

18TH REPORT OF THE MALAYSIAN DIALYSIS & TRANSPLANT REGISTRY 2010

SPONSORS:
**MALAYSIAN SOCIETY OF NEPHROLOGY
ASSOCIATION OF DIALYSIS MEDICAL ASSISTANTS AND NURSES**

THE NATIONAL RENAL REGISTRY IS FUNDED WITH GRANTS FROM:
**THE MINISTRY OF HEALTH MALAYSIA
ROCHE
AIN MEDICARE
BAXTER HEALTHCARE
FRESENIUS MEDICAL CARE**

April 2011

© National Renal Registry, Malaysia

ISSN 1675-8862

Published by:

The National Renal Registry

Malaysian Society of Nephrology

Suite 1604, Plaza Permata

6, Jalan Kampar

50400 Kuala Lumpur

Malaysia

Telephone. : (603) 4045 8636

Direct Fax : (603) 4042 7694

e-mail : nrr@msn.org.my

Web site : <http://www.msn.org.my/nrr>

Important information:

This report is copyrighted. However it may be freely reproduced without the permission of the National Renal Registry. Acknowledgment would be appreciated. Suggested citation is: YN Lim, LM Ong, BL Goh (Eds) Eighteenth Report of the Malaysian Dialysis and Transplant 2010, Kuala Lumpur 2011

This report is also published electronically on the website of the National Renal Registry at: <http://www.msn.org.my/nrr>

ACKNOWLEDGEMENTS

The Malaysian Dialysis and Transplant Registry of the National Renal Registry would like to thank each and everyone who have in one way or another contributed to the success of the Malaysian Dialysis and Transplant Registry.

In particular we would like to thank the following:

The Nephrologists, physicians and staff of the Dialysis and Transplant follow-up centres: thank you for participating in the Registry. The success of the Registry depends on you.

The Ministry of Health, Malaysia for financial support and other support seen and unseen;

The Clinical Research Centre, in particular Dr Goh Pik Pin and Dr Jamaiah for their tireless effort in supporting the work of registries.

For their generous support:-

Roche

AIN Medicare

Baxter Healthcare

Fresenius Medical Care

NRR ADVISORY COMMITTEE MEMBERS 2010 to 2012

MEMBERS:	MSN APPOINTMENT:	FACILITIES
Datuk Dr. Ghazali Ahmad	Chairman	Hospital Kuala Lumpur
Dr. Abdul Halim Abd Gafor	University representative	University Kebangsaan Malaysia Medical Centre
Dr. S. Prasad Menon	Private sector representative	Sime Darby Medical Centre Subang Jaya
Dato' Dr. Zaki Morad B Mohd Zaher	NGO representative	National Kidney Foundation
Dr. Ong Loke Meng	CRC representative	Hospital Penang
Mr. Husin Harun	ADMAN representative	Hospital Kuala Lumpur
Dr. Wong Hin Seng	eMOSS sub-committee Chairperson	Hospital Selayang
Dato' Dr. Wan Shaariah Md Yusuf	MRRB sub-committee Chairperson	Tuanku Ja'afar Hospital
Dr. Lim Yam Ngo	MDTR sub-committee Chairperson	Hospital Kuala Lumpur
Dr. Lim Teck Onn	MDTR advisor	Independent Consultant Nephrologist
Dr. Goh Bak Leong	MINR sub-committee Chairperson	Hospital Serdang
Dr. Rafidah Abdullah	Honorary MSN Treasurer	Hospital Selayang

STATISTICIAN	Jasmine Chew Sze Ming
NRR MANAGER	Lee Day Guat
CLINICAL RESEARCH ASSOCIATE	Choo Cheh Loo
	Suhazelini Ali

ABOUT THE MALAYSIAN DIALYSIS AND TRANSPLANT REGISTRY (MDTR).....

The Malaysia Dialysis and Transplant Registry (MDTR) collects information on patients with end stage renal disease (ESRD) on renal replacement therapy (RRT) in Malaysia.

Objectives:

The objectives of the registry are as follows:

1. **Describe the natural history of ESRD.** The registry shall describe the characteristics of patients with ESRD, its management, and patient survival and quality of life outcomes with treatment; and shall describe variation thereof across different groups, healthcare sectors or geographic regions, and its secular trend over time in Malaysia.
2. **Determine effectiveness of treatments for ESRD.** The registry shall determine clinical effectiveness and cost effectiveness of treatments of ESRD in real-world clinical practices in Malaysia.
3. **Monitor safety and harm of products and services used in the treatment of ESRD.** The registry shall serve as an active surveillance system for the occurrence of unexpected or harmful events for products and services.
4. **Evaluating access to and quality of treatment services for ESRD.** The registry shall assess differences between providers or patient populations based on performance measures that compare treatments provided or outcomes achieved with “gold standards” (e.g., evidence-based guidelines) or comparative benchmarks for specific health outcomes (e.g., risk-adjusted survival rates). Such programs may be used to identify disparities in access to care, demonstrate opportunities for improvement, establish differentials for payment by third parties, or provide transparency through public reporting.
5. **To maintain the national renal transplant waiting list electronically – the eMOSS or electronic Malaysian Organ Sharing System.** The dialysis registry shall maintain and update patients on dialysis who do not have contraindications to kidney transplantation onto the national renal transplant waiting list according to published agreed criteria. This list is available on the web for ready access by the transplant physicians any time a deceased kidney becomes available.

Registry design:

This is a multi-center, observational cohort study designed to evaluate the health outcomes of patients with ESRD undergoing treatment at participating clinical centres. Patient inclusion criterion is deliberately broad and shall include any patient with a confirmed diagnosis of ESRD.

There is no prescribed study visits. Patient shall attend the clinical site as and when required per the standard of care at the site. Required data shall be collected as they become available.

- A clinical site shall notify all new patients to the registry, and shall continue to do so until the termination of the registry. Patients shall be follow-up for life.
- Participation. Site shall notify the patients' treatment to the registry in a calendar year of its participation. A site shall similarly notify patients during each year of its participation in the registry.

Registry study population:

The registry study population consists of male or female patients with ESRD to be recruited from participating sites in Malaysia. Participation in this study is voluntary. However, in accordance with the Private Health-care Facilities Act 1998 (AKTA 586), all dialysis health facility are required to submit data to the Malaysian Dialysis and Transplant Registry (MDTR).

All clinical centres or sites that satisfy the following selection criteria will be invited to participate:

1. This registry is opened to all clinical sites that provide RRT services for patients with ESRD in Malaysia.
2. Each site shall have a Principal Investigator who is also a licensed physician / Surgeon and a qualified professional experienced with ESRD management.
3. Each site shall appoint a Site Coordinator (SC). The SC is the person at the participating clinical site who is responsible for all aspects of registry management and data collection at site, and who will liaise with the Clinical Registry Manager (CRM) and Clinical Registry Assistant (CRA) at the Registry Coordinating Centre (RCC).
4. Each site shall accept responsibility for data collection, as well as for ensuring proper record keeping and registry document filing.
5. Each site shall agree to comply with the registry procedures and shall be willing to be subjected to ongoing review of data by CRM or CRA or other representative of MDTR. This may include one or more site visits by prior arrangement

Patient eligibility criteria:

- All new patients with ESRD undergoing treatment at a participating clinical site are eligible for entry into the registry.
- In addition, a site may opt to enter existing patients on follow-up at the site into the registry.

Registry data:

The data elements to be collected by the registry shall be relevant and reliable with modest burden to sites, shall comply with existing data standard where this exists, shall be compatible with established data set used by other existing registries, and shall employ standard terminology (dictionary) where available.

Two datasets are defined:

- Core dataset: These are data elements that are needed to address the key questions for which the registry was created.
- Non-core dataset: these are speculative data elements included to provide an opportunity to generate hypotheses or to explore other subsidiary questions not of primary interest to the registry.

The data domains and related specific data elements to be collected by this registry is tabulated below:

A	Identifier	Name, NRIC number, Other identifying document numbers, Address, Contact numbers
B	Demographics	Age, Sex, Ethnicity, Educational attainment, Occupation, Household Income group, Weight & Height, Use of tobacco, Funding for Treatment
C	Medical history	Medical history/ comorbidities, Family history
D	ESRD diagnosis	Date of first diagnosis, Date re-entering each RRT.
E	Laboratory investigations	Date & time of tests, Blood chemistry, Hematology, Serology
F	Treatment	Modalities of RRT- haemodialysis, peritoneal dialysis; treatment of other uraemic complications; kidney transplantation
G	Outcomes	Patient survival; death, date of death, cause of death Quality of Life/ Work rehabilitation status
H	Economics	Source of funding for dialysis treatment, and immunosuppressive drug treatment for transplantation
J	Healthcare provider characteristics	Sector providing dialysis treatment, (private, public or NGO),

PARTICIPATING HAEMODIALYSIS CENTRES 2010

Johor Darul Takzim

1. Batu Pahat Hospital, HD Unit
2. Batu Pahat Rotary, HD Unit
3. BP Renal Care (Rengit), HD Unit
4. BP Renal Care (Batu Pahat), HD Unit
5. BP Renal Care (Kluang), HD Unit
6. BP Renal Care (Segamat), HD Unit
7. BP Renal Care Simpang Renggam, HD Unit
8. BP Renalcare (Yong Peng), HD Unit
9. Che Eng Khor Centre, HD Unit
10. Hospital Pakar Sultanah Fatimah (Muar), HD Unit
11. JB Lions MAA-Medicare Charity Dialysis Centre (1), HD Unit
12. JB Lions MAA-Medicare Charity Dialysis Centre (2), HD Unit
13. JJ Lions Dialysis Centre, HD Unit
14. Johor Quarries Association Dialysis Centre, HD Unit
15. Johor Specialist Hospital, HD Unit
16. Kluang Hospital, HD Unit
17. Kota Tinggi Hospital, HD Unit
18. Mersing Hospital, HD Unit
19. Mersing Rotary Centre, HD Unit
20. Muar Dialysis, HD Unit
21. Muar Lions Renal Centre, HD Unit
22. Persatuan Membaiki Akhlak-Che Luan Khor_NKF, HD Unit
23. Pertubuhan Hemodialisis Muhibbah Segamat (Labis), HD Unit
24. Pertubuhan Kebajikan Amitabha, HD Unit
25. Pontian Hospital, HD Unit
26. Pontian Rotary Haemodialysis Centre, HD Unit
27. Premier Renal Care, HD Unit
28. Prima Dialysis Kluang, HD Unit
29. Prima Dialysis Masai, HD Unit
30. Pusat Dialisis Nefro Utama (Johor Bahru), HD Unit
31. Pusat Dialisis Nefro Utama (Kota Tinggi), HD Unit
32. Pusat Dialisis Nefro Utama Pontian, HD Unit
33. Pusat Dialisis Perbadanan Islam (Johor Bahru), HD Unit
34. Pusat Dialisis Perbadanan Islam (Pontian), HD Unit
35. Pusat Dialisis Waqaf An-nur (Batu Pahat), HD Unit
36. Pusat Dialisis Waqaf An-nur (Kota Raya), HD Unit
37. Pusat Dialisis Waqaf An-nur (Pasir Gudang), HD Unit
38. Pusat Dialysis Makmur, HD Unit
39. Pusat Haemodialisis Suria (Tangkak), HD Unit
40. Pusat Haemodialisis Amal Lexin, HD Unit
41. Pusat Hemodialisis Ar-Raudhah, HD Unit
42. Pusat Hemodialisis Bandar Mas, HD Unit
43. Pusat Hemodialisis Darul Takzim (Batu Pahat), HD Unit
44. Pusat Hemodialisis Darul Takzim (Parit Raja), HD Unit
45. Pusat Hemodialisis Hidayah, HD Unit
46. Pusat Hemodialisis Iman, HD Unit
47. Pusat Hemodialisis MAIJ, HD Unit
48. Pusat Hemodialisis Mawar (Yong Peng) HD Unit
49. Pusat Hemodialisis Muar, HD Unit
50. Pusat Hemodialisis Rotary Kota Tinggi, HD Unit
51. Pusat Hemodialisis Rotary Kulai, HD Unit
52. Pusat Hemodialisis Sejahtera (Batu Pahat), HD Unit
53. Pusat Hemodialisis Sejahtera Muar, HD Unit
54. Pusat Hemodialisis Syifa (Bukit Gambir), HD Unit
55. Pusat Perubatan Perbadanan Islam (Segamat), HD Unit
56. Puteri Specialist Hospital, HD Unit
57. Segamat Hospital, HD Unit
58. Sinar Haemodialysis (Batu Pahat), HD Unit
59. Sultan Ismail Hospital (Paed), HD Unit
60. Sultan Ismail Hospital, HD Unit
61. Sultanah Aminah Hospital, HD Unit
62. Systemic Dialysis Centre (2), HD Unit
63. Systemic Dialysis Centre, HD Unit
64. Tangkak Hospital, HD Unit
65. Tangkak Lions Renal Centre, HD Unit

66. Temenggong Seri Maharaja Tun Ibrahim Hospital, HD Unit
67. The Rotary HD Centre (Johor Bahru), HD Unit
68. Yayasan Pembangunan Keluarga Johor-NKF, HD Unit
69. Yayasan Rotary Kluang, HD Unit
70. Zhi En Dialysis Centre, HD Unit

Kedah Darul Aman

71. Asia Renal Care (Penang) Kulim, HD Unit
72. Baling Hospital, HD Unit
73. Buddhist Tzu Chi (Jitra), HD Unit
74. Buddhist Tzu Chi Dialysis Centre (Kedah), HD Unit
75. Caring Dialysis (Gurun), HD Unit
76. Kuala Nerang Hospital, HD Unit
77. Kulim Haemodialysis (CS Tan), HD Unit
78. Kulim Hospital, HD Unit
79. Langkawi Hospital, HD Unit
80. Metro Specialist Hospital, HD Unit
81. Northern Dialysis Centre, HD Unit
82. Pantai Hospital Sungai Petani, HD Unit
83. Pertubuhan Bakti Fo En Bandar Kulim, HD Unit
84. Pusat Dialisis Albukhary, HD Unit
85. Pusat Dialysis K K Tan (Sg Petani), HD Unit
86. Pusat Haemodialisis Dr. Ismail, HD Unit
87. Pusat Hemodialisis Beng Siew, HD Unit
88. Pusat Hemodialisis Mergong, HD Unit
89. Pusat Hemodialisis S P, HD Unit
90. Pusat Hemodialisis Seroja (Kulim 1), HD Unit
91. Pusat Hemodialisis Seroja (Kulim 2), HD Unit
92. Pusat Hemodialisis Syifa (Pendang), HD Unit
93. Pusat Kesihatan Jitra, HD Unit
94. Pusat Pakar Dialisis Traktif (Jitra), HD Unit
95. Pusat Rawatan Hemodialisis Yayasan Enkay & Sultanah Bahiyah, HD Unit
96. Putra Haemodialysis Centre, HD Unit
97. Putra Medical Centre, HD Unit
98. Rawatan Dialisis Amal Lion_NKF, HD Unit
99. Renal Care (Kedah), HD Unit
100. Sik Hospital, HD Unit
101. Sultan Abdul Halim Hospital, HD Unit
102. Sultanah Bahiyah Hospital, HD Unit
103. Superkids Trinity-NKF Dialysis Centre, HD Unit
104. Yan Hospital, HD Unit
105. Zaharah Dialysis Center, HD Unit

