In January 1975, de facto, the Nephrology Department was founded at the Medical Faculty in Skopje as the first institution of such a type in former Yugoslavia. The Nephrology Department was the driving force for the further development of nephrology in the Republic of Macedonia. D. Hrisoho was the first Director of the Department, and its subsequent Directors were G. Masin, M. Polenakovic, K. Zafirovska and currently A. Sikole. Prior to the establishment of the Nephrology Clinic there had been considerable experience in the diagnosis and treatment of renal patients. The first haemodialysis (HD) in the Republic of Macedonia (RM) was performed in 1959 on a patient with acute renal failure (ARF) using a Kolff-Brigham rotating drum artificial kidney at the Blood Transfusion Institute in Skopje. In 1965 the Renal Unit at the Department of Medicine, Medical Faculty, Skopje obtained a new, modern "Websinger" artificial kidney with a sigma motor pump and possibilities for the use of a disposable Kolff "twin coil" dialyser. Between 1959 and 1971, HD was performed only on patients with ARF. In May 1971, a Unit for Chronic HD was founded at the Renal Unit and the programme of maintenance haemodialysis (MHD) was started with five Stuttgart Fresenius machines and 12 patients dialysed on twin coil dialysers. That was a great incentive for the development of HD in the Republic of Macedonia enforced by the great number of patients with end stage renal disease. Thus in 2007 we have 18 HD centres in the Republic of Macedonia, with 1183 patients. Treatment of the patients with MHD is the greatest success achieved in the Republic of Macedonia in nephrology concerning patients with end stage renal disease. Prior to the treatment with MHD patients were destined to die, whereas now, with this type of treatment, they have a normal life and families. Patients with kidney diseases are examined in outpatients clinics as well as treated in the wards of the Department. All types of vascular accesses, renal biopsies, bone biopsies, kidney ultrasound, plasmapheresis and other investigations are performed every day at the Nephrology Department of the Medical Faculty. On the basis of the results of renal biopsy, a classification of parenchymal renal diseases has been established, as well as appropriate immunosuppressive and other treatments. The nephrology doctrine for primary, secondary and tertiary healthcare has been prepared and has been distributed to all medical centres in the Republic of Macedonia. The first (living donor) renal transplantation was performed in July 1977. Later, living and cadaver donor transplantations were performed, so the Department of Nephrology was complete concerning dialysis and renal transplantation, and it became part of the European centres for diagnosis and therapy of kidney disease. Doctors from the Nephrology Department are among the most productive scientific workers in the Republic of Macedonia and their papers can be found on the internet Pub Med. The Department of Nephrology, together with the Nephrology Association, was the source of knowledge in the area of nephrology and the transfer of knowledge from abroad into Macedonia and vice versa. The Nephrology Association has made a great contribution in the development of nephrology in our country. The most famous European and world nephrologists have participated in the work of our association and have contributed to the development of nephrology not only in Macedonia, but on the Balkans as well.

Key words: Nephrology Department, development, educational, haemodialysis, classification, renal transplantation, nephrology doctrine.
the driving force for the further development of nephrology in the Republic of Macedonia. D. Hrisoso was the first Director of the Department, and its subsequent Directors were G. Masin, M. Polenakovic, K. Zafirovska and currently A. Sikole. The change in the management was caused by the development needs, and, in recent years, also by political influence.

The development and the needs of the patients for modern nephrology diagnosis and therapy have led to the establishment of sub-specialist clinics from the Internal Clinic at the Medical Faculty.

The basic ideas of the development of nephrology in Macedonia were set even within the Internal Clinic, so that immediately after the establishment of the new University Department of Nephrology, the units of the Department were stipulated in its Statute: a Unit for Chronic Maintenance Dialysis led by Gj. Masin; an Intensive Nephrology Unit led by J. Jovanovski; a Unit for Vascular Access led by A. Oncevski; an Etiotstructural Unit (for Immune morphological examinations) led by M. Polenakovic and a Nephology Functional Evaluation Unit led by K. Zafirovska. In time, the Unit for Renal Transplantation was established as well as the Daily Nephrology Outpatient Unit and the unit for Peritoneal Dialysis. From the beginning, there was also an Outpatient Unit at the department led by R. Grozdanovski.

