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Contributions to the Registry

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- Igor Rus, MD, Chief, Dialysis center Jesenice, Medical Director, General Hospital Jesenice: providing data for individual and center questionnaires
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- Bojan Vujkovac, MD, Chief, Dialysis Center, General Hospital Slovenj-Gradec: providing data for individual and center questionnaires
Introduction

The present report provides an update of the epidemiology and treatment practices of the end-stage renal disease (ESRD) patients treated by renal replacement therapy (RRT) in Slovenia in 2005. The report is based on individual and center questionnaires, prepared by the Slovenian Renal Replacement Therapy Registry Group. The response rate to questionnaires was 100%. Pediatric data are included.

The Expert group for dialysis initiated annual RRT reports in 1999. Initially, these reports were based on data from renal center questionnaires, with each questionnaire tapping at the aggregate data for patients at one center. In 2002, we began collecting individual patient data as well and, by 2004, we have achieved a response rate of 100% for individual patients. With these data Slovenian RRT registry has joined ERA/EDTA (European Renal Association-European Dialysis and Transplant Association) registry (section B, aggregated data), and Slovenian RRT Registry Group was founded, as a working group of the Slovenian Society of Nephrology. The registry is voluntary.

The general population of Slovenia is about 2 million (in 2005 2.000 000, 979 000 men and 1021000 women).
Renal centers

On December 31, 2005, there were 21 renal centers in Slovenia (1 dialysis center more than in 2004): 15 in-hospital dialysis centers, 5 private, out-patient hemodialysis centers (4 of them Fresenius Medical Care) and 1 transplant center (Fig. 1). One of 15 in-hospital centers is a Pediatric dialysis and transplant unit, and one is a Center for Peritoneal Dialysis at the University Medical Center Ljubljana. 12 out of 15 in-hospital centers perform hemodialysis procedures for patients with acute renal failure, including continuous renal replacement therapy. In addition to the specialized Center for Peritoneal Dialysis at the University Medical Center, peritoneal dialysis is performed in 8 in-hospital centers in Slovenia.
Incident patients

a) Incident patients at day 1

There were 249 incident patients (day 1) in 2005, with incidence rate of 124.5 pmp (per million of population). Out of those 249 patients, 138 were men (141 pmp) and 111 women (108.7 pmp). Men represented 55.4% of the incident (day 1) patients. Mean age of incident (day 1) patients was 63.3±13.3 years, median age was 65 years. Mean age of incident (day 1) men was 61.8±15.7 years (median 65 years). Mean age of incident (day 1) women was 65.2±17 years (median 69.5 years).

![Fig. 2. Primary renal disease in incident (at day 1) patients in Slovenia in 2005 (Abbreviations: DM: diabetic nephropathy; HT: hypertensive nephrosclerosis (+ischemic nephropathy); GN: glomerulonephritis; PKD: polycystic kidney disease; PN: pyelonephritis)](image)

b) Incident patients at day 91 (only patients that survived 91 days on RRT)

There were 238 incident patients (day 91) in 2005, with incidence rate 119 pmp. 134 men (136.9 pmp) and 104 women (101.9 pmp). Men represented 56.3% of the incident (day 91) patients. Mean age of incident (day 91) patients was 62.8±16.3 years (median 65). Mean age of incident (day 91) men was 61.5±15.7 years (median 64). Mean age of incident (day 91) women was 64.5±17.1 years (median 67). The primary renal disease in incident patients at day 91 were almost the same as in the incident day 1.
Prevalent patients

Data relating to prevalent ESRD patients on different forms of RRT are presented in Table 1 and Fig. 3. The annual increase in 2005 was 3.8%. After two years of increase, a decrease in number of patients treated with peritoneal dialysis was observed.

![Different forms of RRT from 1998-2005](image)

### Table 1. Prevalence of end-stage renal disease patients on different forms of renal replacement therapy on December 31 in the period from 1998-2005 (residents only)

<table>
<thead>
<tr>
<th>December 31</th>
<th>Hemodialysis</th>
<th>Peritoneal dialysis</th>
<th>Functioning graft</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998 (n)</td>
<td>957</td>
<td>121</td>
<td>201</td>
<td>1279</td>
</tr>
<tr>
<td>1999 (n)</td>
<td>1000</td>
<td>129</td>
<td>230</td>
<td>1359</td>
</tr>
<tr>
<td>2000 (n)</td>
<td>1051</td>
<td>117</td>
<td>267</td>
<td>1435</td>
</tr>
<tr>
<td>2001 (n)</td>
<td>1125</td>
<td>113</td>
<td>304</td>
<td>1542</td>
</tr>
<tr>
<td>2002 (n)</td>
<td>1131</td>
<td>110</td>
<td>343</td>
<td>1584</td>
</tr>
<tr>
<td>2003 (n)</td>
<td>1171</td>
<td>116</td>
<td>374</td>
<td>1661</td>
</tr>
<tr>
<td>2004* (n)</td>
<td>1202</td>
<td>119</td>
<td>415</td>
<td>1736</td>
</tr>
<tr>
<td>2005* (n)</td>
<td>1260</td>
<td>115</td>
<td>427</td>
<td>1802</td>
</tr>
</tbody>
</table>
On December 31, 2005, there were 1802 prevalent RRT patients in Slovenia, with prevalence rate of 901 pmp, 1007 men (1028.6 pmp) and 795 women (778.6 pmp). Men represented 55.9% of the prevalent RRT patients. Mean age of prevalent patients was 58.1±15 years, median age was 59 years. Mean age of prevalent men was 57.4±14.6 years, median 59 years. Mean age of prevalent women was 59±15.6 years, median age 60 years.

