Renal replacement therapy in Europe—a summary of the 2009 ERA–EDTA Registry Annual Report

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Abstract

Introduction. This study provides a summary of the 2009 ERA-EDTA Registry Report, with a focus on the differences in the incidence and prevalence of haemodialysis (HD), peritoneal dialysis (PD) and renal transplantation between countries and over time.

Methods. For this report, 56 data sets on renal replacement therapy (RRT) from national and regional registries in 30 countries in Europe and bordering the Mediterranean Sea were available. Data sets with individual patient data were received from 26 registries, whereas 19 registries contributed data in aggregated form. For both types of registries, we present incidence, prevalence and transplant rates. Survival analysis is based on individual patient records.

Results. In 2009, the overall incidence rate of RRT for end-stage renal disease (ESRD) among all registries reporting to the ERA–EDTA Registry was 125 per million population (p.m.p.). Incidence rates varied from 259 p.m.p. in Turkey to 19 p.m.p. in Ukraine and the mean age of patients starting RRT in 2009 ranged from 47.6 years in Russia to 69.5 year in Dutch-speaking Belgium. When examining the relative change of the HD, PD and transplantation distribution (at Day 91 after the start of RRT) between 2005 and 2009, we found overall a 0.5% decrease in HD, 1.4% decrease in PD utilization and an 1.8% increase of the share of patients living on a functioning graft. The overall prevalence of RRT for ESRD as of 31 December 2009 was 730 p.m.p. The highest prevalence was reported by Portugal (1507 p.m.p.) and the lowest by Ukraine (101 p.m.p.). In Norway, 70% of the patients on RRT were living with a functioning graft (591 p.m.p.) at 31 December 2009. The number of transplants performed p.m.p. in 2009 was highest in Spain (Cantabria) (78 p.m.p.). For the cohort 2000–04, the adjusted 1-, 2- and 5-year survival of patients on RRT was 87.4% (95% confidence interval: 87.2–87.7), 78.5% (95% confidence interval: 78.2–78.8) and 56.3% (95% confidence interval: 55.9–56.7), respectively.

Keywords: incidence; prevalence; survival; dialysis; transplantation

Introduction

This summary of the 2009 ERA–EDTA (European Renal Association–European Dialysis and Transplant Association) Registry Report includes data on renal replacement therapy (RRT) using 56 data sets from national and regional registries in 30 countries in Europe and bordering the Mediterranean Sea (Figure 1). Data sets with individual patient data for analysis were received from 26 national and regional registries in 14 countries, whereas 19 national registries from 19 countries contributed data only in aggregated form.

For both types of registries, we present incidence and prevalence data as well as transplant rates. In this article, we focus on differences in the incidence and prevalence of treatment modality, i.e. haemodialysis (HD), peritoneal dialysis (PD) and renal transplantation, between countries and over time. Survival analysis used the data from countries and regions that provided individual patient records.

More detailed data than those presented in the paper can be found in the 2009 ERA–EDTA Registry Report [1] that is also available on www.era-edta-reg.org.

The incidence of RRT for end-stage renal disease across Europe

In 2009, the overall incidence rate of RRT for end-stage renal disease (ESRD) among all registries reporting to the ERA–EDTA Registry was 125 per million population (p.m.p.). Figure 2 shows that the highest incidence rates at Day 1 were reported by Turkey (259 p.m.p.), Portugal (240 p.m.p.) and Greece (205 p.m.p.), whereas incidence rates <100 p.m.p. were reported by Ukraine (19 p.m.p.), Montenegro (30 p.m.p.), Russia (33 p.m.p.), Estonia (51 p.m.p.), Finland (83 p.m.p.), Iceland (88 p.m.p.), Latvia (89 p.m.p.), UK, Northern Ireland (90 p.m.p.), Spain, Castille-La Mancha (94 p.m.p.) and the FYR of Macedonia (97 p.m.p.).
Fig. 1. Incidence of RRT p.m.p. at Day 1, 2009. B&H, Bosnia–Herzegovina; FYROM, former Yugoslav Republic of Macedonia.

Fig. 2. Incidence of RRT p.m.p. at Day 1 in 2009 for all patients and for patients with diabetes mellitus as PRD and mean age (years), unadjusted. Figures include data from renal registries providing individual patient data (left figure) and aggregated data (right figure).
In Table 2, we present the incidence of RRT at Day 1 over the period from 2005 to 2009 for countries and regions providing individual patient data, adjusted for age and gender distribution.