Table 1

<table>
<thead>
<tr>
<th>HD Center</th>
<th>Founded year</th>
<th>Patients on HD in 2007</th>
<th>Percent on HD</th>
<th>No of machines</th>
<th>Bicarbonate</th>
<th>Acetate</th>
<th>hPO</th>
<th>HBV prevalence</th>
<th>HCV prevalence</th>
<th>MD</th>
<th>Renal nurse</th>
<th>Engineer</th>
<th>Technician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Nephrology, Skopje</td>
<td>1971</td>
<td>165</td>
<td>42</td>
<td>100% (42)</td>
<td>/</td>
<td>86%</td>
<td>9.7%</td>
<td>66%</td>
<td>7</td>
<td>31</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HDC Struga</td>
<td>1978</td>
<td>195</td>
<td>55</td>
<td>100% (55)</td>
<td>/</td>
<td>88%</td>
<td>9.5%</td>
<td>59%</td>
<td>12</td>
<td>60</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HDC Bitola</td>
<td>1980</td>
<td>47</td>
<td>12</td>
<td>92% (11)</td>
<td>8% (1)</td>
<td>96%</td>
<td>/</td>
<td>45%</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Military Hospital Sk.</td>
<td>1981</td>
<td>64</td>
<td>16</td>
<td>100% (16)</td>
<td>/</td>
<td>86%</td>
<td>6.0%</td>
<td>47%</td>
<td>1</td>
<td>18</td>
<td>/</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Gostivar</td>
<td>1982</td>
<td>43</td>
<td>14</td>
<td>100% (14)</td>
<td>/</td>
<td>98%</td>
<td>28%</td>
<td>37%</td>
<td>3</td>
<td>15</td>
<td>/</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>HDC Stip</td>
<td>1984</td>
<td>52</td>
<td>18</td>
<td>100% (18)</td>
<td>/</td>
<td>92%</td>
<td>7%</td>
<td>56%</td>
<td>2</td>
<td>11</td>
<td>1</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Prilep</td>
<td>1985</td>
<td>60</td>
<td>16</td>
<td>69% (11)</td>
<td>31% (5)</td>
<td>87%</td>
<td>8%</td>
<td>40%</td>
<td>5</td>
<td>17</td>
<td>/</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Kumanovo</td>
<td>1986</td>
<td>56</td>
<td>15</td>
<td>100% (15)</td>
<td>/</td>
<td>100%</td>
<td>9%</td>
<td>45%</td>
<td>2</td>
<td>15</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Strumica</td>
<td>1986</td>
<td>45</td>
<td>13</td>
<td>100% (13)</td>
<td>/</td>
<td>100%</td>
<td>28%</td>
<td>62%</td>
<td>2</td>
<td>12</td>
<td>/</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Veles</td>
<td>1987</td>
<td>43</td>
<td>13</td>
<td>92% (12)</td>
<td>8% (1)</td>
<td>79%</td>
<td>14%</td>
<td>40%</td>
<td>2</td>
<td>9</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Tetovo</td>
<td>1989</td>
<td>82</td>
<td>17</td>
<td>100% (17)</td>
<td>/</td>
<td>100%</td>
<td>7.4%</td>
<td>37%</td>
<td>3</td>
<td>15</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>HDC Kavadarci</td>
<td>1989</td>
<td>40</td>
<td>12</td>
<td>42% (5)</td>
<td>58% (7)</td>
<td>90%</td>
<td>18%</td>
<td>53%</td>
<td>2</td>
<td>8</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Kocani</td>
<td>1991</td>
<td>34</td>
<td>9</td>
<td>100% (9)</td>
<td>/</td>
<td>100%</td>
<td>29%</td>
<td>76%</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Gevgelija</td>
<td>1991</td>
<td>32</td>
<td>6</td>
<td>100% (6)</td>
<td>/</td>
<td>62%</td>
<td>6%</td>
<td>78%</td>
<td>4</td>
<td>12</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>HDC Debar</td>
<td>1991</td>
<td>9</td>
<td>6</td>
<td>50% (3)</td>
<td>50% (3)</td>
<td>100%</td>
<td>11%</td>
<td>/</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Zelezara, Skopje</td>
<td>1996</td>
<td>152</td>
<td>38</td>
<td>100% (38)</td>
<td>/</td>
<td>100%</td>
<td>12%</td>
<td>24%</td>
<td>6</td>
<td>24</td>
<td>/</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HDC Delcevo</td>
<td>2000</td>
<td>33</td>
<td>11</td>
<td>58% (7)</td>
<td>12% (4)</td>
<td>97%</td>
<td>12%</td>
<td>64%</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HDC Kriva Palanka</td>
<td>2004</td>
<td>21</td>
<td>7</td>
<td>100% (7)</td>
<td>/</td>
<td>95%</td>
<td>ND</td>
<td>ND</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>Total: 18 HDC</td>
<td></td>
<td>1173</td>
<td>320</td>
<td>93% (299)</td>
<td>7% (21)</td>
<td>62–100%</td>
<td>6–28%</td>
<td>37–78%</td>
<td>60</td>
<td>283</td>
<td>11</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