In pediatric patients alone, the distribution of primary renal diseases would be different. However, since the absolute number of pediatric patients was very small, the inclusion of these patients did not have any significant effect on the statistical results.

The distribution of modalities of RRT is presented in Table 2. The majority of prevalent RRT patients are treated with chronic hemodialysis. These patients are older and with higher percentage of diabetics than patients treated by peritoneal dialysis or kidney transplantation.
### Table 2. Patients treated by different forms of renal replacement therapy (RRT) in Slovenia on December 31, 2005

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No of patients (% of all RRT)</th>
<th>% Men</th>
<th>Median age (range) – years</th>
<th>% Diabetics</th>
<th>Crude death rate in 2005**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemodialysis</td>
<td>1260 (70%)</td>
<td>55%</td>
<td>64 (13-92)</td>
<td>18.3%</td>
<td>13.4%</td>
</tr>
<tr>
<td>Peritoneal dialysis</td>
<td>115 (6%)</td>
<td>59%</td>
<td>52 (1-80)</td>
<td>17.4%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Transplantation*</td>
<td>427 (24%)</td>
<td>57%</td>
<td>51 (15-75)</td>
<td>4%</td>
<td>0.95%</td>
</tr>
<tr>
<td>All*</td>
<td>1802 (100%)</td>
<td>56%</td>
<td>59 (1-92)</td>
<td>15%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

*Residents only. **Incident patients at day 1 included.

### Table 3. Number of prevalent and incident patients per million of the population (p.m.p.) from 1998-2005

<table>
<thead>
<tr>
<th>December 31</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004*</th>
<th>2005*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence p.m.p.</td>
<td>651</td>
<td>692</td>
<td>723</td>
<td>771</td>
<td>807</td>
<td>846</td>
<td>869</td>
<td>901</td>
</tr>
<tr>
<td>Incidence p.m.p.</td>
<td>-</td>
<td>115</td>
<td>109</td>
<td>144</td>
<td>115</td>
<td>131</td>
<td>125</td>
<td>125</td>
</tr>
</tbody>
</table>

*Based on individual patient data.
Long-term (≥30 years) RRT survivors

In May 2007, 27 patients (1.5% of prevalent RRT patients) treated by RRT for ≥30 years were alive. There were 15 men and 12 women, aged 61±10 years (47-83). Primary renal disease in these patients was: glomerulonephritis in 16, pyelonephritis in 3, unknown nephropathy in 5, analgesic in 1, lupus in 1 and Alport in 1. None had diabetes. Duration of RRT was 32±1.8 years (30-36.5).

Group 1. Chronic HD ≥30 years: 13 patients, 5 men and 8 women, aged 62±12 years (45-83), duration of RRT 31.6±1.5 years (30-34). One had a 18-month period of functioning cadaveric kidney graft, the other unsuccessful transplantation (Tx) with graft that never functioned. Vascular access in 10 is AV fistula, in 3 single-lumen temporary catheter, locked with citrate, used as permanent vascular access.

Group 2. Kidney graft in function ≥30 years: 2 patients (men), 75 and 68 years old, both received full-matched kidney from living related donor (LRD) on 2 June 1976 (after 2 months, and 2 years on HD, respectively), that functions today. Current immunosuppression are low-dose steroids.

Group 3. Current HD, with prolonged Tx period: 3 patients, 2 men, 62 years (24 years Tx and 11 years HD) and 71 years old (22 years Tx and 14 years HD) and a woman 52 years old (25 years Tx, 7 years HD).

Group 4. Current Tx, with prolonged HD period: 9 patients, 6 men and 3 women, aged 58±5 years (51-70), duration of RRT 31.7±1.4 years (30-34). HD period was 15.8±7 years (7-28).

HD contributed to 590 years (68.4%) and Tx to 273 years (31.6%) of cumulative 863 years of life in long-term survivors on RRT.

As of May 2007, the longest duration of RRT treatment was 36 years and 6 months (22 years of Tx, LRD, 14 years of HD). The longest duration of HD has been is 34 years, 4 months.

The longest functioning kidney graft is 31 years (2 patients), who both have kidney from full-matched LRD.

22/27 long-term (≥30 years) survivors (11 hemodialysis patients and 11 patients with functioning kidney graft) have been treated at the Department of Nephrology, University Medical Center Ljubljana. Two patients have been treated in Dialysis Center Izola, one in Dialysis Center Šempeter, one in Dialysis Center Trbovlje, and one in Dialysis center Krško.
Crude death rate of RRT patients

During 2005, 177 RRT patients died. Of these, there were 173 dialysis patients and 4 kidney graft recipients.