| Country/region providing individual patient data | 2005 (p.m.a.r.p.) | 2006 (p.m.a.r.p.) | 2007 (p.m.a.r.p.) | 2008 (p.m.a.r.p.) | 2009 (p.m.a.r.p.) |
|-----------------------------------------------|------------------|------------------|------------------|------------------|------------------|
| All countries                                  | 130.8            | 131.7            | 129.5            | 129.1            | 127.0            |
| Austria                                       | 155.2            | 160.9            | 154.8            | 150.8            | 145.0            |
| Belgium                                       | 172.8            | 178.5            | 174.3            | 173.5            | 181.3            |
| Dutch speaking<sup>a</sup>                    | 180.6            | 190.9            | 190.5            | 196.0            | 198.7            |
| French speaking<sup>a</sup>                   | 124.1            | 122.5            | 147.9            | 125.3            | 126.0            |
| Denmark                                       | 96.2             | 86.0             | 90.2             | 92.3             | 79.7             |
| Greece                                       | 181.8            | 182.4            | 174.5            | 181.4            | 182.4            |
| Iceland                                       | 85.2             | 83.9             | 94.2             | 89.1             | 111.5            |
| Italy (Calabria)                              | 135.9            | 133.4            | 145.5            | 152.1            | 138.4            |
| Norway                                        | 105.9            | 106.7            | 118.6            | 119.4            | 121.6            |
| Spain                                         | 162.4            | 143.7            | 131.4            | 135.9            | 128.6            |
| Asturias                                      | 104.9            | 112.1            | 108.7            | 109.3            | 112.1            |
| Basque country                                | 112.5            | 103.2            | 104.9            | 100.2            | 117.5            |
| Cantabria                                     | 151.0            | 118.0            | 99.7             | 103.3            | 102.3            |
| Castilla and Leon<sup>a</sup>                 | 99.2             | 104.5            | 104.2            | 108.5            | 96.3             |
| Castilla-La Mancha                           | 121.4            | 107.1            | 98.5             | 98.3             | 93.1             |
| Catalonia                                     | 149.5            | 133.6            | 142.3            | 146.7            | 142.3            |
| Extremadura                                   | 116.4            | 127.7            | 97.8             | 127.2            | 100.4            |
| Valencian region                              | 147.5            | 153.1            | 147.1            | 136.3            | 139.3            |
| Sweden                                        | 116.1            | 124.0            | 122.6            | 116.9            | 115.3            |
| The Netherlands                               | 113.5            | 119.9            | 122.9            | 128.5            | 125.3            |
| UK, all countries                             | 115.3            | 116.8            | 112.7            | 111.6            | 108.8            |
| UK, England                                   | 111.5            | 115.0            | 110.7            | 111.9            | 109.5            |
| UK, Northern Ireland                          | 161.6            | 142.1            | 129.6            | 123.0            | 100.6            |
| UK, Scotland                                  | 126.4            | 117.0            | 113.7            | 106.8            | 104.1            |
| UK, Wales                                     | 128.0            | 131.6            | 136.2            | 111.0            | 110.6            |

The incidence rate of RRT for diabetic ESRD was highest in Turkey (88 p.m.p.), Israel (83 p.m.p.) and Spain, Canary Islands (73 p.m.p.), while the registries of Iceland, Spain, Castilla-La Mancha, Romania, the Netherlands, Ukraine, Montenegro, Russia, Estonia and Latvia reported incidence rates for ESRD due to diabetes mellitus < 20 p.m.p. In addition, both the mean and median age of patients starting RRT in 2009 is presented in Figure 2. The mean age ranged from 47.6 years in Russia to 69.5 years in Belgium (Dutch-speaking), while the overall mean age was 62.9 years.

Table 1 shows the unadjusted incidence rate of RRT per million age-related population (p.m.a.r.p.) at Day 1 by age group. For the age group 0–19 years at the start of RRT, data were available for 20 registries from 13 countries. For an overview of paediatric RRT, data collected from those registries please visit www.espn-reg.org.

In Table 2, we present the incidence of RRT at Day 1 over the period from 2005 to 2009 for countries and regions providing individual patient data, adjusted for age and gender distribution. Only those countries and regions with complete data from 2005 onwards are presented in this table.

The incidence of the different treatment modalities (HD, PD and transplantation) in 2009 was measured as the number of patients p.m.p. on a treatment modality at Day 91 of RRT (Table 3). Whereas incidence rates of HD were highest in Turkey (176 p.m.p.), Greece (167 p.m.p.), Israel (155 p.m.p.) and in Dutch-speaking and French-speaking Belgium (154 and 153 p.m.p., respectively), the incidence rates for PD were highest in Sweden (39 p.m.p.), Denmark (35 p.m.p.) and Spain, Basque country (29 p.m.p.). The highest incidence rates of patients living on a functioning graft at Day 91 of RRT were observed in Norway.
the prevalence of RRT p.m.p. at 31 December 2009 was highest in Portugal (1507 p.m.p.), Belgium (French-speaking) (1193 p.m.p.) and Spain, Catalonia (1160 p.m.p.). The lowest prevalence was reported by Ukraine (101 p.m.p.) and Russia (170 p.m.p.). Additionally, the mean and median age of prevalent patients on RRT at 31 December 2009 are presented in Figure 2. The mean age ranged from 46.9 in Russia to 64.6 in Belgium (Dutch-speaking), while the overall mean age was 58.8 years.

Table 4 shows the unadjusted prevalence of RRT p.m.a.r.p. on 31 December 2009, by age group and in Table 5, we present the prevalence of RRT at 31 December per year over the period from 2005 to 2009 for countries and regions providing individual patient data, adjusted for age and gender distribution. Only those countries and regions with complete data from 2005 onwards are presented in this table.

