Acute Peritoneal Dialysis Treatment Programs for Countries of the East African Community

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Key Words

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Abstract

The literature abounds with attestations about the lack of treatment programs for kidney injury in developing countries. To date, no sustainable treatment program exists for acute kidney injury (AKI) in many of the 48 countries in the sub-Saharan region of Africa. The Sustainable Kidney Care Foundation, together with industry, universities, and funding organizations, has been working on establishing peritoneal dialysis treatment programs for AKI in East Africa, starting with the countries comprising the East African Community and with a special focus on treating children and women of childbearing age.

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Background

Acute kidney injury (AKI) in the developing world is commonly caused by malaria, diarrheal diseases, and obstetrical complications. From 2000 to 2003, of the 10.6 million deaths reported in children under the age of 5 years, 0.62 million died from malaria and 1.4 million

from diarrheal diseases, the second leading cause of mortality in this age group after severe lower respiratory track infections [1]. It is estimated that the rotavirus vaccine would reduce mortality from diarrheal diseases in children by 30% [2]. Although prevention is the best approach and fluid and electrolyte repletion is an inexpensive treatment option for dehydration, in many circumstances neither practice is carried out due to lack of education, training, and resources. Obstetrical complications are a major cause of AKI in developing countries. In a study from Morocco, of 178 women admitted with eclampsia, the incidence of AKI was 25.8%, dialysis was needed in one third of the cases, and AKI was associated with a mortality rate of 32.6% [3]. Because of the shortage of trained nephrologists, both adult and pediatric, and the lack of infrastructure for procurement of dialysis-related consumables, treatment for AKI is not commonly encountered in the countries of sub-Saharan Africa and plans for initiating appropriate programs are meager. Funding agencies may not differentiate between the urgent need for managing the recoverable AKI from chronic kidney disease and requests for the establishment of chronic dialysis treatment programs from which there is ordinarily no recourse except transplantation. The objective of this paper is to describe the current efforts of SKCF to establish the acute peritoneal dialysis program in East Africa.

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Approach to the Problem

With the world's focus on attaining the United Nations Millennium Development Goals of reducing the mortality rate of children under 5 years of age by two thirds and maternal mortality by three quarters by 2015 [4], the Sustainable Kidney Care Foundation (SKCF), founded in 2006, has joined the effort to address this challenge. The United Republic of Tanzania, which has a population of 42.7 million and has enjoyed a peaceful democracy since its independence in 1964 [5], was selected as the first country to initiate an acute peritoneal dialysis (PD) program because it had none available. The model to realize SKCF's mission 'to bring treatment for kidney injury where none exists', has been implemented at the Kilimanjaro Christian Medical Center (KCMC) in Moshi, Tanzania. Located at the foothills of Mount Kilimanjaro, KCMC was opened in 1991 by the Good Samaritan Foundation and is a referral hospital for over 11 million people in Northern Tanzania. It is a large complex with over 450 beds and 1,000 employees, and is the teaching hospital for the Kilimanjaro Christian Medical College [6].

PD as Choice Therapy

The reason for selecting PD as the preferred modality of renal replacement therapy was because of its adaptability to the low-technology environments frequently encountered in healthcare facilities in developing countries. In a similar environment, PD has been shown to perform comparably to hemodialysis (HD). This was demonstrated in a controlled clinical trial which compared the effectiveness and cost of HD with PD using locally made PD fluids in Nigeria. The trial found that the outcomes were comparable, but PD was significantly cheaper. This study population included patients with AKI as well as those with chronic kidney disease and acute exacerbation. The major complication of PD was peritonitis, while HD was associated with more episodes of hypotension [7]. Although it might be thought that the organization of the application of a technique such as PD, with its elementary technology, would be reasonably practicable, it is the emphasis on sustainability of our efforts that has added complexity.

The sustainability can only be achieved with full local commitment, availability of professional skills, a suitable physical environment, training in the procedures of PD, and experience in the care of AKI patients. The availability of consumables, which are mainly a range of PD solutions, PD lines, and catheters, and good laboratory fa-

cilities are the basic requirements. Procurement of consumables is a major challenge in many countries as these products need to be registered on the national formulary, which is a lengthy process that is both time-consuming and expensive, and have to be economically viable for industry to proceed. This leads to interruptions in the supply chain of life-saving consumables. Another major undertaking is the availability of transportation for acutely ill patients who need immediate care from the rural villages to the nearest hospitals which can administer acute PD treatment. A mutually agreed cost structure between the foundation and the hospital is also an absolute requirement. Other elements include the presence and development of national health insurance plans and considerations of associated clinical research.

Training of Professional Staff

Through collaboration with the International Society of Nephrology, two doctors and two nurses from KCMC were trained in acute PD in Curitiba, Brazil, and then became trainers for others. Although the program suffered a loss when one of the doctors left for another position in a hospital in central Tanzania, the doctor's expertise remained [8]. Because of licensing requirements, hands-on training is not possible in countries in North America or Europe. Additionally, because healthcare providers in many countries have a clear division of labor among nephrologists, vascular surgeons, and interventional radiologists, PD catheter placement techniques require training from other specialty groups and may not be readily accessible. The International Society of Nephrology, International Society of Peritoneal Dialysis, and International Pediatric Nephrology Association support nephrology training for doctors from developing countries and applications are readily available on their respective websites. Including training in AKI diagnosis, PD treatment, and PD catheter placement would be of great benefit, especially for trainees from developing countries. Because the hospital clinical laboratory is critical to the success of this program, a biochemist was included on the SKCF team and care was taken to ensure that quality control measures were put in place by sharing the same batch of serum samples for duplicate testing on site and in the USA [9]. Additionally, the International Federation of Kidney Foundations can help facilitate the establishment of new national kidney foundations in countries which are starting kidney prevention, treatment, and training programs [10].