Kelantan Darul Naim

106. Gua Musang Hospital, HD Unit
107. Hudaz Dialysis Centre, HD Unit
108. Jeli Hospital, HD Unit
109. KB Rotary-MAA Charity Dialysis, HD Unit
110. Keluarga Bahagia Haemodialisis, HD Unit
111. Kuala Krai Hospital, HD Unit
112. Machang Hospital, HD Unit
113. Nephrolife Haemodialysis Centre, HD Unit
114. Pakar Perdana Hospital, HD Unit
115. Pasir Mas Hospital, HD Unit
116. Pusat Dialisis Yayasan Buah Pinggang Kebangsaan (Kota Bharu), HD Unit
117. Pusat Hemodialisis Berkat Seroja (Machang), HD Unit
118. Pusat Hemodialysis Syifaq, HD Unit
119. Pusat Perubatan Tentera (Kota Bharu), HD Unit
120. Pusat Rawatan Dialisis Islah (Kota Bharu), HD Unit
121. Raja Perempuan Zainab II Hospital, HD Unit
122. Renal-Link (Kelantan), HD Unit
123. Tanah Merah Hospital, HD Unit
124. Tengku Anis Hospital, HD Unit
125. Tumpat Hospital, HD Unit
126. Universiti Sains Malaysia Hospital, HD Unit

Negeri Melaka

127. 94 Hospital Angkatan Tentera (Terendak), HD Unit
128. Alor Gajah Dialysis Centre, HD Unit
129. Alor Gajah Hospital, HD Unit
130. Amitabha Centre (Melaka), HD Unit
131. Damai Medical & Heart Clinic, HD Unit
132. Mahkota Medical Centre, HD Unit
133. Melaka Hospital, HD Unit
134. Pantai Air Keroh Hospital, HD Unit
135. Pertubuhan Kebajikan Hemodialisis Hospital Pakar Putra Melaka, HD Unit
136. Pusat Dialisis Giat Kurnia (Masjid Tanah), HD Unit
137. Pusat Dialisis Giat Kurnia (Merlimau), HD Unit
138. Pusat Dialisis Nephrocare (Bukit Piatu), HD Unit
139. Pusat Dialysis Comfort, HD Unit
140. Pusat Haemodialisis Suria (Jasin), HD Unit
141. Pusat HD SJAM Bacang Melaka, HD Unit
142. Pusat Hemodialisis Aman, HD Unit
143. Pusat Hemodialisis Impian, HD Unit
144. Pusat Hemodialisis Krisda, HD Unit
145. Pusat Hemodialisis SJAM Pulau Sebang, HD Unit
146. Pusat Hemodialisis Yayasan Toh Puan Zurina, HD Unit
147. Pusat Rawatan Dialisis Nefro Utama (Masjid Tanah), HD Unit
148. Sinar Hemodialisis, HD Unit
149. Tenang Haemodialysis Centre, HD Unit
150. Tenang Haemodialysis Jasin, HD Unit

Negeri Sembilan Darul Khusus

151. D'kasih Hemodialysis
152. Giat Kurnia Dialysis Centre (Nilai)
153. Haemodialysis Mawar Gemas
154. Jelebu Hospital
155. Port Dickson Hospital
156. Pusat Dialisis Suria (Tampin)
157. Pusat Haemodialisis Renalife
158. Pusat Haemodialisis Suria (Senawang)
159. Pusat Hemodialisis Berkat Seroja (Kuala Pilah)
160. Pusat Hemodialisis Gemencheh
161. Pusat Hemodialisis Mawar (Mantin)
162. Pusat Hemodialisis Mawar N. Sembilan (Bahau)
163. Pusat Hemodialisis Mawar N. Sembilan (Lukut)
164. Pusat Hemodialisis Mawar N. Sembilan (Rantau)
165. Pusat Hemodialisis Mawar N. Sembilan (Seremban)
166. Pusat Hemodialisis Mutiara
167. Pusat Pakar Dialisis Traktif (Kuala Pilah)
168. Pusat Waqaf An-nur (Senawang)
169. Seremban Specialist Hospital
170. Tampin Hospital
171. Tuanku Ampuan Najihah Hospital
172. Tuanku Ja'afar Hospital (Paed)
173. Tuanku Ja'afar Hospital

Pahang Darul Makmur

174. Bentong Hospital
175. Caring Dialysis (Jerantut)
176. Fitra Med
177. Hospital Sultanah Hajjah Kalsom
178. Jengka Hospital
179. Jerantut Hospital
180. Kuala Lipis Hospital
181. Kuantan Clinical Diagnostic Centre
182. Kuantan Medical Centres
183. Kuantan Specialist Centre
184. Lipis Dialysis Centre

185. MAA-Medicare Charity (Mentakab)
186. Mentakab Haemodialysis Unit
187. Muadzam Shah Hospital
188. Pahang Buddhist Association
189. Pekan Hospital
190. Pusat Hemodialisis Islam Makmur
191. Pusat Hemodialisis Jerantut
192. Pusat Hemodialisis Suria (Bentong)
193. Pusat Rawatan Dialisis Fitra
194. Pusat Rawatan Dialisis Fitra
195. Pusat Rawatan Dialisis Tun Abdul Razak-NKF Kuantan
196. Pusat Rawatan Hemodialisis Sang Riang Bera
197. Raub Hospital
198. SJAM-KPS Haemodialysis Centre 9 (Raub)
199. Sultan Haji Ahmad Shah Hospital
200. Suria Dialysis Centre (Temerloh)
201. Tengku Ampuan Afzan Hospital (Paed)
202. Tengku Ampuan Afzan Hospital

Perak Darul Ridzuan

203. 96 Hospital Angkatan Tentera (Lumut)
204. Batu Gajah Hospital
205. Berchaam Dialysis Centre
206. C. S. Loo Kidney & Medical Specialist Centre
207. Caring Dialysis Centre (Batu Gajah)
208. Caring Dialysis Centre (Sg Siput)
209. Caring Dialysis Centre (Teluk Intan)
210. Changkat Melintang Hospital
211. Fatimah Hospital
212. Gerik Hospital
213. Hope Haemodialysis Society Ipoh
214. Kampar Hospital
215. Kuala Kangsar Hospital
216. MAA-Medicare Charity (Teluk Intan)
217. MB Star Rawatan Dialisis
218. Nur Dialysis Centre
219. Parit Buntar Hospital
220. Persatuan Amal Chin Malaysia Barat
221. Pertubuhan Perkhidmatan Haemodialisis Ar-Ridzuan
222. Pertubuhan Perkhidmatan Hemodialisis AIXIN Kerian
223. PMA Chan Meng Khor-MAA Medicare Charity Dialysis Centre
224. Pulau Pangkor Hospital
225. Pusat Dialisis Darul Iltizam (Slim River)
226. Pusat Dialisis Darul Iltizam (Taiping)
227. Pusat Dialisis Ehsan Perak (Parit Buntar)
228. Pusat Dialisis Intan
229. Pusat Dialisis Kuala Kangsar
230. Pusat Dialisis Makmur
231. Pusat Dialisis Mutiara
232. Pusat Dialisis Penawar Permai
233. Pusat Dialisis Setia (Ipoh)
234. Pusat Dialisis Taiping (Kamunting)
235. Pusat Dialisis Taiping (Kuala Kangsar)
236. Pusat Dialisis Taiping (Parit Buntar)
237. Pusat Dialisis Taiping
238. Pusat Dialisis Setia
239. Pusat Hemodialisis Darul Iltizam (Ipoh)
240. Pusat Hemodialisis Kampar Yayasan Nanyang-SJAM
241. Pusat Hemodialisis Manjung
242. Pusat Hemodialisis Nyata Segar
243. Pusat Rawatan Dialisis Wan Nong
244. Putri Haemodialysis Centre (Ipoh)
245. Raja Permaisuri Bainun Hospital (Home)



- 246. Raja Permaisuri Bainun Hospital
- 247. Renal Care (Ipoh Specialist)
- 248. Selama Hospital
- 249. Seri Manjung Hospital
- 250. Sg Siput Hospital
- 251. SJ Dialysis Centre (Bidor)
- 252. SJ Dialysis Centre (Ipoh)
- 253. SJAM_KPS 15 (Ipoh)
- 254. Slim River Hospital (Tanjong Malim)
- 255. Taiping Hospital
- 256. Tapah Hospital
- 257. Teluk Intan Hospital
- 258. Woh Peng Cheang Seah
- 259. Yayasan Akhlak-NKF Taiping
- 260. Yayasan Dialysis Pendidikan Akhlak Perak-NKF Ipoh

Perlis Indera Kayangan

- 261. Tuanku Fauziah Hospital
- 262. Tuanku Syed Putra_NKF Kangar Haemodialysis Centre

Penang

- 263. Alkom Bakti Dialysis
- 264. AMD Rotary (Penang)
- 265. Asia Renal Care (Penang) BM
- 266. Balik Pulau Hospital
- 267. BBA (Butterworth) Dialysis Centre
- 268. Buddhist Tzu Chi Dialysis Centre (Butterworth)
- 269. Buddhist Tzu Chi HD Centre (Penang)
- 270. Bukit Mertajam Hospital
- 271. Fo Yi NKF Dialysis Centre (1)
- 272. Fo Yi NKF Dialysis Centre (2)
- 273. Gleneagles Medical Centre
- 274. Happy Kid Nees Dialysis Centre
- 275. Island Hospital
- 276. K K Tan Specialist (BM)
- 277. Kepala Batas Hospital
- 278. KPJ Penang Specialist Hospital
- 279. Lam Wah Ee Hospital
- 280. Lim Boon Sho Dialysis Centre
- 281. Loh Guan Lye Specialist Centre
- 282. MAA-Medicare Charity (Butterworth)
- 283. Muhibah Renal Care
- 284. NEPH Sdn Bhd
- 285. Nucare Dialysis Centre
- 286. Penang Adventist Hospital
- 287. Penang Caring Dialysis Society
- 288. Persatuan Kebajikan Haemodialysis St Anne BM
- 289. Pertubuhan Dialysis Rotary-Satu Hati
- 290. Pertubuhan Hemodialisis SPS
- 291. Province Wellesley Renal Medifund
- 292. Pulau Pinang Hospital (Home)
- 293. Pulau Pinang Hospital (Paed)
- 294. Pulau Pinang Hospital
- 295. Pusat Dialisis BMC
- 296. Pusat Dialisis Ehsan Perak (Pedar)
- 297. Pusat Haemodialisis Zakat (Jawi)
- 298. Pusat Hemodialisis Sinona
- 299. Pusat Hemodialisis Zakat (Balik Pulau)
- 300. Pusat Hemodialisis Zakat (Bukit Mertajam)
- 301. Pusat Hemodialisis Zakat (Butterworth)
- 302. Pusat Hemodialisis Zakat (Kepala Batas)
- 303. Pusat Hemodialisis Zakat (P. Pinang)
- 304. Pusat Hemodialisis Bestari

- 305. Pusat Rawatan Dialisis Lions-NKF (Penang)
- 306. PWRM (BM) Dialysis Centre
- 307. Renal Link (Penang)
- 308. Seberang Jaya Hospital (Butterworth)
- 309. Seberang Perai (Bagan)
- 310. SJ Dialysis Centre (Seberang Jaya)
- 311. Sungai Bakap Hospital
- 312. The Penang Community HD Society
- 313. TSC Renal Care

Sabah

- 314. BBA (Tawau) Dialysis Centre
- 315. Beaufort Hospital
- 316. Beluran Hospital
- 317. Caring Dialysis Centre (Sandakan)
- 318. Caring Dialysis Centre Kota Kinabalu
- 319. Duchess of Kent Hospital
- 320. Keningau Hospital
- 321. Kota Belud Hospital
- 322. Kota Kinabatangan Hospital
- 323. Kota Marudu Hospital
- 324. Kudat Hospital
- 325. Labuan Hospital
- 326. Lahad Datu Hospital
- 327. Likas Hospital (Paed)
- 328. Likas Hospital
- 329. MAA-Medicare Charity (Kota Kinabalu)
- 330. Nobel Dialysis Centre
- 331. Papar Hospital
- 332. Persatuan Buah Pinggang Sabah
- 333. Persatuan Hemodialisis Kinabalu Sabah
- 334. Pusat Rawatan Dialisis MUIS-NKF
- 335. Queen Elizabeth Hospital
- 336. Ranau Hospital
- 337. Rotary Tawau Tanjung
- 338. Sabah Medical Centre
- 339. Sandakan Kidney Society
- 340. Semporna Hospital
- 341. Sipitang Hospital
- 342. Tambunan Hospital
- 343. Tawau Hospital
- 344. Tenom Hospital

Sarawak

- 345. 801 Rumah Sakit Angkatan Tentera (Kuching)
- 346. Bau Hospital
- 347. Betong Hospital
- 348. Bintulu Hospital
- 349. CHKMUS-MAA Medicare Charity
- 350. Hospital Daerah Daro
- 351. Kanowit Hospital
- 352. Kapit Hospital
- 353. KAS-Rotary-NKF
- 354. Kuching Specialist Hospital
- 355. Lawas Hospital
- 356. Limbang Hospital
- 357. Lundu Hospital
- 358. Marudi Hospital
- 359. Miri Hospital
- 360. Miri Red Crescent Dialysis Centre
- 361. Mukah Hospital
- 362. Normah Medical Specialist Centre
- 363. Pusat Dialisis Cahaya