As presented in Table 6, the prevalence of HD at 31 December 2009 was highest in Portugal (908 p.m.p.), Italy (14 of 20 regions, 905 p.m.p.) and Greece (782 p.m.p.) and lowest in Ukraine (76 p.m.p.), Russia (121 p.m.p.) and Estonia (154 p.m.p.). The prevalence of PD was highest in UK, Wales (104 p.m.p.), Denmark (102 p.m.p.) and Sweden (93 p.m.p.), whereas the lowest prevalence of this treatment was reported in Montenegro (5 p.m.p.).

(19 p.m.p.) and the Netherlands and Spain, Catalonia (both 12 p.m.p.).

Finally, Figure 3 presents the distribution of the different treatment modalities in 2005 and the change in this distribution over the subsequent 5 years (2005–09). Overall, we found a 0.5% decrease in HD and 1.4% decrease in PD utilization at Day 91, whereas the share of patients living on a functioning graft increased with 1.8% between 2005 and 2009. The increase over time in HD utilization was highest in Iceland (+13%), UK, Northern Ireland (+9.9%), UK, Wales (+7.5%) and UK, Scotland (+7.4%), while in Norway a decrease of −7.4% was observed. The largest decreases in PD utilization were found in the Netherlands (−5.0%) and the UK, Northern Ireland (−12.8%), Wales (−7.2%) and Scotland (−8.0%), whereas PD utilization increased in Sweden (+4.4%). The share of patients living on a functioning graft at Day 91 after the start of RRT decreased between 2005 and 2009 with 11% in Iceland and increased with 4% in Norway and the Netherlands.

The prevalence of RRT for ESRD across Europe

The overall prevalence among all registries reporting to the ERA–EDTA Registry was 730 p.m.p. Figure 4 shows that the prevalence of RRT p.m.p. at 31 December 2009 was highest in Portugal (1507 p.m.p.), Belgium (French-speaking) (1193 p.m.p.) and Spain, Catalonia (1160 p.m.p.). The lowest prevalence was reported by Ukraine (101 p.m.p.) and Russia (170 p.m.p.). Additionally, the mean and median age of prevalent patients on RRT at 31 December 2009 are presented in Figure 2. The mean age ranged from 46.9 in Russia to 64.6 in Belgium (Dutch-speaking), while the overall mean age was 58.8 years.

Table 4 shows the unadjusted prevalence of RRT p.m.a.r.p. on 31 December 2009, by age group and in Table 5, we present the prevalence of RRT at 31 December per year over the period from 2005 to 2009 for countries and regions providing individual patient data, adjusted for age and gender distribution. Only those countries and regions with complete data from 2005 onwards are presented in this table.

As presented in Table 6, the prevalence of HD at 31 December 2009 was highest in Portugal (908 p.m.p.), Italy (14 of 20 regions, 905 p.m.p.) and Greece (782 p.m.p.) and lowest in Ukraine (76 p.m.p.), Russia (121 p.m.p.) and Estonia (154 p.m.p.). The prevalence of PD was highest in UK, Wales (104 p.m.p.), Denmark (102 p.m.p.) and Sweden (93 p.m.p.), whereas the lowest prevalence of this treatment was reported in Montenegro (5 p.m.p.),
Fig. 3. Relative change in HD, PD and Tx at Day 91 in 2009 compared to 2005. HD, haemodialysis; PD, peritoneal dialysis; Tx, kidney transplantation.
Ukraine and Russia (both 12 p.m.p.). Finally, the prevalence of patients living on a functioning graft was highest in Spain, Basque country (628 p.m.p.), Spain, Catalonia and Norway (both 591 p.m.p.), representing 59, 51 and 70% of the patients on RRT, respectively.

Renal transplants performed in 2009

Table 7 shows that the highest transplant rates were reported by Spain, Cantabria (78 p.m.p.), Spain, Catalonia (70 p.m.p.) and Norway (61 p.m.p.). Countries with the highest transplant rates with living donor kidneys included Spain, Castille-La Mancha (40 p.m.p.), the Netherlands (25 p.m.p.), Norway (22 p.m.p.), Iceland (22 p.m.p.) and Turkey (21 p.m.p.).

Patient and graft survival

Survival analysis used the data from 19 registries in 12 countries that provided individual patient records for the period from 2000 to 2004. Three Spanish regions were also included in the analyses based on the cohort 2003–07 because for these registries, complete data were available from 2002. Data are presented for all countries and regions together (Figures 5–7). In Table 8, we present the results of the unadjusted and adjusted survival analyses. The adjusted analyses, as well as the comparisons of survival by treatment modality, were adjusted for fixed values of age, gender and distribution of primary renal disease (PRD) (Appendix 1). Similar adjustments have been applied to survival comparisons by PRD. The precise methodology of the survival analyses is described in the Appendix 1.

