

SPECIAL ARTICLE

PERITONEAL DIALYSIS TO TREAT PATIENTS WITH ACUTE KIDNEY INJURY—THE SAVING YOUNG LIVES EXPERIENCE IN WEST AFRICA: PROCEEDINGS OF THE SAVING YOUNG LIVES SESSION AT THE FIRST INTERNATIONAL CONFERENCE OF DIALYSIS IN WEST AFRICA, DAKAR, SENEGAL, DECEMBER 2015

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In December 2015, as part of the First African Dialysis Conference organized in Dakar, Senegal, 5 physicians from West African countries who have participated in the Saving Young Lives Program reviewed their experiences establishing peritoneal dialysis (PD) programs to treat patients with acute kidney injury (AKI). Thus far, nearly 200 patients have received PD treatment in these countries. The interaction and discussion amongst the participants at the meeting was meaningful and informative. The presentations highlighted the creativity, conviction, and determination of the physicians in overcoming the various barriers and challenges they encountered to establish PD/AKI programs. Hopefully, these successes and the increased awareness of the importance of early diagnosis and treatment of AKI will inspire much needed support from government, hospital, and international organizations.

Perit Dial Int 2017; 37 (2):155–158
<https://doi.org/10.3747/pdi.2016.00178>

The Saving Young Lives Program (SYL) was established in 2012 to develop sustainable peritoneal dialysis (PD) programs to treat patients with acute kidney injury (AKI) in low-resource settings. The details of the program and its goals and objectives have been recently reviewed (1). In brief, SYL represents a partnership amongst 4 international nephrology organizations (ISN [International Society of Nephrology], IPNA [International Pediatric Nephrology Association], ISPD [International Society for Peritoneal Dialysis], and EuroPD) and the Sustainable Kidney

Care Foundation (SKCF). The international organizations provide support for education and training, while SKCF provides cuffed PD catheters and commercially prepared dialysis supplies to initiate new programs. No cyclers are provided and all PD exchanges are done manually. From its inception, the plan has been to provide basic support in terms of education and training of physicians and nurses and funding for supplies to start PD programs for patients with AKI needing renal replacement therapy (RRT), with the programs becoming fiscally sustainable after 2 to 3 years. Details of the model have been described elsewhere (1).

Thus far, 10 programs have been established, 5 of which are in West Africa. During the First African Dialysis Conference organized in Dakar, Senegal, in December 2015, participants from these 5 West African SYL programs were invited to discuss their experiences establishing PD programs to manage patients with AKI and share their successes and challenges in developing their programs.

This report summarizes the presentations at the meeting and plans for the SYL Program moving forward in this region. It also highlights the enormous benefits of sharing and networking that a regional conference can provide—the development of peer relationships and the sharing of knowledge, tools, and resources that enables individual programs to adapt creatively to the demands of their particular circumstances. Table 1 summarizes the number of patients treated at each center.

MBINGO HOSPITAL, CAMEROON

The Mbingo Baptist Hospital is a primary care and referral hospital located in northwestern Cameroon. The hospital is

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Received 1 July 2016; accepted 22 August 2016.

TABLE 1

Number of Patients with AKI Treated with PD at the 5 Sites with Mean Age and Serum Creatinine at the Start of Dialysis, Dialysis Duration, and In-Hospital Mortality

Site	# patients treated	Mean age (years) ^a	Mean serum creat (mg/dL) at start of dialysis ^a	Mean dialysis duration (days) ^a	In-hospital mortality rate
Abidjan	24	5±3	10±5	21±31	25%
Accra	14	6±3	10±4	11±5	28%
Cotonou	28	8±4	14±5	12±23	27%
Kumasi	88	6±4	8±6	8±8	30%
Mbingo	43	26±13	17±10	20±15	21%
Total	197	10±10	12±7	14±17	27%

AKI = acute kidney injury; PD = peritoneal dialysis; creat = creatinine.

^a All numbers expressed as mean±standard deviation.

supported by the North American Baptist Conference. Prior to starting a PD program, almost all patients with AKI who needed RRT died. In Cameroon, there is only 1 hemodialysis (HD) center in each of the 10 regions of the country and the nearest HD facility to Mbingo is situated in Bamenda, 45 km away.

