of patients in Sheet I, and does not necessarily agree with the total number of patients counted according to the method of treatment. ‡The number of dialysis patients was calculated from questionnaire sheets II to IV.

The number of patients treated by home hemodialysis was 193 and has been slightly increasing. As a result of the decreasing number of patients with intermittent peritoneal dialysis (IPD) and the increasing use of the automatic peritoneal dialysis machine, the boundary between continuous ambulatory peritoneal dialysis (CAPD) and IPD became ambiguous. Therefore, the categories of CAPD and IPD in the classification of treatment methods in the facility survey were unified in the 2008 survey into a new category, peritoneal dialysis. Nevertheless, the number of patients treated by peritoneal dialysis was 9300 (3.3%) in 2008, smaller than the number of CAPD patients in 2007 (9314 patients, 3.4%).

According to the patient survey, the longest period on dialysis was 40 years and 8 months.

Table 2 shows the total number of dialysis patients in each prefecture of Japan determined from the facility survey. The number of dialysis patients per million at the end of 2008 was 2219.6. Table 3 shows the changes in the number of dialysis patients per million.

2. Mean age. The dialysis patient population in Japan is aging yearly. The patient survey showed that the mean age of new patients who were started on dialysis in 2008 was 67.2 ± 13.3 years (± SD) and the mean age of the entire dialysis patient population in 2008 was 65.3 ± 12.7 years (Table 4). The dialysis patient population aged by 7.0 years from the end of 1988 to the end of 1998 and by 5.4 years from the end of 1998 to the end of 2008. Thus, the rate of aging of the dialysis patient population has decreased. Similarly, the mean age of new patients started on dialysis increased by 5.8 years from the end of 1988 to the end of 1998, but increased by only 4.5 years from the end of 1998 to the end of 2008. These findings show that the rate of aging of new patients started on dialysis has also decreased.

Table 5 shows the gender and age distributions of new patients started on dialysis in 2008. Table 6 shows the gender and age distributions of all dialysis patients in 2008. The data in these tables were obtained from the patient survey.

3. Primary disease of new patients started on dialysis. Table 7 shows a summary of the primary diseases of new patients started on dialysis in 2008. Table 8 shows a summary of the primary diseases of all patients at the end of 2008.

Table 9 shows changes in the percentages of patients with various primary causes of renal failure (primary diseases) among new patients started on dialysis each year. In 1998, the percentage of patients with diabetic nephropathy as the primary disease became the highest among the new patients started on dialysis and has continued to increase. Previously, the top primary disease was chronic glomerulone-

TABLE 2. *Number of chronic dialysis patients in each prefecture*

Administrative divisions	Daytime	Nighttime	Home hemodialysis	Peritoneal dialysis	Total[†]
Hokkaido	11 924	1 441	7	481	13 853
Aomori Prefecture	2 831	230	0	93	3 154
Iwate Prefecture	2 268	344	0	125	2 737
Miyagi Prefecture	3 821	801	0	73	4 695
Akita Prefecture	1 697	186	0	69	1 952
Yamagata Prefecture	1 820	277	2	156	2 255
Fukushima Prefecture	3 928	385	0	224	4 537
Ibaraki Prefecture	5 581	821	1	125	6 530
Tochigi Prefecture	4 349	768	2	58	5 177
Gunma Prefecture	4 056	816	0	116	4 988
Saitama Prefecture	11 874	1 817	26	374	14 092
Chiba Prefecture	9 873	1 903	0	242	12 013
Tokyo	21 117	5 259	6	827	27 191
Kanagawa Prefecture	13 223	3 199	8	474	16 903
Niigata Prefecture	3 463	1 062	1	171	4 698
Toyama Prefecture	1 839	288	1	67	2 132
Ishikawa Prefecture	1 988	319	0	99	2 406
Fukui Prefecture	1 440	179	0	81	1 700
Yamanashi Prefecture	1 748	223	1	48	2 020
Nagano Prefecture	3 645	633	1	123	4 402
Gifu Prefecture	3 479	629	1	143	4 252
Shizuoka Prefecture	7 479	1 409	4	292	9 184
Aichi Prefecture	11 495	3 179	36	572	15 283
Mie Prefecture	3 105	563	3	133	3 804
Shiga Prefecture	2 075	400	12	112	2 599
Kyoto Prefecture	4 488	1 051	2	241	5 782
Osaka Prefecture	17 175	2 879	45	655	20 754
Hyogo Prefecture	9 523	1 713	14	311	11 561
Nara Prefecture	2 535	312	4	110	2 960
Wakayama Prefecture	2 363	270	1	30	2 664
Tottori Prefecture	1 047	124	0	97	1 268
Shimane Prefecture	1 230	151	0	95	1 476
Okayama Prefecture	3 412	581	0	229	4 221
Hiroshima Prefecture	5 667	600	2	459	6 728
Yamaguchi Prefecture	2 655	400	0	137	3 192
Tokushima Prefecture	2 000	290	0	174	2 464
Kagawa Prefecture	2 025	169	6	242	2 442
Ehime Prefecture	2 737	488	1	154	3 380
Kochi Prefecture	1 835	247	0	40	2 123
Fukuoka Prefecture	10 027	2 223	2	402	12 653
Saga Prefecture	1 659	268	1	12	1 941
Nagasaki Prefecture	2 998	500	1	146	3 651
Kumamoto Prefecture	4 687	919	0	138	5 746
Oita Prefecture	3 047	356	1	126	3 530
Miyazaki Prefecture	2 952	555	0	49	3 556
Kagoshima Prefecture	4 126	469	1	107	4 703
Okinawa Prefecture	3 211	709	0	68	3 988
Total	231 517	42 405	193	9300	283 340

[†]The total number of chronic dialysis patients is the total of the column for the number of patients in Sheet I, and does not necessarily agree with the total number of patients counted according to the method of treatment. The number of dialysis patients was calculated based on facility survey data.

phritis. Among new patients started on dialysis in 2008, the percentage of patients with diabetic nephropathy was 43.3%, a slight decrease from 43.4% in the 2007 survey. Note that the number of new patients started on dialysis in 2008 who had diabetic nephropathy as the primary disease was 16 061, an increase from 15 681 patients in 2007 (1). The percentage of patients with chronic glomerulonephritis, the second most common primary disease, has declined annually, as has the absolute number of such patients. Among all new patients started on dialysis in 2008, the percentage of patients with chronic glomerulonephritis was 22.8%, the lowest since the start of the statistical survey. The percentage of patients with "unspecified" primary diseases was the third highest (10.6%), a 0.4 point increase since 2007, and has increased yearly. In relation to the aging of new dialysis patients, the percentage of patients with nephrosclerosis was 10.6%, a 0.6 point increase from 2007, and the fourth highest. The percentages of patients

TABLE 3. *Changes in the number of patients per million*

Year	Patients per million	Year	Patients per million
1983	443.7	1996	1328.4
1984	497.5	1997	1394.9
1985	547.8	1998	1472.5
1986	604.4	1999	1556.7
1987	658.8	2000	1624.1
1988	721.1	2001	1721.9
1989[†]	790.0	2002	1801.2
1990	835.7	2003	1862.7
1991	937.6	2004	1943.5
1992	995.8	2005	2017.6
1993	1076.4	2006	2069.9
1994	1149.4	2007	2154.2
1995	1229.7	2008	2219.6

[†]The collection rate is corrected at 86%; that is, rounded off at the 100th order. The number of dialysis patients was calculated based on facility survey data.

with polycystic kidney disease, rapidly progressive glomerulonephritis, systemic lupus erythematosus nephritis, and chronic pyelonephritis as the primary diseases were nearly the same as those in previous years.

Table 10 shows the changes in the percentage of patients with different primary diseases among all the dialysis patients each year. Similarly to the trend among new patients started on dialysis each year, the decrease in the percentage of patients with chronic glomerulonephritis as the primary disease of renal failure was clear. The percentage of patients with chronic glomerulonephritis among all the dialysis patients in 2008 was 39.0%, a 1.4 point decrease from 2007. In contrast, the percentage of patients with diabetic nephropathy among all dialysis patients increased to 34.2% in 2008, a 0.8 point increase from 2007, and has been continuously increasing. The primary diseases with the third and fourth largest percentages of patients among all dialysis patients in 2008 were unspecified primary diseases (7.6%) and nephrosclerosis (6.8%), respectively. The percentage of patients with unspecified primary diseases among all dialysis patients was increasing each year, similarly to the pattern among new dialysis patients. The percentages of patients with polycystic kidney disease, chronic pyelonephritis, systemic lupus erythematosus nephritis, and rapidly progressive glomerulonephritis as the primary diseases were nearly the same as those in previous years.

4. Causes of death. Table 11 shows the classification of the causes of death of new patients who were started on dialysis in 2008 and who had died by the end of 2008. Table 12 shows the classification of the causes of death of patients who died in 2008 among the entire dialysis patient population. Table 13 shows changes in the percentages of the leading causes of death in the entire dialysis patient population. The classification of the causes of death was changed to that based on the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) since the survey of 2003.

Similarly to the results in 2004, 2006, and 2007, the leading cause of death of new patients started on dialysis in 2008 was infectious diseases (25.2%). The second, third, fourth, and fifth leading causes were cardiac failure (24.1%), others (10.6%), malignant tumors (9.8%), and cerebrovascular disorder (5.1%), respectively. An obvious overall trend was the increase in the percentage of patients who died of infectious diseases. The percentage of patients who died of cardiac failure has recently shown no marked change after a rapid decrease from 1990 to 1996. The percentage of patients who died of malignant tumors has remained steady at approximately 10% in recent years. The percentage of patients who died of cerebrovascular disorder tended to decrease yearly.

Also among the entire dialysis patient population, the leading cause of death was cardiac failure; the percentage of patients who died of cardiac failure

TABLE 4. *Changes in the mean age of new patients started on dialysis and of patients at the end of each year*

	Mean age of patients newly begun on dialysis treatment		Mean age of patients at the end of each year	
Year	Mean	±SD	Mean	±SD
1983	51.9	15.5	48.3	13.8
1984	53.2	15.3	49.2	13.8
1985	54.4	15.4	50.3	13.7
1986	55.1	15.2	51.1	13.6
1987	55.9	14.9	52.1	13.7
1988	56.9	14.9	52.9	13.6
1989	57.4	14.7	53.8	13.5
1990	58.1	14.6	54.5	13.5
1991	58.1	14.6	55.3	13.5
1992	59.5	14.5	56.0	13.5
1993	59.8	14.4	56.6	13.5
1994	60.4	14.3	57.3	13.5
1995	61.0	14.2	58.0	13.4
1996	61.5	14.2	58.6	13.4
1997	62.2	14.0	59.2	13.4
1998	62.7	13.9	59.9	13.3
1999	63.4	13.9	60.6	13.3
2000	63.8	13.9	61.2	13.2
2001	64.2	13.7	61.6	13.1
2002	64.7	13.6	62.2	13.0
2003	65.4	13.5	62.8	12.9
2004	65.8	13.4	63.3	12.9
2005	66.2	13.4	63.9	12.8
2006	66.4	13.4	64.4	12.8
2007	66.8	13.3	64.9	12.7
2008	67.2	13.3	65.3	12.7

TABLE 5. *Number of new patients started on dialysis in 2008 according to age and gender*

Age of the patients when newly begun on dialysis (years)	Male (%)†	Female (%)†	Subtotal (%)†	No information available	Total (%)†
<5	8 (0.0)	8 (0.1)	16 (0.0)	0	16 (0.0)
5–9	3 (0.0)	3 (0.0)	6 (0.0)	0	6 (0.0)
10–14	7 (0.0)	3 (0.0)	10 (0.0)	0	10 (0.0)
15–19	25 (0.1)	17 (0.1)	42 (0.1)	0	42 (0.1)
20–24	67 (0.3)	30 (0.2)	97 (0.3)	0	97 (0.3)
25–29	99 (0.4)	66 (0.5)	165 (0.4)	0	165 (0.4)
30–34	247 (1.0)	128 (1.0)	375 (1.0)	0	375 (1.0)
35–39	464 (1.9)	219 (1.7)	683 (1.8)	0	683 (1.8)
40–44	663 (2.7)	270 (2.1)	933 (2.5)	0	933 (2.5)
45–49	954 (4.0)	419 (3.3)	1 373 (3.7)	0	1 373 (3.7)
50–54	1 468 (6.1)	613 (4.8)	2 081 (5.6)	0	2 081 (5.6)
55–59	2 706 (11.2)	1 100 (8.5)	3 806 (10.3)	0	3 806 (10.3)
60–64	3 080 (12.8)	1 287 (10.0)	4 367 (11.8)	0	4 367 (11.8)
65–69	3 413 (14.1)	1 597 (12.4)	5 010 (13.5)	0	5 010 (13.5)
70–74	3 791 (15.7)	1 981 (15.4)	5 772 (15.6)	0	5 772 (15.6)
75–79	3 510 (14.5)	2 135 (16.6)	5 645 (15.2)	0	5 645 (15.2)
80–84	2 426 (10.1)	1 772 (13.8)	4 198 (11.3)	0	4 198 (11.3)
85–89	950 (3.9)	971 (7.5)	1 921 (5.2)	0	1 921 (5.2)
90–94	229 (0.9)	229 (1.8)	458 (1.2)	0	458 (1.2)
≥95	25 (0.1)	36 (0.3)	61 (0.2)	0	61 (0.2)
Total	24 135 (100.0)	12 884 (100.0)	37 019 (100.0)	0	37 019 (100.0)
No information available	58	27	85	0	85
Total	24 193	12 911	37 104	0	37 104
Mean	66.32	68.99	67.24	0	67.24
SD	13.01	13.60	13.28	0	13.28

†The value in parentheses on the right-hand side of each number is the percentage of patients with respect to the total of the column.

TABLE 6. *Number of all dialysis patients in 2008 according to age and gender*

Age (years)	Male (%)†	Female (%)†	Subtotal (%)†	No information available	Total (%)†
<5	25 (0.0)	20 (0.0)	45 (0.0)	0	45 (0.0)
5–9	14 (0.0)	13 (0.0)	27 (0.0)	0	27 (0.0)
10–14	18 (0.0)	13 (0.0)	31 (0.0)	0	31 (0.0)
15–19	69 (0.0)	43 (0.0)	112 (0.0)	0	112 (0.0)
20–24	262 (0.2)	148 (0.1)	410 (0.2)	0	410 (0.2)
25–29	676 (0.4)	368 (0.4)	1 044 (0.4)	0	1 044 (0.4)
30–34	1 760 (1.0)	892 (0.9)	2 652 (1.0)	0	2 652 (1.0)
35–39	3 515 (2.1)	1 793 (1.7)	5 308 (1.9)	0	5 308 (1.9)
40–44	5 504 (3.3)	2 783 (2.7)	8 287 (3.0)	0	8 287 (3.0)
45–49	7 908 (4.7)	4 190 (4.0)	12 098 (4.4)	0	12 098 (4.4)
50–54	12 007 (7.1)	6 721 (6.4)	18 728 (6.9)	0	18 728 (6.9)
55–59	21 687 (12.9)	12 315 (11.7)	34 002 (12.4)	0	34 002 (12.4)
60–64	25 547 (15.2)	14 302 (13.6)	39 849 (14.6)	0	39 849 (14.6)
65–69	26 274 (15.6)	15 648 (14.9)	41 922 (15.3)	0	41 922 (15.3)
70–74	24 904 (14.8)	15 192 (14.5)	40 096 (14.7)	0	40 096 (14.7)
75–79	20 141 (12.0)	13 424 (12.8)	33 565 (12.3)	0	33 565 (12.3)
80–84	12 239 (7.3)	10 142 (9.7)	22 381 (8.2)	0	22 381 (8.2)
85–89	4 533 (2.7)	5 219 (5.0)	9 752 (3.6)	0	9 752 (3.6)
90–94	1 116 (0.7)	1 449 (1.4)	2 565 (0.9)	0	2 565 (0.9)
≥95	146 (0.1)	213 (0.2)	359 (0.1)	0	359 (0.1)
Total	168 345 (100.0)	104 888 (100.0)	273 233 (100.0)	0	273 233 (100.0)
No information available	3	1	4	0	4
Total	168 348	104 889	273 237	0	273 237
Mean	64.59	66.51	65.33	0	65.33
SD	12.47	12.87	12.66	0	12.66

†The value in parentheses on the right-hand side of each number is the percentage of patients with respect to the total of the column.