364. Pusat Dialisis Waqaf An-Nur (Sarawak)
 365. Rejang Medical Centre
 366. Renal Life Dialysis Centre
 367. Renal Therapy Services
 368. Saratok Hospital
 369. Sarawak General Hospital
 370. Sarikei Hospital
 371. Serian Hospital
 372. Sibu Hospital
 373. Sibu Kidney Foundation
 374. Simunjan Hospital
 375. SJAM-KPS 10 (Bintulu)
 376. SJAM-KPS Haemodialysis Centre 8 (Sibu)
 377. Sri Aman Hospital
 378. Timberland Medical Centre
- Selangor Darul Ehsan**
379. 819 Rumah Sakit Angkatan Tentera
 380. Ampang Hospital
 381. Apex Club of Klang-NKF Charity Dialysis Centre
 382. Assunta Hospital
 383. Bakti-NKF Dialysis Centre
 384. Bangi Dialysis Centre
 385. Banting Hospital
 386. BBA (Puchong) Dialysis Centre
 387. Berjaya NKF Dialysis Centre
 388. Caring Dialysis Centre (Cheras)
 389. Caring Dialysis Centre (Sabak Bernam)
 390. Caring Dialysis Centre (Sg. Besar)
 391. Caring Dialysis Centre Andalas (Klang)
 392. Damansara Specialist Hospital
 393. EAM Dialysis Centre
 394. Haemodialysis Association Klang
 395. Harmoni Dialysis (Damansara)
 396. Harmoni Dialysis (Kajang)
 397. Healthcare Dialysis Centre
 398. Hemodialisis Yayasan Veteran ATM (S Kembangan)
 399. Jerteh Dialysis Centre
 400. Kajang Hospital
 401. Kelana Jaya Medical Centre
 402. KPJ Ampang Puteri Specialist Hospital
 403. KPJ Kajang Specialist Hospital
 404. KPJ Selangor Specialis Hospital
 405. Kuala Kubu Bharu Hospital
 406. MAA-Medicare Charity (Kajang)
 407. Persatuan Dialisis Kurnia PJ
 408. Ping Rong-NKF
 409. PNSB Dialysis Centre
 410. Pusat Dialisis Aiman (Shah Alam)
 411. Pusat Dialisis An'nur
 412. Pusat Dialisis As Sofi
 413. Pusat Dialisis LZS (Kapar)
 414. Pusat Dialisis LZS (Sg. Besar)
 415. Pusat Dialisis LZS (Shah Alam)
 416. Pusat Dialisis MAIS Taman Melawati
 417. Pusat Dialisis MAIS
 418. Pusat Dialisis Mesra (Kuala Selangor)
 419. Pusat Dialisis NKF-Rotary Damansara
 420. Pusat Dialisis Pakar Medi-Nefro
 421. Pusat Dialisis Putra Jaya (Kajang)
 422. Pusat Dialisis Sijangkang
 423. Pusat Dialisis Touch
 424. Pusat Dialysis Mesra (Kapar)
 425. Pusat Dialysis Mesra (Rahman Putra)
 426. Pusat Dialysis Mesra KKB
 427. Pusat Dialysis Putra Jaya (Semenyih)
 428. Pusat Haemodialysis Nilam
 429. Pusat Hemodialisis Fasa (Kg Medan)
 430. Pusat Hemodialisis Fasa (Sri Manja)
 431. Pusat Hemodialisis Kau Ong Yah Ampang
 432. Pusat Hemodialisis Mawar N. Sembilan (Sepang)
 433. Pusat Hemodialisis Mawar N. Sembilan (Seri Kembangan)
 434. Pusat Hemodialisis Permata
 435. Pusat Hemodialisis Syifa (Batangkali)
 436. Pusat Hemodialisis Yayasan Veteran ATM (Batu Caves)
 437. Pusat Perubatan Dialisis
 438. Pusat Perubatan Primier HUKM
 439. Pusat Rawatan Dialisis Hidayah
 440. Pusat Rawatan Dialisis Islah (Batu Caves)
 441. Pusat Rawatan Dialisis Islah (Selayang)
 442. Pusat Rawatan Dialisis Mukmin
 443. Pusat Rawatan Dialisis Nefro Utama (Puchong Jaya)
 444. Pusat Rawatan Dialysis Nefro Utama (Kajang Prima)
 445. Pusat Rawatan Hemodialisis Ampang Jaya
 446. Pusat Rawatan Hemodialisis Felina
 447. Putrajaya Hospital
 448. Rawatan Dialysis Bukit Tinggi
 449. Renal Associates
 450. Renal Care Dialysis Services
 451. S.P. Menon Dialysis Centre (Klang)
 452. S.P. Menon Dialysis Centre (Petaling Jaya)
 453. Sayang Dialysis Selayang
 454. Selayang Hospital
 455. Serdang Hospital
 456. Sime Darby Medical Centre Subang Jaya
 457. SJAM-KPS Haemodialysis Centre 1 (Raja Muda Musa)
 458. SJAM-KPS Haemodialysis Centre 11 (Shah Alam)
 459. SJAM-KPS Haemodialysis Centre 12 (Balakong)
 460. SJAM-KPS Haemodialysis Centre 2 (Klang)
 461. SJAM-KPS Haemodialysis Centre 3 (Banting)
 462. SJAM-KPS Haemodialysis Centre 5 (Rawang)
 463. SJAM-KPS Haemodialysis Centre 6 (Kuala Selangor)
 464. SJAM-KPS Pusat Hemodialisis Tasik Puteri
 465. Smartcare Dialysis Centre (Subang Jaya)
 466. Sri Kota Medical Centre
 467. Sungai Buloh Hospital
 468. Sunway Medical Centre (2)
 469. Sunway Medical Centre
 470. Suriya Dialysis Centre
 471. Syukur Elit
 472. Tanjung Karang Hospital
 473. Tengku Ampuan Jemaah Hospital
 474. Tengku Ampuan Rahimah Hospital
 475. Tulips Dialysis Centre
 476. Universiti Kebangsaan Malaysia Bangi
 477. Yayasan Kebajikan SSL Puchong
 478. Yayasan Kebajikan SSL (Petaling Jaya)

Terengganu Darul Iman

- 479. Besut Hospital
- 480. Dungun Hospital
- 481. Hulu Terengganu Hospital
- 482. Kemaman Hospital
- 483. Pusat Dialisis MAIDAM
- 484. Pusat Dialisis Nuraeen
- 485. Pusat Dialisis Terengganu/NKF
- 486. Pusat Hemodialisis Nabilah
- 487. Pusat Pakar Dialisis Traktif (Besut)
- 488. Pusat Rawatan Dialisis Islah (Kuala Terengganu)
- 489. Sultanah Nur Zahirah Hospital
- 490. YKN Dialisis (Terengganu)

Wilayah Persekutuan Kuala Lumpur

- 491. Aiman Dialysis Centre
- 492. Al-Islam Specialist Hospital
- 493. Charis-NKF Dialysis Centre
- 494. Cheras Dialysis Centre
- 495. Hospital Angkatan Tentera Tuanku Mizan
- 496. Kuala Lumpur Hospital (Home)
- 497. Kuala Lumpur Hospital (Paed.)
- 498. Kuala Lumpur Hospital (Unit 1)
- 499. Kuala Lumpur Hospital (Unit 3)
- 500. Kuala Lumpur Hospital (Unit 4)
- 501. Kuala Lumpur Lions Renal Centre
- 502. MAA-Medicare Charity (Cheras)
- 503. MAA-Medicare Charity (Kuala Lumpur)
- 504. National Kidney Foundation Dialysis Centre (KL)
- 505. Pantai ARC Dialysis Services
- 506. Pantai Hospital Ampang
- 507. Poliklinik Komuniti Tanglin
- 508. Prince Court Medical Centre

- 509. Pusat Dialisis Falah
- 510. Pusat Dialisis Nefro Utama (Bangsar)
- 511. Pusat Dialisis Pusat Punggutan Zakat (Kuala Lumpur)
- 512. Pusat Dialysis Sentral
- 513. Pusat Hemodialisis Dato' Lee Kok Chee
- 514. Pusat Hemodialisis Desa Aman Puri
- 515. Pusat Hemodialisis Harmoni (Cheras)
- 516. Pusat Hemodialisis Harmoni (Shamelin)
- 517. Pusat Hemodialisis Mawar N. Sembilan (Seputih)
- 518. Pusat Hemodialisis PMKL
- 519. Pusat Hemodialisis PUSRAWI
- 520. Pusat Hemodialisis Waz Lian
- 521. Pusat Hemodialisis Yayasan Felda
- 522. Pusat Hemodialisis Medipro Alliance
- 523. Pusat Pakar Tawakal
- 524. Pusat Perubatan Universiti Kebangsaan Malaysia
- 525. Pusat Rawatan Dialisis Fungates Superflow-NKF
- 526. Pusat Rawatan Dialisis Good Health-NKF (Kg Pandan)
- 527. Pusat Rawatan Dialisis Islah (KL)
- 528. Pusat Rawatan Dialisis Nefro Utama (Setapak)
- 529. Renal Dialysis Centre
- 530. Rotary Damansara-NKF Dialysis
- 531. S.P. Menon Dialysis Centre (Kuala Lumpur)
- 532. Sayang Dialysis Cawangan Wangsa Maju
- 533. Sentosa Medical Centre
- 534. Smartcare Dialysis Clinic (Cheras)
- 535. The Kidney Dialysis Centre (1)
- 536. The Kidney Dialysis Centre (2)
- 537. The Nayang-NKF Dialysis Centre
- 538. Tung Shin Hospital & Yayasan Nanyang Press
- 539. Tung Shin Hospital
- 540. University Malaya Medical Centre
- 541. University Malaya Specialist Centre
- 542. YKN Dialisis (Kuala Lumpur)

Johor Darul Takzim

1. BP Renal Care (Batu Pahat)
2. BP Renal Care (Segamat)
3. Hospital Pakar Sultanah Fatimah (Muar)
4. Puteri Specialist Hospital
5. Sultan Ismail Hospital (Paed)
6. Sultanah Aminah Hospital

Kedah Darul Aman

7. Sultanah Bahiyah Hospital

Kelantan Darul Naim

8. Raja Perempuan Zainab II Hospital
9. Universiti Sains Malaysia Hospital

Negeri Melaka

10. Damai Medical & Heart Clinic
11. Melaka Hospital

Negeri Sembilan Darul Khusus

12. Tuanku Ja'afar Hospital (Paed)
13. Tuanku Ja'afar Hospital

Pahang Darul Makmur

14. Tengku Ampuan Afzan Hospital (Paed)
15. Tengku Ampuan Afzan Hospital

Perak Darul Ridzuan

16. 96 Hospital Angkatan Tentera (Lumut)
17. Raja Permaisuri Bainun Hospital
18. Renal Care (Ipoh Specialist)

Penang

19. Pulau Pinang Hospital (Paed)
20. Pulau Pinang Hospital

Sabah

21. Duchess of Kent Hospital
22. Queen Elizabeth Hospital
23. Sabah Medical Centre

Sarawak

24. Normah Medical Specialist Centre
25. Sarawak General Hospital

Selangor Darul Ehsan

26. Selayang Hospital (Paed)
27. Selayang Hospital
28. Serdang Hospital
29. Sri Kota Medical Centre
30. Tengku Ampuan Rahimah Hospital

Terengganu Darul Iman

31. Sultanah Nur Zahirah Hospital

Wilayah Persekutuan Kuala Lumpur

32. Kuala Lumpur Hospital (Paed.)
33. Kuala Lumpur Hospital
34. Pusat Perubatan Universiti Kebangsaan Malaysia
35. University Malaya Medical Centre

PARTICIPATING TRANSPLANT FOLLOW-UP CENTRES 2010

Johor Darul Takzim

1. Batu Pahat Hospital
2. Kluang Hospital
3. Mersing Hospital
4. Pakar Sultanah Fatimah Muar Hospital
5. Pontian Hospital
6. Segamat Hospital
7. Sultan Ismail Hospital (Paed)
8. Sultan Ismail Pandan Hospital
9. Sultanah Aminah Hospital

Kedah Darul Aman

10. Sultanah Bahiyah Hospital

Kelantan Darul Naim

11. Raja Perempuan Zainab II Hospital
12. Universiti Sains Malaysia Hospital

Negeri Melaka

13. Mahkota Medical Centre
14. Melaka Hospital

Negeri Sembilan Darul Khusus

15. Tuanku Ja'afar Hospital

Pahang Darul Makmur

16. Tg. Ampuan Afzan Hospital

Perak Darul Ridzuan

17. Raja Permaisuri Bainun Hospital
18. Renal Care (Ipoh Specialist)
19. Taiping Hospital

Penang

20. Pulau Pinang Hospital

Sabah

21. Duchess of Kent Hospital
22. Klinik Dr Choo & Liew
23. Labuan Hospital
24. Queen Elizabeth Hospital
25. Sabah Medical Centre
26. Tawau Hospital

Sarawak

27. Bintulu Hospital
28. Miri Hospital
29. Sarawak General Hospital
30. Sibul Hospital
31. Timberland Medical Centre

Selangor Darul Ehsan

32. Assunta Hospital
33. KPJ Ampang Puteri Specialist Hospital
34. Selayang Hospital
35. Serdang Hospital
36. Sime Darby Medical Centre Subang Jaya
37. Sri Kota Medical Centre
38. Tan Medical Renal Clinic
39. Tg. Ampuan Rahimah Hospital

Terengganu Darul Iman

40. Kemaman Hospital
41. Sultanah Nur Zahirah Hospital

Wilayah Persekutuan Kuala Lumpur

42. Fan Medical Renal Clinic
43. Kuala Lumpur Hospital (Paed)
44. Kuala Lumpur Hospital
45. Prince Court Medical Centre
46. Pusat Perubatan Universiti Kebangsaan Malaysia
47. University Malaya Medical Centre