The PD program was started at Mbingo Baptist Hospital in May 2013 under the leadership of Dr. Dennis Palmer, a US missionary surgeon based in Mbingo, after encouraging visits to the hospital by US nephrologists, notably Dr. William Lawton from University of Iowa Carver College of Medicine and Dr. Thomas Krahn from Brown University. The program started with supplies, including PD solutions and cuffed PD catheters, provided by SKCF. Only patients with presumed AKI are treated; those assessed to have end-stage renal disease (ESRD) are referred to Bamenda for consideration for long-term HD. Peritoneal dialysis catheters are placed by surgeons in the operating theater. Importantly, Mbingo Hospital has a well-run residency training program, exposing many trainees to PD treatment. The experience in Mbingo was summarized at the Dakar meeting by Dr. Norah Nyah, a senior resident in medicine at Mbingo.

The first case that was dialyzed was a 5-year-old girl who was admitted to the PD unit on 27 May 2013 with AKI secondary to severe malaria, with a serum creatinine of 10 mg/dL. She was started on PD via a surgically placed cuffed PD catheter. On hospital day 8, the patient had substantially improved, having had 37 PD exchanges. She was discharged with a serum creatinine of 4.1 mg/dL, and when she returned 2 weeks later, her serum creatinine had decreased to 1.8 mg/dL.

The program has been treating an average of 1 patient per month. As of February 2016, the program has dialyzed 43 patients (17 males and 26 females), ranging in age from 4 months to 62 years. Fourteen of these 43 patients were below age 18. Of the 43 patients treated, 20 (46%) recovered renal function and were discharged and 9 (21%) died in hospital.

Fourteen (33%) did not recover renal function, were felt to have end-stage renal disease (ESRD), and were referred to Bamenda for consideration for long-term HD. Only 1 out of the 43 patients developed peritonitis. This is particularly important since only the initial 20 patients were treated with commercially produced PD solutions donated by SKCF; subsequent PD solutions were successfully made locally at the central hospital pharmacy, after consultation with the SYL Steering Committee and following the recently published ISPD guidelines on PD treatment for AKI (2). Solutions were made from lactated Ringer's solution, with carefully titrated addition of 50% dextrose, as recommended in the guidelines.

KATH IN KUMASI, GHANA

The KATH hospital, the second largest hospital in Ghana, with approximately 1,000 beds (affiliated with KNUST/KATH School of Medical Sciences), is located in the city of Kumasi, in the Ashanti Region. Dr. Sampson Antwi returned to Ghana in late 2009, having completed pediatric nephrology training in Europe. At that time, there were no pediatric renal services available in Kumasi. He started a pediatric renal clinic and developed a PD program, using locally made solutions and whatever catheters were available. After he treated 4 AKI patients with PD in 2010 and 2011 with locally made solutions, the hospital agreed to purchase a limited amount of PD supplies. In 2012, Dr. Antwi contacted SKCF, who agreed to provide support; he was then able to use commercially prepared PD solutions and cuffed PD catheters provided by SKCF. Four dedicated nurses were trained by Dr. Antwi to help support the PD program. The program rapidly expanded, and they are now treating an average of 2 to 3 patients per month. Thus far, 88 PD patients have been treated for AKI with PD. Twenty-six (29.5%) died in hospital. Sixty-two patients (70.5%) survived the initial PD treatment; 14 (16%) of these 62 were felt to have ESRD. The remaining 48 were discharged with recovered renal function.

A major challenge for the program is the affordability of PD. For those insured under Ghana's national health insurance program, the hospital receives payment for the treatment of AKI with a flat rate of GHC800 (USD216). Costs for PD beyond this amount have to be covered by the patient, family, relatives, or friends. The income generated from the acute PD program has been used to purchase additional PD solutions and catheters to underwrite the sustainability of the program, as originally proposed by SKCF (1).