TABLE 7. *Number of new patients started on dialysis in 2008 according to their primary disease and mean age*

Primary disease	Number of patients (%)†	No information available (%)†	Total (%)†	Mean age (years)	SD
Chronic glomerulonephritis	8 411 (22.7)	32 (37.6)	8 443 (22.8)	66.96	14.38
Chronic pyelonephritis	272 (0.7)	1 (1.2)	273 (0.7)	66.40	15.63
Rapidly progressive glomerulonephritis	450 (1.2)	1 (1.2)	451 (1.2)	69.49	12.85
Nephropathy of pregnancy/pregnancy toxemia	77 (0.2)	1 (1.2)	78 (0.2)	57.52	13.32
Other nephritides that cannot be classified	159 (0.4)	0 (0.0)	159 (0.4)	62.55	18.74
Polycystic kidney	913 (2.5)	3 (3.5)	916 (2.5)	61.99	12.52
Nephrosclerosis	3 936 (10.6)	6 (7.1)	3 942 (10.6)	74.07	11.30
Malignant hypertension	282 (0.8)	1 (1.2)	283 (0.8)	66.53	15.65
Diabetic nephropathy	16 053 (43.4)	8 (9.4)	16 061 (43.3)	65.62	11.62
Systemic lupus erythematosus nephritis	280 (0.8)	0 (0.0)	280 (0.8)	61.58	15.74
Amyloidal kidney	145 (0.4)	0 (0.0)	145 (0.4)	66.79	11.22
Gouty kidney	98 (0.3)	0 (0.0)	98 (0.3)	65.45	14.32
Renal failure due to congenital abnormality of metabolism	19 (0.1)	0 (0.0)	19 (0.1)	50.05	22.45
Kidney and urinary tract tuberculosis	22 (0.1)	0 (0.0)	22 (0.1)	72.45	10.84
Kidney and urinary tract stone	67 (0.2)	0 (0.0)	67 (0.2)	70.34	10.49
Kidney and urinary tract tumor	189 (0.5)	2 (2.4)	191 (0.5)	70.62	11.40
Obstructive urinary tract disease	95 (0.3)	0 (0.0)	95 (0.3)	68.58	15.31
Myeloma	159 (0.4)	0 (0.0)	159 (0.4)	70.67	9.89
Hypoplastic kidney	38 (0.1)	3 (3.5)	41 (0.1)	29.55	23.73
Undetermined	3 924 (10.6)	15 (17.6)	3 939 (10.6)	70.33	13.59
Reintroduction after transplantation	247 (0.7)	4 (4.7)	251 (0.7)	55.99	16.26
Others	1 182 (3.2)	8 (9.4)	1 190 (3.2)	67.13	15.78
Total	37 018 (100.0)	85 (100.0)	37 103 (100.0)	67.24	13.28
No information available	1	0	1	81.00	
Total	37 019	85	37 104	67.24	13.28

†The value in parentheses on the right-hand side of each number is the percentage of patients with respect to the total of the column.

TABLE 8. *Number of all dialysis patients in 2008 according to their primary disease and mean age*

Primary disease	Number of patients (%)†	No information available (%)†	Total (%)†	Mean age (years)†	SD
Chronic glomerulonephritis	106 458 (39.0)	2 (50.0)	106 460 (39.0)	64.00	12.78
Chronic pyelonephritis	3 099 (1.1)	0 (0.0)	3 099 (1.1)	63.19	14.21
Rapidly progressive glomerulonephritis	1 851 (0.7)	0 (0.0)	1 851 (0.7)	65.44	14.00
Nephropathy of pregnancy/pregnancy toxemia	1 777 (0.7)	0 (0.0)	1 777 (0.7)	60.48	10.02
Other nephritides that cannot be classified	1 278 (0.5)	0 (0.0)	1 278 (0.5)	58.62	16.86
Polycystic kidney	9 225 (3.4)	0 (0.0)	9 225 (3.4)	63.26	11.01
Nephrosclerosis	18 711 (6.8)	0 (0.0)	18 711 (6.8)	73.11	11.89
Malignant hypertension	2 115 (0.8)	0 (0.0)	2 115 (0.8)	63.20	14.48
Diabetic nephropathy	93 519 (34.2)	1 (25.0)	93 520 (34.2)	65.97	10.99
Systemic lupus erythematosus nephritis	2 295 (0.8)	0 (0.0)	2 295 (0.8)	57.79	13.85
Amyloidal kidney	534 (0.2)	0 (0.0)	534 (0.2)	65.72	11.33
Gouty kidney	1 266 (0.5)	0 (0.0)	1 266 (0.5)	65.90	11.75
Renal failure due to congenital abnormality of metabolism	261 (0.1)	0 (0.0)	261 (0.1)	47.68	17.07
Kidney and urinary tract tuberculosis	364 (0.1)	0 (0.0)	364 (0.1)	69.96	9.68
Kidney and urinary tract stone	554 (0.2)	0 (0.0)	554 (0.2)	69.03	11.42
Kidney and urinary tract tumor	711 (0.3)	0 (0.0)	711 (0.3)	69.91	11.89
Obstructive urinary tract disease	682 (0.2)	0 (0.0)	682 (0.2)	60.86	18.15
Myeloma	225 (0.1)	0 (0.0)	225 (0.1)	69.89	10.26
Hypoplastic kidney	555 (0.2)	0 (0.0)	555 (0.2)	40.15	19.02
Undetermined	20 635 (7.6)	0 (0.0)	20 635 (7.6)	67.61	13.45
Reintroduction after transplantation	2 004 (0.7)	0 (0.0)	2 004 (0.7)	53.59	12.90
Others	5 113 (1.9)	1 (25.0)	5 114 (1.9)	63.20	16.14
Total	273 232 (100.0)	4 (100.0)	273 236 (100.0)	65.33	12.66
No information available	1	0	1	81.00	
Total	273 233	4	273 237	65.33	12.66

†The value in parentheses on the right-hand side of each number is the percentage of patients with respect to the total of the column.

TABLE 9. *Changes in the percentage of new patients started on dialysis each year in terms of primary disease*

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Diabetic nephropathy	15.6	17.4	19.6	21.3	22.1	24.3	26.5	26.2	28.1	28.4	29.9	30.7	31.9
Chronic glomerulonephritis	60.5	58.7	56.0	54.8	54.2	49.9	47.4	46.1	44.2	42.2	41.4	40.5	39.4
Nephrosclerosis	3.0	3.3	3.5	3.7	3.9	3.9	4.1	5.4	5.5	5.9	6.2	6.1	6.3
Polycystic kidney	2.8	2.8	3.1	2.9	3.2	3.1	3.1	2.9	3.0	2.7	2.6	2.5	2.4
Chronic pyelonephritis	2.4	2.2	2.1	2.0	1.8	1.8	1.5	1.5	1.7	1.6	1.1	1.4	1.2
Rapidly progressive glomerulonephritis	0.9	0.7	0.9	1.0	0.8	0.9	0.8	0.7	0.6	0.7	0.8	0.8	0.8
Systemic lupus erythematosus nephritis	1.1	1.1	1.1	1.2	0.9	0.9	1.0	1.1	1.3	1.3	1.2	1.2	1.1
Undetermined	4.4	4.0	4.8	4.2	4.1	3.8	4.0	3.3	3.7	3.7	3.3	3.9	4.5
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Diabetic nephropathy	33.1	33.9	35.7	36.2	36.6	38.1	39.1	41.0	41.3	42.0	42.9	43.4	43.3
Chronic glomerulonephritis	38.9	36.6	35.0	33.6	32.5	32.4	31.9	29.1	28.1	27.4	25.6	23.8	22.8
Nephrosclerosis	6.4	6.8	6.7	7.0	7.6	7.6	7.8	8.5	8.8	9.0	9.4	10.0	10.6
Polycystic kidney	2.5	2.4	2.4	2.2	2.4	2.3	2.4	2.3	2.7	2.3	2.4	2.3	2.5
Chronic pyelonephritis	1.1	1.2	1.1	1.1	1.0	1.1	0.9	1.0	0.9	1.0	0.8	0.8	0.7
Rapidly progressive glomerulonephritis	0.8	1.1	0.9	0.9	1.0	1.0	1.1	1.2	1.1	1.1	1.2	1.3	1.2
Systemic lupus erythematosus nephritis	1.3	1.0	1.1	1.2	0.9	1.0	0.9	0.7	0.8	0.8	0.8	0.8	0.8
Undetermined	5.0	5.5	5.6	6.1	7.6	9.0	8.4	8.8	9.3	9.5	9.9	10.2	10.6

was 23.7% in 2008, a slight decrease from 2007. The percentage of death from cardiac failure among the entire dialysis patient population markedly decreased between 1990 and around 1996, and remained at nearly 24–25% thereafter. This may be due to the improvement in anemia therapy following the clinical application of erythropoietin since the beginning of the 1990s. The percentage of patients who died of infectious diseases among the entire dialysis patient population was 19.9% in 2008, and has tended to gradually increase since 1992. The percentage of patients who died of cerebrovascular disorder has steadily decreased since 1994 and reached as low as 8.6% in 2008. The percentage of patients

TABLE 10. *Changes in the percentage of all patients at the end of each year in terms of primary disease*

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Diabetic nephropathy	7.4	8.4	9.4	10.5	11.7	12.8	14.0	14.9	16.4	17.1	18.2	19.2	20.4
Chronic glomerulonephritis	74.5	72.1	72.3	70.6	69.4	67.9	65.9	64.1	61.7	60.4	58.8	57.7	56.6
Nephrosclerosis	1.5	1.7	1.9	2.0	2.1	2.1	2.3	2.6	2.9	3.1	3.4	3.6	3.8
Polycystic kidney	2.7	2.9	3.0	3.1	3.1	3.2	3.2	3.3	3.3	3.3	3.3	3.2	3.2
Chronic pyelonephritis	3.1	3.3	2.6	2.4	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.8	1.7
Rapidly progressive glomerulonephritis	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Systemic lupus erythematosus nephritis	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1
Undetermined	2.2	2.3	2.3	2.5	2.6	2.5	2.6	2.6	2.9	2.9	2.9	3.1	3.2
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Diabetic nephropathy	21.6	22.7	24.0	25.1	26.0	27.2	28.1	29.2	30.2	31.4	32.3	33.4	34.2
Chronic glomerulonephritis	55.4	54.1	52.5	51.1	49.7	49.6	48.2	46.6	45.1	43.6	42.2	40.4	39.0
Nephrosclerosis	4.0	4.2	4.4	4.5	4.8	5.0	5.1	5.3	5.7	5.9	6.2	6.5	6.8
Polycystic kidney	3.2	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.4	3.3	3.4	3.4	3.4
Chronic pyelonephritis	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.1
Rapidly progressive glomerulonephritis	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Systemic lupus erythematosus nephritis	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.8
Undetermined	3.6	3.9	4.2	4.4	5.0	5.6	5.9	6.3	6.4	6.6	7.0	7.4	7.6

TABLE 11. *Classification of the causes of death of new patients who were started on dialysis and died in 2008*

Cause of death	Male (%)	Female (%)	Total (%)	No information available	Total (%)
Cardiac failure	454 (22.1)	316 (27.6)	770 (24.1)	0	770 (24.1)
Cerebrovascular disease	101 (4.9)	63 (5.5)	164 (5.1)	0	164 (5.1)
Infectious disease	531 (25.9)	275 (24.0)	806 (25.2)	0	806 (25.2)
Hemorrhage	46 (2.2)	28 (2.4)	74 (2.3)	0	74 (2.3)
Malignant tumor	230 (11.2)	83 (7.2)	313 (9.8)	0	313 (9.8)
Cachexia/uremia	51 (2.5)	38 (3.3)	89 (2.8)	0	89 (2.8)
Cardiac infarction	52 (2.5)	38 (3.3)	90 (2.8)	0	90 (2.8)
Potassium poisoning/moribund	64 (3.1)	36 (3.1)	100 (3.1)	0	100 (3.1)
Chronic hepatitis/cirrhosis	39 (1.9)	19 (1.7)	58 (1.8)	0	58 (1.8)
Encephalopathy	1 (0.0)	1 (0.1)	1 (0.0)	0	1 (0.0)
Suicide/refusal of treatment	35 (1.7)	12 (1.0)	47 (1.5)	0	47 (1.5)
Intestinal obstruction	15 (0.7)	9 (0.8)	24 (0.8)	0	24 (0.8)
Lung thrombus/pulmonary embolus	5 (0.2)	5 (0.4)	10 (0.3)	0	10 (0.3)
Death due to disaster	9 (0.4)	2 (0.2)	11 (0.3)	0	11 (0.3)
Others	211 (10.3)	129 (11.3)	340 (10.6)	0	340 (10.6)
Undetermined	210 (10.2)	93 (8.1)	303 (9.5)	0	303 (9.5)
Total	2054 (100.0)	1146 (100.0)	3200 (100.0)	0	3200 (100.0)
No information available	0	0	0	0	0
Total	2054	1146	3200	0	3200

who died of myocardial infarction has also gradually decreased from 8.4% in 1997 to 4.1% in 2008. The percentage of patients who died of malignant tumors was 9.2%, equal to that in 2007. The percentage of patients who died of "unspecified" diseases has increased gradually each year, similar to the trends in the primary disease.

5. Annual crude death rate. The annual crude death rate was calculated from the facility survey data. It shows the percentage of patients who died in a given year with respect to the mean annual number of dialysis patients. The annual crude death rate in 2008 was 9.8%. Table 14 shows the trend of annual crude death rates since 1983. It is expected that the annual crude death rate will increase because of the increase in the number of patients with a poor prognosis, such as older dialysis patients, diabetic patients, and patients with nephrosclerosis. The annual crude death rate has remained at approximately 9.5% since exceeding 9% in 1992; however, the rate was 9.8% in 2008, as mentioned above. This rate seems to be gradually increasing, as seen from the changes in the annual crude death rate since 2000 (Table 14).

6. Cumulative survival rate of new patients started on dialysis each year. The cumulative survival rates of new patients started on dialysis from 1983 are

TABLE 12. *Classification of the causes of death of all patients who died in 2008*

Cause of death	Male (%)	Female (%)	Total (%)	No information available	Total (%)
Cardiac failure	3 586 (22.0)	2483 (26.6)	6 069 (23.7)	0	6 069 (23.7)
Cerebrovascular disease	1 397 (8.6)	810 (8.7)	2 207 (8.6)	1	2 208 (8.6)
Infectious disease	3 298 (20.2)	1802 (19.3)	5 100 (19.9)	0	5 100 (19.9)
Hemorrhage	281 (1.7)	189 (2.0)	470 (1.8)	1	471 (1.8)
Malignant tumor	1 685 (10.3)	667 (7.2)	2 352 (9.2)	0	2 352 (9.2)
Cachexia/uremia	431 (2.6)	335 (3.6)	766 (3.0)	0	766 (3.0)
Cardiac infarction	704 (4.3)	352 (3.8)	1 056 (4.1)	0	1 056 (4.1)
Potassium poisoning/moribund	814 (5.0)	401 (4.3)	1 215 (4.7)	0	1 215 (4.7)
Chronic hepatitis/cirrhosis	241 (1.5)	85 (0.9)	326 (1.3)	0	326 (1.3)
Encephalopathy	8 (0.0)	4 (0.0)	12 (0.0)	0	12 (0.0)
Suicide/refusal of treatment	185 (1.1)	55 (0.6)	240 (0.9)	0	240 (0.9)
Intestinal obstruction	148 (0.9)	117 (1.3)	265 (1.0)	0	265 (1.0)
Lung thrombus/pulmonary embolus	38 (0.2)	29 (0.3)	67 (0.3)	0	67 (0.3)
Death due to disaster	138 (0.8)	45 (0.5)	183 (0.7)	0	183 (0.7)
Others	1 468 (9.0)	1027 (11.0)	2 495 (9.7)	0	2 495 (9.7)
Undetermined	1 866 (11.5)	918 (9.9)	2 784 (10.9)	0	2 784 (10.9)
Total	16 288 (100.0)	9319 (100.0)	25 607 (100.0)	2	25 609 (100.0)
No information available	0	1	1	0	1
Total	16 288	9320	25 608	2	25 610

TABLE 13. *Annual changes in the major causes of death*

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Cardiac failure	30.3	30.5	31.3	33.2	32.7	36.5	33.4	30.4	30.5	31.1	29.9	28.2	25.4
Infectious disease	11.0	11.5	11.5	12.0	12.0	12.2	11.7	11.6	12.1	11.3	12.2	12.6	13.8
Cerebrovascular disease	14.2	15.4	14.2	14.0	14.2	12.9	13.2	13.9	13.7	13.6	13.5	14.1	13.5
Malignant tumor	7.7	6.9	6.4	6.9	5.8	6.9	7.6	8.2	7.6	7.1	7.4	7.3	7.2
Cardiac infarction	5.3	4.8	5.3	6.1	6.0	5.4	5.3	5.8	5.8	5.8	5.7	7.1	7.5
Others	5.1	4.9	5.7	4.7	5.2	4.8	4.4	4.6	4.4	4.5	4.1	4.5	5.8
Unspecified	1.9	2	2.8	2.2	2.4	1.6	1.9	2.1	1.8	2.5	2.6	2.8	3.2

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cardiac failure	24.1	23.9	24.1	24.3	23.2	25.5	25.1	25.0	25.1	25.8	24.9	24.0	23.7
Infectious disease	14.6	14.9	15.0	16.3	16.6	16.3	15.9	18.5	18.8	19.2	19.9	18.9	19.9
Cerebrovascular disease	12.9	12.6	12.1	11.3	11.3	11.6	11.2	10.7	10.6	9.8	9.4	8.9	8.6
Malignant tumor	7.7	8.1	7.7	7.6	8.3	8.5	8.5	8.5	9.0	9.0	9.2	9.2	9.2
Cardiac infarction	7.4	8.4	7.9	7.4	7.0	7.4	7.4	6.2	5.4	5.1	4.4	4.4	4.1
Others	6.3	6.7	7.0	7.7	7.9	9.1	9.0	9.7	10.3	9.1	9.5	9.7	9.7
Unspecified	2.5	3.5	3.9	3.6	8.1	5.7	6.6	5.6	6.5	7.3	8.3	10.3	10.9

summarized by year of introduction (Table 15). The 1-, 5-, 10-, 15-, 20-, and 25-year survival rates of patients started on dialysis have been extracted from the table and plotted in Figure 1.