HD – haemodialysis; HDC – haemodialysis centre; HBV – hepatitis B virus; HCV – hepatitis C virus; MD – medical doctor

Prior to the establishment of the Nephrology Clinic there had been considerable experience in the diagnosis and treatment of renal patients. The first haemodialysis (HD) in the Republic of Macedonia (RM) was performed in 1959 on a patient with acute renal failure (ARF) using a Kolff-Brigham rotating drum artificial kidney at the Blood Transfusion Institute in Skopje. In 1965 the Renal Unit at the Department of Medicine, Medical Faculty, Skopje obtained a new, modern "Websinger" artificial kidney with a sigma motor pump and possibilities for the use of a disposable Kolff "twin coil" dialyser. Between 1959 and 1971, HD was performed only in patients with ARF [1, 2]. In May 1971, a Unit for chronic HD was founded at the Renal Unit and the programme of maintenance haemodialysis (MHD) was started with five Stuttgart Fresenius machines and 12 patients dialysed on twin coil dialysers. That was a great incentive for the development of HD in the Republic of Macedonia enforced by the great number of patients with end stage renal disease. Thus, in 2007 we had 18
HD centres in the Republic of Macedonia, with 1183 patients.

All doctors and renal nurses as well as technicians (engineers) were educated for HD at the Nephrology Department, Unit for Maintenance HD. The average distance between the centres and the patients’ place of residence is 30–50 km, in order to facilitate their access to treatment and to work. All patients who have had symptoms indicating the need for treatment with haemodialysis have been accepted on MHD. The Government pays all the expenses of the treatment and the salaries of the staff.
320 machines were used in the 18 Maintenance HD centres.

We need more rigorous hygienic measures in our centres for MHD, more space for the patients and the staff and new machines for treatment on MHD. In each MHD centre there are mainly technicians and in some centres also engineers for inspection and repair of the machines.

60 MD and 283 renal nurses are devoted to the management and treatment of patients with terminal renal insufficiency with MHD [2, 3, 4].

The survival rate of our patients treated with MHD was 60% at 5 years, 37% at 10 years, 25% at 15 years and 9% at 20 years. Female patient survival was superior to male. Patients aged under 40 at the start of dialysis had a better survival probability
compared to older patients. Patients with diabetes mellitus and nephroangiosclerosis had a lower survival rate compared to patients with glomerulonephritis and with adult dominant polycystic kidney disease.

Cardiac death was the most common cause of death (52%). Death is the most severe consequence of inadequate dialysis and can be used as an index of the adequacy of the dialysis therapy. Treatment factors that may improve outcomes include an early start of dialysis therapy, a high dose of dialysis (Kt/V over 1.2), correction of anaemia, adequate protein and caloric intake, control of calcium and phosphate metabolism and the use of biocompatible dialysers [3, 4, 12, 13].

Treatment of patients with MHD is the greatest success achieved in the Republic of Macedonia in nephrology concerning patients with end stage renal disease. Patients prior to the treatment with MHD were destined to die, and now with this type of treatment they have a normal life and families.

Patients with kidney diseases are examined in outpatients clinics as well as treated in the wards of the Department. All types of vascular accesses, renal biopsies, bone biopsies, kidney ultrasound, plasmapheresis and other investigations are performed every day at the Nephrology Department at the Medical Faculty. On the basis of the results of renal biopsy, a classification of parenchymal diseases has been established, as well as appropriate immunosuppressive and other treatments. The nephrology doctrine for primary, secondary and tertiary healthcare has been prepared and has been distributed to all medical centres in the Republic of Macedonia [5–14].

In 1986 the Department of Nephrology extended its working capacity by founding a separate dialysis centre in the polyclinic at Chair, in Skopje.

The first (living donor) renal transplantation was performed in July 1977. Later, living and cadaver donor transplantations were performed, so that the Department of Nephrology was complete concerning dialysis and renal transplantation, and it became part of the European centres for diagnosis and therapy of kidney disease [15].