CONTRIBUTING AUTHORS

CHAPTER TITLE	AUTHORS	INSTITUTIONS
1 ALL RENAL REPLACEMENT THERAPY IN MALAYSIA	Lim Yam Ngo	Kuala Lumpur Hospital
	Ghazali B Ahmad	Kuala Lumpur Hospital
	Lee Day Guat	National Renal Registry
2 DIALYSIS IN MALAYSIA	Lim Yam Ngo	Kuala Lumpur Hospital
	Ghazali B Ahmad	Kuala Lumpur Hospital
	Tan Chwee Choon	Tengku Ampuan Rahimah Hospital
	Lee Day Guat	National Renal Registry
3 DEATH AND SURVIVAL ON DIALYSIS	Wong Hin Seng	Selayang Hospital
	Ong Loke Meng	Penang Hospital
4 QOL AND REHABILITATION OUTCOMES ON DIALYSIS PATIENTS IN MALAYSIA	Liu Wen Jiun	Sultanah Aminah Hospital
	Chew Thian Fook	Seremban Specialist Hospital
	Christopher Lim Thiam Seong	University Putra Malaysia
	Zaki Morad B Mohd Zaher	KPJ Kajang Specialist Hospital
5 PAEDIATRIC RENAL REPLACEMENT THERAPY	Lee Ming Lee	Tuanku Ja'afar Hospital
	Lim Yam Ngo	Kuala Lumpur Hospital
	Lynster Liaw Chiew Tung	Penang Hospital
	Susan Pee	Sultan Ismail Hospital
	Wan Jazilah Wan Ismail	Selayang Hospital
6 MANAGEMENT OF ANAEMIA IN DIALYSIS PATIENTS	Philip N. Jeremiah	KPJ Ampang Puteri Specialist Hospital
	Bee Boon Cheak	Selayang Hospital
	Ghazali B Ahmad	Kuala Lumpur Hospital
	Lim Soo Kun	University Malaya Specialist Centre
	Zawawi B Nordin	Sultanah Nur Zahirah Hospital
7 NUTRITIONAL STATUS ON DIALYSIS	Winnie Chee Siew Swee	International Medical University
	Abdul Halim B Abd Gafor	Pusat Perubatan Universiti Kebangsaan Malaysia
	Ahmad Fauzi B Abd Rahman	Puteri Specialist Hospital
	Koh Keng Hee	Sarawak General Hospital
	Tilakavati Karupaiah	Faculty of Allied Health Sciences University Kebangsaan Malaysia
8 BLOOD PRESSURE CONTROL AND DYSLIPIDAEMIA	S. Prasad Menon	Sime Darby Medical Centre Subang Jaya
	Hooi Lai Seong	Sultanah Aminah Hospital
	Lee Wan Tin	Sime Darby Medical Centre Subang Jaya
	Sunita Bavanandan	Kuala Lumpur Hospital
9 CHRONIC KIDNEY DISEASE - MINERAL AND BONE DISORDERS	Rozina Bt Ghazalli	Pulau Pinang Hospital
	Ching Chen Hua	Sultanah Bahiyah Hospital
	Fan Kin Sing	Gleneagles Intan Medical Centre
	Liew Yew Fong	Pulau Pinang Hospital
10 HEPATITIS ON DIALYSIS	Teo Sue Mei	Putri Haemodialysis Centre (Ipoh)
	Chow Yok Wai	Pantai Air Keroh Hospital
	Clare Tan Hui Hong	Sarawak General Hospital
	T. Thiruventhiran	Sunway Medical Centre
11 HAEMODIALYSIS PRACTICES	Tan Chwee Choon	Tengku Ampuan Rahimah Hospital
	Norleen Bt Zulkarnain Sim	Tengku Ampuan Rahimah Hospital
	Rafidah Abdullah	Selayang Hospital
	Shahnaz Shah Firdaus Khan	Tengku Ampuan Rahimah Hospital
12 PERITONEAL DIALYSIS PRACTICES	Sunita Bavanandan	Kuala Lumpur Hospital
	Anita Bhajan Manocha	Hospital Seberang Jaya
	Lily Mushahar	Tuanku Ja'afar Hospital
13 RENAL TRANSPLANTATION	Goh Bak Leong	Serdang Hospital
	Fan Kin Sing	Gleneagles Intan Medical Centre
	Rohan Malek Bin Dato' Dr. Johan	Selayang Hospital
	Rosnawati Yahya	Kuala Lumpur Hospital
	S. Prasad Menon	Sime Darby Medical Centre Subang Jaya
	Tan Si Yen	Prince Court Medical Centre
Wong Hin Seng	Selayang Hospital	

FOREWORD

The time has come again for the much awaited latest report on dialysis and renal transplant program in Malaysia. What has now become a routine annual publication since 1993 has resulted in an assumed process that many among us has taken for granted until significant changes had taken place by circumstances and need.

In June 2010 , the pioneer and founder of the National Renal Registry (NRR), Dato' Dr. Zaki Morad Mohd Zaher had relinquished his post and ended his sterling service as the Chairman of the National Renal Registry , Malaysia and passed the baton to yours sincerely as approved by the Council of the Malaysian Society of Nephrology, the main sponsor of NRR. In addition , the pioneer Chief Editor and the main driver of NRR from its inception, Dr. Lim Teck Onn had also decided to let NRR move on with newer and younger blood to take over.

To ensure continuity and further developments, NRR need to prepare `second liners' and recruit new professionals to shadow and eventually take over the management from existing ones. For this purpose, we have now included two highly capable and committed nephrologists to assist the Editor, Dr. Lim Yam Ngo in her work. Dr. Goh Bak Leong and Dr. Ong Loke Meng will now serve as deputy editors to ensure the continued success of NRR. I wish to place on record here the gratitude and indebtedness of the nephrology community in this country to both Dato' Dr. Zaki Morad and Dr. Lim Teck Onn for their immense and untiring contributions to NRR making it one of the most successful clinical registry in this country. The success of NRR has even obtained recognition from the Health Ministry, Brunei Darussalam which had signed a memorandum of understanding in February this year for NRR to assist the country to establish the Brunei Dialysis and Transplant Registry.

As we move forward , there remains several issues which need serious thoughts and input from various stakeholders and clients of this registry.

1. With as much voluntarism and charitable efforts contributed by many including the MSN Council, The NRR Advisory Committee, The Expert Committee members etc , NRR will not and cannot function or survive without adequate and assured funding to manage its administrative and publication needs. Some members of the healthcare industry had valued the importance of the works and reports of NRR thereby contributed significantly to assure the financial requirements of NRR are met with and adequately supported. While this formula had worked in many years of NRR's existence, it may not serve the NRR needs perpetually. The stakeholders and clients of NRR need to join hands to support this need for many years to come to ensure NRR viability .
2. Since 2006 , the submission of annual return and the need to notify NRR of any significant outcomes affecting CAPD , HD and renal transplant patients had become a part of the legislation under the Private Healthcare Facilities and Services Act which had been enforced since 2008. Notwithstanding this fact , it is regretted that some operators of the haemodialysis service in private and NGO HD units did not comply and failed to submit data accordingly. While this is seen and can be interpreted as transgressing the current act , no action has been taken so far by the regulatory authority to ensure full compliance of this need. The time has now come to tie the funding mechanism of dialysis treatment with the submission of the necessary data to NRR to ensure compliance.
3. While the number of the HD units continue to rise exponentially in the country it has now come to a point when our emphasis should be focused on fulfilling the quality dialysis needs rather than continuously pursue the quantity agenda as we now have haemodialysis units in almost all the breadth and length of the country. The quality elements should be carefully thought of in the future collection of dataset and analysis to inform the professionals , the public , the healthcare industry, the healthcare authority and the fund providers regarding the quality of the output and outcome delivered to patients on long term dialysis.
4. Additionally , there are obvious needs for serious efforts and program to promote and expand peritoneal dialysis option and renal transplant program as both suffer poor progress compared to haemodialysis. . The need to have an effective national program to prevent and detect early the occurrence of chronic kidney diseases cannot be overemphasized.

On behalf of the NRR Advisory Committee members , I wish to record a sincere appreciation to all the data contributors without which we have no data to report , The Chairman and the Council Members of the Malaysian Society of Nephrology for the continued support of NRR needs , the expert committee members for diligently studying the analysed datasets and coming out with the timely expert reports on voluntary basis, the fund sponsors particularly Roche, AIN Medicare, Baxter Healthcare and Fresenius Medical Care, The Ministry of Health and last but not least the untiring and highly dedicated NRR Managers led by Mdm Lee Day Guat.

Datuk Dr. Ghazali Ahmad
Chairman
National Renal Registry

CONTENTS

Acknowledgement	iii	
NRR Advisory Board Members	iv	
About The Malaysian Dialysis and Transplant Registry (MDTR)	v	
Participating Haemodialysis Centres	vii	
Participating Chronic Peritoneal Dialysis Centres	xii	
Participating Transplant Follow-up Centres	xii	
Contributing Editors	xiv	
Foreword	xv	
Contents	xvi	
List of Tables	xviii	
List of Figures	xxiii	
Report Summary	xxviii	
Abbreviations	xxxi	
CHAPTER 1	ALL RENAL REPLACEMENT THERAPY IN MALAYSIA	1
Section 1.1	Stock and flow	2
Section 1.2	Treatment provision rate	3
CHAPTER 2	DIALYSIS IN MALAYSIA	5
Section 2.1	Provision of dialysis in Malaysia (registry report)	6
2.1.1	Dialysis treatment provision	6
2.1.2	Geographic distribution	6
Section 2.2	Dialysis provision in Malaysia (Centre survey report)	7
2.2.1	Growth in dialysis in Malaysia by state and sector	7
2.2.2	Manpower in dialysis centres	25
Section 2.3	Distribution of dialysis Treatment	28
2.3.1	Gender distribution	28
2.3.2	Age distribution	29
2.3.3	Method and location of dialysis	31
2.3.4	Funding for dialysis treatment	32
2.3.5	Distribution of dialysis patients by sector	33
Section 2.4	Primary renal disease	34
CHAPTER 3	DEATH AND SURVIVAL ON DIALYSIS	35
Section 3.1	Death on dialysis	36
Section 3.2	Patient survival on dialysis	37
3.2.1	Patient survival by type of dialysis modality	37
3.2.2	Patient survival by year of starting dialysis	38
3.2.3	Patient survival by age at starting dialysis	40
3.2.4.	Patient survival by diabetic status	41
Section 3.3	Survival of incident dialysis patients by centre	42
3.3.1	Survival of incident haemodialysis patients 2001-2010 by centre	42
3.3.2	Survival of incident PD patients by centre	43
Section 3.4	Adjusted mortality of dialysis patient	44
3.4.1	Adjusted hazard ratio for mortality of dialysis patients	44
3.4.2	Adjusted hazard ratio for mortality of haemodialysis patients	47
3.4.3	Adjusted hazard ratio for mortality of peritoneal dialysis patients	49
3.4.4	Risk adjusted mortality rate for haemodialysis patients by haemodialysis centres	51
CHAPTER 4	QUALITY OF LIFE AND REHABILITATION OUTCOMES OF DIALYSIS PATIENTS IN MALAYSIA	53
Section A	QoL Index score	54
Section B	Work related rehabilitation	57

CHAPTER 5	PAEDIATRIC RENAL REPLACEMENT THERAPY	59
Section A	RRT provision for paediatric patients	60
Section B	Distribution of paediatric dialysis patients	61
Section C	Primary renal disease	63
Section D	Types of renal transplantation	63
Section E	Survival analysis	64
CHAPTER 6	MANAGEMENT OF ANAEMIA IN DIALYSIS PATIENTS	67
Section 6.1	Treatment for anaemia in patient on Dialysis	67
Section 6.2	Iron status on dialysis	71
Section 6.3	Haemoglobin outcomes on dialysis	78
CHAPTER 7	NUTRITIONAL STATUS ON DIALYSIS	83
Section 7.1	Serum albumin levels on dialysis	84
Section 7.2	Body Mass Index (BMI) on dialysis	86
CHAPTER 8	BLOOD PRESSURE CONTROL AND DYSLIPIDAEMIA	89
Section 8.1	Blood Pressure Control on dialysis	90
Section 8.2	Dyslipidaemia in dialysis patients	96
CHAPTER 9	CHRONIC KIDNEY DISEASE - MINERAL BONE DISORDERS	103
Section 9.1	Treatment of renal bone disease	104
Section 9.2	Serum calcium and phosphate control	105
Section 9.3	Serum parathyroid hormone control	114
CHAPTER 10	HEPATITIS ON DIALYSIS	121
Section A	Prevalence	122
Section B	Centre variation	122
Section C	Seroconversion risks	124
CHAPTER 11	HAEMODIALYSIS PRACTICES	127
Section 11.1	Vascular access and its complications	128
Section 11.2	HD prescription	130
Section 11.3	Technique survival on dialysis	141
CHAPTER 12	PERITONEAL DIALYSIS PRACTICES	145
Section 12.1	PD practices	146
12.1.1	Modalities and prescription of PD	146
Section 12.2	Achievement of solute clearance and peritoneal transport	148
Section 12.3	Technique survival on PD	150
Section 12.4	PD Peritonitis	157
CHAPTER 13	RENAL TRANSPLANTATION	161
Section 13.1	Stock and flow	162
Section 13.2	Recipients' characteristics	164
Section 13.3	Transplant practices	165
Section 13.4	Transplant outcomes	168
13.4.1	Post transplant complications	168
13.4.2	Deaths and graft loss	168
Section 13.5	Patient and graft survival	170
Section 13.6	Cardiovascular risk in renal transplant recipients	177
13.6.1	Risk factors for ischaemic heart disease	177
13.6.2	Blood pressure classification according to JNC VI criteria, 2006-2010	179
13.6.3	Level of allograft function	180
13.6.4	Body mass Index	181
13.6.5	Lipid profile	182
13.6.7	Blood pressure control	183
Section 13.7:	QoL index score in renal transplant recipients	
APPENDIX I	DATA MANAGEMENT	
APPENDIX II	ANALYSIS SETS, STATISTICAL METHODS AND DEFINITIONS	