The one- to ten-year survival rates have been increasing since 1992 for patients started on dialysis in 1992 or later. The significant change around 1992 was due to the clinical use of erythropoietin. This trend of increasing survival rate for patients started on dialysis after 1992 may be due to the improvement of anemia therapy using erythropoietin starting at the initial phase of dialysis.

The 15-year and longer survival rates of patients started on dialysis after 1992 are still unclear because only data from patients started on dialysis before 1992 are used for calculating the 15-year and longer survival rates. It will be interesting to determine whether the 15-year and longer survival rates will also increase for the patients started on dialysis after 1992.

TABLE 14. *Change in the annual crude death rate*

Year	Crude death rate (%)	Year	Crude death rate (%)
1983	9.0	1996	9.4
1984	8.9	1997	9.4
1985	9.1	1998	9.2
1986	9.0	1999	9.7
1987	8.5	2000	9.2
1988	9.2	2001	9.3
1989	7.9	2002	9.2
1990	9.6	2003	9.3
1991	8.9	2004	9.4
1992	9.7	2005	9.5
1993	9.4	2006	9.2
1994	9.5	2007	9.4
1995	9.7	2008	9.8

B. Current status of dialysate quality control

Following the 2006 and 2007 surveys, the surveyed items included: (i) the frequency of measurement and the endotoxin concentration in the dialysate; (ii) the frequency of measurement of the bacterial count in the dialysate; (iii) the bacterial count in the dialysate; (iv) the medium used for bacterial cultivation of the dialysate; (v) the volume of the sample taken for the measurement of the bacterial count in the dialysate; and (vi) the installation of an endotoxin retentive filter (ETRF).

In the guidelines of JSDT on dialysate quality control published in 2008 by the academic committee of the Japanese Society for Dialysis Therapy, the unit of endotoxin concentration was changed from EU/L to EU/mL (7). This report also followed this change

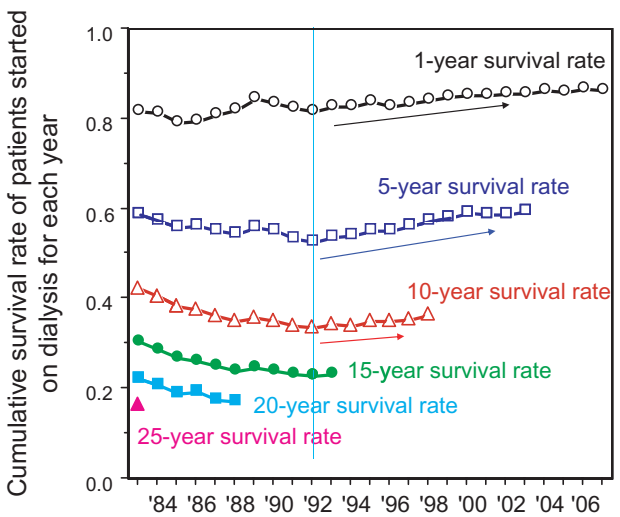

FIG. 1. Changes in the cumulative survival rate of patients started on dialysis for each year.

TABLE 15. *Survival rates of new patients started on dialysis since 1983*

Year of introduction	Number of patients	1-year survival rate	2-year survival rate	3-year survival rate	4-year survival rate	5-year survival rate	6-year survival rate	7-year survival rate	8-year survival rate	9-year survival rate	10-year survival rate	11-year survival rate	12-year survival rate	13-year survival rate	14-year survival rate	15-year survival rate	16-year survival rate	17-year survival rate	18-year survival rate	19-year survival rate	20-year survival rate	21-year survival rate	22-year survival rate	23-year survival rate	24-year survival rate	25-year survival rate
1983	9 902	0.819	0.748	0.683	0.634	0.590	0.557	0.524	0.486	0.457	0.426	0.396	0.372	0.349	0.330	0.308	0.289	0.273	0.256	0.242	0.227	0.214	0.201	0.190	0.180	0.167
1984	10 745	0.817	0.735	0.671	0.620	0.577	0.538	0.498	0.466	0.436	0.408	0.379	0.355	0.330	0.309	0.289	0.272	0.254	0.240	0.228	0.213	0.200	0.190	0.181	0.169	
1985	11 646	0.795	0.720	0.661	0.610	0.564	0.522	0.486	0.446	0.414	0.386	0.362	0.337	0.312	0.290	0.272	0.254	0.237	0.223	0.209	0.193	0.181	0.170	0.158		
1986	12 636	0.799	0.725	0.667	0.619	0.566	0.521	0.480	0.445	0.408	0.379	0.352	0.328	0.305	0.284	0.267	0.250	0.234	0.221	0.209	0.196	0.183	0.173			
1987	13 596	0.815	0.738	0.672	0.608	0.557	0.507	0.463	0.427	0.394	0.365	0.339	0.315	0.294	0.272	0.254	0.239	0.221	0.204	0.191	0.181	0.171				
1988	14 801	0.825	0.741	0.668	0.604	0.549	0.500	0.457	0.420	0.385	0.354	0.328	0.304	0.283	0.261	0.243	0.226	0.212	0.198	0.187	0.175					
1989	14 610	0.849	0.762	0.688	0.619	0.563	0.514	0.468	0.429	0.393	0.362	0.336	0.310	0.288	0.268	0.250	0.233	0.218	0.204	0.193						
1990	16 566	0.839	0.750	0.675	0.610	0.556	0.503	0.460	0.420	0.385	0.354	0.326	0.301	0.279	0.261	0.244	0.228	0.212	0.196							
1991	18 248	0.828	0.735	0.662	0.598	0.539	0.488	0.445	0.407	0.375	0.345	0.318	0.293	0.273	0.254	0.237	0.221	0.206								
1992	19 942	0.822	0.728	0.652	0.589	0.532	0.484	0.440	0.402	0.369	0.342	0.316	0.291	0.272	0.250	0.232	0.216									
1993	20 937	0.833	0.743	0.667	0.599	0.543	0.492	0.447	0.409	0.376	0.346	0.319	0.295	0.272	0.253	0.237										
1994	21 458	0.830	0.744	0.670	0.605	0.546	0.493	0.450	0.412	0.376	0.345	0.316	0.293	0.271	0.251											
1995	22 965	0.841	0.754	0.680	0.612	0.554	0.505	0.462	0.424	0.388	0.356	0.327	0.302	0.278												
1996	25 024	0.833	0.751	0.675	0.611	0.557	0.510	0.459	0.421	0.386	0.354	0.326	0.299													
1997	25 682	0.839	0.753	0.683	0.623	0.566	0.516	0.472	0.429	0.393	0.360	0.331														
1998	26 989	0.846	0.766	0.699	0.638	0.578	0.528	0.479	0.438	0.402	0.370															
1999	27 960	0.852	0.775	0.709	0.643	0.584	0.533	0.486	0.446	0.406																
2000	29 509	0.857	0.779	0.714	0.651	0.594	0.541	0.495	0.451																	
2001	31 156	0.856	0.777	0.710	0.644	0.590	0.538	0.491																		
2002	31 841	0.859	0.782	0.714	0.652	0.593	0.540																			
2003	33 011	0.862	0.785	0.719	0.657	0.600																				
2004	34 200	0.868	0.792	0.726	0.666																					
2005	35 224	0.864	0.790	0.723																						
2006	36 240	0.872	0.796																							
2007	37 228	0.869																								

and adopted EU/mL for the unit of endotoxin concentration instead of EU/L, which was used in the 2007 report. In the 2008 survey, 3201 facilities responded to questions regarding endotoxin concentration in the dialysate; however, answers that may have resulted from misunderstanding the unit of measurement of endotoxin concentration were found in the responses collected from many facilities. Therefore, the tabulation results on endotoxin concentration in the dialysate are not provided in this report. We sincerely apologize to all the people who cooperated in this survey for the omission of endotoxin concentration data from this report.

1. *Frequency of measurement of the endotoxin concentration in the dialysate.* There were 3784 facilities that responded to questions regarding the frequency of measurement of the endotoxin concentration in the dialysate. Table 16 shows a summary of the frequency of measurement of the endotoxin concentration in the dialysate in different medical organizations. The frequencies of measurement of the endotoxin concentration in the dialysate in all types of medical organizations were almost the same as those in the previous year (1); namely, the endotoxin concentration in the dialysate was measured at least once a year in 87.5% of the facilities that responded to the questionnaire. However, the percentage of facilities that carried out the measurement more than once a month, as recommended in the quality control standard of the Japanese Society for Dialysis Therapy, was only 33.1%. This finding indicates that the promotion of more frequent measurement in facilities is required.

2. *Frequency of measurement of bacterial count in the dialysate.* There were 3607 facilities that responded to questions regarding the frequency of measurement of the bacterial count in the dialysate (Table 17). A bacterial test was carried out at 54.5% of these facilities, a 4.4 point increase from the end of 2007 (1). The quality control standard issued by the Japanese Society for Dialysis Therapy (7) recommends that the bacterial count in the dialysate be measured more than once a month. However, the percentage of facilities that carried out the test more than once a month was only 20.8%, indicating that the promotion of more frequent measurement in facilities is required.

3. *Bacterial count in the dialysate.* Bacterial counts in the dialysate were reported by 1805 facilities, 97.6% of which satisfied the quality control standard

TABLE 16. *Measurement frequency of the dialysate solution endotoxin concentration at different medical facilities*

	Measurement frequency of dialysate solution endotoxin concentration										
Kind of facility	None	Every day	Every week	Every two weeks	Every month	Several times per year	Once a year	Subtotal	Unspecified	No information available	Total
National public university hospital	4	0	0	1	20	20	5	50	1	1	52
(%)	(8.0)	(0.0)	(0.0)	(2.0)	(40.0)	(40.0)	(10.0)	(100.0)			
Private university hospital	6	0	2	5	24	21	3	61	0	1	62
(%)	(9.8)	(0.0)	(3.3)	(8.2)	(39.3)	(34.4)	(4.9)	(100.0)			
National hospital	12	0	1	0	7	11	7	38	3	0	41
(%)	(31.6)	(0.0)	(2.6)	(0.0)	(18.4)	(28.9)	(18.4)	(100.0)			
Prefectural municipal village hospital	50	0	2	11	93	176	64	396	30	12	438
(%)	(12.6)	(0.0)	(0.5)	(2.8)	(23.5)	(44.4)	(16.2)	(100.0)			
Social insurance hospital	5	0	1	4	13	28	7	58	2	1	61
(%)	(8.6)	(0.0)	(1.7)	(6.9)	(22.4)	(48.3)	(12.1)	(100.0)			
“Kouseiren”† hospital	8	0	1	7	35	43	19	113	7	1	121
(%)	(7.1)	(0.0)	(0.9)	(6.2)	(31.0)	(38.1)	(16.8)	(100.0)			
Other public hospital	24	0	8	9	48	64	23	176	7	0	183
(%)	(13.6)	(0.0)	(4.5)	(5.1)	(27.3)	(36.4)	(13.1)	(100.0)			
Private general hospital	15	1	1	6	28	41	13	105	5	2	112
(%)	(14.3)	(1.0)	(1.0)	(5.7)	(26.7)	(39.0)	(12.4)	(100.0)			
Private hospital	120	9	20	60	258	396	172	1035	74	10	1119
(%)	(11.6)	(0.9)	(1.9)	(5.8)	(24.9)	(38.3)	(16.6)	(100.0)			
Private clinic	230	7	37	134	400	664	280	1752	115	25	1892
(%)	(13.1)	(0.4)	(2.1)	(7.6)	(22.8)	(37.9)	(16.0)	(100.0)			
Total	474	17	73	237	926	1464	593	3784	244	53	4081
(%)	(12.5)	(0.4)	(1.9)	(6.3)	(24.5)	(38.7)	(15.7)	(100.0)			

†Kouseiren: a welfare association belonging to agricultural cooperative associations.

TABLE 17. *Measurement frequency of the dialysate solution bacterial count at different medical facilities*

	Measurement frequency of the dialysate solution bacterial count										
Kind of facility	None	Every day	Every week	Every two weeks	Every month	Several times per year	Once a year	Subtotal	Unspecified	No information available	Total
National public university hospital	18	0	0	0	16	12	4	50	1	1	52
(%)	(36.0)	(0.0)	(0.0)	(0.0)	(32.0)	(24.0)	(8.0)	(100.0)			
Private university hospital	18	0	1	3	14	20	3	59	2	1	62
(%)	(30.5)	(0.0)	(1.7)	(5.1)	(23.7)	(33.9)	(5.1)	(100.0)			
National hospital	24	0	1	1	3	4	2	35	6	0	41
(%)	(68.6)	(0.0)	(2.9)	(2.9)	(8.6)	(11.4)	(5.7)	(100.0)			
Prefectural municipal village hospital	178	0	1	8	49	88	45	369	57	12	438
(%)	(48.2)	(0.0)	(0.3)	(2.2)	(13.3)	(23.8)	(12.2)	(100.0)			
Social insurance hospital	15	0	2	0	7	20	7	51	9	1	61
(%)	(29.4)	(0.0)	(3.9)	(0.0)	(13.7)	(39.2)	(13.7)	(100.0)			
“Kouseiren”† hospital	36	0	0	2	29	30	10	107	13	1	121
(%)	(33.6)	(0.0)	(0.0)	(1.9)	(27.1)	(28.0)	(9.3)	(100.0)			
Other public hospital	78	0	2	4	29	35	21	169	13	1	183
(%)	(46.2)	(0.0)	(1.2)	(2.4)	(17.2)	(20.7)	(12.4)	(100.0)			
Private general hospital	53	0	0	4	18	14	10	99	11	2	112
(%)	(53.5)	(0.0)	(0.0)	(4.0)	(18.2)	(14.1)	(10.1)	(100.0)			
Private hospital	442	3	11	38	172	223	100	989	119	11	1119
(%)	(44.7)	(0.3)	(1.1)	(3.8)	(17.4)	(22.5)	(10.1)	(100.0)			
Private clinic	778	5	15	86	227	373	195	1679	187	26	1892
(%)	(46.3)	(0.3)	(0.9)	(5.1)	(13.5)	(22.2)	(11.6)	(100.0)			
Total	1640	8	33	146	564	819	397	3607	418	56	4081
(%)	(45.5)	(0.2)	(0.9)	(4.0)	(15.6)	(22.7)	(11.0)	(100.0)			

†Kouseiren: a welfare association belonging to agricultural cooperative associations.

TABLE 18. *Dialysate solution bacterial counts for different medical facilities*

Kind of facility	Dialysate solution bacterial count (cfu/mL) <0.1	0.1–0.9	1–9	10–99	≥100	Subtotal	Unspecified	No information available	Total
National public university hospital	9	7	9	2	0	27	6	19	52
(%)	(33.3)	(25.9)	(33.3)	(7.4)	(0.0)	(100.0)			
Private university hospital	21	11	7	1	1	41	2	19	62
(%)	(51.2)	(26.8)	(17.1)	(2.4)	(2.4)	(100.0)			
National hospital	8	1	2	1	0	12	5	24	41
(%)	(66.7)	(8.3)	(16.7)	(8.3)	(0.0)	(100.0)			
Prefectural municipal village hospital	86	30	45	15	2	178	69	191	438
(%)	(48.3)	(16.9)	(25.3)	(8.4)	(1.1)	(100.0)			
Social insurance hospital	20	2	5	4	1	32	13	16	61
(%)	(62.5)	(6.3)	(15.6)	(12.5)	(3.1)	(100.0)			
"Kouseiren"[†] hospital	38	13	9	7	1	68	16	37	121
(%)	(55.9)	(19.1)	(13.2)	(10.3)	(1.5)	(100.0)			
Other public hospital	51	16	13	5	0	85	19	79	183
(%)	(60.0)	(18.8)	(15.3)	(5.9)	(0.0)	(100.0)			
Private general hospital	21	5	11	3	2	42	15	55	112
(%)	(50.0)	(11.9)	(26.2)	(7.1)	(4.8)	(100.0)			
Private hospital	227	108	98	49	17	499	166	454	1119
(%)	(45.5)	(21.6)	(19.6)	(9.8)	(3.4)	(100.0)			
Private clinic	434	158	149	61	19	821	264	807	1892
(%)	(52.9)	(19.2)	(18.1)	(7.4)	(2.3)	(100.0)			
Total	915	351	348	148	43	1805	575	1701	4081
(%)	(50.7)	(19.4)	(19.3)	(8.2)	(2.4)	(100.0)			

[†]Kouseiren: a welfare association belonging to agricultural cooperative associations.