The crude death rate was calculated by dividing the number of patients who died with the average number of prevalent RRT patients at the end of 2004 and 2005 (Table 4). Crude death rate for dialysis patients in 2005 was 12.8/ (13.4% for HD patients and 6.8% for PD patients), 0.95% for the transplanted patients and 10% for all RRT patients. The most common cause of death in dialysis patients was cardiovascular disease (33%), followed by sepsis (18%), malignoma (15%) and cerebrovascular disease (9%), Fig. 5. There were three suicides in hemodialysis patients in 2005, two in patients with advanced malignant disease and one in the patient with depression. The cause of death in four renal transplant recipients was: sepsis in 2, acute myocardial infarction in one and cerebrovascular accident in one. The mortality rate of dialysis patients slightly increased between 1999-2005 (Table 4, Fig 6).
Table 4. Crude death rate of dialysis patients in the period from 1999-2005 (for 2005: individual patient data, incident patients at day 1 included)

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dialysis (†HD+‡PD)</td>
<td>10.96%</td>
<td>10.45%</td>
<td>10.4%</td>
<td>12.9%</td>
<td>11.8%</td>
<td>12.6%</td>
<td>12.8%</td>
</tr>
<tr>
<td>HD</td>
<td>11.3%</td>
<td>10.8%</td>
<td>10.5%</td>
<td>13.2%</td>
<td>12.0%</td>
<td>13.1%</td>
<td>13.4%</td>
</tr>
<tr>
<td>PD</td>
<td>8.8%</td>
<td>7.3%</td>
<td>9.6%</td>
<td>9.8%</td>
<td>9.8%</td>
<td>8.3%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

† HD: Hemodialysis
‡ PD: Peritoneal dialysis

Fig. 6. Crude death rate of dialysis patients in the period from 1999-2005 (for 2005: individual patient data, incident patients at day 1 included)
Erythropoiesis stimulating agents (ESA) therapy in prevalent RRT patients

Hemodialysis patients (n=1260, median age 64 yrs (13-92), 55% men, 18,3% diabetics): 88.7% (1116/1260) have received ESA, almost all of them intravenously. Mean dose in the last week of December 2005 was ~ 8000 units (7910±5991, range 500-60000 units, with only the patients that received ESA were counted). 42% of the patients have received NeoRecormon, 44% Eprex and 4% Aranesp.

Peritoneal dialysis patients (n=115, median age 52 yrs, range 1-80, 59% men, 17,4% diabetics): 78.3% (90/115) have received ESA subcutaneously. Mean dose in the last week of December 2005 was approximately 6000 units (5996±4304, range 500-20000 units, with only the patients that received ESA were counted). 79% of the patients have received NeoRecormon, 21% Aranesp.

Transplant patients (n=427, Median age 51 yrs, range 15-75, 57% men, 4% diabetics): 10.5% (45/427) have received ESA subcutaneously. Mean dose in the last week of December 2005 was ~ 6000 units (5844±4011, range 2000-18000 units, only the patients that received ESA were counted). 67% of the patients received NeoRecormon, 33% Aranesp.

Fig. 7. Percentage of dialysis patients treated with erythropoiesis stimulating agents (ESA) from 2000-2005
Hemodialysis in prevalent patients

The majority of Slovenian hemodialysis patients were treated in in-hospital centers (79.7% at the end of 2005). The percentage of patients treated in private, out-patient hemodialysis centers has been stable from 2002-2005. Four out of 5 private centers (that served 220 patients in 2004 and 253 patients in 2005) are owned by Fresenius Medical Care.

**Table 5. Number and percentage of hemodialysis patients treated in private, out-patient hemodialysis centres on December 31, 1999-2005.**

<table>
<thead>
<tr>
<th>December 31</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004*</th>
<th>2005*</th>
</tr>
</thead>
<tbody>
<tr>
<td>private/all HD patients (n)</td>
<td>131/1000</td>
<td>157/1051</td>
<td>177/1125</td>
<td>223/1131</td>
<td>246/1171</td>
<td>243/1202</td>
<td>269/1260</td>
</tr>
<tr>
<td>% of private HD patients</td>
<td>13.1%</td>
<td>14.9%</td>
<td>15.7%</td>
<td>19.7%</td>
<td>21.0%</td>
<td>20.2%</td>
<td>21.3%</td>
</tr>
</tbody>
</table>

*Individual patient data

The percentage of the patients treated by convective techniques (hemodiafiltration/hemofiltration) increased from 17.5% in 2004 to 26.9% of all hemodialysis patients (n=339). The majority of the patients at the end of 2005 (73.1%, n=921) have been treated by bicarbonate hemodialysis. In the majority of hemodialysis patients (66.4%, 837/1260) ultrapure dialysis fluid has been used.