There were specializations at the Nephrology Clinic for doctors from the Republic of Macedonia and from abroad. Many master’s and doctoral thesis were defended at the Clinic, and the Clinic staff was very active in the preparation and publication of its own experience in different papers published in domestic and foreign scientific journals. The doctors from the Nephrology Department are among the most productive scientific workers in the Republic of Macedonia and their papers can be found on the internet Pub Med.

Influence of the activities of the nephrology societies on the development of nephrology in the Republic of Macedonia

The Department of Nephrology, together with the Nephrology Association, was the source of knowledge in the area of nephrology and the transfer of knowledge from abroad into Macedonia and vice versa. The Nephrology Association has made a great contribution to the development of nephrology in our country. The most famous European and world nephrologists have participated in the work of our association and have contributed to the development of nephrology not only in Macedonia, but on the Balkans as well.

The proceedings of the meetings have been published as documents from the meetings. We will mention some of them.

In 1970, the Nephrology section was formed as part of the Macedonian Medical Association.

The First Scientific Meeting of Yugoslav Nephrologists was held in Struga, 26–28 September 1977 [16, 17].

The Fourth Congress of the Yugoslav Nephrologists was held in Skopje, September 27–30 1989. That was the last Congress of Yugoslav Nephrologists before the dissolution of Yugoslavia [18].

In 1992, the Macedonian Society of Nephrology, Dialysis, Transplantation, and Artificial Organs (MSNDTAO) was formed.

In 1993, during the First Congress of the MSNDTAO, the Balkan Association of Nephrology, Dialysis, Transplantation, and Artificial Organs (BANTAO) was formed [19]. BANTAO contributed much to the development of nephrology in the Balkans and to the development of friendship among the colleagues of the Balkans in the turbulent period of the war in Yugoslavia.

The International Conference Renal Aspects of Disaster Relief was held in Ohrid, May 24–26, 1996 [20].

The Second Congress of BANTAO was held in Struga, September 6–8, 1997 [21].

The Second Congress of MSNDTAO was held in Struga, October 8–10, 1997 [21].

In November 2000, the Department of Nephrology of Ss. Cyril and Methodius University, Skopje, celebrated its 25th Anniversary. The European Society for Artificial Organs took this as an opportunity to organize the Symposium "Artificial Organs 2000". The Symposium took place in Skopje on November 25–26, 2000 at the MASA and attracted many renowned speakers and participants from all over Europe. A special issue of the International Journal of Artificial Organs was devoted to this Symposium [22].

The Third Congress of MSNDTAO was held in Skopje, May 30 – June 2, 2001 [23].
The Seventh Congress of BANTAO was held in Ohrid, 8–11 September, 2005 [24].
We have organized Macedonian-Croatian and Macedonian-Serbian Nephrology Days.
The Nephrology Society has organized several professional and scientific meetings and CME courses of the ERA-EDTA with a good influence on the development of nephrology in Macedonia as well as regular local meetings in the Republic of Macedonia [25, 26].

Distinguished European and world nephrologists have influenced the development of nephrology and dialysis in Macedonia and in former Yugoslavia, participating in meetings.
The doctors from the Nephrology Department were and are the most scientifically productive in the Republic of Macedonia. Their publications can be found on the internet, as well as in our journals. Several scientific projects funded by domestic and foreign sources have been conducted at the Nephrology Department since its establishment. The following members of the Department have been awarded the highest Macedonian awards, as well some international awards for their research: M. Polenakovic, R. Grozdanovski and N. Ivanovski. Some of them have been elected for the highest position in the Macedonian Medical Association and M. Polenakovic has been elected a member of the Macedonian Academy of Sciences and Arts.

These activities of the members of the Nephrology Department have been noticed and the Department was taken into consideration as one of the five potential Centres of Excellence in the Republic of Macedonia in the negotiation with the EU.
The staff of the Department is aware that it is necessary to work hard in the future to justify the achieved results and to achieve new ones and to improve nephrology in the Republic of Macedonia.

What we should do:
– stimulate education and research, both basic and clinical.
– point out the problems of chronic kidney disease (CKD) and chronic renal failure (CRF) in the Republic of Macedonia.
– detect patients with CKD among our population, as early as possible.
– early diagnosis of Hypertension and Diabetes Mellitus.
– early diagnosis and prevention of renal disease is imperative.
– postpone or to stop the development of chronic renal failure (CRF) with therapy.
– improve the facilities for dialysis, (new equipment, personnel, etc.).
– increase the number of patients on peritoneal dialysis.
– reduce infection in patients on haemodialysis, especially Hepatitis C.
– increase renal transplantation from cadaver and living donors.
– improve the psycho- and physical rehabilitation of patients with kidney disease especially those treated with maintenance dialysis and renal transplantation.