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### Table 4. Prevalence of RRT p.m.a.r.p. on 31 December 2009 by age group, unadjusted

| Country/region providing individual patient data | 0–19 (p.m.a.r.p.) | 20–44 (p.m.a.r.p.) | 45–64 (p.m.a.r.p.) | 65–74 (p.m.a.r.p.) | 75+ (p.m.a.r.p.) |
|--------------------------------------------------|------------------|------------------|--------------------|-------------------|-----------------|
| Austria                                          | 63.5             | 453.0            | 1570.4             | 2534.8            | 1952.2          |
| Belgium                                          |                  |                  |                    |                   |                 |
| Dutch speakingb                                  |                  |                  |                    |                   |                 |
| French speakingb                                 |                  |                  |                    |                   |                 |
| Denmark                                          | 73.8             | 545.4            | 1265.6             | 1973.7            | 1776.1          |
| Finland                                          | 96.4             | 433.2            | 1265.9             | 1811.3            | 1207.6          |
| France                                           | 51.1             | 529.4            | 1513.7             | 2533.7            | 2715.2          |
| Greece                                           | 49.3             | 430.7            | 1419.8             | 2704.7            | 2981.4          |
| Iceland                                          | 44.3             | 489.9            | 787.5              | 1499.0            | 1258.6          |
| Italy                                            | 33.3             | 419.7            | 1420.0             | 2674.6            | 3199.2          |
| Norway                                           | 67.2             | 488.0            | 1364.5             | 2390.4            | 1801.7          |
| Romania                                          | 26.5             | 288.5            | 962.1              | 1268.8            | 765.2           |
| Spain                                            |                  |                  |                    |                   |                 |
| Andalusia                                        | 55.8             | 506.2            | 1691.8             | 2691.8            | 2389.4          |
| Asturias                                         | 45.7             | 454.7            | 1408.6             | 2115.2            | 1756.2          |
| Basque country                                   | 83.4             | 470.5            | 1599.8             | 2699.7            | 1939.8          |
| Canary Islands                                   | 18.8             | 521.9            | 1817.7             | 3546.2            | 3089.8          |
| Cantabria                                        | 408.1            | 1371.6           | 2432.2             | 1451.4            | 1451.4          |
| Castille and Leonb                              |                  |                  |                    |                   |                 |
| Catalonian                                       | 63.6             | 476.3            | 1811.0             | 3346.1            | 3027.0          |
| Extremadura                                      | 8.9              | 551.8            | 1513.0             | 2152.3            | 1800.7          |
| Galicia                                          | 72.2             | 511.8            | 1582.8             | 2503.7            | 1874.7          |
| Valencian region                                 | 60.7             | 455.6            | 1674.3             | 2943.4            | 3208.5          |
| Sweden                                           | 70.5             | 466.8            | 1463.9             | 2166.4            | 1631.0          |
| The Netherlands                                  | 67.4             | 496.1            | 1345.9             | 2259.5            | 2179.9          |
| UK, all countriesb                               |                  |                  |                    |                   |                 |
| England                                          | 54.6             | 534.6            | 1329.6             | 1918.0            | 1695.2          |
| Northern Irelandb                                | 552.2            | 1278.5           | 2258.1             | 2245.4            |                 |
| Scotland                                         | 85.8             | 612.1            | 1323.3             | 1623.4            | 1385.2          |
| Walesb                                           |                  |                  |                    |                   |                 |

*Patients < 20 years of age are not reported.

bData based on the regions Alsace, Auvergne, Bourgogne, Bretagne, Champagne-Ardenne, Corse, Haute Normandie, Languedoc Roussillon, Limousin, Midi-Pyrénées, Pays de Loire, Picardie, Poitou-Charentes, Provence-Alpes-Côte d’Azur, Rhône Alpes and the overseas department of Reunion.

cData based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy, Marche, Sardinia, Tuscany, Umbria and Veneto.

### Table 5. Prevalence of RRT at 31 December 2009 over the period 2005–09 p.m.p., adjusted for age and gender distribution