LIST OF TABLES

Table 1.1	Stock and Flow of RRT, Malaysia 2001-2010	2
Table 1.2	New Dialysis Acceptance rate and New Transplant Rate per million population 2001-2010	3
Table 1.3	RRT Prevalence Rate per million population 2001-2010	3
Table 2.1.1	Stock and flow-Dialysis Patients 2001-2010	6
Table 2.1.2	Dialysis Treatment Rate per million populations 2001-2010	6
Table 2.1.3	Dialysis Treatment Rate by state, per million populations 2001-2010	6
Table 2.2.1	Number and density of Dialysis Centres in Malaysia by State and Sector, 2001-2010	7
Table 2.2.2	Number and density of HD centres in Malaysia by State and Sector, 2001-2010	10
Table 2.2.3	Number and density of PD centres in Malaysia by State and Sector, 2001-2010	11
Table 2.2.4	Number and density of HD machines in Malaysia by State and Sector, 2001-2010	13
Table 2.2.5	Number and Prevalence Rate of Dialysis Patients (HD&PD) in Malaysia by State and Sector, 2001-2010	16
Table 2.2.6	Number and Prevalence Rate of Hemodialysis Patients in Malaysia by State and Sector, 2001-2010	19
Table 2.2.7	Number and Prevalence Rate of PD Patients in Malaysia by State and Sector, 2001-2010	20
Table 2.2.8	HD Capacity to Patient Ratio among HD Centres in Malaysia by State and Sector, 2001-2010	22
Table 2.2.9	Number & density of Registered Dialysis Nurses/ Medical technicians in Malaysia by State and Sector, 2001-2010	25
Table 2.3.1(a)	Dialysis Treatment Rate by Gender, per million male or female population 2001-2010	28
Table 2.3.1(b)	Gender Distribution of Dialysis Patients 2001-2010	28
Table 2.3.2(a)	Dialysis Treatment Rate by Age Group, per million age group population 2001-2010	29
Table 2.3.2	Percentage Age Distribution of Dialysis Patients 2001-2010	30
Table 2.3.3	Method and Location of Dialysis Patients 2001-2010	31
Table 2.3.4	Funding for Dialysis Treatment 2001-2010	32
Table 2.3.5	Distribution of Dialysis Patients by Sector 2001-2010	33
Table 2.4.1	Primary Renal Diseases 2001-2010	34
Table 3.1.1	Deaths on Dialysis 2001-2010	36
Table 3.1.2	Causes of Death on Dialysis 2001-2010	36
Table 3.2.1(a)	Patient survival by dialysis modality analysis (censored for change of modality)	37
Table 3.2.1(b)	Patient survival by dialysis modality analysis (not censored for change of modality)	38
Table 3.2.2	Unadjusted patient survival by year of entry, 2001-2010	38
Table 3.2.3	Unadjusted patient survival by age, 2001-2010	40
Table 3.2.4	Unadjusted patient survival by Diabetes status, 2001-2010	41
Table 3.4.1	Adjusted hazard ratio for mortality of dialysis patients uncensored for change of modality (2001-2010)	44
Table 3.4.2	Adjusted hazard ratio for mortality of HD patients uncensored for change of modality (2001-2010 cohort)	47
Table 3.4.3	Adjusted hazard ratio for mortality of PD patients uncensored for change of modality (2001-2010 cohort)	49
Table 4.1	Cumulative distribution of QoL-Index score in relation to dialysis modality, All dialysis patients 2001-2010	54
Table 4.2	Cumulative distribution of QoL-Index score in relation to DM, All dialysis patients 2001-2010	54
Table 4.3	Cumulative distribution of QoL-index score in relation to Gender, All Dialysis patients 2001-2010	55
Table 4.4	Cumulative distribution of QoL-index score in relation to Age, All Dialysis patients 2001-2010	55
Table 4.5	Cumulative distribution of QoL-Index score in relation to year of entry, HD patients 2001-2010	56
Table 4.6	Cumulative distribution of QoL-Index score in relation to year of entry, PD patients 2001-2010	56
Table 4.7	Work related rehabilitation in relation to modality, dialysis patients, 2001-2010	57
Table 4.8	Work related rehabilitation in relation to year of entry, HD patients 2001-2010	57
Table 4.9	Work related rehabilitation in relation to year of entry, PD patients 2001-2010	57
Table 5.1	Stock and Flow of Paediatric Renal Replacement Therapy 2001-2010	60
Table 5.2	Paediatric Dialysis and Transplant Rates per million age-group population 2001-2010	60
Table 5.3(a)	Dialysis Treatment Rate by State, per million state age group populations; 2001-2010	61
Table 5.3(b)	New Dialysis Patients by State, 2001-2010	61
Table 5.4	Number of New Dialysis and Transplant Patients by Gender 2001-2010	61
Table 5.5	New RRT Rate, Per Million Age Related Population by Age Group 2001-2010	62
Table 5.6	New Dialysis by treatment modality 2001-2010	62
Table 5.7	New Dialysis by sector 2001-2010	63
Table 5.8	Primary renal disease by sex, 2001-2010	63
Table 5.9	Types of Renal Transplantation, 2001-2010	63
Table 5.10(a)	Patient survival by dialysis modality analysis (not censored with change of modality)	64

LIST OF TABLES (CONT'D)

Table 5.10(b)	Patient survival by dialysis modality analysis (censored with change of modality)	64
Table 5.11	Dialysis Technique Survival by Modality, 2001-2010	64
Table 5.12	Transplant Graft Survival, 2001-2010	65
Table 6.1.1	Treatment for Anaemia, HD patients 2001-2010	68
Table 6.1.2	Treatment for Anaemia, PD patients 2001-2010	68
Table 6.1.3	Variation in Erythropoietin utilization (% patients) among HD centres, 2001-2010	68
Table 6.1.4	Variation in Erythropoietin utilization (% patients) among PD centres, 2001-2010	69
Table 6.1.5	Variation in median weekly Erythropoietin dose (u/week) among HD centres, 2001-2010	69
Table 6.1.6	Variation in median weekly Erythropoietin dose (u/week) among PD centres, 2001-2010	69
Table 6.1.7	Variation in use of blood transfusion (% patients) among HD centres, 2001-2010	70
Table 6.1.8	Variation in use of blood transfusion (% patients) among PD centres, 2001-2010	70
Table 6.2.1	Distribution of Serum Ferritin without Erythropoietin, HD patients 2001-2010	71
Table 6.2.2	Distribution of Serum Ferritin without Erythropoietin, PD patients 2001-2010	71
Table 6.2.3	Distribution of Serum Ferritin on Erythropoietin, HD patients 2001-2010	72
Table 6.2.4	Distribution of Serum Ferritin on Erythropoietin, PD patients 2001-2010	72
Table 6.2.5	Distribution of transferrin saturation without Erythropoietin, HD patients, 2001-2010	72
Table 6.2.6	Distribution of transferrin saturation without Erythropoietin, PD patients, 2001-2010	73
Table 6.2.7	Distribution of Transferrin saturation on Erythropoietin, HD patients, 2001-2010	73
Table 6.2.8	Distribution of Transferrin saturation on Erythropoietin, PD patients, 2001-2010	73
Table 6.2.9	Variation in iron status outcomes among HD centres,2001-2010	74
Table 6.2.9(a)	Medium serum ferritin among patients on erythropoietin	74
Table 6.2.9(b)	Proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, HD centres	74
Table 6.2.9(c)	Median transferrin saturation among patients on erythropoietin, HD centres	75
Table 6.2.9(d)	Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, HD centres	75
Table 6.2.10	Variation in iron status outcomes among PD centres, 2001-2010	76
Table 6.2.10(a)	Medium serum ferritin among patients on erythropoietin	76
Table 6.2.10(b)	Proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, PD centres	76
Table 6.2.10(c)	Median transferrin saturation among patients on erythropoietin, PD centres	76
Table 6.2.10(d)	Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, PD centres	77
Table 6.3.1	Distribution of Haemoglobin Concentration without Erythropoietin, HD patients 2001-2010	78
Table 6.3.2	Distribution of Haemoglobin Concentration without Erythropoietin, PD patients 2001-2010	78
Table 6.3.3	Distribution of Haemoglobin Concentration on Erythropoietin, HD patients 2001-2010	79
Table 6.3.4	Distribution of Haemoglobin Concentration on Erythropoietin, PD patients 2001-2010	79
Table 6.3.5	Variation in Haemoglobin outcomes among HD centres 2001-2010	80
Table 6.3.5(a)	Median haemoglobin level among patients on Erythropoietin	80
Table 6.3.5(b)	Proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, HD centres	80
Table 6.3.5(c)	Proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, HD centres	81
Table 6.3.6	Variation in Haemoglobin outcomes among PD centres 2001-2010	81
Table 6.3.6(a)	Median haemoglobin level among patients on Erythropoietin	81
Table 6.3.6(b)	Proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, PD centres	82
Table 6.3.6(c)	Proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, PD centres	82
Table 7.1.1	Distribution of serum albumin, HD patients, 2001-2010	84
Table 7.1.2	Distribution of serum albumin, PD patients, 2001-2010	84
Table 7.1.3	Variation in Proportion of patients with serum albumin ≥ 40 g/L among HD centres 2001-2010	85
Table 7.1.4	Variation in Proportion of patients with serum albumin ≥ 40 g/L among PD centres 2001-2010	85
Table 7.2.1	Distribution of BMI, HD patients, 2001-2010	86
Table 7.2.2	Distribution of BMI, PD patients 2001-2010	86
Table 7.2.3	Variation in Proportion of patients with BMI ≥ 18.5 among HD centres 2001-2010	87
Table 7.2.4	Variation in Proportion of patients with BMI ≥ 18.5 among PD centres 2001-2010	87
Table 7.2.5	Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among HD centres 2001-2010	88
Table 7.2.6	Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among PD centres 2001-2010	88
Table 8.1.1	Distribution of Pre dialysis Systolic Blood Pressure, HD patients 2001-2010	90
Table 8.1.2	Distribution of Pre dialysis Systolic Blood Pressure, PD patients 2001-2010	90
Table 8.1.3	Distribution of Pre dialysis Diastolic Blood Pressure, HD patients 2001-2010	91

LIST OF TABLES (CONT'D)

Table 8.1.4	Distribution of Pre dialysis Diastolic Blood Pressure, PD patients 2001-2010	91
Table 8.1.5	Variation in BP control among HD centres 2001-2010	92
Table 8.1.5(a)	Median systolic blood pressure among HD patients, HD centres	92
Table 8.1.5(b)	Median Diastolic blood pressure among HD patients, HD centres	92
Table 8.1.5(c)	Proportion of HD patients with pre dialysis blood pressure < 140/90 mmHg, HD centres	93
Table 8.1.6	Variation in BP control among PD centres 2001-2010	94
Table 8.1.6(a)	Median systolic blood pressure among PD patients	94
Table 8.1.6(b)	Median Diastolic blood pressure among PD patients, PD centres	94
Table 8.1.6(c)	Proportion of PD patients with pre dialysis blood pressure < 140/90 mmHg, PD centres	95
Table 8.2.1	Distribution of serum Cholesterol, HD patients 2001-2010	96
Table 8.2.2	Distribution of serum Cholesterol, PD patients 2001-2010	96
Table 8.2.3	Distribution of serum Triglyceride, HD patients 2001-2010	97
Table 8.2.4	Distribution of serum Triglyceride, PD patients 2001-2010	97
Table 8.2.5	Variation in Dyslipidaemia among HD centres 2001-2010	98
Table 8.2.5(a)	Median serum cholesterol level among HD patients	98
Table 8.2.5(b)	Proportion of HD patients with serum cholesterol < 5.3 mmol/L	98
Table 8.2.5(c)	Median serum triglyceride level among HD patients	99
Table 8.2.5(d)	Proportion of HD patients with serum triglyceride < 2.1mmol/L	99
Table 8.2.6	Variation in Dyslipidaemia among PD centres 2001-2010	100
Table 8.2.6(a)	Median serum cholesterol level among PD patients	100
Table 8.2.6(b)	Proportion of PD patients with serum cholesterol < 5.3 mmol/L	100
Table 8.2.6(c)	Median serum triglyceride level among PD patients	101
Table 8.2.6(d)	Proportion of PD patients with serum triglyceride < 2.1mmol/L	101
Table 9.1.1	Treatment for renal bone disease, HD patients, 2001-2010	104
Table 9.1.2	Treatment for renal bone disease, PD patients, 2001-2010	104
Table 9.2.1	Distribution of corrected serum calcium, HD patients, 2001-2010	105
Table 9.2.2	Distribution of corrected serum calcium, PD patients, 2001-2010	105
Table 9.2.3	Distribution of serum phosphate, HD patients, 2001-2010	106
Table 9.2.4	Distribution of serum phosphate, PD patients, 2001-2010	106
Table 9.2.5	Distribution of corrected calcium x phosphate product, HD patients 2001-2010	107
Table 9.2.6	Distribution of corrected calcium x phosphate product, PD patients 2001-2010	107
Table 9.2.7	Variation in corrected serum calcium level among HD centres, 2010	108
Table 9.2.7(a)	Median serum calcium level among HD patients	108
Table 9.2.7(b)	Proportion of patients with serum calcium 2.1 to 2.37 mmol/L, HD centres, 2010	109
Table 9.2.8	Variation in corrected serum calcium level among PD centres, 2010	108
Table 9.2.8(a)	median serum calcium level among PD patients	108
Table 9.2.8(b)	Proportion of patients with serum calcium 2.1 to 2.37 mmol/L, PD centres	109
Table 9.2.9	Variation in serum phosphate level among HD centres, 2010	110
Table 9.2.9(a)	Median serum phosphate level among HD patients	110
Table 9.2.9(b)	Proportion of patients with serum phosphate 1.13-1.78 mmol/L, HD centres, 2010	110
Table 9.2.10	Variation in serum phosphate levels among PD centres, 2001-2010	111
Table 9.2.10(a)	Median serum phosphate level among PD patients	111
Table 9.2.10(b)	Proportion of patients with serum phosphate 1.13-1.78 mmol/L, PD centres 2010	111
Table 9.2.11	Variation in corrected calcium x phosphate product HD centres, 2001-2010	112
Table 9.2.11(a)	median corrected calcium x phosphate product among HD patients	112
Table 9.2.11(b)	Proportion of patients with corrected calcium x phosphate < 4.5 mmol ² /L ² , HD centres	113
Table 9.2.12	Variation in corrected calcium x phosphate product among PD centres, 2001-2010	112
Table 9.2.12(a)	median corrected calcium x phosphate product among PD patients	112
Table 9.2.12(b)	Proportion of patients with corrected calcium x phosphate < 4.5 mmol ² /L ² , PD	113
Table 9.3.1(a)	Distribution of iPTH, HD patients, 2001-2010	114
Table 9.3.1(b)	Distribution of iPTH, diabetic HD patients, 2001-2010	114
Table 9.3.1(c)	Distribution of iPTH, non diabetic HD patients, 2001-2010	115
Table 9.3.2(a)	Distribution of iPTH, PD patients, 2001-2010	115
Table 9.3.2(b)	Distribution of iPTH, diabetic PD patients, 2001-2010	116

LIST OF TABLES (CONT'D)

