The provision of renal replacement therapy (RRT) in developing economies is limited by lack of financial and other resources. There are no national reimbursement policies for RRT in many countries in Asia. The Southeast Asia countries of Singapore, Malaysia, Thailand, and Indonesia have adopted a strategy of encouraging public-private partnerships to increase the RRT rates in their respective countries. The private organizations include both for-profit and philanthropic bodies. The latter raise funds from ordinary citizens, corporations, and faith-based groups, as well as receive subsidies from the government to support RRT for patients in need. The kidney foundations of these countries play a leadership role in this public-private partnership. Many of the private organizations that support RRT are providers of treatment in addition to offering financial assistance to patients, with hemodialysis being the most frequently supported modality. Public-private partnership in funding RRT is sustainable over the long term with proper organization and facilitated by support from the government.

INDEX WORDS: End-stage renal disease (ESRD); renal replacement therapy (RRT); health care funding; health care disparities; economic incentives; public-private partnership; public health; nongovernmental organizations; medical charities; Southeast Asia; Singapore; Malaysia; Thailand; Indonesia.
is Brunei, a high-income nation with an end-stage renal disease incidence and prevalence among the highest in the region (265 and 1,250 per million population, respectively, in 2011). The other high-income country in Southeast Asia, Singapore, conceivably could finance its RRT program from the country’s public health care system, but instead has chosen to adopt a public-private funding model for the nearly 5.5 million people of this city-state. It was a pioneer in the region in this respect. A report in 1999 from the Ministry of Health Singapore helps explain this apparent enigma: its health care philosophy has emphasized the individuals’ responsibility toward their health and health care expenditures.

In addition to Singapore, we also focus on 3 middle-income countries in Southeast Asia that have made use of public-private funding models: Malaysia and Thailand (upper-middle income) and Indonesia (lower-middle income). These countries, particularly Indonesia, still face challenges with public health and tropical diseases, thus limiting expenditure on clinical services, including RRT. The amount of health care spending per capita in each of these middle-income countries, as compared to Singapore, is shown in Table 1.

### ESRD PREVALENCE AND RRT PRACTICES

In common with most countries in the region, Singapore, Malaysia, Thailand, and Indonesia have experienced recent marked increases in the incidence and prevalence of CKD requiring RRT. Table 2 shows the increase in the incidence and prevalence of treated ESRD over a 5-year period from 2007 to 2011. The overall burden of ESRD could be substantially higher given that studies in Malaysia and Thailand showed the prevalence of CKD stage 5 in the community to be 0.36% and 0.15%, respectively. The 2 studies differed in methodology, but nonetheless indicate a gap between current treatment rates and the numbers that could be treated if resources were available.

Hemodialysis (HD) continues to be the predominant RRT modality in these 4 countries. Singapore and Malaysia are able to provide standard thrice-weekly dialysis for almost all patients. In Thailand and Indonesia, as a consequence of the financial burden of HD treatment, most patients are dialyzed 2 and 2.3 ± 0.5 times a week, respectively. The majority of HD centers in all 4 countries reuse dialyzers. Measures of dialysis adequacy are available for Malaysia and Thailand, which have comprehensive dialysis registries. Mean prescribed Kt/V values are 1.7 ± 0.4 and 1.5 in Malaysia and Thailand, respectively, while the corresponding urea reduction ratios are 72.5% and 71%.

Table 1. Health Expenditure in Selected Southeast Asian Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>GNP per Capita*</th>
<th>Total Expenditure on Health as % of GDP10</th>
<th>Governmental Component of Total Expenditure on Health9</th>
<th>Per Capita Governmental Expenditure on Health10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>$42,784</td>
<td>4.5</td>
<td>31.4%</td>
<td>$813</td>
</tr>
<tr>
<td>Malaysia</td>
<td>$8,754</td>
<td>4.4</td>
<td>55.5%</td>
<td>$358</td>
</tr>
<tr>
<td>Thailand</td>
<td>$4,803</td>
<td>3.9</td>
<td>75%</td>
<td>$248</td>
</tr>
<tr>
<td>Indonesia</td>
<td>$2,947</td>
<td>2.8</td>
<td>36.1%</td>
<td>$44</td>
</tr>
</tbody>
</table>

Note: Data for amount spent on renal replacement therapy were not available. Abbreviations: GDP, gross domestic product; GNP, gross national product.