| Country/regions providing individual patient data | 2005 (p.m.p.) | 2006 (p.m.p.) | 2007 (p.m.p.) | 2008 (p.m.p.) | 2009 (p.m.p.) |
|--------------------------------------------------|--------------|--------------|--------------|--------------|--------------|
| All countries                                    | 827.1        | 847.3        | 867          | 889.2        | 910.1        |
| Austria                                          | 887.4        | 909.8        | 928.4        | 972.4        | 958.7        |
| Belgium                                          | 948.6        | 978.9        | 1003.5       | 1027.6       | 1054.9       |
| Dutch speakingb                                  | 1056.4       | 1101.9       | 1137.5       | 1175.2       | 1217.0       |
| French speakingb                                 | 778.2        | 786.4        | 823.8        | 830.2        | 832.2        |
| Denmark                                          | 704.2        | 710.8        | 724.0        | 740.2        | 767.3        |
| Greece                                           | 912.4        | 926.0        | 941.6        | 956.9        | 974.7        |
| Iceland                                          | 540.5        | 551.0        | 577.6        | 587.5        | 613.0        |
| Italy (Calabria)                                  | 947.1        | 954.1        | 971.1        | 971.0        | 965.4        |
| Norway                                           | 770.8        | 790.7        | 815.7        | 852.4        | 876.7        |
| Spain                                            | 1033.2       | 1029.5       | 1011.6       | 1027.6       | 1066.2       |
| Andalusia                                        | 826.7        | 834.6        | 830.2        | 840.0        | 850.4        |
| Asturias                                         | 911.0        | 922.6        | 937.1        | 945.8        | 975.7        |
| Basque country                                   | 801.2        | 795.5        | 785.3        | 796.2        | 815.7        |
| Cantabria                                        | 820.7        | 828.4        | 823.6        | 846.0        | 853.4        |
| Castille and Leon                                 | 934.7        | 939.9        | 938.1        | 953.7        | 929.7        |
| Catalonian                                       | 1079.5       | 1079.8       | 1117.0       | 1162.6       | 1169.1       |
| Extremadura                                      | 850.7        | 871.1        | 873.8        | 892.9        | 915.2        |
| Valencian region                                 | 1087.6       | 1095.1       | 1099.6       | 1109.0       | 1099.0       |
| Sweden                                           | 805.6        | 828.5        | 841.7        | 862.8        | 880.9        |
| The Netherlands                                  | 761.2        | 794.6        | 818.8        | 857.5        | 897.7        |
| UK, all countriesb                               | 720.1        | 746.8        | 778.3        | 804.7        | 825.9        |
| England                                          | 709.6        | 737.6        | 769.7        | 799.9        | 827.0        |
| Northern Irelandb                                | 847.2        | 874.3        | 890.6        | 905.3        | 899.8        |
| Scotland                                         | 767.3        | 785.8        | 809.6        | 817.6        | 829.4        |
| Walesb                                           | 730.6        | 759.2        | 814.8        | 817.3        | 840.5        |
### Table 6. Prevalence of RRT p.m.p. on 31 December 2009 by treatment modality, unadjusted\(^a\)

| Country/region providing individual patient data | All (p.m.p.) | HD (p.m.p.) | PD (p.m.p.) | Tx (p.m.p.) | Unknown/missing (p.m.p.) |
|------------------------------------------------|-------------|-------------|-------------|------------|-------------------------|
| Austria                                       | 979         | 457         | 45          | 476        | 0                       |
| Belgium                                       | 1141        | 607         | 68          | 466        | 0                       |
| Dutch speaking                               | 1193        | 649         | 60          | 484        | 0                       |
| Denmark                                       | 838         | 369         | 102         | 364        | 3                       |
| Finland (16 of 26 regions)\(^c\)              | 1043        | 526         | 63          | 473        | 0.3                     |
| Greece                                        | 1065        | 782         | 67          | 215        | 0                       |
| Iceland                                       | 540         | 166         | 25          | 349        | 0                       |
| Italy (12 of 20 regions)\(^a\)                | 1132        | 766         | 93          | 273        | 0                       |
| Norway                                        | 862         | 266         | 47          | 591        | 0                       |
| Romania                                       | 513         | 404         | 74          | 35         | 0                       |
| Spain                                         |            |             |             |            |                         |
| Andalusia                                     | 990         | 479         | 42          | 468        | 0.1                     |
| Asturias                                      | 991         | 365         | 54          | 570        | 0.9                     |
| Basque country                               | 1066        | 353         | 86          | 628        | 0                       |
| Canary Islands                               | 1112        | 592         | 58          | 461        | 0.5                     |
| Cantabria                                     | 872         | 335         | 61          | 476        | 0                       |
| Castile and Leon                             | 997         | 438         | 62          | 490        | 0                       |
| Catallonia                                    | 914         | 385         | 34          | 491        | 5                       |
| Catalonia                                     | 1159        | 526         | 43          | 591        | 0                       |
| Extremadura                                   | 950         | 464         | 59          | 427        | 0                       |
| Galicia                                       | 1083        | 501         | 93          | 489        | 0                       |
| Valencia region                               | 1105        | 619         | 40          | 445        | 1                       |
| Sweden                                        | 890         | 301         | 93          | 497        | 0.1                     |
| The Netherlands                               | 895         | 318         | 69          | 508        | 0                       |
| UK, all countries                            | 818         | 377         | 72          | 348        | 0.1                     |
| UK, England                                   | 815         | 375         | 72          | 343        | 24                      |
| UK, Northern Ireland                          | 818         | 414         | 468         | 356        | 3                       |
| UK, Scotland                                  | 835         | 362         | 59          | 414        | 0.8                     |
| UK, Wales                                     | 867         | 417         | 104         | 337        | 9                       |

\(^a\)Categories may not add up because of rounding off. When cells are left empty, (complete) data are unavailable. Tx, kidney transplantation.

\(^b\)Data based on the regions Alsace, Auvergne, Bourgogne, Bretagne, Centre, Champagne-Ardenne, Corse, Haute-Normandie, Ile de France, Languedoc-Roussillon, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas de Calais, Pays de Loire, Picardie, Poitou-Charentes, Provence-Alpes-Côte d’Azur and Rhône-Alpes and the overseas department of Reunion.