(7) of the Japanese Society for Dialysis Therapy (i.e. <100 cfu/mL) (Table 18). The percentage of facilities that satisfied the ultrapure dialysate level of <0.1 cfu/mL was 50.7%.

4. Medium used for bacterial cultivation of the dialysate. According to the quality control standard of the Japanese Society for Dialysis Therapy, the use of an oligotrophic medium, for example, Reasoner's No. 2 agar (R2A) and tryptone glucose extract agar (TGEA), is recommended for the cultivation of bacteria in the dialysate (7). The survey result showed that these media were used at 77.0% of the facilities (Table 19).

TABLE 19. *Dialysate solution bacterial counts for different cultivation media*

Media used for bacterial cultivation of the dialysate solution	Dialysate solution bacterial count (cfu/mL) <0.1	0.1–0.9	1–9	10–99	≥100	Subtotal	Unspecified	No information available	Total
General agar medium	121	42	33	19	2	217	17	1	235
(%)	(55.8)	(19.4)	(15.2)	(8.8)	(0.9)	(100.0)			
R2A medium	523	227	246	94	26	1116	57	2	1175
(%)	(46.9)	(20.3)	(22.0)	(8.4)	(2.3)	(100.0)			
TGEA medium	115	45	29	9	1	199	6	0	205
(%)	(57.8)	(22.6)	(14.6)	(4.5)	(0.5)	(100.0)			
Blood agar medium	22	4	5	3	1	35	7	0	42
(%)	(62.9)	(11.4)	(14.3)	(8.6)	(2.9)	(100.0)			
TSA medium	6	4	3	3	0	16	0	0	16
(%)	(37.5)	(25.0)	(18.8)	(18.8)	(0.0)	(100.0)			
Other media	57	16	17	7	3	100	20	0	120
(%)	(57.0)	(16.0)	(17.0)	(7.0)	(3.0)	(100.0)			
Subtotal	844	338	333	135	33	1683	107	3	1793
(%)	(50.1)	(20.1)	(19.8)	(8.0)	(2.0)	(100.0)			
Unspecified	71	13	15	13	10	122	468	1032	1622
(%)	(58.2)	(10.7)	(12.3)	(10.7)	(8.2)	(100.0)			
No information available	0	0	0	0	0	0	0	666	666
(%)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)			
Total	915	351	348	148	43	1805	575	1701	4081
(%)	(50.7)	(19.4)	(19.3)	(8.2)	(2.4)	(100.0)			

R2A, Reasoner's No 2 agar; TGEA, tryptone glucose extract agar; TSA, tryptic soy agar.

TABLE 20. *Bacterial counts in dialysate for different volumes of sample for measurement of bacterial counts*

	Dialysate solution bacterial count (cfu/mL)								
Amount of sample	<0.1	0.1–0.9	1–9	10–99	≥100	Subtotal	Unspecified	No information available	Total
<1 mL	119	27	25	9	1	181	18	1	200
(%)	(65.7)	(14.9)	(13.8)	(5.0)	(0.6)	(100.0)			
1–9 mL	304	140	131	54	14	643	66	2	711
(%)	(47.3)	(21.8)	(20.4)	(8.4)	(2.2)	(100.0)			
10–49 mL	212	82	95	39	10	438	32	0	470
(%)	(48.4)	(18.7)	(21.7)	(8.9)	(2.3)	(100.0)			
50–99 mL	165	61	56	26	6	314	13	0	327
(%)	(52.5)	(19.4)	(17.8)	(8.3)	(1.9)	(100.0)			
100–499 mL	63	23	24	9	6	125	3	0	128
(%)	(50.4)	(18.4)	(19.2)	(7.2)	(4.8)	(100.0)			
500–999 mL	7	6	8	2	0	23	3	0	26
(%)	(30.4)	(26.1)	(34.8)	(8.7)	(0.0)	(100.0)			
1–9 L	15	6	0	6	2	29	1	0	30
(%)	(51.7)	(20.7)	(0.0)	(20.7)	(6.9)	(100.0)			
≥10 L	6	0	0	0	0	6	0	0	6
(%)	(100.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Subtotal	891	345	339	145	39	1759	136	3	1898
(%)	(50.7)	(19.6)	(19.3)	(8.2)	(2.2)	(100.0)			
Unspecified	24	6	9	3	4	46	439	1034	1519
(%)	(52.2)	(13.0)	(19.6)	(6.5)	(8.7)	(100.0)			
No information available	0	0	0	0	0	0	0	664	664
(%)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)			
Total	915	351	348	148	43	1805	575	1701	4081
(%)	(50.7)	(19.4)	(19.3)	(8.2)	(2.4)	(100.0)			

5. Volume of sample for measurement of the bacterial count in the dialysate. Generally, the volume of a sample used to measure bacterial count in plate media is less than 1 mL. However, at least 10 mL of a sample is required to measure bacterial counts of <0.1 cfu/mL in the dialysate, which is the count required to maintain an ultrapure dialysate (7). The volume of the sample dialysate used for measurement of bacterial count was 10 mL or more at 52.0% of the facilities that responded to the questions regarding the volume of the sample (Table 20).

6. Installation of an ETRF. There were 4019 facilities that responded to the questions regarding the installation of an ETRF (Table 21). At least one console was equipped with an ETRF at 84.0% of these facilities. According to the 2007 survey, the percentage of facilities that have at least one console equipped with an ETRF was 82.1% (1); therefore, the percentage of such facilities increased by 1.9 points from 2007 to 2008.

C. Current status of dialysis conditions

1. Frequency of dialysis per week. A total of 95.4% of patients treated by facility hemodialysis and 98.2% of those treated by hemodiafiltration underwent treatment three times per week (Table 22). Few patients underwent treatment four or more times per week. In contrast, the percentage of patients who underwent home hemodialysis, which can be more freely performed than facility hemodialysis, three times per week was only 68.1%, and the percentage of patients who underwent home hemodialysis at least four times per week was high at 22.7% and 3.5% for four and five times per week, respectively. However, the percentage of patients who underwent treatment six or more times per week was low (5.7%), even for patients treated by home hemodialysis.

2. Dialysis duration. The percentages of patients who underwent dialysis treatment for four hours at one time were 66.5% for facility hemodialysis and 63.4% for hemodiafiltration (Table 23). Approximately two-thirds of the patients treated by facility hemodialysis and hemodiafiltration underwent each treatment for four-hour sessions. The percentages of patients who underwent facility hemodialysis for fewer than four hours and for at least four and a half hours were 22.6% and 10.9%, respectively. The mean duration of dialysis for patients treated by facility hemodialysis was 3.92 ± 0.53 hours.

On the other hand, 11.7% of patients underwent hemodiafiltration for fewer than four hours and 24.7% were treated for at least four and a half hours. The percentage of patients who underwent short dialysis is lower for hemodiafiltration than for facility hemodialysis. Approximately one quarter of the

TABLE 21. *Percentages of bedside consoles with an endotoxin retentive filter (ETRF) for different medical facilities*

	Percentages of bedside consoles with ETRF														
Kind of facility	0 (No ETRF)	<10	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	≥90	100 (All consoles equipped with ETRF)	Subtotal	No information available	Total
National public university hospital	4	0	0	1	0	0	0	0	0	0	1	45	51	1	52
(%)	(7.8)	(0.0)	(0.0)	(2.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(2.0)	(88.2)	(100.0)		
Private university hospital	4	0	2	2	0	3	3	0	4	3	4	37	62	0	62
(%)	(6.5)	(0.0)	(3.2)	(3.2)	(0.0)	(4.8)	(4.8)	(0.0)	(6.5)	(4.8)	(6.5)	(59.7)	(100.0)		
National hospital	3	0	0	2	0	1	0	2	1	1	3	28	41	0	41
(%)	(7.3)	(0.0)	(0.0)	(4.9)	(0.0)	(2.4)	(0.0)	(4.9)	(2.4)	(2.4)	(7.3)	(68.3)	(100.0)		
Prefectural municipal village hospital	48	15	18	9	13	10	8	7	12	10	26	255	431	7	438
(%)	(11.1)	(3.5)	(4.2)	(2.1)	(3.0)	(2.3)	(1.9)	(1.6)	(2.8)	(2.3)	(6.0)	(59.2)	(100.0)		
Social insurance hospital	6	3	5	4	2	3	2	1	2	5	4	24	61	0	61
(%)	(9.8)	(4.9)	(8.2)	(6.6)	(3.3)	(4.9)	(3.3)	(1.6)	(3.3)	(8.2)	(6.6)	(39.3)	(100.0)		
"Kouseiren"[†] hospital	6	5	9	4	5	2	5	1	3	2	6	72	120	1	121
(%)	(5.0)	(4.2)	(7.5)	(3.3)	(4.2)	(1.7)	(4.2)	(0.8)	(2.5)	(1.7)	(5.0)	(60.0)	(100.0)		
Other public hospital	15	7	13	5	3	2	4	10	7	4	8	105	183	0	183
(%)	(8.2)	(3.8)	(7.1)	(2.7)	(1.6)	(1.1)	(2.2)	(5.5)	(3.8)	(2.2)	(4.4)	(57.4)	(100.0)		
Private general hospital	17	6	5	2	3	1	2	2	1	0	6	64	109	3	112
(%)	(15.6)	(5.5)	(4.6)	(1.8)	(2.8)	(0.9)	(1.8)	(1.8)	(0.9)	(0.0)	(5.5)	(58.7)	(100.0)		
Private hospital	153	62	63	38	36	20	25	21	18	32	47	588	1103	16	1119
(%)	(13.9)	(5.6)	(5.7)	(3.4)	(3.3)	(1.8)	(2.3)	(1.9)	(1.6)	(2.9)	(4.3)	(53.3)	(100.0)		
Private clinic	386	123	105	82	51	50	38	37	37	42	68	839	1858	34	1892
(%)	(20.8)	(6.6)	(5.7)	(4.4)	(2.7)	(2.7)	(2.0)	(2.0)	(2.0)	(2.3)	(3.7)	(45.2)	(100.0)		
Total	642	221	220	149	113	92	87	81	85	99	173	2057	4019	62	4081
(%)	(16.0)	(5.5)	(5.5)	(3.7)	(2.8)	(2.3)	(2.2)	(2.0)	(2.1)	(2.5)	(4.3)	(51.2)	(100.0)		

[†]Kouseiren: a welfare association belonging to agricultural cooperative associations.

TABLE 22. *Frequency of dialysis per week for different dialysis methods (those using extracorporeal circulation†)*

Method of dialysis	Frequency of dialysis per week (times/week)							Subtotal	No information available	Total	Mean	SD
	1	2	3	4	5	6	7					
Facility hemodialysis	863	9071	214 311	441	7	8	1	224 702	20 388	245 090	2.95	0.24
%	(0.4)	(4.0)	(95.4)	(0.2)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemodiafiltration	20	200	15 578	63	0	0	1	15 862	1 518	17 380	2.99	0.15
%	(0.1)	(1.3)	(98.2)	(0.4)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemofiltration	1	14	222	0	1	0	0	238	10	248	2.94	0.30
%	(0.4)	(5.9)	(93.3)	(0.0)	(0.4)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	1	5	1 590	4	0	0	0	1 600	95	1 695	3.00	0.09
%	(0.1)	(0.3)	(99.4)	(0.3)	(0.0)	(0.0)	(0.0)	(100.0)				
Home hemodialysis	0	0	96	32	5	7	1	141	47	188	3.48	0.84
%	(0.0)	(0.0)	(68.1)	(22.7)	(3.5)	(5.0)	(0.7)	(100.0)				
Total	885	9290	231 797	540	13	15	3	242 543	22 058	264 601	2.96	0.23
%	(0.4)	(3.8)	(95.6)	(0.2)	(0.0)	(0.0)	(0.0)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 23. *Dialysis durations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Dialysis duration (h)										Subtotal	No information available	Total	Mean	SD
	<3.0	3.0–3.4	3.5–3.9	4.0–4.4	4.5–4.9	5.0–5.4	5.5–5.9	6.0–6.4	6.5–6.9	≥7.0					
Facility hemodialysis	592	28 052	19 571	142 184	11 199	10 784	326	561	84	378	213 731	580	214 311	3.92	0.53
%	(0.3)	(13.1)	(9.2)	(66.5)	(5.2)	(5.0)	(0.2)	(0.3)	(0.0)	(0.2)	(100.0)				
Hemodiafiltration	20	967	832	9 833	1 805	1 849	79	99	7	19	15 510	68	15 578	4.12	0.53
%	(0.1)	(6.2)	(5.4)	(63.4)	(11.6)	(11.9)	(0.5)	(0.6)	(0.0)	(0.1)	(100.0)				
Hemofiltration	0	20	16	152	14	14	1	1	0	4	222	0	222	4.04	0.62
%	(0.0)	(9.0)	(7.2)	(68.5)	(6.3)	(6.3)	(0.5)	(0.5)	(0.0)	(1.8)	(100.0)				
Hemoadsorption	1	20	51	1 016	239	233	9	13	0	6	1 588	2	1 590	4.25	0.61
%	(0.1)	(1.3)	(3.2)	(64.0)	(15.1)	(14.7)	(0.6)	(0.8)	(0.0)	(0.4)	(100.0)				
Home hemodialysis	3	0	0	17	10	51	1	8	0	4	94	2	96	4.90	1.02
%	(3.2)	(0.0)	(0.0)	(18.1)	(10.6)	(54.3)	(1.1)	(8.5)	(0.0)	(4.3)	(100.0)				
Total	616	29 059	20 470	153 202	13 267	12 931	416	682	91	411	231 145	652	231 797	3.93	0.54
%	(0.3)	(12.6)	(8.9)	(66.3)	(5.7)	(5.6)	(0.2)	(0.3)	(0.0)	(0.2)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

patients treated by hemodiafiltration underwent dialysis for at least four and a half hours per session. The mean duration of dialysis for patients treated by hemodiafiltration was 4.12 ± 0.53 hours. These findings indicate that patients treated by hemodiafiltration tend to select long-time dialysis treatment compared with those treated by facility hemodialysis.

3. Blood flow rate. Patients who underwent dialysis treatment at a blood flow rate of 180–219 mL/min (i.e. approximately 200 mL/min) accounted for the majority of the patient population in both facility hemodialysis (63.3%) and hemodiafiltration (54.3%) (Table 24). The mean blood flow rate for patients treated by hemodiafiltration (211 ± 40 mL/min) was greater than that for patients treated by facility hemodialysis (197 ± 31 mL/min). Although the percentage of patients who underwent treatment at a blood flow rate of 220 mL/min or higher was only 20.5% for facility hemodialysis, that for hemodiafiltration was as high as 35.6%.

4. Dialysate flow rate. The dialysate flow rates were 500–549 mL/min for approximately 80% of patients treated by both facility hemodialysis (81.1%) and hemodiafiltration (79.7%) (Table 25). The mean dialysate flow rates were 487 ± 33 mL/min for facility hemodialysis and 501 ± 52 mL/min for hemodiafiltration. There was a tendency for a slightly higher dialysate flow rate among patients undergoing hemodiafiltration compared with patients undergoing facility hemodialysis.

5. Area of the dialyzer membrane. For facility hemodialysis, the highest percentage of patients used a dialyzer with a membrane area of 1.4–1.5 m^2 (29.0%), followed by the patients who used a dialyzer with a membrane area of 2.0–2.1 m^2 (18.7%) (Table 26). In contrast, for hemodiafiltration, the highest percentage of patients (29.8%) used a dialyzer with a membrane area of 2.0–2.1 m^2, followed by patients who used a dialyzer with a membrane area of 1.4–1.5 m^2 (23.9%). The mean membrane areas of dialyzers were 1.63 ± 0.35 m^2 for facility hemodialysis and 1.75 ± 0.34 m^2 for hemodiafiltration. Thus, dialyzers with a large membrane area tended to be more frequently selected for hemodiafiltration than for facility hemodialysis.