Table 2. Incidence and Prevalence of ESRD in Selected Southeast Asia Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Incidence (pmp)</th>
<th>Prevalence (pmp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>268</td>
<td>1,494</td>
</tr>
<tr>
<td>Malaysia</td>
<td>150</td>
<td>690</td>
</tr>
<tr>
<td>Thailand</td>
<td>159</td>
<td>407</td>
</tr>
</tbody>
</table>

Note: Data from Indonesia were not available because its renal registry only recently was established. Abbreviations: ESRD, end-stage renal disease; pmp, per million population. Data from US Renal Data System (2013).
Table 3. Government Funding for RRT in Selected South East Asian Countries

<table>
<thead>
<tr>
<th>Population (in millions)</th>
<th>Singapore</th>
<th>Malaysia</th>
<th>Thailand</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients on RRTa</td>
<td>5.4</td>
<td>30.2</td>
<td>67.2</td>
<td>252.8</td>
</tr>
<tr>
<td>HD</td>
<td>6,643</td>
<td>30,484</td>
<td>—</td>
<td>27,871</td>
</tr>
<tr>
<td>PD</td>
<td>1,989 (7.1%)</td>
<td>1,894 (6.2%)</td>
<td>—</td>
<td>1,989 (7.1%)</td>
</tr>
<tr>
<td>Kidney Tx</td>
<td>1,406 (21.2%)</td>
<td>1,894 (6.2%)</td>
<td>—</td>
<td>1,989 (7.1%)</td>
</tr>
<tr>
<td>RRT funding by government</td>
<td>Minimal</td>
<td>58%</td>
<td>61.1%</td>
<td>41%</td>
</tr>
<tr>
<td>HD</td>
<td>Minimal</td>
<td>100%</td>
<td>95.4%</td>
<td>Partial</td>
</tr>
<tr>
<td>PD</td>
<td>Limited</td>
<td>100%</td>
<td>—</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: Information on funding by governments are approximations based on registry data and unpublished observations of the authors.

Abbreviations: HD, hemodialysis; PD, peritoneal dialysis; RRT, renal replacement therapy; Tx, transplantation.

aData sources: Indonesian Renal Registry (personal communication, Dr Ria Bandaria, July 23, 2014), Lim et al., and Singapore Renal Registry.

employees of government or private corporations were later accepted for RRT. However, access to treatment still remained limited and the private sector, both for-profit and not-for-profit organizations, was encouraged to provide RRT services as described later in this article. The main beneficiaries of private support for RRT, especially from philanthropic organizations, were the less privileged segments of society.

ROLE OF THE PRIVATE SECTOR

Provision of RRT

In Singapore, Malaysia, and, to some extent, Thailand, not-for-profit organizations, spearheaded by the respective kidney foundation of each country, have played major roles as dialysis providers, setting up HD centers that complement their governments’ RRT programs. However, in Indonesia, much of the support comes in the form of financial assistance to patients who receive treatment in government or private centers. The National Kidney Foundation of Singapore (NKF Singapore) is the largest nongovernmental not-for-profit provider of HD services in the region, followed by the National Kidney Foundation of Malaysia (NKF Malaysia). The kidney foundations are not direct providers of PD treatment but offer financial or other forms of support to PD patients who have the treatment in hospital-based PD units. Similarly, charity organizations support kidney transplantation through financial assistance to live donors and transplant recipients.

Private for-profit HD centers have developed over the years, especially in Singapore and Malaysia; many provide HD treatment to patients under contracts funded by the government and philanthropic organizations.

Awareness and Education

The kidney foundations in these 4 countries play other roles apart from directly supporting RRT. They are active in public education programs and frequently are involved in initiatives such as World Kidney Day activities. In Singapore, Malaysia, and Thailand, the respective kidney foundations also undertake formal training of allied health staff (eg, HD nursing programs), complementing the efforts of government agencies.

In recent years, with increasing awareness of CKD, particularly regarding diabetes mellitus as its major cause, these organizations have been offering health screening programs, which are heavily subsidized by public donations.