Sustainability

The sustainability of the acute PD program is ensured by having the hospital agree to accept full financial responsibility for the procurement of supplies after the initial donation of the consumables (which should last for 2 years). As the program is evolving, continual clinical support is provided in a modified form of telemedicine via the internet, including internet phone. The Tanzanian Minister of Health was fully appraised of SKCF's plan for the acute PD program in advance because transparency in these matters is essential. Unfortunately, none of the East African Community countries has the infrastructure to manufacture the requisite consumables, which were procured from Fresenius Medical Care (FMC) in Germany, shipped to Dar es Salaam, then trucked to Moshi. Importation of consumables presented the greatest challenge and adds nearly 25% to the cost of treatment [8].

Industry is reluctant to commit to building local manufacturing plants because of a lack of commitment from the countries of the East African Community countries to procure enough supplies to make the operation financially viable. One could envision that the five countries of the East African Community, Burundi, Kenya, Rwanda, Tanzania, and Uganda, with a total population of 133.5 million [11] could form a united front and work with industry to set up local manufacturing and supply chains. The transport costs from Europe versus South Africa where PD solutions are manufactured were lower because only limited duties were required to be paid, even on donated supplies. The transport costs for land-locked countries, to which PD fluid may need to be flown in, will need to be evaluated.

Acute PD programs are an introduction to the care of kidney disease in countries where none exists and can be readily followed by chronic PD and/or HD programs and transplantation. In Hong Kong, PD penetration is at 80%, the highest in East Asia because of the 'PD first' policy developed and adopted in the mid-1980s to meet the dialysis demand, given the insufficient HD service capacity and cost-effectiveness of PD over HD. This allowed for the rapid expansion of dialysis services while keeping health budgetary expenses at an acceptable level [12].

Formal Education

In March 2011, as part of its 40th anniversary, KCMC hosted a 3-day postgraduate seminar, entitled 'Responding to the burden of kidney diseases: treatment and pre-

vention'. This continuing medical education conference was sponsored in collaboration with the International Society of Nephrology, the International Society of Peritoneal Dialysis, the International Pediatric Nephrology Association, and SKCF. The educational component of the acute PD model is very active. Those involved in the acute PD program go out to clinics and secondary hospitals in KCMC's catchment zone to inform and raise awareness in the local community and healthcare providers in rural villages about kidney diseases, prevention, and treatment, especially among children and women of childbearing age. Although the first patients treated were those mainly living in Moshi, for programs of this kind to succeed in Africa, the catchment area for AKI patients must include rural villages. Even though each village has a healthcare worker who could be trained in elementary fluid care for severe diarrhea using packaged electrolyte concentrate, the principles of triage of the severely hypovolemic patient need to be assimilated. The development of a semiquantitative salivary test for urea nitrogen should make decisions concerning the diagnosis of AKI easier [13].

New Acute PD Program

The implementation of this model is now being pursued at the Mulago Hospital in Kampala, Uganda, which has a different developmental situation concerning treatment of kidney failure. Mulago Hospital is the national referral hospital for Uganda and the primary teaching hospital for the Makerere University College of Health Sciences. Uganda has a population of 34.6 million [5]; however, there has been little infrastructural development to match the growing challenges posed by diseases leading to AKI, or to prevention and treatment. Mulago Hospital currently has six HD machines with three in good operational status, supporting a total of 25 patients on chronic dialysis who can afford to pay for the services. Patients with AKI are not treated in this program, creating an unmet need for acute dialysis which may be life-saving for many, especially children. In the late 1990s, interventions using PD were mainly for chronic kidney disease and were foiled by a high incidence of peritonitis. The current emphasis on chronic HD has not been associated with development of PD, which is easily accessible and often cheaper to set up. This has not only deprived children, who cannot use the existing adult HD machines, access to these services, but it has also delayed the expansion and roll-out of this vital service beyond Mu-

lago Hospital. Acute PD is cheaper and easier to set up than HD once the dialysis supplies logistics are in place. The importance of Mulago Hospital and the excellent reputation and support of the staff and administration makes it an ideal location to begin an acute PD program [14].

Conclusion

The low number of patients with AKI at KCMC was a surprise; however, after understanding the local conditions, it became clear that knowledge about kidney diseases and awareness that treatment is available was nonexistent in the community. One can surmise that when treatment for a condition is unavailable, the condition becomes invisible in practice. The almost exclusive focus of the global community on prevention of malaria and diarrheal diseases has excluded from consideration and funding opportunities the only rescue therapy available for AKI, which results from these conditions, and PD treat-

ment, which can restore full kidney function in majority of cases at a fraction of the cost of treatment of chronic kidney disease. What is a life worth?

Because dialysis in the public eye is associated with chronic care, it has been a difficult task to convince relevant organizations, both in governments and nongovernmental organizations, that it is not enough to devote resources to prevention because the latter is often utilized too late to have an effect. Saving lives with adequate dialysis is also needed. As the world's focus is evolving from communicable to noncommunicable diseases, this is likely to change. A major step in that direction was taken by the World Health Organization, which sponsored a meeting at the United Nations in September 2011 that brought global leaders together to focus the world's attention on noncommunicable diseases responsible for 63% of all deaths worldwide. Among the main killers are heart attacks, strokes, cancers, chronic respiratory disease, and diabetes [15]. It is noted to the detriment of thousands, if not hundreds of thousands of patients, that kidney disease was not considered.

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