\(^c\)Data based on the regions Alsace, Auvergne, Bourgogne, Bretagne, Centre, Champagne-Ardenne, Corse, Haute-Normandie, Languedoc Roussillon, Limousin, Midi-Pyrénées, Pays de Loire, Picardie, Poitou-Charentes, Provence-Alpes-Côte d’Azur, Rhône-Alpes and the overseas department of Reunion.

\(^d\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy (part), Marche, Sardinia (part), Sicily, Trentino-Alto Adige, Tuscany (part), Umbria and Veneto.

\(^e\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy, Marche, Sardinia, Tuscany, Umbria and Veneto.

\(^f\)Data based on the regions Andalusia, Aragon, Asturias, Balearic Islands, Basque country, Canary Islands, Cantabria, Castile and Leon, Castile-La Mancha, Catalonia, Extremadura, Galicia, La Rioja, Navarre, Valencian region and the overseas cities Ceuta and Melilla.

\(^g\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy, Marche, Sardinia, Tuscany, Umbria and Veneto.

\(^h\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy, Marche, Sardinia, Tuscany, Umbria and Veneto.

\(^i\)Data based on the regions Andalusia, Aragon, Asturias, Balearic Islands, Basque country, Canary Islands, Cantabria, Castile and Leon, Castile-La Mancha, Catalonia, Extremadura, Galicia, La Rioja, Navarre, Valencian region and the overseas cities Ceuta and Melilla.

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1. ERA-EDTA Registry: ERA-EDTA Registry Annual Report 2009. Amsterdam, The Netherlands: Academic Medical Center, Department of Medical Informatics, 2011.

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Table 7. Renal transplants performed p.m.p. in 2009 by donor type, unadjusted\(^a\)

| Country/region providing individual patient data | All (p.m.p.) | Living donor (p.m.p.) | Deceased donor (p.m.p.) | Unknown type donor (p.m.p.) | Country/region providing aggregated data | All (p.m.p.) | Living donor (p.m.p.) | Deceased donor (p.m.p.) | Unknown type donor (p.m.p.) |
|-------------------------------------------------|--------------|----------------------|------------------------|---------------------------|----------------------------------------|--------------|----------------------|------------------------|---------------------------|
| Austria                                          | 47.5         | 7.2                  | 40.3                   | 0                         | Bosnia and Herzegovina                 | 5.7          | 4.8                  | 0.3                    | 0.6                       |
| Belgium                                          |              |                      |                        |                           | Bulgaria                                | 4.4          | 2.0                  | 2.3                    | 0                         |
| Dutch speaking                                   | 37.2         | 1.6                  | 35.5                   | 0.2                       | Croatia                                 | 37.6         | 2.7                  | 25.9                   | 9.0                       |
| French speaking                                  | 36.6         | 3.9                  | 29.3                   | 3.3                       | Czech Republic                         | 33.0         | 2.6                  | 30.5                   | 0                         |
| Denmark                                          | 40.3         | 15.8                 | 24.6                   | 0                         | Estonia                                 | 39.7         | 3.0                  | 36.7                   | 0                         |
| Finland                                          | 32.8         | 0.7                  | 32.0                   | 0                         | France (20 of 26 regions)\(^b\)         | 44.7         | 3.6                  | 41.1                   | 0                         |
| France (16 of 26 regions)\(^c\)                  | 40.6         | 2.4                  | 38.1                   | 0.1                       | FYR of Macedonia                       | 5.4          | 5.4                  | 0                      | 0                         |
| Greece                                           | 14.9         | 3.1                  | 11.8                   | 0                         | Israel                                  | 49.4         | 16.0                 | 25.6                   | 7.7                       |
| Iceland                                          | 22.0         | 22.0                 | 0                      | 0                         | Italy (14 of 20 regions)\(^d\)          | 46.1         | 3.5                  | 42.6                   | 0                         |
| Italy (12 of 20 regions)\(^e\)                   | 20.1         | 1.4                  | 18.7                   | 0                         | Latvia                                  | 25.8         | 2.7                  | 23.1                   | 0                         |
| Norway                                           | 38.0         | 21.5                 | 38.9                   | 0                         | Montenegro                              | 17.4         | 12.6                 | 4.7                    | 0                         |
| Romania                                          | 6.5          | 3.6                  | 1.5                    | 1.4                       | Poland                                  | 20.6         | 0.6                  | 20.0                   | 0                         |
| Spain                                            |              |                      |                        |                           | Portugal                                 | 55.8         | 5.9                  | 49.9                   | 0                         |
| Andalusia                                        | 46.4         |                      |                        |                           | Russia                                   | 5.8          | 1.1                  | 4.7                    | 0                         |
| Asturias                                         | 42.4         | 0.9                  | 41.5                   | 0.0                       | Serbia                                   | 12.9         | 8.7                  | 4.2                    | 0                         |
| Basque country                                   | 52.4         | 0                    | 52.4                   | 0                         | Slovakia                                 | 38.8         | 4.3                  | 34.6                   | 0                         |
| Canary Islands                                   | 46.9         | 0                    | 46.9                   | 0                         | Spain (all of 21 regions)\(^f\)          | 48.9         | 5.0                  | 44.8                   | 0                         |
| Cantabria                                        | 77.9         | 0                    | 77.9                   | 0                         | Turkey                                   | 26.6         | 20.9                 | 5.7                    | 0                         |
| Castille and Leon                                | 35.1         | 0                    | 35.1                   | 0                         | Ukraine                                  | 2.4          |                      |                        | 2.4                       |
| Castille-La Mancha                              | 40.7         | 40.2                 | 0                      | 0                         |                                       |              |                      |                        |                           |
| Catalonia                                        | 70.1         | 17.7                 | 52.4                   | 0                         |                                       |              |                      |                        |                           |
| Extremadura                                      | 40.7         | 0.9                  | 30.8                   | 9.1                       |                                       |              |                      |                        |                           |
| Galicia                                          | 45.4         | 5.7                  | 39.7                   | 0                         |                                       |              |                      |                        |                           |
| Valencian region                                 | 41.4         | 1.2                  | 40.2                   | 0                         |                                       |              |                      |                        |                           |
| Sweden                                           | 42.0         | 17.4                 | 24.6                   | 0                         |                                       |              |                      |                        |                           |
| The Netherlands                                  | 50.0         | 24.7                 | 24.1                   | 1.1                       |                                       |              |                      |                        |                           |
| UK, all countries                                | 41.9         | 15.9                 | 26.0                   | 0                         |                                       |              |                      |                        |                           |
| UK, England                                      | 43.6         | 17.0                 | 26.7                   | 0                         |                                       |              |                      |                        |                           |
| UK, Northern Ireland                             | 24.6         | 7.3                  | 17.3                   | 0                         |                                       |              |                      |                        |                           |
| UK, Scotland                                     | 34.8         | 10.0                 | 24.8                   | 0                         |                                       |              |                      |                        |                           |
| UK, Wales                                        | 33.7         | 12.7                 | 21.0                   | 0                         |                                       |              |                      |                        |                           |