Fundraising Efforts

Although (aside from Singapore) government funding primarily is responsible for funding PD and kidney transplantation, a considerable percentage of HD treatment costs are funded by the private sector (Table 3). Because HD is the most common RRT modality, the overall amount of such funding is substantial. Thus, the biggest challenge for the philanthropic organizations in supporting renal replacement services is sustainability. Ensuring continuing community and corporate donations for their programs is an all-consuming objective of these organizations. They adopt strategies not unlike any good business enterprise: engage, retain, and ensure continuing loyalty of their “customers” (the donors). The organizations also seek donations in kind, such as dialysis machines, disposable equipment, and medications.

Another major source of philanthropy is local and international faith-based groups. The Buddhist dogma “giving is a merit” is an influential impetus for donations in Thailand (K.T., unpublished observations). The Buddhist Compassion Relief Tzu Chi Foundation dedicates itself to helping the poor by carrying out charitable works, including providing medical care and education.

In Malaysia, local church groups have been active in supporting RRT, and a number of churches in Malaysia have set up HD centers in collaboration with NKF Malaysia, which provides the technical and medical expertise to run these centers. In the predominantly Muslim countries of Indonesia and Malaysia, a major source of funds for medical philanthropy is the zakat, a tithe, expected from all Muslims who have excess income. It amounts to 2.5% of excess income and is paid to a public treasury empowered by the state. The zakat fund is used...
to effect social justice, helping the sick and poor being one of the main reasons for using the fund. Another system of Islamic philanthropy is the waqf, a form of endowment. Some HD centers in Malaysia are built on waqf land.

An important aspect of these philanthropic organizations’ success is to stay relevant and active in the community. Corporate and government leaders are appointed either to the board of directors or advisory committees and provide links with the business community and government agencies. Luminaries are secured as patrons of these organizations, garnering prestige. The operations and accounts of the foundations are transparent and made public through annual reports. Members of professional groups including nephrologists and nurses often serve in voluntary capacities in these centers. Any perception of misuse of funds can have serious implications on philanthropic contributions, as experienced by NKF Singapore in 2005. As recounted in its website, the scandal “left an indelible mark in the charity sector in Singapore, resulting in massive changes in the regulation of charities and raising awareness of charity accountability and transparency.”

PUBLIC-PRIVATE COLLABORATION

The experiences of the 4 countries vary. Singapore and Malaysia have the most organized public-private collaboration for RRT and related activities.

Singapore

At the end of 2012, of 5.31 million people then living in Singapore, 5,237 patients were receiving dialysis treatment and 1,406 had functioning transplants (Table 3). The main dialysis modality was HD, with PD patients forming 12% of the dialysis population.

The majority of HD patients are funded by not-for-profit organizations, mainly by NKF Singapore, which receives donations from the public and large corporations. Government subsidies for HD and PD are minimal and the amount provided varies according to household income. NKF Singapore was established in 1969 and began sponsoring a dialysis program in 1975. At first, patients and their helpers were trained at the Singapore General Hospital to perform their own dialysis and subsequently would dialyze themselves at a satellite center. NKF Singapore subsequently decided to operate its own centers and opened its first HD center at the Kwong Wai Shiu Hospital, with 10 stations in 1982. With successful fund raising and partnerships with many businesses, as well as philanthropic organizations and individuals, it since has steadily added centers, which now number 25.

Another organization, the Kidney Dialysis Foundation, shared in the responsibility to provide dialysis to the needy from 1996. A third voluntary welfare organization, the Khoo Foundation, started dialysis services at the Peoples Dialysis Centre also in 1996. In 1999, the support provided by all the voluntary welfare organizations combined cared for 75% of HD patients in Singapore. More recently in 2009, the proportion was 68.4%. This declining trend is related to improved rates of coverage by the national health and private insurance schemes.

PD patients have been cared for largely by hospital physicians. The Kidney Dialysis Foundation has a PD program directly involved in patient care since 2005, whereas NKF Singapore only provides subsidies for patients.

Apart from direct patient care, the voluntary welfare organizations have many other programs, which include a patient welfare fund, children’s dialysis and transplantation fund, support for living kidney donors, public education, and continuing education for health care professionals.

The many donors, ranging from the ordinary citizens to multimillionaire philanthropists and their charitable foundations or business organizations, have played a crucial role in the development of nephrology services in Singapore.