Prescription of hemodialysis: the minority of patients (5.3%, 68/1260) are treated with 2x weekly dialysis, 9 patients (0.7%) by 4x weekly hemodialysis and the vast majority, 93.9% (1183/1260) by 3x weekly hemodialysis. The average weekly time on dialysis has been 13.1±2.1 hours (this includes patients treated by 2x weekly dialysis), the median weekly time on hemodialysis has been 13.5 hours. Regular night shift dialysis has been offered in Dialysis Center Zaloška to the employed patients, students and pupils. The mean dry body weight of hemodialysis patients was 67.8±15.7 kg (29.5-138.5 kg, median body weight 66 kg). The mean blood flow was 282±40 ml/min (140-400), and 101 patients (8%) were dialyzed in single-needle dialysis mode. Anticoagulation was performed by low molecular weight heparin in 18.6% (237/1269) of hemodialysis patients, while unfractioned heparin was used in the majority (81.4%) of hemodialysis patients. Mean heparin dose was 5337±2268 iu per hemodialysis (ranging from 2000-19.500 units, with dose of low molecular weight heparin, expressed in antiXa units, included).
Vascular access in hemodialysis patients

Prevalent hemodialysis patients (n=1260): Vascular access were: native arteriovenous fistula (AV) in 85% (n=1072), PTFE graft in 4.8% (n=60) and HD catheter in 10.2% (n=128), Fig. 7. In patients with AV fistula and graft, location of fistula/anastomosis was on forearm in 65.6% (n=740), elbow/arm in 33% (n=374) and on thigh in 1.6% (n=18). AV fistula or graft were on the left side in 68.9% (n=780) and on the right side in 31.1% (n=292) of cases. Hemodialysis catheters (n=128) were: temporary (noncuffed) in 92.2% (n=118) and permanent silastic in 7.8% (n=10); precurved jugular in 80% (n=102), subclavian in 16% (n=21) and femoral in 4% (n=5); placed on the right side in 94.5% (n=121) and on the left in 5.5% (n=7); single-lumen in 80.5% (n=105) and double-lumen in 19.5% (n=23). The catheters were locked with citrate (4% or 30%) in interdialysis period in the majority of the patients. The most common type of catheter that has been used (also as a permanent access) is a precurved noncuffed single-lumen jugular catheter (Medcomp, Harleysville, PA, USA). In some patients this type of the catheter has been used for years.

Incident hemodialysis patients: On December 31, 2005, there were n= 208 (56.3% men, median age 66 years, range 14-92 years, 21.6% diabetics) patients who were alive and on hemodialysis, with a vascular
access (on December 31, 2005): native arteriovenous fistula in 71.6% (n=149), PTFE graft in 2.0% (n=4) and HD catheter in 26.4% (n=55). In patients with AV fistula and graft the location of fistula/anastomosis was on forearm in 63.4% (n=97), elbow/arm in 36.6% (n=56) of cases. AV fistula or graft were on the left side in 75.2% (n=115) and on the right side in 24.8% (n=38) of these patients. Hemodialysis catheters (n=55) were: temporary (noncuffed) in 96.5% (n=53) and permanent silastic in 3.5% (n=2); precurved jugular in 78% (n=43), subclavian in 18% (n=10) and femoral in 4% (n=2); placed on the right side in 94.5% (n=52) and on the left in 5.5% (n=3); single-lumen in 85.4% (n=47) and double-lumen in 14.6% (n=8) of all cases.

Vascular access activity in Dialysis Center Zaloška, Department of Nephrology. Two dedicated nephrologists (M. M. and R. P.) from the Department of Nephrology perform vascular access surgery for the majority of the Slovenian hemodialysis patients (13 centers, 64% patients), including children. This includes vascular access surgeries for all private hemodialysis centers in Slovenia. In the rest of the country (6 centers, 36% of the patients) vascular access surgeries are performed by a dedicated surgeon at each hospital, with complicated cases being referred to nephrologists at the Dialysis Center Zaloška. These cases include salvage of the suddenly thrombosed AV fistula and graft. The surgical procedures are performed in the operative theatre at the Dialysis Center Zaloška, under local anesthesia and as outpatient procedure in the vast majority of the patients. In a few patients (mainly pediatric) AV fistula is created under general anesthesia, again by nephrologists.

In 2006, 273 surgical procedures were performed, and 61 of them were salvage procedures of thrombosed AV fistula or graft. In 2006, 843 hemodialysis catheters – mainly temporary (noncuffed) – were inserted. In addition, 445 ultrasonography examinations of AV fistula or graft (preoperative mapping, ultrasonography of dysfunctional or failed fistula) were performed.

In the previous five years (2001-2005) a total of 1108 surgical procedures (AV fistula and grafts: construction, reconstruction and salvage) and 3873 hemodialysis catheter insertions were performed. A total of 4534 AVF/graft construction/salvage procedures and 17943 of hemodialysis catheter insertions were performed in Dialysis Center Zaloška at the end of 2006.
Hemodialysis monitors in Slovenia

On December 31, 2005, there were 465 hemodialysis monitors in Slovenia, 41.9% from Fresenius, 35.1% from Gambro, 13.1% from Braun, and 7.3% from Hospal-Gambro (Integra). There were 12 monitors for continuous renal replacement therapy, 10 of which were from Prisma-Hospal and two of which were from Braun (Table 6).