\(^a\)Categories may not add up because of rounding off. When cells are left empty, (complete) data are unavailable.
\(^b\)Data based on the regions Alsace, Auvergne, Bourgogne, Bretagne, Centre, Champagne-Ardenne, Corse, Haute-Normandie, Ile de France, Languedoc-Roussillon, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas de Calais, Pays de Loire, Picardie, Poitou-Charentes, Provence-Alpes-Côte d’Azur and Rhône-Alpes and the overseas department of Reunion.
\(^c\)Data based on the regions Alsace, Auvergne, Bourgogne, Bretagne, Centre, Champagne-Ardenne, Corse, Haute-Normandie, Languedoc-Roussillon, Limousin, Midi-Pyrénées, Pays de Loire, Picardie, Poitou-Charentes, Provence-Alpes-Côte d’Azur, Rhône Alpes and the overseas department of Reunion.
\(^d\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy (part), Marche, Sardinia (part), Sicily, Trentino-Alto Adige, Tuscany (part), Umbria and Veneto.
\(^e\)Data based on the regions Abruzzi, Apulia, Basilicata, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Lombardy, Marche, Sardinia, Tuscany, Umbria and Veneto.
\(^f\)Data based on the regions Andalusia, Aragon, Asturias, Balearic Islands, Basque country, Canary Islands, Cantabria, Castille and Leon, Castille-La Mancha, Catalonia, Extremadura, Galicia, La Rioja, Navarre, Valencian region and the overseas cities Ceuta and Melilla.

Appendix 1 Statistical methods

Statistical methods to Table 8

Data presented include the survival of incident patients on RRT and of patients receiving a first transplant between 2000 and 2004 or between 2003 and 2007 with their 95% confidence intervals. Patients were followed until 31 December 2009. Statistical analysis of unadjusted survival was performed by the Kaplan–Meier method, while for the adjusted survival analyses, the Cox regression model was used. For the analysis of patient survival on RRT, the day at the start of RRT was taken as the starting point and the event studied was death. Censored observations were recovery of renal function, loss to follow-up and end of follow-up time. Regarding the analysis of patient survival on dialysis, the first day on dialysis was the starting point, the event was death and reasons for censoring were recovery of renal function, loss to follow-up, end of follow-up time and renal transplantation. In the Cox regression model, we adjusted for the fixed values of age (60 years), gender (60% men) and PRD (20% diabetes mellitus, 15% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other cause). For the analysis of patient and graft survival after transplantation, the date of the first renal transplantation was defined as the first day of follow-up. The event studied for the patient survival after transplantation was death, while for the graft survival, the events were graft failure and death. Reasons for censoring were loss to follow-up and end of follow-up time. In the adjusted analyses, we adjusted for the fixed values of age (45 years), gender (60% men) and PRD (10% diabetes mellitus, 8% hypertension/renal vascular disease, 28% glomerulonephritis and 54% other cause). Patients for whom age, gender or PRD was missing were excluded.