Malaysia

There were 28,590 patients receiving dialysis in Malaysia at the end of 2012, giving a prevalence of 975 per million population. The corresponding figures for kidney transplantation were 1,894 recipients, with a prevalence of 65 per million population. Of the patients on dialysis therapy, only 8.8% were treated by PD. In that year, the government funded 58% of HD patients and all PD patients. About 40% of those receiving HD were supported by private funds, especially from the philanthropic organizations. Kidney transplant recipients whose surgery was performed in Malaysia were supported fully by the government (Table 3).

Maintenance dialysis treatment started in Malaysia in 1967 and became organized in the early 1970s; however, it remained inaccessible to most patients with ESRD until the late 1980s. By 2005, dialysis treatment rates had increased more than 8-fold compared to 1990, which coincided with the rapid economic growth of the country. More importantly, this period saw a new initiative in the country; a partnership between the public and private sectors, as well as philanthropic nongovernmental organizations, which collaborated to develop facilities for HD treatment. The public sector purchased HD services from the private for-profit sector, thereby encouraging its growth. It encouraged and facilitated the growth of HD centers run by philanthropic nongovernmental...
organizations, which, with funds raised from donors, were able to provide HD treatment at reduced or no charge to patients in need. This led to a rapid increase in the number of patients receiving long-term RRT.

Two important developments led to a further increase in private involvement in the treatment of ESRD in the country. The first was the liberal implementation of a health care law in Malaysia that enabled organizations to start an HD facility irrespective of whether they have links to a hospital. Both for-profit and charity groups were able to develop freestanding HD centers in varied and sometimes unlikely locations such as storefronts, renovated bungalow houses, mosques, churches, and offices. The second development was the announcement by the government in its 2001 budget that it would provide regular financial support to any nongovernmental organization offering subsidized HD treatment. This support came in the form of a matching grant for the start-up cost and a subsidy of RM $50 (US $15.60) per HD treatment. The government grant later was increased to include the cost of erythropoiesis-stimulating agents. The government subsidy, which continues today, amounts to about a third of the cost of treatment.

NKF Malaysia, which was founded in 1969, was the first nongovernmental organization to start charity HD centers in 1993, and later, many others followed. It currently provides heavily subsidized HD treatment to 1,550 patients in 26 centers, spending about US $9 million annually. Other philanthropic organizations in Malaysia that provide HD treatment include faith-based organizations from the Islamic, Buddhist, and Christian groups; service organizations like the Rotary and Lions clubs, and cultural bodies.

A number of the nongovernmental organizations support patients by paying for their treatment at private for-profit HD centers rather than providing the treatment themselves. Zakat organizations play a major role in funding renal replacement services in Malaysia. Because Muslims form about 60% of the population, zakat contributions are sizeable. In one region of the country, 16.4% of the zakat allocation for social services was reported to go toward funding dialysis treatment. At the end of 2012, there were 145 HD centers (22%) belonging to nongovernmental organization groups and 367 (55%) belonging to private for-profit groups of a total 670 centers, most of which were freestanding.

Thailand

The total number of dialysis patients in Thailand in 2013 was 41,107 (Table 3), with 22% of these receiving PD. All Thai citizens receive full or partial government support for RRT. About 61.1% of HD and 95.4% of PD patients receive full government funding.

There are 5 not-for-profit nonhospital-based foundations in Thailand that deal with renal services. The oldest is the Kidney Foundation of Thailand (KFT), established in 1978, which has contributed tremendously to nephrology in the country. KFT now operates 6 HD centers; 4 in Bangkok and 2 in other provinces. It was a great encouragement to philanthropy when His Majesty the King of Thailand graciously allowed 2 HD centers under KFT supervision to be stationed at Chitrakada Palace (the King’s residence) and at the Grand Palace. Together, the 6 centers can accommodate up to 750 patients. The cost of HD per session varies according to a patient’s source of funding. In the past, when patients usually paid out of pocket for HD treatment, the charge was only 30% of the actual HD cost. At present, patients who are under the Civil Servants Medical Beneficiary Reimbursement System (government officers) are charged US $66 per HD session. Corporate workers who are under the Social Security System and other less privileged Thai citizens who are under the National Health Security Office payment scheme are charged no higher than US $50 per session. For those who have to pay out of pocket, the dialysis charge varies from US $7 to $33 per session. Only a few patients are dialyzed for free at KFT centers. Beyond dialysis care, other renal activities that KFT has been actively and continuously engaged with for more than 3 decades include supporting kidney transplantation, training, education, and research. Altogether, the KFT’s contribution to the Thai renal community is about US $35 million (K.T., unpublished data).