Table 6. *Number and manufacturers of hemodialysis monitors used in Slovenia on 31 December in 2001-2005*

<table>
<thead>
<tr>
<th>HD monitors (n)</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>351</td>
<td>400</td>
<td>413</td>
<td>429</td>
<td>465</td>
</tr>
<tr>
<td>Gambro</td>
<td>160</td>
<td>163</td>
<td>164</td>
<td>154</td>
<td>163</td>
</tr>
<tr>
<td>Fresenius</td>
<td>147</td>
<td>173</td>
<td>176</td>
<td>187</td>
<td>195</td>
</tr>
<tr>
<td>Hospal Integra</td>
<td>25</td>
<td>28</td>
<td>27</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>Braun</td>
<td>14</td>
<td>29</td>
<td>35</td>
<td>45</td>
<td>61</td>
</tr>
<tr>
<td>CRRT†</td>
<td>5</td>
<td>7</td>
<td>11 (Prisma 10)</td>
<td>11 (Prisma 9)</td>
<td>12 (Prisma 10)</td>
</tr>
</tbody>
</table>

†CRRT: continuous renal replacement therapy
Transmissible diseases in dialysis patients

2.2% of dialysis patients had the hepatitis B or C virus infection in 2005, and their number and percentage has remained low over the years (Table 7). The number of methycillin resistant Staphylococcus aureus (MRSA)-positive dialysis patients has been decreasing in the last three years. All positive patients (including MRSA) have been isolated.

There were no HIV-positive patients on chronic renal replacement therapy through the end of the year 2005.

Table 7. Number and percentage of dialysis patients positive for hepatitis B or C virus and MRSA (methycillin resistant Staphylococcus aureus).

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>†HBV (n)</td>
<td>13</td>
<td>14</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>†HCV (n)</td>
<td>22</td>
<td>22</td>
<td>21</td>
<td>22</td>
<td>20</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>HBV+HCV (%)</td>
<td>3.1</td>
<td>3.1</td>
<td>3.3</td>
<td>3.4</td>
<td>3.1</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td>††MRSA (n) (+HD/††PD)</td>
<td>-</td>
<td>14/5</td>
<td>32/4</td>
<td>36/4</td>
<td>34/2</td>
<td>26/4</td>
<td>24/2</td>
</tr>
<tr>
<td>MRSA HD+PD (%)</td>
<td>1.6</td>
<td>2.9</td>
<td>3.2</td>
<td>2.8</td>
<td>2.3</td>
<td>1.9</td>
<td></td>
</tr>
</tbody>
</table>

† HBV: hepatitis B virus
‡ HCV: hepatitis C virus
†‡ MRSA: methycillin resistant Staphylococcus aureus
‡‡ HD: hemodialysis
†† PD: peritoneal dialysis
Dialysis patients and a waiting list for a cadaveric kidney transplantation

According to individual referral from dialysis centers, 108 hemodialysis patients (9%) were on the waiting list for cadaveric kidney transplantation at December 31, 2005, with additional 149 patients under work-up for the inclusion. 37% patients were not included because of the age (and associated comorbidities), 27% because of medical contraindications, 191 (15%) hemodialysis patients have refused to be transplanted. These patients were thoroughly informed about kidney transplantation, and have continuously been informed about new drugs, improvements in immunosuppressive protocols and other approaches that are expected to improve results and decrease side effects of immunosuppressive therapy after transplantation. Their decisions to refuse kidney transplantation were discussed during their regular visits to nephrologists.

28/115 (24.3%) of peritoneal dialysis patients were included on the waiting list, with additional 42 patients in the work-up for the inclusion to the waiting list.

![Fig. 9. Hemodialysis patients and a waiting list for a cadaveric kidney transplantation.](image-url)
Kidney transplantation

There is one transplant center in Slovenia located at the University Medical Center Ljubljana. Slovenia has been a member of Eurotransplant since January 1, 2000.

In 2005, 28 cadaveric kidney transplantations were performed, which was a decrease compared to 55 cadaveric kidney transplantations performed in 2004. In 27 patients this was the first and in one patient it was the second graft. Three transplant recipients were older than 60 years, one transplant recipient was diabetic, none of the recipients was younger than 18 years. Four (out of 427) kidney graft recipients died in 2005, and 13 started a chronic dialysis because of the end-stage graft failure.

The total number of kidney transplantations in Slovenia from 1970 to December 31, 2005 was 636, of which 124 were from a living related donor and 512 from a cadaveric donor.

On December 31, 2005 there were 427 patients with functioning kidney graft in Slovenia (residents only), 403 from cadaveric and 24 from living related donor, 57% were men, median age 51 years (range 15-75), 4% were diabetics.
The Department of Nephrology is the largest nephrological institution in the country. It is also one of the largest departments of the University Medical Center Ljubljana (one of two University Medical Centers in the country, with an over 7000 employees).

The Department of Nephrology has 178 employees (25 physicians, 143 nurses and technicians, 10 administrative workers) and is organized in seven units:

1. a hospital ward (32 beds),
2. an outpatient unit for general nephrology and hypertension (about 5000 patient visits per year)
3. the Center for Kidney Transplantation, which takes care of all renal transplant recipients in Slovenia and keeps a waiting list for kidney transplantation,
4. Center for Dialysis Zaloška: 41 dialysis stations operating in 4 shifts, 24 hour/day, ≈36 000 dialysis procedures per year, intensive-care dialysis operating in >15 dislocated intensive care units, including pediatric intensive care unit (where adult nephrologists and nurses perform hemodialysis and plasma exchange of newborns and infants), all kinds of vascular access, performed by nephrologists (temporary and permanent hemodialysis catheters, native and graft arteriovenous fistula), plasma exchange, LDL apheresis, immunoadsorption,
5. Center for Hemodialysis Leonišče: 18 dialysis stations, ≈10 000 dialysis procedures per year,
6. Center for Peritoneal Dialysis: ≈40-50 patients on peritoneal dialysis,
7. Ultrasound unit: biopsies of native and transplanted kidneys, ultrasonography/Doppler of kidneys and renal arteries, ultrasonography/Doppler related to vascular access for hemodialysis: preoperative mapping, ultrasonography/Doppler of dysfunctional and failed AV fistula, ultrasonography-guided hemodialysis catheter insertion, echocardiography, all performed by dedicated nephrologists.
At the end of 2005, 746/1802 (41.4%) of all RRT patients in Slovenia have been treated at the Department of Nephrology (as their primary center). Among these, 278 were chronic hemodialysis patients, 41 patients were on peritoneal dialysis, and 427 patients had a functioning kidney graft. In 2005, ≈46 000 hemodialysis procedures were performed. The Department of Nephrology is also a tertiary referral center for all complicated cases in the areas of nephrology and dialysis for the whole country.

**Apheresis procedures at the Department of Nephrology, University Medical Center Ljubljana**

Apheresis procedures (membrane plasma exchange, LDL apheresis with dextrane-sulphate columns - Kaneka and protein A immunoadsorption) are performed at the Dialysis Center Zaloška, Department of Nephrology, University Medical Center Ljubljana. From 1997-2005, an increase in the number of plasma exchange procedures has been observed, with a comparatively stable number of immunoadsorption procedures in the last 3 years (Table 8).

**Table 8. Number of apheresis (membrane plasma exchange, LDL apheresis and protein A immunoadsorption) procedures performed in the period from 1997-2005**

<table>
<thead>
<tr>
<th>Year</th>
<th>All apheresis procedures</th>
<th>Membrane plasma exchange</th>
<th>LDL apheresis</th>
<th>Immunoadsorption (protein A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>183</td>
<td>113</td>
<td>27</td>
<td>43</td>
</tr>
<tr>
<td>1998</td>
<td>251</td>
<td>136</td>
<td>17</td>
<td>98</td>
</tr>
<tr>
<td>1999</td>
<td>296</td>
<td>180</td>
<td>64</td>
<td>52</td>
</tr>
<tr>
<td>2000</td>
<td>452</td>
<td>293</td>
<td>65</td>
<td>94</td>
</tr>
<tr>
<td>2001</td>
<td>443</td>
<td>231</td>
<td>61</td>
<td>151</td>
</tr>
<tr>
<td>2002</td>
<td>480</td>
<td>235</td>
<td>54</td>
<td>191</td>
</tr>
<tr>
<td>2003</td>
<td>572</td>
<td>242</td>
<td>80</td>
<td>250 (24 new)</td>
</tr>
<tr>
<td>2004</td>
<td>569</td>
<td>246</td>
<td>78</td>
<td>245 (22 new)</td>
</tr>
<tr>
<td>2005</td>
<td>673</td>
<td>410</td>
<td>34</td>
<td>229 (21 new)</td>
</tr>
</tbody>
</table>
## International comparison

**Table 9. Some data from other countries, selected from ERA-EDTA registry, Annual report 2005**

<table>
<thead>
<tr>
<th>Country</th>
<th>General population in thousands*</th>
<th>Incidence at day 1 (N)</th>
<th>Incidence pmp</th>
<th>Incident diabetics pmp</th>
<th>Prevalence (N)</th>
<th>Prevalence pmp</th>
<th>Tx pmp*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>8131</td>
<td>1234</td>
<td>152</td>
<td>51</td>
<td>7242</td>
<td>891</td>
<td>430</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>3832</td>
<td>398</td>
<td>104</td>
<td>21</td>
<td>2012</td>
<td>525</td>
<td>36</td>
</tr>
<tr>
<td>Croatia</td>
<td>4437</td>
<td>637</td>
<td>144</td>
<td>42</td>
<td>3708</td>
<td>836</td>
<td>166</td>
</tr>
<tr>
<td>Denmark</td>
<td>5419</td>
<td>652</td>
<td>120</td>
<td>29</td>
<td>4243</td>
<td>783</td>
<td>314</td>
</tr>
<tr>
<td>Finland</td>
<td>5246</td>
<td>495</td>
<td>94</td>
<td>33</td>
<td>3724</td>
<td>710</td>
<td>417</td>
</tr>
<tr>
<td>Germany</td>
<td>82437</td>
<td>16766</td>
<td>203</td>
<td>71</td>
<td>87151</td>
<td>1057</td>
<td>288</td>
</tr>
<tr>
<td>Greece</td>
<td>11104</td>
<td>2139</td>
<td>193</td>
<td>57</td>
<td>10648</td>
<td>959</td>
<td>181</td>
</tr>
<tr>
<td>Norway</td>
<td>4623</td>
<td>549</td>
<td>99</td>
<td>13</td>
<td>3384</td>
<td>732</td>
<td>520</td>
</tr>
<tr>
<td>Poland</td>
<td>38157</td>
<td>4578</td>
<td>120</td>
<td>33</td>
<td>20479</td>
<td>537</td>
<td>194</td>
</tr>
<tr>
<td>Romania</td>
<td>21673</td>
<td>1857</td>
<td>86</td>
<td>10</td>
<td>6957</td>
<td>321</td>
<td>17</td>
</tr>
<tr>
<td>Russia</td>
<td>143473</td>
<td>3485</td>
<td>24</td>
<td>3</td>
<td>16483</td>
<td>115</td>
<td>25</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2000</td>
<td>249</td>
<td>125</td>
<td>27</td>
<td>1802</td>
<td>901</td>
<td>214</td>
</tr>
<tr>
<td>Sweden</td>
<td>9030</td>
<td>1079</td>
<td>119</td>
<td>31</td>
<td>7385</td>
<td>818</td>
<td>439</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>16320</td>
<td>1698</td>
<td>104</td>
<td>16</td>
<td>12023</td>
<td>737</td>
<td>403</td>
</tr>
<tr>
<td>UK, England</td>
<td>45389</td>
<td>4618</td>
<td>102</td>
<td>18</td>
<td>30326</td>
<td>668</td>
<td>293</td>
</tr>
<tr>
<td>UK, Scotland</td>
<td>5095</td>
<td>619</td>
<td>121</td>
<td>24</td>
<td>3838</td>
<td>753</td>
<td>353</td>
</tr>
<tr>
<td>Turkey</td>
<td>68267</td>
<td>12758</td>
<td>187</td>
<td>51</td>
<td>35983</td>
<td>527</td>
<td>60</td>
</tr>
</tbody>
</table>