We should do our best to offer our citizens the best of nephrology, diagnosis and treatment.

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Резиме

УНИВЕРЗИТЕТСКА КЛИНИКА ЗА НЕФРОЛОГИЈА НА МЕДИЦИНСКИОТ ФАКУЛТЕТ, УНИВЕРЗИТЕТ „СВ. КИРИЛ И МЕТОДИЈ“, СКОПЈЕ – СОЗДАВАЊЕ НЕФРОЛОШКА ЗАШТИТА ЗА ГРАЃАНИТЕ НА РЕПУБЛИКА МАКЕДОНИЈА

Поленаковиќ М.

Македонска академија на науките и уметностите, Скопје, Р. Македонија

Во јануари 1975 година, де фактио, формирана е Клиниката за нефрологија на Медицинскиот факултет во Скопје, како прва институција од ваков вид во поранешна Југославија. Клиниката за нефрологија беше движечка сила за натамошниот развој на нефрологијата во Република Македонија. Д. Хрисох обезпрео беше првот директор на Клиниката, а нејзините последователи директори беа Г. Масин, М. Поленаковиќ, К Забирговска и во момента е А. Шиколе. Пред формирањето на Клиниката за нефрологија постоела исклучување во дијагностицата и третманот на бубрежни пациенти. Првата хемодиализа (ХД) во Република Македонија беше извршена во 1959 година која пациент со акутина ренална инсуфициенција (АРИ) со користење вештачки бубрег „Колф-Бригам
Ротиращки барабанч“ на Институтот за трансфузиологија во Скопје. Во 1965 година Нефролошкото одделение при Клиниката за интерна медицина на Медицинскиот факултет во Скопје, доби модерен, нов вештачки "Websinger" апарат со сигма моторна пумпа и можности за еднакво користење на Колфовиот дијализер. Помеѓу 1959 и 1971 година, ХД беше изведуваан само кај пациенти со акутна ренална инсуфициенција. Во мај 1971 година на Нефролошкото одделение беше основана Единица за хронична ХД и програма за лекување со одржувачка хемодијализа (ОХД) која започна со пет Штутгарт Fresenius машини и 12 пациенти. Тоа беше голем потик за развој на ХД во Република Македонија. Имаат потреба поради големиот број пациенти со краен стадиум на бубрежна болест, за отворање нови места, центри за лекување со ОХД. Во 2007 година имаме 18 центри за ОХД во Република Македонија со 1183 пациенти. Третманот на пациентите со ОХД е најголем успех постигнат во Република Македонија во нефрологијата во врска со пациенти со краен стадиум на бубрежна болест. Пациентите пред лекувањето со ОХД беа предопредени да умрат, а сега се овој вид третман, тие имаат нормален живот и семејства. Пациентите со бубрежни болести се испитуваат и лекуваат во амбуланти на Клиниката за нефрологија. Сите типови на васкуларни пристапи, бубрежна биопсија, коскена биопсија, ултразвук на бубрежите, плазмаферезата и други испитувања се изведуваат секој ден на Клиниката за нефрологија на Медицинскиот факултет. Врз основа на резултатите од бубрежната биопсија, направена е класификација на паренхимните бубрежни заболувања, како и примена на соодветни имunosупресивни средства и други третмани. Нефролошката доктрина за примарното, секундарното и терцијалното здравство е подготвена и е доставена до сите медицински центри во Република Македонија. Првата (жив дарител) ренална трансплантација е извршена во јули 1977 година. Подоцна, се изведуваат трансплантации од живи и од почнати донатори, па Клиниката за нефрологија беше комплетирана во однос на дијализата и трансплантацијата на бубрези, и стана дел од европските центри за дијагноза и терапија на болести на бубрезите. Лекарите од Клиниката за нефрологија се меѓу најпродуктивните научни работници во Република Македонија и нивните трудови може да се најдат на интернет базата – PubMed. Клиниката за нефрологија, заедно со нефролошкото здружение беше извор на знаење во нефролошката област и трансфер на знаење од странство во Македонија и обратно. Нефролошкото здружение има направлено голем придонес во развојот на нефрологијата во нашата земја. Најпознатите европски и светски неф- рологи учествуваат во работата на нашето здружение и придонесоа за развојот на нефроологијата, не само во Македонија туку и на Балканот.

Клучни зборови: Клиника за нефрологија, развој, образование, хемодијализа, класификација, бубрежна трансплантација, нефролошка доктрина.