Two other foundations, the General Chamlong Srimuang Foundation and Srirattanakosin Foundation, follow HD treatment models similar to KFT’s subsidization of the poor by charging full fees for those whose care is covered by third parties. The Bhumirajanagarinda Kidney Institute is the latest foundation dedicated to kidney disease. The mission of the US $70 million institute, established to commemorate the 60th anniversary of the King’s rule, includes high-standard HD and PD treatment, public education and awareness, and research and personnel training. The Jitra-Nukroa Foundation is the only foundation that is located outside Bangkok.

The most important philanthropists for kidney diseases in Thailand are their Majesties King Bhumipol and the Queen Sirikit of Thailand, who besides providing sites for HD centers in their palaces, have supported more than...
100 kidney patients (including those receiving RRT) with contributions of more than US $200,000 a year.

Indonesia

Indonesia is the most populous country in Southeast Asia. Its population of more than 252 million is spread over a wide archipelago, posing challenges for social services, including health care. RRT is available in most parts of the country, but is not readily accessible to most with CKD. In 2013, it was estimated that there were 27,871 patients receiving RRT, with 24,524 treated by HD, 1,358 receiving PD, and the rest with functioning transplants (Table 3). The prevalence rates of dialysis and kidney transplantation were 109 per million population and 8.4 per million population respectively (S., unpublished data).

The number of new patients accepted for treatment per million population is still low. There has been a marked increase in recent years, but the number that remain on treatment has not increased as rapidly. About 32% of incident patients are self-funded, whereas the rest are supported by insurance or the state. Of prevalent patients, ~22% are self-funded. There are many foundations, including those established by patient groups, most of which are locally based, that provide financial support for patients on RRT; however, they are not as organized or structured as those in Singapore or Malaysia. Although Muslims form more than 85% of the population, funds from zakat are not widely used for RRT, unlike in Malaysia. There are far greater demands for zakat funds to be used for low-priced or free medical services for the poor. The sister of the third president of the republic of Indonesia, Mrs Sri Soedarsono, established the only kidney hospital in the country, named after their late mother, dedicated to help those with kidney disease and ESRD (S., unpublished observations). The hospital also donated more than 200 HD machines to dialysis centers in the region.

Sustainability of Public-Private Partnerships

The sustainability of public-private partnerships in supporting costly treatment such as RRT is subject to scrutiny. In most advanced economies, such treatment is borne by the state. In developing countries, the competing demands for limited health care funds constrain expenditure on such therapies. Two countries on the different ends of the national income spectrum have shown that such a model can be sustained for RRT. The Sindh Institute of Urology and Transplantation in Pakistan not only has been able to maintain the model for more than 25 years, but increased the number of patients treated annually. Singapore, a high-income country that pioneered the public-private partnership in RRT, has continued with the model since the 1980s. Improvement in the economic status of the country may lead to less reliance on private contributions and more involvement of the government in provision of RRT as seen in Singapore. However, improved economic status of the nation also may lead to greater contributions to medical charities and thus sustain the partnership, as seems to have happened in Pakistan. Similarly, in Malaysia, zakat collection has increased pari passu with improvement in the nation’s economic status, thus enabling the zakat organizations to increase their support of RRT.40

The success and sustainability of public-private partnerships eventually may rest on the public’s perception on how well their contributions have been used and on good governance of these programs. The guiding principles of “equity, transparency, accountability to its supporting organizations,” as adopted by the Sindh Institute of Urology and Transplantation, may be the factors that sustain the model. A government that encourages and facilitates such partnership and the presence of organized structures to handle the partnership can ensure its viability.

Conclusions

Many countries in Southeast Asia have limited expenditure on health care and thus are unable to provide treatment for many with ESRD. The experiences of 4 Southeast Asia countries—Singapore, Malaysia, Thailand, and Indonesia—have shown that public-private collaboration in funding of RRT may enable more patients to be treated. Implementation of policies that acknowledge and support private contributions, as well as liberal implementation of health care laws, encourages voluntary organizations to participate in the provision of RRT. Involvement of private organizations in treating ESRD also may engage community participation, promote volunteerism and caring attitudes among the populace, and serve as an avenue for creating awareness of CKD among the community.

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