Table 9.3.2(c)	Distribution of iPTH, non diabetic PD patients, 2001-2010	116
Table 9.3.3(a)	Variation in iPTH among HD centres 2001-2010	117
Table 9.3.3(b)	Variation in proportion of patients with iPTH 150-300ng/ml, HD centres, 2001-2010	117
Table 9.3.4	Variation in iPTH among PD centres, 2001-2010	118
Table 9.3.4(a)	Median iPTH among PD patients	118
Table 9.3.4(b)	Proportion of patients with iPTH 150-300ng/ml	118
Table 10.1	Prevalence of positive HBsAg and positive Anti-HCV at annual survey, HD patients 2001-2010	122
Table 10.2	Prevalence of positive HBsAg and positive Anti-HCV at annual survey, PD patients 2001-2010	122
Table 10.3	Variation in Proportion of patients with positive HBsAg at annual survey among HD centres, 2001-2010	122
Table 10.4	Variation in Proportion of patients with positive HBsAg at annual survey among PD centres, 2001-2010	123
Table 10.5	Variation in Proportion of patients with positive anti-HCV at annual survey among HD centres, 2001-2010	123
Table 10.6	Variation in Proportion of patients with positive anti-HCV at annual survey among PD centres, 2001-2010	123
Table 10.7(a)	Cumulative risk of sero-conversion to HBsAg positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 2001-2010	124
Table 10.7(b)	Cumulative risk of sero-conversion to anti HCV antibody positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 2001-2010	124
Table 10.8(a)	Risk factors in relation to HD practices for seroconversion to anti-HCV positive among sero-negative patients 2001-2010	125
Table 10.8(b)	Risk factors for seroconversion to anti-HCV positive among sero-negative patients in PD 2001-2010	126
Table 11.1.1	Vascular Access on Haemodialysis, 2001-2010	128
Table 11.1.2	Difficulties report with Vascular Access, 2001-2010	128
Table 11.1.3	Complications reported with Vascular Access, 2001-2010	129
Table 11.2.1	Blood Flow Rates in HD centers, 2001-2010	130
Table 11.2.2	Number of HD Sessions per week, 2001-2010	131
Table 11.2.3	Duration of HD, 2001-2010	131
Table 11.2.4	Dialyser membrane types in HD centres, 2001-2010	132
Table 11.2.5	Dialyser Re-use Frequency in HD centres, 2001-2010	133
Table 11.2.6(a)	Distribution of prescribed Kt/V, HD patients 2001-2010	134
Table 11.2.6(b)	Distribution of delivered Kt/V, HD patients 2006-2010	134
Table 11.2.6(c)	Distribution of URR, HD patients 2006-2010	135
Table 11.2.7	Variation HD prescription among HD centres, 2001-2010	136
Table 11.2.7(a)	Median blood flow rates in HD patients, HD centres	136
Table 11.2.7(b)	Proportion of patients with blood flow rates > 300 ml/min, HD centres 2001-2010	136
Table 11.2.7(c)	Proportion of patients with 3 HD sessions per week, HD centres 2001-2010	137
Table 11.2.7(d)	Median prescribed Kt/V in HD patients, HD centres 2001-2010	137
Table 11.2.7(e)	Proportion of patients with prescribed Kt/V ≥ 1.3 , 2001-2010	138
Table 11.2.7(f)	Median delivered Kt/V in HD patients, HD centres 2006-2010	138
Table 11.2.7(g)	Proportion of patients with delivered Kt/V ≥ 1.2 , HD centres 2006-2010	139
Table 11.2.7(h)	Median URR among HD patients, HD centres 2006-2010	140
Table 11.2.7(i)	Proportion of HD patients with URR $\geq 65\%$, HD centres 2006-2010	140
Table 11.3.1	Unadjusted technique survival by Dialysis modality, 2001-2010	141
Table 11.3.2	Unadjusted technique survival by year of entry, 2001-2010	142
Table 11.3.3	Unadjusted technique survival by age, 2001-2010	143
Table 11.3.4	Unadjusted technique survival by Diabetes status, 2001-2010	144
Table 12.1.1	Chronic Peritoneal Dialysis Regimes, 2001-2010	146
Table 12.1.2	CAPD Connectology, 2001-2010	146
Table 12.1.3	PD Number of Exchanges per day, 2001-2010	147
Table 12.1.4	PD Volume per Exchange, 2001-2010	147
Table 12.2.1	Distribution of delivered Kt/V, PD patients 2003-2010	148
Table 12.2.2	Variation in proportion of patients with Kt/V ≥ 1.7 per week among PD centres, 2003-2010	149
Table 12.2.3	Peritoneal transport status by PET D/P creatinine at 4 hours, new PD patients 2003-2010	149
Table 12.2.4	Peritoneal transport status by PET D/P creatinine at 4 hours, prevalent PD patients 2003-2010	149
Table 12.2.5	Association among PET and comorbidity, 2003-2010	149
Table 12.3.1	Unadjusted technique survival by Dialysis modality, 2001-2010	150
Table 12.3.2	Unadjusted technique survival by era 2001-2005 and 2006-2010	151
Table 12.3.3	Unadjusted technique survival by age, 2001-2010	152

LIST OF TABLES (CONT'D)

Table 12.3.4	Unadjusted technique survival by Gender, 2001-2010	153
Table 12.3.5	Unadjusted technique survival by Diabetes status, 2001-2010	153
Table 12.3.6	Unadjusted technique survival by Kt/V, 2001-2010	154
Table 12.3.7	Adjusted hazard ratio for change of modality, 2001-2010	154
Table 12.3.8	Reasons for change of dialysis modality to HD, 2001-2010	156
Table 12.4.1	Variation in peritonitis rate (pt-month/epi) among PD centres, 2001-2010	157
Table 12.4.2	Causative organism in PD peritonitis, 2001-2010	158
Table 12.4.3(a)	Outcome of peritonitis by Causative organism, 2001-2005	158
Table 12.4.3(b)	Outcome of peritonitis by Causative organism, 2006-2010	159
Table 12.4.4	Risk factor influencing peritonitis rate, 2001-2010	159
Table 13.1.1	Stock and Flow of Renal Transplantation, 2001-2010	162
Table 13.1.2	New transplant rate per million population (pmp), 2001-2010	162
Table 13.1.3	Transplant prevalence rate per million population (pmp), 2001-2010	163
Table 13.1.4	Place of transplantation, 2001-2010	163
Table 13.2.1	Renal Transplant Recipients' Characteristics, 2001-2010	164
Table 13.2.2	Primary causes of end stage renal failure, 2001-2010	164
Table 13.3.1	Type of Renal Transplantation, 2001-2010	165
Table 13.3.2	Biochemical data, 2006-2010	165
Table 13.3.3	Medication data, 2006-2010	167
Table 13.4.1	Post-transplant complications, 2006-2010	168
Table 13.4.2	Transplant Patients Death Rate and Graft Loss, 2001-2010	168
Table 13.4.3	Causes of Death in Transplant Recipients, 2001-2010	169
Table 13.4.4	Causes of Graft Failure, 2001-2010	170
Table 13.5.1(a)	Patient survival, 2001-2010	170
Table 13.5.1(b)	Risk factors for transplant patient survival 2001-2010	171
Table 13.5.2(a)	Graft survival, 2001-2010	172
Table 13.5.2(b)	Risk factors for transplant graft survival 2001-2010	172
Table 13.5.3	Unadjusted Patient survival by type of transplant, 2001-2010	173
Table 13.5.4	Graft survival by type of transplant, 2001-2010	174
Table 13.5.5	Patient survival by year of transplant (Living related transplant, 2001-2010)	174
Table 13.5.6	Graft survival by year of transplant (Living related transplant, 2001-2010)	175
Table 13.5.7	Patient survival by year of transplant (Commercial cadaver transplant, 2001-2010)	175
Table 13.5.8	Graft survival by year of transplant (Commercial cadaver transplant, 2001-2010)	176
Table 13.6.1	Risk factors for IHD in renal transplant recipients at year 2006-2010	177
Table 13.6.2(a)	Systolic BP, 2006-2010	179
Table 13.6.2(b)	Diastolic BP, 2006-2010	179
Table 13.6.3	CKD stages, 2006-2010	180
Table 13.6.4	BMI, 2006-2010	180
Table 13.6.5(a)	LDL, 2006-2010	181
Table 13.6.5(b)	Total Cholesterol, 2006-2010	181
Table 13.6.5(c)	HDL, 2006-2010	182
Table 13.6.6(a)	Treatment for hypertension, 2006-2010	182
Table 13.6.6(b)	Distribution of Systolic BP without anti-hypertensives, 2006-2010	182
Table 13.6.6(c)	Distribution of Diastolic BP without anti-hypertensives, 2006-2010	182
Table 13.6.6(d)	Distribution of Systolic BP on anti-hypertensives, 2006-2010	183
Table 13.6.6(e)	Distribution of Diastolic BP on anti-hypertensives, 2006-2010	183
Table 13.7.1	Cumulative distribution of QoL-Index score in relation to Dialysis Modality, Transplant recipient patients 2001-2010	183
Table 13.7.2	Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipient patients 2001-2010	184
Table 13.7.3	Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipient patients 2001-2010	184
Table 13.7.4	Cumulative distribution of QoL-Index score in relation to Age, Transplant recipient patients 2001-2010	185
Table 13.7.5	Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipient patients 2001-2010	185

LIST OF FIGURES

Figure 1.1	Stock and Flow of RRT, Malaysia 2001-2010	2
Figure 1.1(a)	New Dialysis and Transplant patients	2
Figure 1.1(b)	Patients Dialysing and with Functioning Transplant at 31st December 2001-2010	2
Figure 1.2	New Dialysis Acceptance and New Transplant Rate 2001-2010	3
Figure 1.3	Dialysis and Transplant Prevalence Rate per million population 2001-2010	3
Figure 2.2.1(a)	Number of Dialysis Centre in Malaysia by Sector, 2001- 2010	9
Figure 2.2.1(b)	Number of Dialysis Centre in Malaysia by State and Sector, 2010	9
Figure 2.2.4(a)	Number of HD machines in Malaysia by Sector, 2001-2010	15
Figure 2.2.4(b)	Number of HD machines in Malaysia by State and Sector, 2010	15
Figure 2.2.5(a)	Number of Dialysis Patients (HD&PD) in Malaysia by Sector, 2001-2010	18
Figure 2.2.5(b)	Number of Dialysis Patients (HD&PD) in Malaysia by State and Sector, 2010	18
Figure 2.2.8(a)	HD Capacity to Patient Ratio among HD Centres in Malaysia, 2001-2010	24
Figure 2.2.8(b)	HD Capacity to Patient Ratio among HD Centres in Malaysia by State and sector, 2010	24
Figure 2.2.9(a)	Number of Registered Dialysis Nurses/ Medical technicians in Malaysia by Sector, 2001-2010	27
Figure 2.2.9(b)	Number of Registered Dialysis Nurses/ Medical technicians in Malaysia by State and Sector, 2010	27
Figure 2.3.1(a)	Dialysis Treatment Rate by Gender 2001-2010	28
Figure 2.3.1(b)	Gender Distribution of Dialysis Patients 2001-2010	28
Figure 2.3.2(a)	Dialysis Treatment Rate by Age Group 2001-2010	29
Figure 2.3.2(b)	Age Distribution of New Dialysis Patients 2001-2010	30
Figure 2.3.3	Method and Location of Dialysis Patients 2001-2010	31
Figure 2.3.4	Funding for Dialysis Treatment 2001-2010	32
Figure 2.3.5	Distribution of Dialysis Patients by Sector 2001-2010	33
Figure 2.4.1	Primary Renal Diseases for New Dialysis Patients 2001-2010	34
Figure 3.1.1	Death Rates on Dialysis 2001-2010	36
Figure 3.2.1(a)	Patient survival by dialysis modality analysis (censored for change of modality)	37
Figure 3.2.1(b)	Patient survival by dialysis modality analysis (not censored for change of modality)	38
Figure 3.2.2	Unadjusted patient survival by year of entry, 2001-2010	39
Figure 3.2.3	Unadjusted patient survival by age, 2001-2010	40
Figure 3.2.4	Unadjusted patient survival by Diabetes status, 2001-2010	41
Figure 3.3.1(a)	Variation in patient survival at 1 year among HD centres adjusted for age and diabetes, 2001-2009	42
Figure 3.3.1(b)	Funnel plot for patient survival at 1 year among HD centres adjusted age and diabetes, 2001-2009 cohort	42
Figure 3.3.1(c)	Variation in patient survival at 5-years among HD centres adjusted for age and diabetes, 2001-2005	42
Figure 3.3.1(d)	Funnel plot for patient survival at 5 years among PD centres adjusted for age and diabetes, 2001-2005 cohort	42
Figure 3.3.2(a)	Variation in patient survival at 1 year among PD centres adjusted for age and diabetes, 2001-2009	43
Figure 3.3.2(b)	Funnel plot of 1-year patient survival from the 90th day of dialysis adjusted for age and diabetes among PD centres, 2001-2009 cohort	43
Figure 3.3.2(c)	Variation in patient survival at 5-years among PD centres adjusted for age and diabetes, 2001-2005	43
Figure 3.3.2(d)	Funnel plot for 5-year patient survival from 90 days of dialysis adjusted for age and diabetes among PD centres, 2001-2005 cohort	43
Figure 3.4.1(a)	Adjusted hazard ratio for mortality of dialysis patients uncensored for change of modality by diastolic blood pressure (2001-2010 cohort)	46
Figure 3.4.1(b)	Adjusted hazard ratio for mortality of dialysis patients uncensored for change of modality by serum phosphate (2001-2010 cohort)	46
Figure 3.4.1(c)	Adjusted hazard ratio for mortality of dialysis patients uncensored for change of modality by hemoglobin (2001-2010 cohort)	46
Figure 3.4.2	Adjusted hazard ratio for mortality of HD patients uncensored for change of modality by Kt/V (2001-2010 cohort)	48
Figure 3.4.3(a)	Unadjusted hazard ratio for mortality of PD patients uncensored for change of modality Kt/V (2001-2010)	50
Figure 3.4.3(b)	Adjusted hazard ratio for mortality of PD patients uncensored for change of modality by Kt/V (2001-2010 cohort)	50
Figure 3.4.4(a)	Variations in RAMR by HD centres, 2009	51
Figure 3.4.4(b)	Funnel plot of RAMR by HD centre, 2009	51
Figure 3.4.5(a)	Variations in RAMR by PD centres, 2009	51
Figure 3.4.5(b)	Funnel plot for RAMR by PD centres, 2009	51
Figure 4.1	Cumulative distribution of QoL-Index score in relation to Dialysis Modality, All Dialysis patients 2001-2010	54
Figure 4.2	Cumulative distribution of QoL-Index score in relation to DM, All Dialysis patients, 2001-2010	54
Figure 4.3	Cumulative distribution of QoL-Index score in relation to Gender, All Dialysis patients, 2001-2010	55
Figure 4.4	Cumulative distribution of QoL-Index score in relation to Age, All Dialysis patients, 2001-2010	55
Figure 4.5	Cumulative distribution of QoL-Index score in relation to year of entry, HD patients 2001-2010	56

LIST OF FIGURES (CONT'D)