6. Material of the dialyzer membrane. For facility hemodialysis, patients who used a polysulfone (PS) membrane accounted for the highest percentage (50.7%), followed by patients who used a cellulose triacetate membrane (20.0%) (Table 27). For

TABLE 24. *Blood flow rates for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Blood flow rate (mL/min)																			No information available	Total	Mean	SD
	<100	100–119	120–139	140–159	160–179	180–199	200–219	220–239	240–259	260–279	280–299	300–319	320–339	340–359	360–379	380–399	400–419	420–439	440–459	≥460	Subtotal				
Facility hemodialysis	34	778	2670	20 927	9293	36 891	96 484	21 324	16 672	1555	1121	2343	167	125	7	17	47	7	30	73	210 565	3746	214 311	197.32	31.42
%	(0.0)	(0.4)	(1.3)	(9.9)	(4.4)	(17.5)	(45.8)	(10.1)	(7.9)	(0.7)	(0.5)	(1.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemodiafiltration	2	21	125	899	514	1 966	6 379	2 119	2 112	264	230	524	38	95	12	9	31	0	28	13	15 381	197	15 578	211.00	39.91
%	(0.0)	(0.1)	(0.8)	(5.8)	(3.3)	(12.8)	(41.5)	(13.8)	(13.7)	(1.7)	(1.5)	(3.4)	(0.2)	(0.6)	(0.1)	(0.1)	(0.2)	(0.0)	(0.2)	(0.1)	(100.0)				
Hemofiltration	0	2	2	26	11	25	117	29	7	1	1	1	0	0	0	0	0	0	0	0	222	0	222	194.14	27.98
%	(0.0)	(0.9)	(0.9)	(11.7)	(5.0)	(11.3)	(52.7)	(13.1)	(3.2)	(0.5)	(0.5)	(0.5)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	0	9	68	60	229	737	240	158	13	10	27	1	4	0	2	5	0	0	1	1 564	26	1 590	206.17	33.04
%	(0.0)	(0.0)	(0.6)	(4.3)	(3.8)	(14.6)	(47.1)	(15.3)	(10.1)	(0.8)	(0.6)	(1.7)	(0.1)	(0.3)	(0.0)	(0.1)	(0.3)	(0.0)	(0.0)	(0.1)	(100.0)				
Home hemodialysis	0	0	0	0	1	9	42	17	17	1	3	3	0	0	0	0	0	0	0	0	93	3	96	216.99	28.19
%	(0.0)	(0.0)	(0.0)	(0.0)	(1.1)	(9.7)	(45.2)	(18.3)	(18.3)	(1.1)	(3.2)	(3.2)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	36	801	2806	21 920	9879	39 120	103 759	23 729	18 966	1834	1365	2898	206	224	19	28	83	7	58	87	227 825	3972	231 797	198.31	32.27
%	(0.0)	(0.4)	(1.2)	(9.6)	(4.3)	(17.2)	(45.5)	(10.4)	(8.3)	(0.8)	(0.6)	(1.3)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 25. *Dialysate flow rates for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Dialysate flow rate (mL/min)										Subtotal	No information available	Total	Mean	SD
	<300	300–349	350–399	400–449	450–499	500–549	550–599	600–649	650–699	≥700					
Facility hemodialysis	55	341	110	19 623	18 200	169 096	235	772	70	81	208 583	5728	214 311	487	33
%	(0.0)	(0.2)	(0.1)	(9.4)	(8.7)	(81.1)	(0.1)	(0.4)	(0.0)	(0.0)	(100.0)				
Hemodiafiltration	44	50	105	726	956	12 237	162	587	142	348	15 357	221	15 578	501	52
%	(0.3)	(0.3)	(0.7)	(4.7)	(6.2)	(79.7)	(1.1)	(3.8)	(0.9)	(2.3)	(100.0)				
Hemofiltration	0	1	0	5	0	200	0	1	0	0	207	15	222	497	22
%	(0.0)	(0.5)	(0.0)	(2.4)	(0.0)	(96.6)	(0.0)	(0.5)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	1	0	119	145	1 259	6	7	0	4	1 541	49	1 590	489	32
%	(0.0)	(0.1)	(0.0)	(7.7)	(9.4)	(81.7)	(0.4)	(0.5)	(0.0)	(0.3)	(100.0)				
Home hemodialysis	0	0	0	3	0	92	0	0	0	0	95	1	96	497	18
%	(0.0)	(0.0)	(0.0)	(3.2)	(0.0)	(96.8)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	99	393	215	20 476	19 301	182 884	403	1367	212	433	225 783	6014	231 797	488	35
%	(0.0)	(0.2)	(0.1)	(9.1)	(8.5)	(81.0)	(0.2)	(0.6)	(0.1)	(0.2)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 26. *Area of dialyzer membrane for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Area of dialyzer membrane (m^2)											Subtotal	No information available	Total	Mean	SD
	<0.6	0.6–0.7	0.8–0.9	1.0–1.1	1.2–1.3	1.4–1.5	1.6–1.7	1.8–1.9	2.0–2.1	2.2–2.3	≥2.4					
Facility hemodialysis	194	880	3434	14 918	25 024	60 848	24 218	34 592	39 217	2088	4143	209 566	4755	214 311	1.63	0.35
%	(0.1)	(0.4)	(1.6)	(7.1)	(11.9)	(29.0)	(11.6)	(16.5)	(18.7)	(1.0)	(2.0)	(100.0)				
Hemodiafiltration	2	30	85	556	1 286	3 644	1 245	3 211	4 555	192	457	15 263	315	15 578	1.75	0.34
%	(0.0)	(0.2)	(0.6)	(3.6)	(8.4)	(23.9)	(8.2)	(21.0)	(29.8)	(1.3)	(3.0)	(100.0)				
Hemofiltration	0	0	5	15	31	100	10	41	15	3	0	220	2	222	1.53	0.29
%	(0.0)	(0.0)	(2.3)	(6.8)	(14.1)	(45.5)	(4.5)	(18.6)	(6.8)	(1.4)	(0.0)	(100.0)				
Hemoadsorption	0	2	3	54	133	455	185	342	348	15	15	1 552	38	1 590	1.70	0.30
%	(0.0)	(0.1)	(0.2)	(3.5)	(8.6)	(29.3)	(11.9)	(22.0)	(22.4)	(1.0)	(1.0)	(100.0)				
Home hemodialysis	0	0	0	0	2	17	9	29	27	7	2	93	3	96	1.86	0.27
%	(0.0)	(0.0)	(0.0)	(0.0)	(2.2)	(18.3)	(9.7)	(31.2)	(29.0)	(7.5)	(2.2)	(100.0)				
Total	196	912	3527	15 543	26 476	65 064	25 667	38 215	44 162	2305	4617	226 684	5113	231 797	1.64	0.35
%	(0.1)	(0.4)	(1.6)	(6.9)	(11.7)	(28.7)	(11.3)	(16.9)	(19.5)	(1.0)	(2.0)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 27. *Dialyzer membrane materials for different dialysis methods (those using extracorporeal circulation,[†] three times per week)*

Method of dialysis	Materials of dialyzer membrane																
	MRC	MRC (Biorex)	CDA	CTA	EVAL	PAES	PAN	PEPA	PES	PMMA	PS	Vit E-coated PS	Others	Subtotal	Unspecified	No information available	Total
Facility hemodialysis	121	157	35	42 044	3138	66	2473	16 401	23 347	11 319	106 400	3686	697	209 884	5	4422	214 311
%	(0.1)	(0.1)	(0.0)	(20.0)	(1.5)	(0.0)	(1.2)	(7.8)	(11.1)	(5.4)	(50.7)	(1.8)	(0.3)	(100.0)			
Hemodiafiltration	3	6	1	1 023	62	11	246	934	2 081	174	10 307	272	141	15 261	0	317	15 578
%	(0.0)	(0.0)	(0.0)	(6.7)	(0.4)	(0.1)	(1.6)	(6.1)	(13.6)	(1.1)	(67.5)	(1.8)	(0.9)	(100.0)			
Hemofiltration	0	0	0	55	6	0	2	16	10	5	121	1	4	220	1	1	222
%	(0.0)	(0.0)	(0.0)	(25.0)	(2.7)	(0.0)	(0.9)	(7.3)	(4.5)	(2.3)	(55.0)	(0.5)	(1.8)	(100.0)			
Hemoadsorption	0	0	0	151	4	0	23	81	206	75	984	20	7	1 551	1	38	1 590
%	(0.0)	(0.0)	(0.0)	(9.7)	(0.3)	(0.0)	(1.5)	(5.2)	(13.3)	(4.8)	(63.4)	(1.3)	(0.5)	(100.0)			
Home hemodialysis	0	0	0	9	1	0	0	0	6	2	72	2	0	92	0	4	96
%	(0.0)	(0.0)	(0.0)	(9.8)	(1.1)	(0.0)	(0.0)	(0.0)	(6.5)	(2.2)	(78.3)	(2.2)	(0.0)	(100.0)			
Total	124	163	36	43 282	3211	77	2744	17 432	25 650	11 575	117 884	3981	849	227 008	7	4782	231 797
%	(0.1)	(0.1)	(0.0)	(19.1)	(1.4)	(0.0)	(1.2)	(7.7)	(11.3)	(5.1)	(51.9)	(1.8)	(0.4)	(100.0)			

[†]Extracorporeal circulation includes the following; hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row. CDA, cellulose diacetate; CTA, cellulose triacetate; EVAL, ethylene vinyl alcohol copolymer; MRC, modified reproductive cellulose; PAES, polyarylethersulfone; PAN, polyacrylonitrile; PEPA, polyester-polymer alloy; PES, polyethersulphone; PMMA, polymethylmethacrylate; PS, polysulfone; Vit E, vitamin E.

hemodiafiltration, the percentage of patients who used a PS membrane was 67.5%, followed by patients who used a polyethersulfone membrane (13.6%). Patients who used a PS membrane accounted for the majority (52.0%) of patients over all the examined methods of dialysis, and the percentage of patients who used a synthesized polymeric membrane reached nearly 80%.

7. Classification of dialyzers by function. Table 28 shows a summary of the classification of dialyzers according to their function based on the classification of medical equipment and materials approved by the Pharmaceutical Affairs Act. For facility hemodialysis, the highest percentage of patients used the IV-type dialyzer (80.3%) followed by the V-type dialyzer (11.4%). For hemodiafiltration, the highest percentage of patients also used the IV-type dialyzer (59.9%) followed by the hemodiafilter (18.8%), a special membrane for hemodiafiltration.

The classification of dialyzers by function based on the above classification is mainly based on the dialyzer clearance rate of β_2-microglobulin (β_2-MG). The β_2-MG clearance rate required for the IV-type dialyzer is 50–70 mL/min and that for the V-type dialyzer is 70 mL/min or higher (Note: This classification was made by Japanese government and is only used in the Japanese medical insurance system). Although the β_2-MG clearance rate of hemodiafilters is not limited, the results of this survey reveal that the β_2-MG reduction rate for patients treated by hemodiafiltration using the hemodiafilter was nearly equal to that for patients treated by dialysis using the IV- or V-type dialyzer (results not shown). Therefore, the results obtained in this survey indicate that a membrane with a high β_2-MG clearance rate tended to be selected for many patients.

D. Predialysis and postdialysis serum concentrations of electrolytes and pH

1. Predialysis serum sodium concentration. The mean predialysis serum sodium concentration for the entire target patient population was 138.8 ± 3.3 mEq/L (Table 29). The predialysis serum sodium concentrations were 137–142 mEq/L for 67.9% of the patients. In addition, the predialysis serum sodium concentrations were lower than 137 mEq/L in 21.0% of patients and 143 mEq/L or higher in 11.0% of patients.

2. Postdialysis serum sodium concentration. The mean postdialysis serum sodium concentration for the entire target patient population was

TABLE 28. *Classification of dialyzers by function for different dialysis methods (those using extracorporeal circulation,† three times per week).*

Method of dialysis	Classification of dialyzers by function								Subtotal	Unspecified	No information available	Total
	I	II	III	IV	V	Hemodiafilter	Plate type	Others				
Facility hemodialysis	2650	2039	8906	168 586	23 973	461	2464	805	209 884	5	4422	214 311
%	(1.3)	(1.0)	(4.2)	(80.3)	(11.4)	(0.2)	(1.2)	(0.4)	(100.0)			
Hemodiafiltration	28	25	305	9 138	2 474	2875	236	180	15 261	0	317	15 578
%	(0.2)	(0.2)	(2.0)	(59.9)	(16.2)	(18.8)	(1.5)	(1.2)	(100.0)			
Hemofiltration	0	7	3	178	11	4	2	15	220	1	1	222
%	(0.0)	(3.2)	(1.4)	(80.9)	(5.0)	(1.8)	(0.9)	(6.8)	(100.0)			
Hemoadsorption	2	4	37	1 175	281	21	23	8	1 551	1	38	1 590
%	(0.1)	(0.3)	(2.4)	(75.8)	(18.1)	(1.4)	(1.5)	(0.5)	(100.0)			
Home hemodialysis	0	1	1	88	2	0	0	0	92	0	4	96
%	(0.0)	(1.1)	(1.1)	(95.7)	(2.2)	(0.0)	(0.0)	(0.0)	(100.0)			
Total	2680	2076	9252	179 165	26 741	3361	2725	1008	227 008	7	4782	231 797
%	(1.2)	(0.9)	(4.1)	(78.9)	(11.8)	(1.5)	(1.2)	(0.4)	(100.0)			

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 29. *Predialysis serum sodium concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Predialysis serum sodium concentration (mEq/L)									Subtotal	No information available	Total	Mean	SD
	<128	128–130	131–133	134–136	137–139	140–142	143–145	146–148	≥149					
Facility hemodialysis	861	2408	8919	31 855	72 630	67 024	19 985	2269	183	206 134	8177	214 311	138.78	3.31
%	(0.4)	(1.2)	(4.3)	(15.5)	(35.2)	(32.5)	(9.7)	(1.1)	(0.1)	(100.0)				
Hemodiafiltration	45	128	525	2 094	5 317	5 235	1 617	183	11	15 155	423	15 578	139.05	3.20
%	(0.3)	(0.8)	(3.5)	(13.8)	(35.1)	(34.5)	(10.7)	(1.2)	(0.1)	(100.0)				
Hemofiltration		3	5	34	76	73	23	3	1	218	4	222	139.10	3.15
%		(1.4)	(2.3)	(15.6)	(34.9)	(33.5)	(10.6)	(1.4)	(0.5)	(100.0)				
Hemoadsorption	1	3	22	132	517	616	231	29	2	1 553	37	1 590	139.89	2.83
%	(0.1)	(0.2)	(1.4)	(8.5)	(33.3)	(39.7)	(14.9)	(1.9)	(0.1)	(100.0)				
Home hemodialysis		1	2	9	19	42	16	2		91	5	96	140.00	3.16
%		(1.1)	(2.2)	(9.9)	(20.9)	(46.2)	(17.6)	(2.2)		(100.0)				
Total	907	2543	9473	34 124	78 559	72 990	21 872	2486	197	223 151	8646	231 797	138.81	3.30
%	(0.4)	(1.1)	(4.2)	(15.3)	(35.2)	(32.7)	(9.8)	(1.1)	(0.1)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

139.5 ± 2.4 mEq/L (Table 30). This was slightly higher than the above-mentioned predialysis serum sodium concentration (138.8 mEq/L). The postdialysis serum sodium concentrations were 137–142 mEq/L for 81.2% of the patients. The percentage of patients with postdialysis serum sodium concentrations lower than 137 mEq/L was 9.4%, which was approximately one-half of the predialysis value, as mentioned above. The percentage of patients with a postdialysis serum sodium concentration of 143 mEq/L or higher was 9.3%, which was similar to the predialysis percentage.

3. Predialysis serum potassium concentration. The mean predialysis serum potassium concentration for the entire target patient population was 4.96 ± 0.81 mEq/L (Table 31). The predialysis serum potassium concentrations were 3.5–5.9 mEq/L for 86.6% of the patients. In addition, 10.7% of the patients showed a high predialysis serum potassium concentration (≥6.0 mEq/L), whereas 2.8% of the patients showed a low predialysis serum potassium concentration (<3.5 mEq/L).

4. Postdialysis serum potassium concentration. The mean postdialysis serum potassium concentration for the entire target patient population was 3.53 ± 0.47 mEq/L, which was considerably lower than the above-mentioned mean predialysis serum potassium concentration (Table 32). This was attributed to the removal of potassium following blood purification.

The percentage of patients with postdialysis serum potassium concentrations of 3.5–5.9 mEq/L was 55.0%, which was markedly lower than the predialysis percentage (86.6%). The percentage of patients with a postdialysis serum potassium concentration of 6.0 mEq/L or higher was very low (0.1%); however, the percentage of patients with postdialysis serum potassium concentrations lower than 3.5 mEq/L was 44.8%, much higher than the predialysis percentage (2.8%). In addition, 7.8% of the patients showed postdialysis serum potassium concentrations lower than 3.0 mEq/L, indicating that a considerable number of patients develop hypokalemia after dialysis.

5. Predialysis serum chloride concentration. The mean predialysis serum chloride concentration for the entire target patient population was 103.4 ± 4.1 mEq/L (Table 33). The predialysis serum chloride concentrations were 95–109 mEq/L for 92.6% of the patients. The highest percentage of patients had a predialysis serum chloride concentration of 100–104 mEq/L (45.6%).