*general population covered by the registry

** number of patients with functioning kidney graft pmp

In USA, a prevalence rate of RRT patients in 2004 was 1563 pmp (459043 patients), incidence rate 342 pmp, and a transplant rate 464 pmp. In Japan there were 236 505 dialysis patients in 2004, with a prevalence rate of 1857 pmp, an incidence rate 267 pmp, and almost all RRT patients being treated by dialysis.
Summary – Renal Replacement therapy in Slovenia 2005

- 21 renal centers (+1 in 2005), 20 dialysis, 1 kidney transplant center
- Prevalence rate 901 pmp (+3.8%), an incidence rate 125 pmp (22% diabetics), median age of incident patients 65 years, 55% men.
- RRT modality of prevalent patients: 70% HD, 24% functioning graft, 6% PD
- HDF in 27% of HD patients, automated PD in 26% of PD patients, cadaveric graft in 93% of patients with a functioning kidney graft
- Crude death rate of dialysis patients 12.8%, of transplant patients 0.95%, of all RRT 10%.
- 27 patients alive in May 2007, ≥30 years on RRT (1.5% of all prevalent patients)
- Vascular access in prevalent HD patients: 85% native AV fistula, 5% graft, 10% catheter
- Approximate epoetin weekly dose: HD 8000 (iv), PD 6000 (sc), Tx 6000 (sc)
Bibliography


Appendix 1. Individual patient questionnaire

Date:


Renal center:

Questionnaire is provided for:

• All the patients that are treated by renal replacement therapy in your renal center for end-stage renal failure, on December 31, 2005

• All the patients treated by renal replacement therapy that died during 2005 at your renal center (even if they were only once dialyzed for ESRD):

Name:      Sex: Date of birth:

Type of RRT on December 31, 2005:      HD      CAPD      Automated      PD      Tx

Primary renal disease:      EDTA code:

Date and type of the first RRT in life ever: HD      PD      Tx  Date:  Comorbidity at the end of 2005:

a) Diabetes mellitus      Type      1      2  a) Diabetes      Type      1      2

b) Ischemic heart disease  b) Ischemic heart disease

c) Peripheral art. occlusive dis.  c) Periph. art. occlusive dis.

d) Cerebrovascular dis.  d) Cerebrovascular dis.

e) Malignant dis.  e) Malignant dis.

Comorbidity at the start of RRT:

Dates of changes in RRT, chronologically (e.g. HD from…….., 1. Tx date ……. Donor cadaveric or living related, restarted HD from ……, 2. Tx date ……. Donor cadaveric or living related, PD from ……, Not requiring dialysis from ……..),

Transfer of the patient from another renal center in 2005 (vacation dialysis not counting):

The patient came from:      Date:

Positive for transimissive diseases (mark): hepatitis B      hepatitis C      MRSA      other:
Appendix 1. Individual patient questionnaire

The patient on RRT that died in 2005 in your renal center:

<table>
<thead>
<tr>
<th>Date of death:</th>
<th>Cause of death:</th>
<th>EDTA code:</th>
</tr>
</thead>
</table>

Epoetin dose (per week) at the last week of December 2005: Dose: No of applications/week:

**EPO (mark):**  Eprex  NeoRecormon  Aranesp  Route of application: i.v.  s.c.

Is **dialysis patient**, that is treated in your renal center on 31 December 2005, included on the **waiting list for cadaveric kidney transplantation:**  yes  no

If no, please explain why?

a) medical contraindications

b) refusal

c) diagnostic workup (preparing for including)

d) age

e) other

Remarks:

Signature:
Additional Questionnaire: For Hemodialysis Patients, Treated at Your Dialysis Center (For ESRD) on December 31, 2005