Figure 4.6	Cumulative distribution of QoL-Index score in relation to year of entry, PD patients 2001-2010	56
Figure 5.1(a)	Incidence cases of RRT by modality in children under 20 years old, 2001-2010	60
Figure 5.1(b)	Prevalence cases of RRT by modality in children under 20 years old,	60
Figure 5.4	Number of New Dialysis and Transplant Patients by Gender 2001-2010	62
Figure 5.5	New RRT Rate by Age group 2001-2010	62
Figure 5.6	New Dialysis by treatment modality 2001-2010	62
Figure 5.7	New Dialysis by sector 2001-2010	63
Figure 5.10(a)	Patient survival by dialysis modality analysis (not censored with change of modality)	64
Figure 5.11	Dialysis Technique Survival by Modality, 2001-2010	65
Figure 5.12	Transplant Graft Survival, 2001-2010	65
Figure 6.1.3	Variation in Erythropoietin utilization (% patients) among HD centres, 2010	69
Figure 6.1.4	Variation in Erythropoietin utilization (% patients) among PD centres, 2010	69
Figure 6.1.5	Variation in median weekly Erythropoietin dose (μ /week) among HD centres, 2010	69
Figure 6.1.6	Variation in median weekly Erythropoietin dose (μ /week) among PD centres, 2010	70
Figure 6.1.7	Variation in use of blood transfusion (% patients) among HD centres, 2010	70
Figure 6.1.8	Variation in use of blood transfusion (% patients) among PD centres, 2010	70
Figure 6.2.1	Cumulative Distribution of Serum Ferritin without Erythropoietin, HD patients 2001-2010	71
Figure 6.2.2	Distribution of Serum Ferritin without Erythropoietin, PD patients 2001-2010	71
Figure 6.2.3	Cumulative distribution of Serum Ferritin on Erythropoietin, HD patients 2001-2010	72
Figure 6.2.4	Cumulative distribution of Serum Ferritin on Erythropoietin, PD patients 2001-2010	72
Figure 6.2.5	Cumulative distribution of transferrin saturation without Erythropoietin, HD patients 2001-2010	73
Figure 6.2.6	Cumulative distribution of transferrin saturation without Erythropoietin, PD patients 2001-2010	73
Figure 6.2.7	Cumulative distribution of transferrin saturation on Erythropoietin, HD patients 2001-2010	73
Figure 6.2.8	Cumulative distribution of transferrin saturation on Erythropoietin, PD patients 2001-2010	74
Figure 6.2.9(a)	Variation in medium serum ferritin among patients on erythropoietin, HD centres 2010	74
Figure 6.2.9(b)	Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, HD centres 2010	75
Figure 6.2.9(c)	Variation in median transferrin saturation among patients on erythropoietin HD centres, 2010	75
Figure 6.2.9(d)	Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, HD centres, 2010	75
Figure 6.2.10(a)	Variation in medium serum ferritin among patients on erythropoietin, PD centres 2010	76
Figure 6.2.10(b)	Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, PD centres 2010	76
Figure 6.2.10(c)	Variation in median transferrin saturation among patients on erythropoietin, PD centres 2010	77
Figure 6.2.10(d)	Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, PD centres 2010	77
Figure 6.3.1	Cumulative distribution of haemoglobin concentration without Erythropoietin, HD patients 2001-2010	78
Figure 6.3.2	Cumulative distribution of haemoglobin concentration without Erythropoietin, PD patients 2001-2010	78
Figure 6.3.3	Cumulative distribution of Haemoglobin Concentration on Erythropoietin, HD patients 2001-2010	79
Figure 6.3.4	Cumulative distribution of Haemoglobin Concentration on Erythropoietin, PD patients 2001-2010	79
Figure 6.3.5(a)	Variation in median haemoglobin level among patients on Erythropoietin, HD centres 2010	80
Figure 6.3.5(b)	Variation in proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, HD centres 2010	80
Figure 6.3.5(c)	Variation in proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, HD centres 2010	81
Figure 6.3.6(a)	Variation in median haemoglobin level among patients on Erythropoietin, PD centres 2010	81
Figure 6.3.6(b)	Variation in proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, PD centres, 2010	82
Figure 6.3.6(c)	Variation in proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, PD centres 2010	82
Figure 7.1.1	Cumulative distribution of Albumin, HD patients 2001-2010	84
Figure 7.1.2	Cumulative distribution of serum albumin, PD patients 2001-2010	84
Figure 7.1.3	Variation in Proportion of patients with serum albumin ≥ 40 g/L, HD centres 2010	85
Figure 7.1.4	Variation in Proportion of patients with serum albumin ≥ 40 g/L, PD centres 2010	85
Figure 7.2.1	Cumulative distribution of BMI, HD patients 2001-2010	86
Figure 7.2.2	Cumulative distribution of BMI, PD patients 2001-2010	86
Figure 7.2.3	Variation in Proportion of patients with BMI ≥ 18.5 among HD centres 2010	87
Figure 7.2.4	Variation in Proportion of patients with BMI ≥ 18.5 among PD centres 2010	87
Figure 7.2.5	Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among HD centres 2010	88
Figure 7.2.6	Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among PD centres 2010	88
Figure 8.1.1	Cumulative distribution of Pre dialysis Systolic Blood Pressure, HD patients 2001-2010	90
Figure 8.1.2	Distribution of Pre dialysis Systolic Blood Pressure, PD patients 2001-2010	90
Figure 8.1.3	Cumulative Distribution of Pre dialysis Diastolic Blood Pressure, HD patients 2001-2010	91
Figure 8.1.4	Cumulative Distribution of Pre dialysis Diastolic Blood Pressure, PD patients 2001-2010	91

LIST OF FIGURES (CONT'D)

Figure 8.1.5(a)	Variation in median systolic blood pressure among HD patients, HD centres 2010	92
Figure 8.1.5(b)	Variation in median diastolic blood pressure among HD patients, HD centres 2010	92
Figure 8.1.5(c)	Variation in proportion of HD patients with pre dialysis blood pressure < 140/90 mmHg, HD centers 2010	93
Figure 8.1.6(a)	Variation in median systolic blood pressure among PD patients, PD centres 2010	94
Figure 8.1.6(b)	Variation in median diastolic blood pressure among PD patients, PD centres 2010	94
Figure 8.1.6(c)	Variation in proportion of PD patients with pre dialysis blood pressure \leq 140/90 mmHg, PD centres 2010	95
Figure 8.2.1	Cumulative distribution of Cholesterol, HD patients 2001-2010	96
Figure 8.2.2	Cumulative distribution of Cholesterol (mmol/L), PD patients 2001-2010	96
Figure 8.2.3	Cumulative distribution of serum triglyceride, HD patients 2001-2010	97
Figure 8.2.4	Cumulative distribution of serum triglyceride, PD patients 2001-2010	97
Figure 8.2.5(a)	Variation in median serum cholesterol level among HD patients, HD centres 2010	98
Figure 8.2.5(b)	Variation in proportion of patients with serum cholesterol < 5.3 mmol/L, HD centres 2010	98
Figure 8.2.5(c)	Variation in median serum triglyceride level among HD patients, HD centers 2010	99
Figure 8.2.5(d)	Variation in proportion of patients with serum triglyceride < 2.1mmol/L, HD centers 2010	99
Figure 8.2.6(a)	Variation in median serum cholesterol level among PD patients, PD centres 2010	100
Figure 8.2.6(b)	Variation in proportion of patients with serum cholesterol < 5.3 mmol/L, PD centres 2010	100
Figure 8.2.6(c)	Variation in median serum triglyceride level among PD patients, PD centres 2010	101
Figure 8.2.6(d)	Variation in proportion of patients with serum triglyceride < 2.1mmol/L, PD centres 2010	101
Figure 9.2.1	Cumulative distribution of corrected serum calcium, HD patients, 2001-2010	105
Figure 9.2.2	Cumulative distribution of corrected serum calcium, PD patients, 2001-2010	105
Figure 9.2.3	Cumulative distribution of serum phosphate, HD patients, 2001-2010	106
Figure 9.2.4	Cumulative distribution of serum phosphate, PD patients, 2001-2010	106
Figure 9.2.5	Cumulative distribution of corrected calcium x phosphate product, HD patients 2001-2010	107
Figure 9.2.6	Cumulative distribution of corrected calcium x phosphate product, PD patients 2001-2010	107
Figure 9.2.7(a)	Variation in median serum calcium among HD patients, HD centres, 2010	108
Figure 9.2.7(b)	Variation in proportion of patients with serum calcium 2.1 to 2.37 mmol/L, HD centres, 2010	109
Figure 9.2.8(a)	Variation in median serum calcium level among PD patients, PD centres, 2010	108
Figure 9.2.8(b)	Variation in proportion of patients with serum calcium 2.1 to 2.37 mmol/L, PD centres, 2010	109
Figure 9.2.9(a)	Variation in median serum phosphate level among HD patients, HD centres, 2010	110
Figure 9.2.9(b)	Variation in proportion of patients with serum phosphate 1.13-1.78 mmol/L, HD centres, 2010	110
Figure 9.2.10(a)	Variation in median serum phosphate level among PD patients, PD centres 2010	111
Figure 9.2.10(b)	Variation in proportion of patients with serum phosphate 1.13-1.78 mmol/L, PD centres 2010	111
Figure 9.2.11(a)	Variation in median corrected calcium x phosphate product among HD patients, HD centres, 2010	112
Figure 9.2.11(b)	Variation in propotion of patients with corrected calcium x phosphate product < 4.5 mmol ² /L ² , HD centres 2010	113
Figure 9.2.12(a)	Variation in median corrected calcium x phosphate product among PD centres, 2010	112
Figure 9.2.12(b)	Variation in proportion of patients with corrected calcium x phosphate product < 4.5 mmol ² /L ² , PD centres, 2010	113
Figure 9.3.1(a)	Cumulative distribution of iPTH, HD patients, 2001-2010	114
Figure 9.3.1(b)	Cumulative distribution of iPTH, diabetic HD patients, 2001-2010	114
Figure 9.3.1(c)	Cumulative distribution of iPTH, non diabetic HD patients, 2001-2010	115
Figure 9.3.2(a)	Cumulative distribution of iPTH, PD patients, 2001-2010	115
Figure 9.3.2(b)	Cumulative distribution of iPTH, diabetic PD patients, 2001-2010	116
Figure 9.3.2(c)	Cumulative distribution of iPTH, non diabetic PD patients, 2001-2010	116
Figure 9.3.3(a)	Variation in median iPTH among HD patients, HD centres 2010	117
Figure 9.3.3(b)	Variation in proportion of patients with iPTH 150-300ng/ml, HD centres, 2010	117
Figure 9.3.4(a)	Variation in median iPTH among PD patients, PD centres, 2010	118
Figure 9.3.4(b)	Variation in proportion of patients with iPTH 150-300ng/ml, PD centres 2010	118
Figure 10.3	Variation in Proportion of patients with positive HBsAg among HD centres, 2010	123
Figure 10.4	Variation in Proportion of patients with positive HBsAg among PD centres, 2010	123
Figure 10.5	Variation in Proportion of patients with positive anti-HCV among HD centres, 2010	124
Figure 10.6	Variation in Proportion of patients with positive anti-HCV among PD centres, 2010	124
Figure 10.7(a)	Cumulative risk of sero-conversion to HBsAg positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 2001-2010	124
Figure 10.7(b)	Cumulative risk of sero-conversion to anti HCV antibody positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 2001-2010	124
Figure 11.2.1	Blood Flow Rates in HD centers, 2001-2010	130
Figure 11.2.4	Dialyser membrane types in HD centres, 2001-2010	132
Figure 11.2.6(a)	Cumulative distribution of prescribed Kt/V, HD patients 2001-2010	134

LIST OF FIGURES (CONT'D)

Figure 11.2.6(b)	Cumulative distribution of delivered Kt/V, HD patients 2006-2010	134
Figure 11.2.6(c)	Cumulative distribution of URR, HD patients 2006-2010	135
Figure 11.2.7(a)	Variation in median blood flow rates in HD patients among centres 2010	136
Figure 11.2.7(b)	Variation in Proportion of patients with blood flow rates ≥ 300 ml/min among HD centres 2010	136
Figure 11.2.7(c)	Variation in proportion of patients with 3 HD sessions per week among HD centres 2010	137
Figure 11.2.7(d)	Variation in median prescribed Kt/V in HD patients among HD centres 2010	137
Figure 11.2.7(e)	Variation in proportion of patients with prescribed Kt/V ≥ 1.3 among HD centres 2010	138
Figure 11.2.7(f)	Variation in median delivered Kt/V in HD patients among HD centres 2010	138
Figure 11.2.7(g)	Variation in proportion of patients with delivered Kt/V ≥ 1.2 , HD centres 2010	139
Figure 11.2.7(h)	Variation in median URR among HD patients, HD centres 2010	140
Figure 11.2.7(i)	Variation in proportion of patients with URR $\geq 65\%$ among HD centres 2010	140
Figure 11.3.1	Unadjusted technique survival by Dialysis modality, 2001-2010	141
Figure 11.3.2	Unadjusted technique survival by year of entry, 2001-2010	142
Figure 11.3.3	Unadjusted technique survival by age, 2001-2010	143
Figure 11.3.4	Unadjusted technique survival by Diabetes status, 2001-2010	144
Figure 12.2.1	Cumulative distribution of delivered Kt/V, PD patients 2003-2010	148
Figure 12.2.2	Variation in proportion of patients with Kt/V ≥ 1.7 per week among PD centres 2010	149
Figure 12.3.1	Unadjusted technique survival by Dialysis modality, 2001-2010	150
Figure 12.3.2	Unadjusted technique survival by era 2001-2005 and 2006-2010	151
Figure 12.3.3	Unadjusted technique survival by age, 2001-2010	152
Figure 12.3.4	Unadjusted technique survival by Gender, 2001-2010	153
Figure 12.3.5	Unadjusted technique survival by Diabetes status, 2001-2010	153
Figure 12.3.6	Unadjusted technique survival by Kt/V, 2001-2010	154
Figure 12.4.1	Variation in peritonitis rate among PD centres, 2010	157
Figure 13.1.1	Stock and Flow of Renal Transplantation, 2001-2010	162
Figure 13.1.2	New transplant rate, 2001-2010	162
Figure 13.1.3	Transplant prevalence rate, 2001-2010	162
Figure 13.4.2(a)	Transplant Recipient Death Rate, 2001-2010	169
Figure 13.4.2(b)	Transplant Recipient Graft Loss Rate, 2001-2010	169
Figure 13.5.1(a)	Patient survival, 2001-2010	170
Figure 13.5.1(b)	Adjusted Transplant Patient Survival related to Year of Transplant, 2001-2010	171
Figure 13.5.2(a)	Graft survival, 2001-2010	172
Figure 13.5.2(b)	Adjusted Transplant Graft Survival related to Year of Transplant, 2001-2010	173
Figure 13.5.3	Patient survival by type of transplant, 2001-2010	174
Figure 13.5.4	Graft survival by type of transplant, 2001-2010	174
Figure 13.5.5	Patient survival by year of transplant (Living related transplant, 2001-2010)	175
Figure 13.5.6	Graft survival by year of transplant (Living related transplant, 2001-2010)	175
Figure 13.5.7	Patient survival by year of transplant (Commercial cadaver transplant, 2001-2010)	176
Figure 13.5.8	Graft survival by year of transplant (Commercial cadaver transplant, 2001-2010)	176
Figure 13.6.1(a)	Venn Diagram for Pre and Post Transplant Complications (in %) at year 2006	177
Figure 13.6.1(b)	Venn Diagram for Pre and Post Transplant Complications (in %) at year 2007	177
Figure 13.6.1(c)	Venn Diagram for Pre and Post Transplant Complications (in %) at year 2008	178
Figure 13.6.1(d)	Venn Diagram for Pre and Post Transplant Complications (in %) at year 2009	178
Figure 13.6.1(e)	Venn Diagram for Pre and Post Transplant Complications (in %) at year 2010	178
Figure 13.6.2(a)	Systolic BP, 2006-2010	179
Figure 13.6.2(b)	Diastolic BP, 2006-2010	179
Figure 13.6.3	CKD stages by year	180
Figure 13.6.4	BMI, 2006-2010	180
Figure 13.6.5(a)	LDL, 2006-2010	181
Figure 13.6.5(b)	Total Cholesterol, 2006-2010	182
Figure 13.6.5(c)	HDL, 2006-2010	182
Figure 13.7.1	Cumulative distribution of QoL-Index score in relation to Dialysis Modality, Transplant recipient patients 2001-2010	183
Figure 13.7.2	Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipient patients 2001-2010	184
Figure 13.7.3	Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipient patients 2001-2010	184
Figure 13.7.4	Cumulative distribution of QoL-Index score in relation to Age, Transplant recipient patients 2001-2010	185
Figure 13.7.5	Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipient patients 2001-2010	185