TABLE 30. *Postdialysis serum sodium concentrations (mEq/L) for different dialysis methods (those using extracorporeal circulation,† three times per week)*

	Postdialysis serum sodium concentration (mEq/L)											
Method of dialysis	<128	128–130	131–133	134–136	137–139	140–142	143–145	146–148	≥149	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	70	141	1262	15 007	69 436	72 312	15 118	1160	70	174 576	39 735	214 311	139.50	2.43
%	(0.0)	(0.1)	(0.7)	(8.6)	(39.8)	(41.4)	(8.7)	(0.7)	(0.0)	(100.0)				
Hemodiafiltration	6	12	76	1 248	5 440	5 184	1 084	107	16	13 173	2 405	15 578	139.42	2.48
%	(0.0)	(0.1)	(0.6)	(9.5)	(41.3)	(39.4)	(8.2)	(0.8)	(0.1)	(100.0)				
Hemofiltration	0	0	1	13	69	37	4	0	0	124	98	222	138.68	1.92
%	(0.0)	(0.0)	(0.8)	(10.5)	(55.6)	(29.8)	(3.2)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	0	6	92	497	555	147	9	0	1 306	284	1 590	139.79	2.27
%	(0.0)	(0.0)	(0.5)	(7.0)	(38.1)	(42.5)	(11.3)	(0.7)	(0.0)	(100.0)				
Home hemodialysis	0	0	0	4	29	28	8	1	0	70	26	96	139.91	2.12
%	(0.0)	(0.0)	(0.0)	(5.7)	(41.4)	(40.0)	(11.4)	(1.4)	(0.0)	(100.0)				
Total	76	153	1345	16 364	75 471	78 116	16 361	1277	86	189 249	42 548	231 797	139.50	2.43
%	(0.0)	(0.1)	(0.7)	(8.6)	(39.9)	(41.3)	(8.6)	(0.7)	(0.0)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 31. *Predialysis serum potassium concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

	Predialysis serum potassium concentration (mEq/L)																	
Method of dialysis	<2.0	2.0–2.4	2.5–2.9	3.0–3.4	3.5–3.9	4.0–4.4	4.5–4.9	5.0–5.4	5.5–5.9	6.0–6.4	6.5–6.9	7.0–7.4	7.5–7.9	≥8.0	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	35	119	885	4833	15 921	33 702	48 283	48 724	33 030	15 078	5068	1379	398	275	207 730	6581	214 311	4.96	0.81
%	(0.0)	(0.1)	(0.4)	(2.3)	(7.7)	(16.2)	(23.2)	(23.5)	(15.9)	(7.3)	(2.4)	(0.7)	(0.2)	(0.1)	(100.0)				
Hemodiafiltration	1	9	49	306	1 060	2 280	3 569	3 745	2 559	1 136	336	108	19	16	15 193	385	15 578	4.99	0.79
%	(0.0)	(0.1)	(0.3)	(2.0)	(7.0)	(15.0)	(23.5)	(24.6)	(16.8)	(7.5)	(2.2)	(0.7)	(0.1)	(0.1)	(100.0)				
Hemofiltration	0	0	1	8	10	40	52	44	42	17	4	0	0	0	218	4	222	4.95	0.78
%	(0.0)	(0.0)	(0.5)	(3.7)	(4.6)	(18.3)	(23.9)	(20.2)	(19.3)	(7.8)	(1.8)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	0	3	11	53	189	387	438	307	115	38	8	3	1	1 553	37	1 590	5.11	0.70
%	(0.0)	(0.0)	(0.2)	(0.7)	(3.4)	(12.2)	(24.9)	(28.2)	(19.8)	(7.4)	(2.4)	(0.5)	(0.2)	(0.1)	(100.0)				
Home hemodialysis	0	0	0	0	1	13	27	18	18	8	2	2	1	2	92	4	96	5.25	0.92
%	(0.0)	(0.0)	(0.0)	(0.0)	(1.1)	(14.1)	(29.3)	(19.6)	(19.6)	(8.7)	(2.2)	(2.2)	(1.1)	(2.2)	(100.0)				
Total	36	128	938	5158	17 045	36 224	52 318	52 969	35 956	16 354	5448	1497	421	294	224 786	7011	231 797	4.96	0.81
%	(0.0)	(0.1)	(0.4)	(2.3)	(7.6)	(16.1)	(23.3)	(23.6)	(16.0)	(7.3)	(2.4)	(0.7)	(0.2)	(0.1)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 32. *Postdialysis serum potassium concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

	Postdialysis serum potassium concentration (mEq/L)																	
Method of dialysis	<2.0	2.0–2.4	2.5–2.9	3.0–3.4	3.5–3.9	4.0–4.4	4.5–4.9	5.0–5.4	5.5–5.9	6.0–6.4	6.5–6.9	7.0–7.4	7.5–7.9	≥8.0	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	78	769	13 476	67 342	73 556	23 047	3953	716	197	62	31	10	9	159	183 405	30 906	214 311	3.53	0.47
%	(0.0)	(0.4)	(7.3)	(36.7)	(40.1)	(12.6)	(2.2)	(0.4)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(100.0)				
Hemodiafiltration	5	54	1 148	5 561	5 273	1 413	237	62	22	14	3	4	2	9	13 807	1 771	15 578	3.49	0.48
%	(0.0)	(0.4)	(8.3)	(40.3)	(38.2)	(10.2)	(1.7)	(0.4)	(0.2)	(0.1)	(0.0)	(0.0)	(0.0)	(0.1)	(100.0)				
Hemofiltration	0	1	12	67	89	34	3	0	1	0	0	0	0	0	207	15	222	3.58	0.45
%	(0.0)	(0.5)	(5.8)	(32.4)	(43.0)	(16.4)	(1.4)	(0.0)	(0.5)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	1	88	567	541	131	13	4	0	0	0	0	0	1	1 346	244	1 590	3.49	0.41
%	(0.0)	(0.1)	(6.5)	(42.1)	(40.2)	(9.7)	(1.0)	(0.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(100.0)				
Home hemodialysis	0	0	1	20	31	8	5	5	0	0	0	0	0	0	70	26	96	3.77	0.57
%	(0.0)	(0.0)	(1.4)	(28.6)	(44.3)	(11.4)	(7.1)	(7.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	83	825	14 725	73 557	79 490	24 633	4211	787	220	76	34	14	11	169	198 835	32 962	231 797	3.53	0.47
%	(0.0)	(0.4)	(7.4)	(37.0)	(40.0)	(12.4)	(2.1)	(0.4)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 33. *Predialysis chloride concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Predialysis chloride concentration (mEq/L)											
	<90	90~	95~	100~	105~	110~	115~	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	367	2798	21 871	74 229	54 556	8589	481	162 891	20 766	183 657	103.37	4.07
%	(0.2)	(1.7)	(13.4)	(45.6)	(33.5)	(5.3)	(0.3)	(100.0)				
Hemodiafiltration	33	184	1 697	5 708	4 225	589	21	12 457	1 293	13 750	103.33	3.92
%	(0.3)	(1.5)	(13.6)	(45.8)	(33.9)	(4.7)	(0.2)	(100.0)				
Hemofiltration	0	5	39	109	47	7	2	209	10	219	102.61	4.02
%	(0.0)	(2.4)	(18.7)	(52.2)	(22.5)	(3.3)	(1.0)	(100.0)				
Hemoadsorption	2	6	106	540	496	72	2	1 224	165	1 389	104.12	3.53
%	(0.2)	(0.5)	(8.7)	(44.1)	(40.5)	(5.9)	(0.2)	(100.0)				
Home hemodialysis	0	0	7	48	32	2	0	89	6	95	103.62	3.16
%	(0.0)	(0.0)	(7.9)	(53.9)	(36.0)	(2.2)	(0.0)	(100.0)				
Total	402	2993	23 720	80 634	59 356	9259	506	176 870	22 240	199 110	103.37	4.05
%	(0.2)	(1.7)	(13.4)	(45.6)	(33.6)	(5.2)	(0.3)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

6. Postdialysis serum chloride concentration. The mean postdialysis serum chloride concentration was 102.1 ± 3.1 mEq/L (Table 34). The postdialysis serum chloride concentrations were 95–109 mEq/L for 98.4% of the patients. The highest percentage of patients had a postdialysis serum chloride concentration of 100–104 mEq/L (60.9%), which was much higher than the predialysis percentage.

7. Predialysis pH. The mean predialysis pH for the entire target patient population was 7.35 ± 0.05 (Table 35). The predialysis pH measurements were 7.300–7.399 for 71.3% of patients. In addition, 12.4% of patients showed a predialysis pH lower than 7.300 and 16.2% of patients showed a predialysis pH of 7.400 or higher.

8. Postdialysis pH. The mean postdialysis pH for the entire target patient population was 7.44 ± 0.05, which was 0.09 higher than the mean predialysis pH (7.35) (Table 36). The percentage of patients with a postdialysis pH of 7.400 or higher was 82.7%, which was markedly higher than the above-mentioned percentage of patients with such a predialysis pH (16.2%). Focusing on the patients who showed a postdialysis pH of 7.450 or higher, the percentage of such patients was still as high as 45.1%. These findings indicate that the acidosis of the patients was corrected upon the implementation of the blood purification therapy. However, 17.3% of the patients still showed a postdialysis pH lower than 7.400.

9. Predialysis HCO_3^- concentration. The mean predialysis HCO_3^- concentration for the entire target patient population was 20.7 ± 3.1 mEq/L. The predialysis HCO_3^- concentration was lower than 22 mEq/L for 67.6% of the patients. According to the classification in Table 37, the highest percentage of patients had a predialysis HCO_3^- concentration of 20–21 mEq/L (27.0%).

10. Postdialysis HCO_3^- concentration. The mean postdialysis HCO_3^- concentration for the entire target patient population was 25.2 ± 2.9 mEq/L, which was 4.5 mEq/L higher than the predialysis value (20.7 mEq/L). The percentage of patients with a postdialysis HCO_3^- concentration of 22 mEq/L or higher was 87.4%. Considering that the predialysis percentage of such patients was only 32.4%, the percentage of patients with high HCO_3^- concentrations increased after dialysis. Patients with postdialysis HCO_3^- concentrations of 24–25 mEq/L accounted for

TABLE 34. *Postdialysis chloride concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Postdialysis chloride concentration (mEq/L)							Subtotal	No information available	Total	Mean	SD
	<90	90~	95~	100~	105~	110~	115~					
Facility hemodialysis	33	928	24 284	82 723	26 745	1196	124	136 033	47 624	183 657	102.13	3.14
%	(0.0)	(0.7)	(17.9)	(60.8)	(19.7)	(0.9)	(0.1)	(100.0)				
Hemodiafiltration	1	72	1 888	6 398	1 892	125	8	10 384	3 366	13 750	102.06	3.13
%	(0.0)	(0.7)	(18.2)	(61.6)	(18.2)	(1.2)	(0.1)	(100.0)				
Hemofiltration	0	1	46	63	6	0	0	116	103	219	100.16	2.53
%	(0.0)	(0.9)	(39.7)	(54.3)	(5.2)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	4	130	602	258	7	0	1 001	388	1 389	102.74	2.93
%	(0.0)	(0.4)	(13.0)	(60.1)	(25.8)	(0.7)	(0.0)	(100.0)				
Home hemodialysis	0	0	6	47	15	1	0	69	26	95	102.70	2.61
%	(0.0)	(0.0)	(8.7)	(68.1)	(21.7)	(1.4)	(0.0)	(100.0)				
Total	34	1005	26 354	89 833	28 916	1329	132	147 603	51 507	199 110	102.13	3.14
%	(0.0)	(0.7)	(17.9)	(60.9)	(19.6)	(0.9)	(0.1)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 35. *Predialysis pH for different dialysis methods (those using extracorporeal circulation,† three times per week)*

Method of dialysis	Predialysis pH															No information available	Total	Mean	SD
	<7.000	7.000–7.049	7.050–7.099	7.100–7.149	7.150–7.199	7.200–7.249	7.250–7.299	7.300–7.349	7.350–7.399	7.400–7.449	7.450–7.499	7.500–7.549	7.550–7.599	≥7.600	Subtotal				
Facility hemodialysis	2	13	13	29	98	902	4786	15 681	17 205	6141	1043	178	36	19	46 146	137 511	183 657	7.35	0.05
%	(0.0)	(0.0)	(0.0)	(0.1)	(0.2)	(2.0)	(10.4)	(34.0)	(37.3)	(13.3)	(2.3)	(0.4)	(0.1)	(0.0)	(100.0)				
Hemodiafiltration	0	0	0	1	7	68	387	1 363	1 658	606	106	9	4	0	4 209	9 541	13 750	7.36	0.05
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.2)	(1.6)	(9.2)	(32.4)	(39.4)	(14.4)	(2.5)	(0.2)	(0.1)	(0.0)	(100.0)				
Hemofiltration	0	0	0	0	0	0	0	2	2	1	1	0	0	0	6	213	219	7.38	0.04
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(33.3)	(33.3)	(16.7)	(16.7)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	0	0	0	1	5	28	130	168	51	6	1	0	3	393	996	1 389	7.36	0.05
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.3)	(1.3)	(7.1)	(33.1)	(42.7)	(13.0)	(1.5)	(0.3)	(0.0)	(0.8)	(100.0)				
Home hemodialysis	0	0	0	0	0	0	1	1	2	0	0	0	0	0	4	91	95	7.33	0.03
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(25.0)	(25.0)	(50.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	2	13	13	30	106	975	5202	17 177	19 035	6799	1156	188	40	22	50 758	148 352	199 110	7.35	0.05
%	(0.0)	(0.0)	(0.0)	(0.1)	(0.2)	(1.9)	(10.2)	(33.8)	(37.5)	(13.4)	(2.3)	(0.4)	(0.1)	(0.0)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 36. *Postdialysis pH for different dialysis methods (those using extracorporeal circulation,[†] three times per week)*

Method of dialysis	Postdialysis pH <7.000	7.000–7.049	7.050–7.099	7.100–7.149	7.150–7.199	7.200–7.249	7.250–7.299	7.300–7.349	7.350–7.399	7.400–7.449	7.450–7.499	7.500–7.549	7.550–7.599	≥7.600	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	0	2	3	6	4	20	89	577	3226	8324	7556	1890	224	49	21 970	161 687	183 657	7.44	0.05
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.4)	(2.6)	(14.7)	(37.9)	(34.4)	(8.6)	(1.0)	(0.2)	(100.0)				
Hemodiafiltration	0	0	0	0	0	1	4	45	212	755	832	287	29	5	2 170	11 580	13 750	7.45	0.05
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.2)	(2.1)	(9.8)	(34.8)	(38.3)	(13.2)	(1.3)	(0.2)	(100.0)				
Hemofiltration	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	217	219	7.51	0.07
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(50.0)	(0.0)	(50.0)	(0.0)	(100.0)				
Hemoadsorption	0	0	0	0	0	0	2	4	18	66	64	26	5	3	188	1 201	1 389	7.45	0.06
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(1.1)	(2.1)	(9.6)	(35.1)	(34.0)	(13.8)	(2.7)	(1.6)	(100.0)				
Home hemodialysis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	94	95	7.37	
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	0	2	3	6	4	21	95	626	3457	9145	8453	2203	259	57	24 331	174 779	199 110	7.44	0.05
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.4)	(2.6)	(14.2)	(37.6)	(34.7)	(9.1)	(1.1)	(0.2)	(100.0)				

[†]Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 37. *Predialysis HCO_3^- concentrations for different dialysis methods (those using extracorporeal circulation,[†] three times per week)*

Method of dialysis	Predialysis HCO_3^- concentration (mEq/L) <10	10–11	12–13	14–15	16–17	18–19	20–21	22–23	24–25	26–27	28–29	≥30	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	103	117	475	2093	6605	12 760	14 690	10 049	4897	1690	601	229	54 309	160 002	214 311	20.68	3.09
%	(0.2)	(0.2)	(0.9)	(3.9)	(12.2)	(23.5)	(27.0)	(18.5)	(9.0)	(3.1)	(1.1)	(0.4)	(100.0)				
Hemodiafiltration	8	8	37	172	584	1 053	1 283	955	477	172	47	15	4 811	10 767	15 578	20.81	3.08
%	(0.2)	(0.2)	(0.8)	(3.6)	(12.1)	(21.9)	(26.7)	(19.9)	(9.9)	(3.6)	(1.0)	(0.3)	(100.0)				
Hemofiltration	0	0	0	0	1	2	4	2	3	0	0	1	13	209	222	22.38	3.68
%	(0.0)	(0.0)	(0.0)	(0.0)	(7.7)	(15.4)	(30.8)	(15.4)	(23.1)	(0.0)	(0.0)	(7.7)	(100.0)				
Hemoadsorption	1	0	2	24	44	106	112	100	39	11	2	0	441	1 149	1 590	20.69	2.85
%	(0.2)	(0.0)	(0.5)	(5.4)	(10.0)	(24.0)	(25.4)	(22.7)	(8.8)	(2.5)	(0.5)	(0.0)	(100.0)				
Home hemodialysis	0	0	0	0	1	1	4	0	1	0	0	0	7	89	96	20.74	2.71
%	(0.0)	(0.0)	(0.0)	(0.0)	(14.3)	(14.3)	(57.1)	(0.0)	(14.3)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	112	125	514	2289	7235	13 922	16 093	11 106	5417	1873	650	245	59 581	172 216	231 797	20.69	3.09
%	(0.2)	(0.2)	(0.9)	(3.8)	(12.1)	(23.4)	(27.0)	(18.6)	(9.1)	(3.1)	(1.1)	(0.4)	(100.0)				

[†]Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

the largest percentage (28.6%) of the entire patient population (Table 38). These findings indicate that the HCO_3^- concentration of dialysis patients increased as a result of blood purification therapy.