Another challenge encountered in Kumasi, as well as at all other SYL sites, has been a limited number of referral of patients with AKI for PD therapy—much lower than was anticipated. A likely explanation for this is a lack of awareness and knowledge on the part of health providers and the public about the significance of identifying and treating AKI (3). In response to this, important initiatives in Kumasi have been developed by Dr. Antwi directed at increasing the awareness of AKI as a major health problem. The success of the PD program has been presented at medical education programs

throughout the country. This has encouraged many health professionals in district health centers to either consult the renal center by phone or directly refer cases to the center. In addition, hands-on PD training sessions have recently been organized for physicians in the emergency department at the KATH hospital as well as in district health centers and hospitals. Plans are also underway to organize focused PD training workshops so that PD can be initiated in district hospitals if RRT is urgently needed. Saving Young Lives is providing support for these exciting initiatives.

THE UNIVERSITY HOSPITAL OF YOPOUGON, CÔTE D'IVOIRE

The Yopougon University Hospital in Côte d'Ivoire is a public hospital that is 1 of the 3 main healthcare centers in the country. The Pediatric Nephrology Unit (*Unité de néphrologie pédiatrique*, UNP) at this hospital is the only public center that treats children with kidney diseases in the country. The UNP is equipped with 4 beds and 2 HD stations; HD is available for older children. About 650 patients are seen in consultation or admitted to the renal ward per year. Support for PD from SKCF was initiated in 2013, and a PD program was established to treat children with AKI under the direction of Dr. Laurence Adonis Koffi. About 1 patient per month currently receives dialysis for AKI; about half of these receive PD, but it is expected that PD utilization will expand as referrals increase. Surgical teams have been trained to place cuffed PD catheters. Good laboratory support is available, and revenue generated from the laboratory is being used to provide support for the PD program.

A notable and important feature of the PD/AKI program at UNP is the effort made to increase awareness of the significance of AKI as a public health problem. A parent support group has been developed through an association called APEMAR (Association for Kidney Disease Children's Parents). In addition to providing support for patients and their families, this group helps raise funds from private partners. Television, radio, and press coverage have emphasized the importance of diagnosing and treating kidney disease. A large-scale program to screen children for kidney disease has recently been started and should contribute to the increase in awareness for both AKI as well as chronic kidney disease (CKD).

Key elements underpinning the success of the program developed in Côte d'Ivoire include good laboratory support (with revenue from the laboratory being used to support the purchase of PD supplies), surgical expertise in placing PD catheters, a large outreach program including the parents' support group, and backing from the adult and pediatric nephrology societies in Côte d'Ivoire.

The largest hurdle limiting the expansion of PD to treat AKI in Côte d'Ivoire is financial support for the program. The cost of PD consumables is entirely covered by the families. Because of this, only 30% of the children in need have access to dialysis and many of these will not pursue treatment. Ironically, the government provides some support for HD treatment for adults for the treatment of both AKI and ESRD.

UNIVERSITY HOSPITAL CNHU-HKM, COTONOU, BENIN

Benin, a West African country with 10 million people, had no pediatric dialysis services prior to 2012; AKI was managed conservatively without RRT. In 2012, SYL met with Dr. Francis Lalya, a pediatric nephrologist based in Cotonou, the capital of Benin. Dr. Lalya was anxious to start a PD program to treat children with AKI who needed RRT. In December 2012, SYL began to provide PD supplies (commercial solutions and cuffed catheters) and Dr. Lalya started the PD/AKI program based at the National Teaching Hospital CNHU-HKM in Cotonou as an integral part of the pediatric ward. The program is staffed by a team composed of a pediatric nephrologist, a registrar, and 3 nurses. Peritoneal dialysis catheters are, in general, inserted at bedside by the nephrology team. Commercial PD fluids have been used, although in some cases, locally made solutions (lactated Ringer's solution and glucose), have been utilized when commercial solutions were not available. All patients have been treated with standard manual exchanges with the frequency of exchanges dictated by the clinical status of the patient. Since the start of the program, 109 cases of AKI have been hospitalized and 26 have needed RRT and received PD. The mean daily number of cycles per day was 5 and the mean duration of dialysis was 10 days (1 to 22 days). Children were between 1 month and 15 years of age, and the most common cause of AKI was malaria. Fifteen of the 26 dialyzed children recovered renal function and were discharged, 7 died in hospital, 4 were felt to have advanced CKD and were discharged, and 3 patients developed peritonitis, which was successfully treated with antibiotics.