REPORT SUMMARY

- The number of patients commencing dialysis more than doubled in 10 years from 2112 in 2001 to 4740 in 2009 and at 4521 in 2010 (preliminary data). The acceptance of new dialysis patients was 170 per million population (pmp) in 2009 and 160 pmp in 2010.
- The number of dialysis patients in Malaysia has tripled in 10 years from 7837 in 2001 to 21245 in 2009 and 22932 in 2010 (preliminary data). The prevalence of dialysis patients was 762 pmp in 2009 and pmp 812 in 2010.
- Transplant incident rate remained at 4 per million and prevalence at 63 pmp in 2009.
- Dialysis treatment rate for elderly patients (≥ 65 years old) have continued to show rapid increase to 1007 pmp in 2009. 55% of new dialysis patients were at least 55 years old at the onset of dialysis.
- There is still great disparity in dialysis provision rate between the economically advantaged and disadvantaged states ranging from 75 pmp to 272 pmp.
- The number of dialysis centres for the whole of Malaysia increased from 230 (10 pmp) in 2001 to 618 (22 pmp) in 2010. The growth was largely contributed by increase in the number of haemodialysis(HD) centres. Private HD sector recorded the highest growth rate particularly in the more economically developed west coast states of Malaysian Peninsula. The peritoneal dialysis rate remained stable.
- The Ministry of Health (MOH) provided dialysis to 30% of patients, non-governmental organizations (NGO) 28% and the private sector 40% of all dialysis patients in 2010.
- 88% of new patients were accepted into centre haemodialysis program in 2009 and 2010.
- The government continued to be the largest provider of funding for dialysis. 57% of patients on dialysis were funded by the government, 10% by non-government organisations and 22% were self funded.
- The proportion of new ESRD patients with diabetes mellitus was 56% in 2010.
- The annual death rate for haemodialysis patients was 11.2% while chronic peritoneal dialysis patients had annual death rate of 16.6%.
- In 2010, cardiovascular disease remained the main cause of death accounting for 34% of all death. Death from infection has increased over the last 4 years and is now the second leading cause of accounting for 24% of all death.
- Survival on haemodialysis was better compared with peritoneal dialysis. The overall unadjusted 5 years and 10 years patient survival censored for change in modality was 57% and 48% respectively on haemodialysis and 35% and 28% respectively on peritoneal dialysis.
- Patient variables that had significant impact on mortality were age, gender, primary renal disease, dialysis modality, BMI, diastolic blood pressure and the presence cardiovascular disease. The biochemical risk factors for mortality were serum albumin, serum cholesterol, haemoglobin, calcium, calcium phosphate product and phosphate.
- There was wide centre variation with regards to HD and PD patient survival.
- Quality of life was satisfactory in both HD and PD patients. Diabetes mellitus and older age were associated with lower median QoL index scores.
- Employment rate in HD patients was 69% and PD patients was 71%.
- The median dose of erythropoietin was 4000 units per week in both HD and PD patients.
- The proportion of patients receiving erythropoietin increased to 90% in HD patients and 78% in PD patients. There was an increasing trend on use of parenteral iron in HD patients (27% in 2010) and static in PD patients (12% in 2010). Requirement for blood transfusion remains the same (14% in HD patients and 16% in PD patients).
- The median usage of EPO among HD centres was 92%. There was a wide variations in the use of EPO among HD centres and blood transfusion rates, and hemoglobin levels among HD and PD centres.
- Mean serum albumin level in 2010 was 38.9 g/L in HD and 32.1 g/L in PD patients. There was a wide variations in proportion of patients with serum albumin ≥ 40 g/L among HD and PD centres.
- The mean body mass index in HD patients was 23.9 kg/m² and 24.5 kg/m² in PD patients was 24.5 in 2010. 35% of HD patients and 39% of PD patients were obese (BMI kg/m²)
- Predialysis systolic blood pressure (SBP) in haemodialysis patients remained suboptimally controlled with only 28% of haemodialysis patients achieving systolic BP < 140 mmHg in 2010. Predialysis SBP was better controlled in PD patients in 2010, with 49% of PD patients having a predialysis SBP < 140 mmHg.

- Control of total serum cholesterol and serum triglyceride levels were poorer in PD patients compared to haemodialysis in 2010. 77% of HD and 56% of PD patients achieved a total cholesterol < 5.3 mmol/L.
- Calcium carbonate remained the main phosphate binder for both HD patients (91%) and PD patients (88%) in 2010. Use of lanthanum (2%) continued to increase while aluminium based phosphate binder use decrease.
- Calcitriol remained the main vitamin D used in both HD (44%) and PD (38%) patients. Paricalcitol use remained small but has increased slightly among HD patients. The proportion of patients undergoing parathyroidectomy has shown a downward trend since 2006 in both HD and PD patients.
- A higher proportion of HD patients achieved normal range serum calcium level compared to PD patients (52% vs 37%) in 2010.
- PD patients had better phosphate control compared to HD patients (median level 1.5 vs 1.7mmol/l) and higher proportion of PD patients had normal range phosphate level compared to HD patients (53 vs 46%).
- PD patients had relatively higher level of iPTH compared to HD patients (median 97.2 ng/ml vs 163 ng/ml) and a higher proportion of HD patients had iPTH level <150 ng/ml (59%) compared to PD patients (48%).
- There was a wide centre variation among HD and PD populations in the prevalence of mineral bone disease.
- The prevalence of patients with Hepatitis B and C remained low. The prevalence of hepatitis C in HD patients continues to decline and was 7% in 2010.
- **Haemodialysis practices:**
 - The proportion of patients with native vascular access has declined from 96% in 2001 to 90% in 2010.
 - The proportion of patients with blood flow rate above 350mls increased from 4% in 2001 to 26% in 2010.
 - 98% of patients were on 3 dialysis sessions per week and 99% on 4 hour sessions
 - 80% of patients were using the dialysers made from synthetic membrane
 - 90% of patients re-use their dialyser. 19% of patients used their dialysers for at least 13 times.
 - The median prescribed Kt/V was 1.6 and delivered Kt/V was 1.4. 80% of patients had a prescribed Kt/V \geq 1.3 while 79% achieve a delivered Kt/V \geq 1.2. The median URR remained the same at 71.2% and 80% of patients achieved a URR \geq 65% .
 - There was wide variation among HD centres in the proportion of patients achieving adequate blood flow and dose of dialysis.
 - Technique survival was better in HD compared to PD. 5 year and 9 year technique survival was 53% and 33% respectively for HD and 27% and 9 % respectively for PD.
 - Age and diabetes status had a significant impact on technique survival but the year of starting dialysis did not.
- **Chronic PD practices:**
 - In 2010, the total number of PD patients increased to 2360. The annual growth rate had slowed to 6.7%. Automated PD had grown gradually to 12.5%..
 - CAPD prescription has not changed much over the years.
 - The median delivered weekly Kt/V was 2.0 and 79% achieved target Kt/V of \geq 1.7
 - 73% of patients had either a low average or high average peritoneal membrane transport characteristic
 - The median PD technique survival time was 34 months
 - Increasing age, diabetes, peritonitis, male gender, cardiovascular disease, low serum albumin, low BMI, abnormal lipid profile, lower Hb, higher serum phosphate and assisted PD were associated with an increased risk for change of modality
 - The commonest reason for PD drop-out was peritonitis, followed by membrane failure and patient preference.
 - The median peritonitis rate among the PD centres was 35.3 episodes per patient-month in 2010. There was a wide inter-centre variation peritonitis rate among PD centres. Gram-positive organisms and gram-negative accounted for 29% of the peritonitis each. Staphylococcus aureus was the most common gram positive o organism while E. coli was the commonest gram negative organism.

- **Renal transplantation:**

- There was an 18% decline in number of transplantations to 102 in 2010 primarily due to the decline in commercial transplantation
- The transplantation rate was 4 pmp in 2010 and the prevalence had remained static at 65 pmp.
- Local kidney transplantation decreased to 55 in 2010 and accounted for 54% of transplantations. The proportion of commercial transplantation has gradually reduced a peak of 79% in 2004 to 34% in 2010. For the first time in 10 years there were more local transplant (66%) compared to overseas transplant (33%). The proportion of live donor transplantation reduced to 29% in 2010 and commercial live donation increased to 24%. There were 31 local cadaveric donation (37% of transplantation in 2010).
- The proportion of diabetic patients undergoing renal transplantation had been on a reducing trend from 18% in 2005 to 12% in 2010.
- Other characteristics remained unchanged. The mean age of transplantation was 40 years and 63% of recipients were males. The commonest primary renal disease was chronic glomerulonephritis followed by hypertension and diabetes mellitus.
- Although cyclosporine based regimes remained the most commonly used (61%), there has been a gradual reduction since 2006 coinciding with increasing trend in tacrolimus use (30% in 2010)
- Mycophenolate mofetil use increased to 59% while the use of Azathioprine declined to 27% in 2010.
- The rates of transplant death and graft loss have remained static for the past 10 years (1.8% and 2.5% respectively in 2010).
- The main causes of death have been infection (37%) and cardiovascular disease (185). Cancer death rate was 13% in 2009.
- Majority of graft loss were due to rejection (54%).
- Patient survival rates from 2001 to 2010 were 94%, 91%, 87% and 80% at year 1, 3, 5 and 10 respectively. The graft survival rate has been 93%, 87%, 81% and 68% at year 1, 3, 5 and 10 respectively.
- Patient and graft survival was the best among live donor recipients and worst in cadaveric graft recipients.

- **Paediatric RRT**

- The overall RRT incidence rate for paediatric patients less than 20 years old was 10 pmarp in 2009 and 8 pmarp in 2010 (preliminary data). 54% were placed on PD and 38% on HD.
- The number of transplants reduced to 8 (1 pmarp) in 2010 after an initial encouraging increase over the last 5 years.
- At the end of 2010, 633 children were on dialysis giving a prevalence of 62 pmarp. The prevalence of transplant in children was 18 pmarp.
- The dialysis treatment rate had leveled off over the last 10 years across the paediatric age spectrum. The treatment rate had remained consistently higher among the older age groups while the number of 0-4 year olds provided chronic dialysis treatment remained very low.
- Chronic PD was the first modality of dialysis in about two thirds of patients.
- Most children (84%) received their dialysis treatment from government centres and hence were government funded.
- The commonest cause of known ESRD was glomerulonephritis (23%). FSGS accounted for another 8% of patients.
- Renal transplantation had the best patient survival with 94% survival at 5 years and 89% at 10 years. HD patients consistently showed better survival compared to PD patients and this disparity becomes more marked when censored for change of dialysis modality.
- The commonest type of renal transplant done in children over the last 5 years was cadaveric transplant accounting for 55%.
- Graft survival for paediatric transplant was 90% at 1 year and 77% at 5 years.

ABBREVIATIONS

BMI	Body Mass Index
BP	Blood pressure
CAPD	Continuous Ambulatory Peritoneal Dialysis
CCPD/APD	Continuous cycling peritoneal dialysis/automated peritoneal dialysis
CI	Concentration Index
CKD	Chronic kidney disease
CRA	Clinical Registry Assistant
CRA	Clinical Registry assistant
CRC	Clinical Research Centre
CRF	Case report form
CRM	Clinical Registry Manager
CVD	Cardiovascular Disease
DAPD	Daytime Ambulatory Peritoneal Dialysis
DM	Diabetes Mellitus
DOQI	Dialysis Outcome Quality Initiative
eMOSS	Malaysian Organ Sharing System (Renal)
ESRD	End Stage Renal Disease
GDP	Gross domestic product
GNI	Gross National Income
HD	Haemodialysis
HKL	Kuala Lumpur Hospital
ITT	Intention to treat
iPTH	Intact parathyroid hormone
JNC VI	Joint National Committee on management of hypertension
Kt/V	Number used to quantify hemodialysis and peritoneal dialysis treatment adequacy
LQ	Lower quartile
MDTR	Malaysian Dialysis and Transplant Registry
MOH	Ministry of Health, Malaysia
MOSS	Malaysian Organ Sharing System
MRRB	Malaysian Registry of Renal Biopsy
MSN	Malaysian Society of Nephrology
NGO	Non-governmental organization
NRIC	National Registration Identity Card
NRR	National Renal Registry, Malaysia
PD	Peritoneal dialysis
PET D/P	peritoneal transport status dialysate and plasma (D/P ratio)
pmap	per million age related population
pmp	per million population
QoL	Quality of Life
ref	Reference
RCC	Registry coordinating centre
RRT	Renal replacement therapy
SC	Site coordinator
SDP	Source data producer
SMR	Standardised Mortality Ratio
UQ	Upper quartile
URR	Urea reduction rate