Statistical methods to Figure 5

For the analyses of patient survival on dialysis, the starting point was Day 91 on dialysis. Analyses were adjusted for the fixed values of age (60 years), gender (60% men) and PRD (20% diabetes mellitus, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other cause). For the analysis of patient survival after transplantation, the starting point was the time of the first transplant. Analyses
Fig. 5. Survival of incident dialysis patients and of patients receiving a first transplant between 2000 and 2004, by treatment modality, adjusted for age, gender and PRD. Analyses regarding incident dialysis patients were adjusted for the fixed values: age (60 years), gender (60% men) and PRD (20% diabetes mellitus, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other cause). Analyses regarding first transplant recipients were adjusted for the fixed values: age (45 years), gender (60% men) and PRD (10% diabetes mellitus, 8% hypertension/renal vascular disease, 28% glomerulonephritis and 54% other cause).

Fig. 6. Survival of incident HD patients in 2000–04, from Day 91, by PRD, adjusted for age and gender. Analyses were adjusted for the fixed values: age (60 years) and gender (60% men).

Fig. 7. Survival of incident PD patients in 2000–04, from Day 91, by PRD, adjusted for age and gender. Analyses were adjusted for the fixed values: age (60 years) and gender (60% men).

**Statistical methods to Figures 6 and 7**

For the analyses presented in each figure, the starting point was Day 91 on dialysis. Analyses were adjusted for the fixed values of age (60 years) and gender (60% men).
Table 8. The 1-2- and 5-year survival probabilities (95% confidence interval) from the first day of RRT for patients who started RRT between 2000 and 2004 and 1- and 2-year survival probabilities for patients who started RRT between 2003 and 2007

|                                      | Cohort 2000–04 |          |          | Cohort 2003–07 |          |          |
|--------------------------------------|----------------|----------|----------|----------------|----------|----------|
|                                      | 1 year      | 2 years  | 5 years  | 1 year      | 2 years  |          |
| Patient survival on RRTa             |             |          |          |              |          |          |
| Unadjusted                           | 80.6 (80.4–80.8) | 69.0 (68.8–69.2) | 46.0 (45.9–46.2) | 81.9 (81.7–82.1) | 70.8 (70.6–71.0) |
| Adjusted                             | 87.4 (87.2–87.7) | 78.5 (78.2–78.8) | 56.3 (55.9–56.7) | 88.3 (88.1–88.5) | 80.0 (79.7–80.2) |
| Patient survival on dialysisa        |             |          |          |              |          |          |
| Unadjusted                           | 80.2 (80.0–80.5) | 67.2 (66.9–67.4) | 38.2 (38.0–38.3) | 81.1 (80.9–81.3) | 68.8 (68.6–69.1) |
| Adjusted                             | 85.6 (85.3–85.9) | 75.1 (74.8–75.5) | 48.0 (47.5–48.5) | 87.1 (86.9–87.4) | 77.9 (77.6–78.2) |
| Patient survival after first transplant (deceased donor)b| | | | | | |
| Unadjusted                           | 95.6 (95.3–95.9) | 93.8 (93.3–94.1) | 87.0 (86.5–87.5) | 95.8 (95.5–96.1) | 93.9 (93.5–94.2) |
| Adjusted                             | 97.1 (96.8–97.4) | 95.8 (95.5–96.2) | 91.0 (90.4–91.5) | 97.3 (97.1–97.6) | 96.1 (95.8–96.4) |
| Patient survival after first transplant (living donor)b| | | | | | |
| Unadjusted                           | 97.5 (96.9–97.9) | 96.6 (96.0–97.2) | 94.1 (93.3–94.8) | 98.0 (97.6–98.4) | 97.1 (96.6–97.6) |
| Adjusted                             | 97.5 (96.9–97.0) | 96.6 (95.9–97.2) | 94.0 (93.1–94.9) | 98.3 (97.9–98.7) | 97.5 (97.0–98.0) |
| Graft survival after first transplant (deceased donor)b| | | | | | |
| Unadjusted                           | 90.1 (89.7–90.6) | 87.3 (86.8–87.8) | 77.7 (77.1–78.3) | 90.0 (89.6–90.4) | 87.1 (86.6–87.6) |
| Adjusted                             | 91.0 (90.5–91.3) | 88.4 (87.8–89.0) | 79.3 (78.6–80.1) | 91.0 (90.6–91.5) | 88.4 (87.9–88.9) |
| Graft survival after first transplant (living donor)b| | | | | | |
| Unadjusted                           | 93.8 (93.0–94.5) | 91.9 (91.0–92.7) | 85.7 (84.6–86.7) | 94.7 (94.1–95.3) | 92.9 (92.1–93.5) |
| Adjusted                             | 93.5 (92.6–94.4) | 91.5 (90.5–92.6) | 84.9 (83.6–86.3) | 94.4 (93.7–95.2) | 92.5 (91.7–93.3) |

aAnalyses were adjusted using fixed values: age (60 years), gender (60% men) and PRD (20% diabetes mellitus, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other cause).

bAnalyses were adjusted using fixed values: age (45 years), gender (60% men) and PRD (10% diabetes mellitus, 8% hypertension/renal vascular disease, 28% glomerulonephritis and 54% other cause).