Name: ___________________________________________________________

If «positive» for transmissible disease, mark the isolation policy:
A) isolated room     B) isolated HD monitor     C) last in the dialysis shift     D) Not isolated

Type of hemodialysis procedure on the last week of December 2005:
BHD     Online HDF     On line HF     AFBF

Ultrapure dialysis fluid: yes  no

Number of HD procedures per week on the last week in December 2005: ________________________________

Number of hours of HD per week on the last week in December 2005 (e.g. 12; 13,5; 15;...): ________________________________

If HF/HDF, the amount of fluid exchanged per procedure:

If HF/HDF (mark) predilutional postdilutional combination

Dialyzer in the last week of December, 2005:

Dry body weight in the last week of December, 2005: ________________________________

Blood flow in the last week of December, 2005 (ml/min):

Single-needle procedure: yes  no

Anticoagulation (last week of December 2005): Unfractioned heparin: dose per HD: ________________________________

Low molecular weight heparin (original name): dose per HD: ________________________________

Vascular access on December 31, 2005: AV FISTULA (mark)

Type native Gore-tex

Position of anastomosis forearm elbow arm thigh

Side right  left

CATHETER

jugular  subclavian  femoral

right  left  temporary (noncuffed)  silastic

single-lumen  double-lumen

Remarks: ___________________________________________________________

Signature: ___________________________________________________________
## Renal Replacement Therapy Questionnaire for 2005 — Dialysis Center

### Renal center:

Number of RRT patients on December 31, 2005

<table>
<thead>
<tr>
<th>All</th>
<th>HD</th>
<th>PD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of hemodialysis stations on December 31, 2005:

Number of «positive» dialysis patients on December 31, 2005:

<table>
<thead>
<tr>
<th>Hepatitis B</th>
<th>Hepatitis C</th>
<th>HBV+HCV</th>
<th>HIV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MRSA</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The isolation policy of «positive» patients (mark):

- **HBV pos.**
  - A) Dedicated rooms
  - B) Dedicated monitors
  - C) Last in shift
  - D) No isolation

- **HCV pos.**
  - A) Dedicated rooms
  - B) Dedicated monitors
  - C) Last in shift
  - D) No isolation

- **MRSA pos.**
  - A) Dedicated rooms
  - B) Dedicated monitors
  - C) Last in shift
  - D) No isolation

### Remarks:

Number of employed physicians in renal center:

Number of employed graduated renal nurses:

Number of employed medical technitians:

Number of employed administrative persons:

Number of employed technitians for hemodialysis monitors maintenance:

Additional personal employed in renal center:

### Remarks:
<table>
<thead>
<tr>
<th>Number of HD procedures performed in 2005 (data for health insurance):</th>
<th>All:</th>
<th>Type I</th>
<th>Type III:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of acute HD procedures performed in 2005 (data for health insurance):</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Acute renal failure, treated by dialysis – number of patients in 2005:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>From these treated</td>
<td>a) only by intermittent HD:</td>
</tr>
<tr>
<td></td>
<td>b) only by CRRT:</td>
</tr>
<tr>
<td></td>
<td>c) combined HD and CRRT:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of dialysis patients treated by epoetins on December 31, 2005:</th>
<th>All:</th>
<th>HD:</th>
<th>PD:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of predialysis patients treated by epoetin on 31 December 2005 (approximations according to available data, assuming that predominantly nephrologists from dialysis center prescribe epoetins to predialysis patients):</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>New patients, starting chronic dialysis in 2005:</th>
<th>All:</th>
<th>HD:</th>
<th>PD:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of dialysis patients that died in (even if they have been dialyzed for ESRD only once):</th>
<th>All:</th>
<th>HD:</th>
<th>PD:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of dialysis patients included on waiting list for cadaveric renal transplantation on December 31, 2005:</th>
<th>All:</th>
<th>HD:</th>
<th>PD:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of hemodialysis monitors on December 31, 2005:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Types of hemodialysis monitors on December 31, 2005: Fresenius:</th>
<th>Gambro:</th>
<th>Integra:</th>
<th>Prisma:</th>
<th>Other:</th>
</tr>
</thead>
</table>

**Remarks:**

**Signature:**

**E-mail:**
Renal Replacement Therapy Questionnaire for 2005 – Center For Kidney Transplantation

Number of kidney transplantations performed in 2005:

Out of that it was: 1. Tx 2. Tx

Cadaveric: Living related:

From all transplantations performed in 2005, functioning kidney grafts on December 31, 2005:

From all transplantations in 2005 there were diabetics:

Number of kidney transplantations according to age of the patients:

< 15 years
< 18 years
> 60 years

Total number of kidney transplantations from 1970 to December 31, 2005:

All: LRD: Cadaveric:

Number of patients with functioning kidney graft on December 31, 2005:

Number of patients that died in 2005, with functioning kidney graft:

Number of patients with failed kidney graft, that started chronic dialysis in 2005:

Number of Tx patients receiving epoetin on December 31, 2005:

Number of dialysis patients on the waiting list for cadaveric kidney transplantation on December 31, 2005:

Chief, Center for Kidney Transplantation:
Prof. dr. Aljosa Kandus, dr. med.