E. Current status of the use of vascular access

Table 39 shows the types of vascular access for patients treated by facility hemodialysis. The percentage of patients who used a native vessel arteriovenous fistula was 89.7%, and the percentage of patients who used an artificial vessel arteriovenous fistula was 7.1%. In the survey conducted at the end of 1998, the former was 91.4% and the latter was 4.8% (8). Thus, the percentage of patients who used an artificial vessel arteriovenous fistula has increased over the past 10 years.

The percentage of patients who used a temporary venous catheter was high for those on dialysis for less than two years. Temporary venous catheters are used for patients during the phase of introduction to dialysis. The percentages of patients who used an arteriovenous fistula via an artificial blood vessel and a superficial artery tended to increase with years on dialysis. Among the other types of vascular access, the percentages of patients who used a long-term implantable catheter were relatively high for patients on dialysis for less than two years and 25 years or more, although the values are small.

Table 40 shows the types of vascular access and the blood flow rates for patients treated by facility hemodialysis. The mean blood flow rate for the entire target patient population was 198 ± 32 mL/min. The mean blood flow rate tended to be high in patients who used a native vessel arteriovenous fistula.

Table 41 shows the types of vascular access and Kt/V_{sp} (6). The mean Kt/V_{sp} for the entire target patient population was 1.38 ± 0.31. The mean values of Kt/V_{sp} for different types of vascular access decreased in the following order: artificial blood vessel arteriovenous fistula (1.45 ± 0.31), native vessel arteriovenous fistula (1.37 ± 0.30), and superficial artery (1.37 ± 0.34). Patients who used a temporary venous catheter showed the lowest mean blood flow rate (154 ± 38 mL/min), as shown in Table 40, and the lowest Kt/V_{sp} (0.97 ± 0.39). In addition to the features of venous catheters, these values may be attributable to their frequent use during the phase of introduction into dialysis. For single-needle dialysis, the blood flow rate was relatively high, whereas Kt/V_{sp} tended to be low, as theoretically predicted.

TABLE 38. *Postdialysis HCO_3^- concentrations for different dialysis methods (those using extracorporeal circulation,† three times per week)*

	Postdialysis HCO_3^- concentration (mEq/L)																
Method of dialysis	<16	16–17	18–19	20–21	22–23	24–25	26–27	28–29	30–31	32–33	34–35	≥36	Subtotal	No information available	Total	Mean	SD
Facility hemodialysis	53	156	642	1990	4575	6414	5087	2272	749	194	23	16	22 171	161 486	183 657	25.06	2.87
%	(0.2)	(0.7)	(2.9)	(9.0)	(20.6)	(28.9)	(22.9)	(10.2)	(3.4)	(0.9)	(0.1)	(0.1)	(100.0)				
Hemodiafiltration	1	17	42	135	343	536	537	355	159	35	10	2	2 172	11 578	13 750	25.95	3.07
%	(0.0)	(0.8)	(1.9)	(6.2)	(15.8)	(24.7)	(24.7)	(16.3)	(7.3)	(1.6)	(0.5)	(0.1)	(100.0)				
Hemofiltration	0	0	0	0	0	2	0	1	0	0	0	0	3	216	219	26.10	1.91
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(66.7)	(0.0)	(33.3)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Hemoadsorption	0	1	4	8	25	57	48	33	8	3	0	1	188	1 201	1 389	26.03	2.87
%	(0.0)	(0.5)	(2.1)	(4.3)	(13.3)	(30.3)	(25.5)	(17.6)	(4.3)	(1.6)	(0.0)	(0.5)	(100.0)				
Home hemodialysis	0	0	0	0	0	1	0	0	0	0	0	0	1	94	95	24.90	
%	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)				
Total	54	174	688	2133	4943	7010	5672	2661	916	232	33	19	24 535	174 575	199 110	25.15	2.90
%	(0.2)	(0.7)	(2.8)	(8.7)	(20.1)	(28.6)	(23.1)	(10.8)	(3.7)	(0.9)	(0.1)	(0.1)	(100.0)				

†Extracorporeal circulation includes the following: hemodialysis, hemodiafiltration, hemofiltration, and hemoadsorption. Values in parentheses under each figure represent the percentage relative to the total in each row.

TABLE 39. *Types of vascular access for different periods of dialysis (for patients treated by facility hemodialysis)*

	Types of vascular access																	
	Double-needle dialysis							Single-needle dialysis										
Years on dialysis	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Subtotal	Unspecified	No information available	Total
<2	36 674	2 283	664	43	327	631	49	70	10	7	0	9	11	3	40 781	3	8 771	49 555
(%)	(89.9)	(5.6)	(1.6)	(0.1)	(0.8)	(1.5)	(0.1)	(0.2)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
2–4	41 436	2 925	738	50	201	53	50	56	10	10	1	8	4	0	45 542	1	9 383	54 926
(%)	(91.0)	(6.4)	(1.6)	(0.1)	(0.4)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
5–9	39 952	3 225	761	55	168	41	43	25	13	5	3	4	2	0	44 297	2	9 229	53 528
(%)	(90.2)	(7.3)	(1.7)	(0.1)	(0.4)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
10–14	18 898	1 729	405	36	78	25	19	11	6	4	3	3	0	0	21 217	0	4 555	25 772
(%)	(89.1)	(8.1)	(1.9)	(0.2)	(0.4)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
15–19	9 149	959	228	16	55	13	10	6	9	3	0	1	0	1	10 450	1	2 316	12 767
(%)	(87.6)	(9.2)	(2.2)	(0.2)	(0.5)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
20–24	4 734	549	144	13	25	9	5	5	1	4	0	0	0	1	5 490	0	1 170	6 660
(%)	(86.2)	(10.0)	(2.6)	(0.2)	(0.5)	(0.2)	(0.1)	(0.1)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
≥25	3 884	594	205	14	46	8	10	4	5	2	1	2	1	0	4 776	0	1 058	5 834
(%)	(81.3)	(12.4)	(4.3)	(0.3)	(1.0)	(0.2)	(0.2)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Total	154 727	12 264	3145	227	900	780	186	177	54	35	8	27	18	5	172 553	7	36 482	209 042
(%)	(89.7)	(7.1)	(1.8)	(0.1)	(0.5)	(0.5)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Mean	6.42	7.92	8.08	8.40	6.20	1.82	6.65	4.66	9.61	8.77	10.50	6.33	3.06	7.00	6.54	5.14	6.61	6.55
SD	6.49	7.54	8.10	8.07	7.74	4.88	7.82	6.55	9.16	8.63	7.91	8.62	7.77	9.75	6.63	6.54	6.74	6.65

II. Prevalence of HCV antibody positivity for dialysis patients

A. Tabulation of HCV antibody positivity rate

1. Type of medical organization. The HCV antibody positivity rate for all the target patients in this analysis was 1.04% (i.e. 1275 of 122 377 patients became HCV-antibody-positive in 2007) (Table 42). The HCV antibody positivity rate in 2001 was 2.1% (9). The results of this analysis revealed that the HCV antibody positivity rate among dialysis patients in Japan has halved over the six years from 2001 to 2007.

The HCV antibody positivity rates for patients in public hospitals and private clinics were lower than that for the entire target patient population, whereas those for patients in other types of medical organization were higher. This finding was similar to that in the previous analysis (9). As shown in Section II-B, a high HCV antibody positivity rate is closely related to malnutrition. Main hospitals have a high percentage of hospitalized patients, many of whom are considered to be malnourished because of complications related to the reason for hospitalization. This may result in the high HCV antibody positivity rate for patients treated in main hospitals.

2. Treatment method. The HCV antibody positivity rate for patients treated by facility hemodialysis was 1.02%, similar to that for all the target patients (1.04%) (Table 43). When analyzing the results for patients treated by hemodiafiltration and hemoadsorption, careful consideration is required because the numbers of these patients were much smaller than the numbers of those treated by other methods. The HCV antibody positivity rate for patients treated by hemodiafiltration (1.43%) was slightly higher than that for all the target patients. The reason for this was unclear.

3. Gender. The HCV antibody positivity rate for male patients was higher than that for female patients (Table 44). This finding was similar to that in the previous analysis (9).

4. Primary disease. The HCV antibody positivity rate for patients with diabetic nephropathy as the primary disease was higher than for patients with other primary diseases (Table 45). Similarly to the finding on gender, this finding was similar to that in the previous analysis.

5. Age. The HCV antibody positivity rate was lower for younger patients, and tended to be higher

TABLE 40. *Types of vascular access for different blood flow rates (for patients treated by facility hemodialysis)*

Blood flow rate (mL/min)	Types of vascular access																	
	Double-needle dialysis							Single-needle dialysis										
	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Subtotal	Unspecified	No information available	Total
<100	20	0	1	0	1	5	0	0	0	0	0	0	0	0	27	0	3	30
(%)	(74.1)	(0.0)	(3.7)	(0.0)	(3.7)	(18.5)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
100–119	478	32	29	9	23	94	11	4	0	1	0	2	2	1	686	0	83	769
(%)	(69.7)	(4.7)	(4.2)	(1.3)	(3.4)	(13.7)	(1.6)	(0.6)	(0.0)	(0.1)	(0.0)	(0.3)	(0.3)	(0.1)	(100.0)			
120–139	1694	173	132	12	88	118	31	5	1	1	0	2	2	0	2 259	2	190	2 451
(%)	(75.0)	(7.7)	(5.8)	(0.5)	(3.9)	(5.2)	(1.4)	(0.2)	(0.0)	(0.0)	(0.0)	(0.1)	(0.1)	(0.0)	(100.0)			
140–159	14 229	1 513	590	40	297	275	40	18	7	8	1	10	7	2	17 037	0	1 906	18 943
(%)	(83.5)	(8.9)	(3.5)	(0.2)	(1.7)	(1.6)	(0.2)	(0.1)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(100.0)			
160–179	6 243	690	215	27	60	40	8	14	7	1	1	5	0	0	7311	1	743	8 055
(%)	(85.4)	(9.4)	(2.9)	(0.4)	(0.8)	(0.5)	(0.1)	(0.2)	(0.1)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(100.0)			
180–199	25 834	2 495	727	33	142	89	27	30	13	3	3	1	3	0	29 400	0	3 231	32 631
(%)	(87.9)	(8.5)	(2.5)	(0.1)	(0.5)	(0.3)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
200–219	70 995	5 452	1071	89	211	124	45	49	18	7	3	7	4	1	78 076	4	8 791	86 871
(%)	(90.9)	(7.0)	(1.4)	(0.1)	(0.3)	(0.2)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
220–239	16 225	908	160	8	31	7	6	11	3	1	0	0	0	0	17 360	0	1 801	19 161
(%)	(93.5)	(5.2)	(0.9)	(0.0)	(0.2)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
240–259	13 195	692	122	5	27	4	6	25	4	4	0	0	0	0	14 084	0	1 399	15 483
(%)	(93.7)	(4.9)	(0.9)	(0.0)	(0.2)	(0.0)	(0.0)	(0.2)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
260–279	1 326	59	10	1	3	0	0	0	0	0	0	0	0	0	1399	0	99	1 498
(%)	(94.8)	(4.2)	(0.7)	(0.1)	(0.2)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
280–299	926	43	5	0	1	0	1	3	0	0	0	0	0	0	979	0	77	1 056
(%)	(94.6)	(4.4)	(0.5)	(0.0)	(0.1)	(0.0)	(0.1)	(0.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
300–319	1 429	84	32	1	7	7	1	10	0	3	0	0	0	1	1 575	0	751	2 326
(%)	(90.7)	(5.3)	(2.0)	(0.1)	(0.4)	(0.4)	(0.1)	(0.6)	(0.0)	(0.2)	(0.0)	(0.0)	(0.0)	(0.1)	(100.0)			
320–339	142	9	1	0	0	0	0	5	0	4	0	0	0	0	161	0	3	164
(%)	(88.2)	(5.6)	(0.6)	(0.0)	(0.0)	(0.0)	(0.0)	(3.1)	(0.0)	(2.5)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
340–359	104	8	3	0	0	0	0	2	0	2	0	0	0	0	119	0	3	122
(%)	(87.4)	(6.7)	(2.5)	(0.0)	(0.0)	(0.0)	(0.0)	(1.7)	(0.0)	(1.7)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
360–379	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	7
(%)	(100.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
380–399	10	4	3	0	0	0	0	0	0	0	0	0	0	0	17	0	0	17
(%)	(58.8)	(23.5)	(17.6)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
400–419	32	5	5	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
(%)	(76.2)	(11.9)	(11.9)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
420–439	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	7
(%)	(100.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
440–459	23	4	4	0	0	0	0	0	0	0	0	0	0	0	31	0	0	31
(%)	(74.2)	(12.9)	(12.9)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
≥460	40	3	0	0	0	1	0	0	0	0	0	0	0	0	44	0	21	65
(%)	(90.9)	(6.8)	(0.0)	(0.0)	(0.0)	(2.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Subtotal	152 958	12 174	3110	225	891	764	176	176	53	35	8	27	18	5	170 620	7	19 102	189 729
(%)	(89.6)	(7.1)	(1.8)	(0.1)	(0.5)	(0.4)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
No information available	1 769	90	35	2	9	16	10	1	1	0	0	0	0	0	1933	0	17 380	19 313
(%)	(91.5)	(4.7)	(1.8)	(0.1)	(0.5)	(0.8)	(0.5)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Total	154 727	12 264	3145	227	900	780	186	177	54	35	8	27	18	5	172 553	7	36 482	209 042
(%)	(89.7)	(7.1)	(1.8)	(0.1)	(0.5)	(0.5)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Mean	198	193	185	178	170	154	168	205	188	219	183	161	157	182	197	171	200	198
SD	31	30	35	32	35	38	39	51	27	73	18	29	33	73	31	38	35	32

TABLE 41. *Types of vascular access for different values of Kt/V_{sp} (for patients treated by facility hemodialysis)*

	Types of vascular access																	
	Double-needle dialysis							Single-needle dialysis										
Kt/V_{sp}	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Arteriovenous fistula via an autogenous blood vessel	Arteriovenous fistula via an artificial blood vessel	Superficial artery	Direct arterial puncture	Long-term implantable catheter	Temporary venous catheter	Others	Subtotal	Unspecified	No information available	Total
<0.4	208	10	11	4	6	18	1	7	0	1	0	0	0	0	266	0	33	299
(%)	(78.2)	(3.8)	(4.1)	(1.5)	(2.3)	(6.8)	(0.4)	(2.6)	(0.0)	(0.4)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
0.4–0.5	564	34	29	6	14	74	1	10	2	7	2	0	1	2	746	0	74	820
(%)	(75.6)	(4.6)	(3.9)	(0.8)	(1.9)	(9.9)	(0.1)	(1.3)	(0.3)	(0.9)	(0.3)	(0.0)	(0.1)	(0.3)	(100.0)			
0.6–0.7	2 612	125	61	8	50	89	4	23	7	2	0	3	1	0	2 985	0	287	3272
(%)	(87.5)	(4.2)	(2.0)	(0.3)	(1.7)	(3.0)	(0.1)	(0.8)	(0.2)	(0.1)	(0.0)	(0.1)	(0.0)	(0.0)	(100.0)			
0.8–0.9	9567	494	245	22	90	92	6	27	7	1	3	0	3	1	10 558	0	1 080	11 638
(%)	(90.6)	(4.7)	(2.3)	(0.2)	(0.9)	(0.9)	(0.1)	(0.3)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
1.0–1.1	25 781	1 519	543	45	158	98	21	38	9	8	0	4	5	0	28 229	2	2 715	30 946
(%)	(91.3)	(5.4)	(1.9)	(0.2)	(0.6)	(0.3)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
1.2–1.3	41 371	2 805	707	50	190	65	40	22	9	1	2	8	2	1	45 273	1	4 223	49 497
(%)	(91.4)	(6.2)	(1.6)	(0.1)	(0.4)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
1.4–1.5	34 930	3 077	641	33	168	40	19	20	6	4	1	9	0	0	38 948	0	3 531	42 479
(%)	(89.7)	(7.9)	(1.6)	(0.1)	(0.4)	(0.1)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
1.6–1.7	18 985	1 981	404	21	74	16	30	8	7	8	0	3	0	0	21 537	0	1 914	23 451
(%)	(88.2)	(9.2)	(1.9)	(0.1)	(0.3)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
1.8–1.9	7852	919	170	8	35	4	20	5	3	2	0	0	0	0	9 018	1	876	9 895
(%)	(87.1)	(10.2)	(1.9)	(0.1)	(0.4)	(0.0)	(0.2)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
≥2.0	3 649	545	107	5	22	7	15	2	0	0	0	0	0	0	4 352	0	530	4 882
(%)	(83.8)	(12.5)	(2.5)	(0.1)	(0.5)	(0.2)	(0.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Subtotal	145 519	11 509	2918	202	807	503	157	162	50	34	8	27	12	4	161 912	4	15 263	177 179
(%)	(89.9)	(7.1)	(1.8)	(0.1)	(0.5)	(0.3)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
No information available	9 208	755	227	25	93	277	29	15	4	1	0	0	6	1	10 641	3	21 219	31 863
(%)	(86.5)	(7.1)	(2.1)	(0.2)	(0.9)	(2.6)	(0.3)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(100.0)			
Total	154 727	12 264	3145	227	900	780	186	177	54	35	8	27	18	5	172 553	7	36 482	209 042
(%)	(89.7)	(7.1)	(1.8)	(0.1)	(0.5)	(0.5)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(100.0)			
Mean	1.37	1.45	1.37	1.26	1.28	0.97	1.49	1.09	1.18	1.17	0.97	1.32	0.97	0.76	1.38	1.35	1.38	1.38
SD	0.30	0.31	0.34	0.37	0.36	0.39	0.41	0.39	0.37	0.48	0.34	0.28	0.28	0.40	0.30	0.34	0.32	0.31

TABLE 42. *Hepatitis C virus (HCV) antibody positivity rates for different medical facilities (for all target patients)*

	Change of reaction to HCV antibody	Kind of facility							
	End of 2006 → end of 2007	National + public university hospital	Private university hospital	National hospital	Prefectural + municipal + village hospital	Social insurance hospital	"Kouseiren"† hospital	Other public hospital	Total
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	656	11 148	1680	3948	2973	36 369	64 328	121 102
	(% relative to total in row)	(0.5)	(9.2)	(1.4)	(3.3)	(2.5)	(30.0)	(53.1)	(100.0)
	Negative → positive (b)	14	111	21	56	41	431	601	1 275
	(% relative to total in row)	(1.1)	(8.7)	(1.6)	(4.4)	(3.2)	(33.8)	(47.1)	(100.0)
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	670	11 259	1701	4004	3014	36 800	64 929	122 377
	(% relative to total in row)	(0.5)	(9.2)	(1.4)	(3.3)	(2.5)	(30.1)	(53.1)	(100.0)
HCV antibody positivity rate (%) = (b ÷ c) × 100		2.09	0.99	1.23	1.40	1.36	1.17	0.93	1.04

†Kouseiren: a welfare association belonging to agricultural cooperative associations.