The biggest challenges to the program involve a lack of financial commitment from the government and administrative issues at the hospital that have made the operation of the program at times challenging. Parents are asked to pay for the dialysis and laboratory tests, with the funds generated being used to help the program become sustainable.

The strengths of the program are the team's enthusiasm and commitment to provide adequate care to patients and raise the awareness of the importance and treatability of AKI by physicians and the community. Educational programs focused on AKI have been organized under the supervision of Dr. Lalya by the Benin Society of Pediatrics. Television and radio programs and interviews have also been aired to explain risk factors for AKI and the need for early medical advice and care. The International Pediatric Nephrology Association supported a nephrology teaching course in November 2015 in Cotonou attended by 126 healthcare providers from Benin as well as 6 other countries. This meeting included a workshop on the practical aspects of PD that was very well received.

KORLE BU TEACHING HOSPITAL, ACCRA, GHANA

The PD program to treat children with AKI in Accra was organized as part of the Department of Child Health at the Korle Bu Teaching Hospital under the direction of Dr. Vikki May in 2014. Dr. May attended a course at the Red Cross Hospital

in Cape Town, South Africa, that reviewed the basic principles of PD and the techniques of bedside insertion of PD catheters. Two pediatric trainees and a pediatric nurse also attended this training program in Cape Town in March 2015. These 4 individuals then formed the core of the PD team at the hospital.

An educational program was then held at the hospital to introduce the concept of PD to the healthcare workers. A week-long workshop on PD and AKI was held in 2014, with the assistance of Seth Johnson, a nurse from the Renal Research Institute in New York supported by SKCF, which helped empower nurses to address the problem of AKI.

Thus far 14 children have been dialyzed. The ages ranged from 2 years 5 months to 11 years; 57% were male. The major causes for AKI were intravascular hemolysis from malaria, severe dehydration and acute glomerulonephritis. Mortality was 28%, and 57% had complete recovery of renal function while 15% were discharged home with chronic renal insufficiency.

To expand the program, several mini workshops, some in collaboration with the adult nephrology unit, have been organized for healthcare workers from district hospitals to increase their awareness of both AKI and the availability of PD to treat AKI in Accra. These healthcare workers in turn have gone on to teach other regional healthcare workers about how to recognize AKI in children and when to refer them to the Korle Bu teaching hospital.

The greatest challenges to expanding the program involve the limited personnel available to deal with all referrals to the hospital and limited financial support. The sustainability of the program depends on financial payments from families of children needing PD to ensure that funds are available to purchase new supplies when the initial donated supplies are exhausted. Setting up a fund to assist the families of children requiring acute PD is being explored. Protocols have been designed to help with the appropriate conservative management of AKI to hopefully limit the need for RRT. Furthermore, differentiating between AKI and advanced CKD has proven to be challenging, given the limitations on performing detailed laboratory, radiologic, and pathologic investigations. When it is not clear whether a patient has AKI or advanced CKD, PD is still offered, but only up to a maximum of 4 weeks of treatment.

SUMMARY

The impact of SYL was highlighted at the meeting in Dakar. Since 2007, PD programs for AKI have been established in 5 sites in West Africa. Nearly 200 patients have been treated by these programs, despite limited financial and administrative support and a lack of awareness in the communities of the importance of early diagnosis and treatment of AKI. Each program has encountered its own distinct challenges, and each center has been remarkably resourceful in dealing with these challenges in spite of the fact that hospitals and governments have not provided adequate financial support for program development. This lack of support has been addressed in part by the successful local manufacture of PD solutions. Revenue from laboratory services and sequestered funds from the treatments of those patients who can pay have been leveraged to support the treatments of the economically disadvantaged. Creative strategies to raise the awareness of the importance of AKI have included imaginative use of television and radio, AKI-focused education programs, training of healthcare providers in district and regional health centers, engaging parent support groups, and engaging physicians and nurses at traditional medical education programs.

What is most notable about the experience in West Africa is the clear demonstration by these program leaders that creativity, conviction, and determination can overcome the various barriers to establish PD/AKI programs. Hopefully, these successes and the increased awareness of the importance of early diagnosis and treatment of AKI will lead to the initiation of much needed support from government, hospitals, and international organizations.

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