TABLE 43. *Hepatitis C virus (HCV) antibody positivity rates for different dialysis methods (for all target patients)*

	Change of reaction to HCV antibody	Method of dialysis						
	End of 2006 → end of 2007	Facility hemodialysis	Hemodiafiltration	Hemofiltration	Hemoadsorption	Home hemodialysis	CAPD	Total
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	112 575	5714	45	308	80	2380	121 102
	(% relative to total in row)	(93.0)	(4.7)	(0.0)	(0.3)	(0.1)	(2.0)	(100.0)
	Negative → positive (b)	1 157	83	2	7	1	25	1 275
	(% relative to total in row)	(90.7)	(6.5)	(0.2)	(0.5)	(0.1)	(2.0)	(100.0)
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	113 732	5797	47	315	81	2405	122 377
	(% relative to total in row)	(92.9)	(4.7)	(0.0)	(0.3)	(0.1)	(2.0)	(100.0)
HCV antibody positivity rate (%) = (b ÷ c) × 100		1.02	1.43	4.26	2.22	1.23	1.04	1.04

CAPD, continuous ambulatory peritoneal dialysis.

TABLE 44. *Hepatitis C virus (HCV) antibody positivity rates for different genders (for all target patients)*

	Change of reaction to HCV antibody	Gender		
	End of 2006 → end of 2007	Male	Female	Total
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	73 397	47 705	121 102
	(% relative to total in row)	(60.6)	(39.4)	(100.0)
	Negative → positive (b)	846	429	1 275
	(% relative to total in row)	(66.4)	(33.6)	(100.0)
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	74 243	48 134	122 377
	(% relative to total in row)	(60.7)	(39.3)	(100.0)
HCV antibody positivity rate (%) = (b ÷ c) × 100		1.14	0.89	1.04

for patients aged 60 years or older (Table 46). This was also similar to the finding in the previous analysis.

6. Years on dialysis. The HCV antibody positivity rate was lowest for patients treated with dialysis for 5–20 years (Table 47). The HCV antibody positivity rate suddenly increased after 20 years or more of dialysis treatment. Interestingly, the previous analysis also indicated that the HCV antibody positivity rate suddenly increased after 15 years on dialysis. Because six years have passed since the previous analysis, the

TABLE 45. *Hepatitis C virus (HCV) antibody positivity rates for different primary diseases (for all target patients)*

	Change of reaction to HCV antibody	Primary disease			
	End of 2006 → end of 2007	Chronic glomerulonephritis	Diabetic nephropathy	Others	Total
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	51 926	38 066	31 110	121 102
	(% relative to total in row)	(42.9)	(31.4)	(25.7)	(100.0)
	Negative → positive (b)	507	491	277	1 275
	(% relative to total in row)	(39.8)	(38.5)	(21.7)	(100.0)
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	52 433	38 557	31 387	122 377
	(% relative to total in row)	(42.8)	(31.5)	(25.6)	(100.0)
HCV antibody positivity rate (%) = (b ÷ c) × 100		0.97	1.27	0.88	1.04

TABLE 46. *Hepatitis C virus (HCV) antibody positivity rates for different ages (for all target patients)*

	Change of reaction to HCV antibody	Age (years)							
	End of 2006 → end of 2007	<30	30–44	45–59	60–74	≥75	Total	Mean	SD
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	929	8867	34 984	51 815	24 507	121 102	63.51	12.70
	(% relative to total in row)	(0.8)	(7.3)	(28.9)	(42.8)	(20.2)	(100.0)		
	Negative → positive (b)	2	55	302	631	285	1 275	65.81	11.04
	(% relative to total in row)	(0.2)	(4.3)	(23.7)	(49.5)	(22.4)	(100.0)		
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	931	8922	35 286	52 446	24 792	122 377	63.54	12.68
	(% relative to total in row)	(0.8)	(7.3)	(28.8)	(42.9)	(20.3)	(100.0)		
HCV antibody positivity rate (%) = (b ÷ c) × 100		0.21	0.62	0.86	1.20	1.15	1.04		

TABLE 47. *Hepatitis C virus (HCV) antibody positivity rates for different periods of dialysis (for all target patients)*

Change of reaction to HCV antibody	End of 2006 → end of 2007	Years on dialysis										
		<2	2–4	5–9	10–14	15–19	20–24	25–29	≥30	Total	Mean	SD
Patients who were HCV-antibody-negative at the end of 2006	Negative → negative (a)	27 933	32 617	31 371	15 582	7666	3710	1755	468	121 102	6.37	6.20
	(% relative to total in row)	(23.1)	(26.9)	(25.9)	(12.9)	(6.3)	(3.1)	(1.4)	(0.4)	(100.0)		
	Negative → positive (b)	307	332	271	133	64	78	63	27	1 275	7.69	8.31
	(% relative to total in row)	(24.1)	(26.0)	(21.3)	(10.4)	(5.0)	(6.1)	(4.9)	(2.1)	(100.0)		
	Total number of patients who were HCV-antibody-negative at the end of 2006 (c)	28 240	32 949	31 642	15 715	7730	3788	1818	495	122 377	6.39	6.23
	(% relative to total in row)	(23.1)	(26.9)	(25.9)	(12.8)	(6.3)	(3.1)	(1.5)	(0.4)	(100.0)		
HCV antibody positivity rate (%) = (b ÷ c) × 100		1.09	1.01	0.86	0.85	0.83	2.06	3.47	5.45	1.04		

patients on dialysis for 15 years or longer in the previous analysis mostly correspond to those on dialysis for 20 years or longer in the present analysis. The findings on the relationship between dialysis years and the HCV antibody positivity rate obtained in the previous and present analyses may include problems related to the measurement of HCV antibody and other issues, and do not necessarily indicate new infection with hepatitis C. For example, the rate of HCV-antibody-positive patients who were started on dialysis before the clinical application of an HCV antibody test and recombinant human erythropoietin and who were treated with dialysis for at least 25 years was as high as 43.3% of those for whom the result of the HCV antibody test was determined. There is a high possibility that their HCV antibody positivity was not caused by new infection because most of the patients positive for the HCV antibody at a low titer were HCV-RNA-negative.

B. Analysis of factors associated with HCV antibody positivity for patients treated by hemodialysis

1. Fundamental factors. The risk of HCV antibody positivity was significantly higher in patients fulfilling any of the following criteria: male gender, 60 years or older, on dialysis for 20 years or longer, and having diabetes (Table 48). This finding is in agreement with that on the HCV antibody positivity rate.

2. Postdialysis weight. The risk of HCV antibody positivity was significantly lower for patients weighing 60 kg or more after dialysis (Table 49). As reported in the following sections, the risk of HCV antibody positivity was lower in patients with good nutritional status, as determined from various nutritional indices. The finding regarding the patients' weight also suggests a relationship between their nutritional conditions and the risk of HCV antibody positivity.

3. Predialysis serum creatinine level. The risk of HCV antibody positivity was significantly higher for patients with a predialysis serum creatinine level of <9 mg/dL (Table 50). It was also low for patients with predialysis serum creatinine levels of 15–18 mg/dL. Low serum creatinine levels in patients are considered to be related to low muscle mass; therefore, this finding also suggests that malnourished patients have a high risk of HCV antibody positivity.

4. Serum albumin level. Low serum albumin levels were associated with a higher risk of HCV

TABLE 48. *Risk of hepatitis C virus (HCV) antibody positivity in relation to fundamental factors (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Risk factor	Relative risk	(95% confidence interval)	*P*-value
Gender			
Male	1.000	(Reference)	Reference
Female	0.779	(0.693–0.876)	<0.0001
Age (year)			
<30	0.567	(0.201–1.599)	0.2831
30–44	0.756	(0.565–1.010)	0.0588
45–59	1.000	(Reference)	Reference
60–74	1.271	(1.113–1.451)	0.0004
≥75	1.319	(1.114–1.561)	0.0013
Years on dialysis			
<2	1.042	(0.879–1.235)	0.6374
2–4	1.007	(0.856–1.185)	0.9284
5–9	1.000	(Reference)	Reference
10–14	0.945	(0.763–1.172)	0.6084
15–19	0.928	(0.690–1.248)	0.6190
20–24	2.785	(2.129–3.644)	<0.0001
25–29	10.33	(8.151–13.10)	<0.0001
≥30	53.61	(40.84–70.36)	<0.0001
Primary disease			
Chronic glomerulonephritis	1.000	(Reference)	Reference
Diabetic nephropathy	1.399	(1.213–1.613)	<0.0001
Others	0.989	(0.850–1.150)	0.8834

antibody positivity (Table 51). Low serum albumin levels in patients indicate their malnutrition; therefore, this finding also suggests a high risk of HCV antibody positivity for malnourished patients.

5. Serum total cholesterol level. Patients with a serum total cholesterol level of <140 mg/dL had a higher risk of HCV antibody positivity (Table 52). This finding also suggests the relationship between malnutrition of patients and their risk of HCV antibody positivity.

TABLE 49. *Risk of hepatitis C virus (HCV) antibody positivity for different postdialysis weights (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Postdialysis weight (kg)	Relative risk	(95% confidence interval)	*P*-value
<30	1.908	(0.853–4.267)	0.1156
30–39	1.101	(0.872–1.389)	0.4199
40–49	1.077	(0.934–1.242)	0.3044
50–59	1.000	(Reference)	Reference
60–69	0.847	(0.719–0.998)	0.0472
70–79	0.741	(0.558–0.984)	0.0384
≥80	0.564	(0.330–0.963)	0.0360

TABLE 50. *Risk of hepatitis C virus (HCV) antibody positivity for different predialysis serum creatinine levels (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for 2 years or longer)*

Predialysis serum creatinine level (mg/dL)	Relative risk	(95% confidence interval)	*P*-value
<6	1.586	(1.06–2.372)	0.0249
6–8	1.517	(1.241–1.854)	<0.0001
9–11	1.159	(0.987–1.36)	0.0712
12–14	1.000	(Reference)	Reference
15–17	0.745	(0.546–1.017)	0.0638
≥18	0.723	(0.279–1.878)	0.5061

TABLE 51. *Risk of hepatitis C virus (HCV) antibody positivity for different serum albumin levels (for patients who were HCV-antibody- negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Serum albumin level (g/dL)	Relative risk	(95% confidence interval)	*P*-value
<3.0	1.858	(1.393–2.478)	<0.0001
3.0–3.4	1.326	(1.138–1.546)	0.0003
3.5–3.9	1.000	(Reference)	Reference
4.0–4.4	0.801	(0.696–0.921)	0.0019
≥4.5	0.692	(0.467–1.026)	0.0669

6. Body mass index. Patients with a body mass index of <20 kg/m^2 had a higher risk of HCV antibody positivity (Table 53). This also suggests the relationship between malnutrition of patients and the risk of HCV antibody positivity.

7. nPCR. No significant relationship was observed between the nPCR and the risk of HCV

TABLE 52. *Risk of hepatitis C virus (HCV) antibody positivity for different serum total cholesterol levels (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Predialysis serum total cholesterol level (mg/dL)	Relative risk	(95% confidence interval)	*P*-value
<100	3.051	(2.372–3.925)	<0.0001
100–139	1.431	(1.179–1.736)	0.0003
140–159	1.008	(0.819–1.239)	0.9432
160–179	0.835	(0.67–1.042)	0.1112
180–199	1.000	(Reference)	Reference
200–219	0.756	(0.552–1.037)	0.0829
220–239	0.727	(0.464–1.137)	0.1618
240–259	0.574	(0.280–1.176)	0.1292
≥260	0.891	(0.411–1.930)	0.7694

TABLE 53. *Risk of hepatitis C virus (HCV) antibody positivity for different values of body mass index (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Body mass index (kg/m^2)	Relative risk	(95% confidence interval)	*P*-value
<16	0.850	(0.596–1.211)	0.3684
16–17	1.029	(0.845–1.254)	0.7764
18–19	1.000	(Reference)	Reference
20–21	0.774	(0.653–0.918)	0.0032
22–23	0.751	(0.621–0.909)	0.0032
24–25	0.724	(0.568–0.922)	0.0088
≥26	0.651	(0.489–0.866)	0.0033

antibody positivity (Table 54). As reported above, the other nutrition indices indicated that malnutrition was related to the risk of HCV antibody positivity; however, no such relationship was observed for nPCR. Considering nPCR to be an index of the amount of protein intake, it showed a different trend from other nutrition indices.

8. Kt/Vsp. There was no strong relationship between Kt/V_{sp}, an index of dialysis dose, and the risk of HCV antibody positivity (Table 55).

9. Dialysis duration. No clear relationship was observed between dialysis duration and the risk of HCV antibody positivity (Table 56). Similarly to the finding on Kt/V_{sp}, it is considered that the dialysis treatment has little relationship with the risk of HCV antibody positivity.

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TABLE 54. *Risk of hepatitis C virus (HCV) antibody positivity for different normalized protein catabolic rate (nPCR) values (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for 2 years or longer)*

nPCR (g/kg/day)	Relative risk	(95% confidence interval)	*P*-value
<0.5	0.601	(0.183–1.972)	0.4012
0.5–0.6	1.210	(0.921–1.59)	0.1719
0.7–0.8	1.019	(0.828–1.253)	0.8610
0.9–1.0	0.994	(0.812–1.218)	0.9565
1.1–1.2	1.000	(Reference)	Reference
1.3–1.4	0.934	(0.584–1.494)	0.7743
1.5–1.6	1.547	(0.562–4.258)	0.3980
≥1.7	1.625	(0.296–8.936)	0.5765

TABLE 55. *Risk of hepatitis C virus (HCV) antibody positivity for different Kt/V_{sp} values (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Kt/V_{sp}	Relative risk	(95% confidence interval)	*P*-value
<0.8	1.207	(0.803–1.814)	0.3654
0.8–0.9	1.130	(0.866–1.474)	0.3676
1.0–1.1	1.000	(Reference)	Reference
1.2–1.3	1.168	(0.980–1.393)	0.0832
1.4–1.5	1.162	(0.963–1.401)	0.1174
1.6–1.7	0.930	(0.733–1.179)	0.5490
≥1.8	1.366	(1.051–1.774)	0.0195

TABLE 56. *Risk of hepatitis C virus (HCV) antibody positivity for different dialysis durations (for patients who were HCV-antibody-negative at the end of 2006 and treated by dialysis three times per week for all periods of dialysis)*

Dialysis duration (h)	Relative risk	(95% confidence interval)	*P*-value
<3.5	1.053	(0.881–1.26)	0.5701
3.5–3.9	1.101	(0.916–1.323)	0.3071
4.0–4.4	1.000	(Reference)	Reference
4.5–4.9	0.812	(0.636–1.037)	0.0947
≥5.0	0.801	(0.62–1.035)	0.0901

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