Acute Kidney Injury
Saving Young Lives
0 by 25

a new frontier for PD

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Nothing to disclose

The Increasing Frequency of Dialysis-Requiring AKI

Hsu et al JASN 24:37, 2013

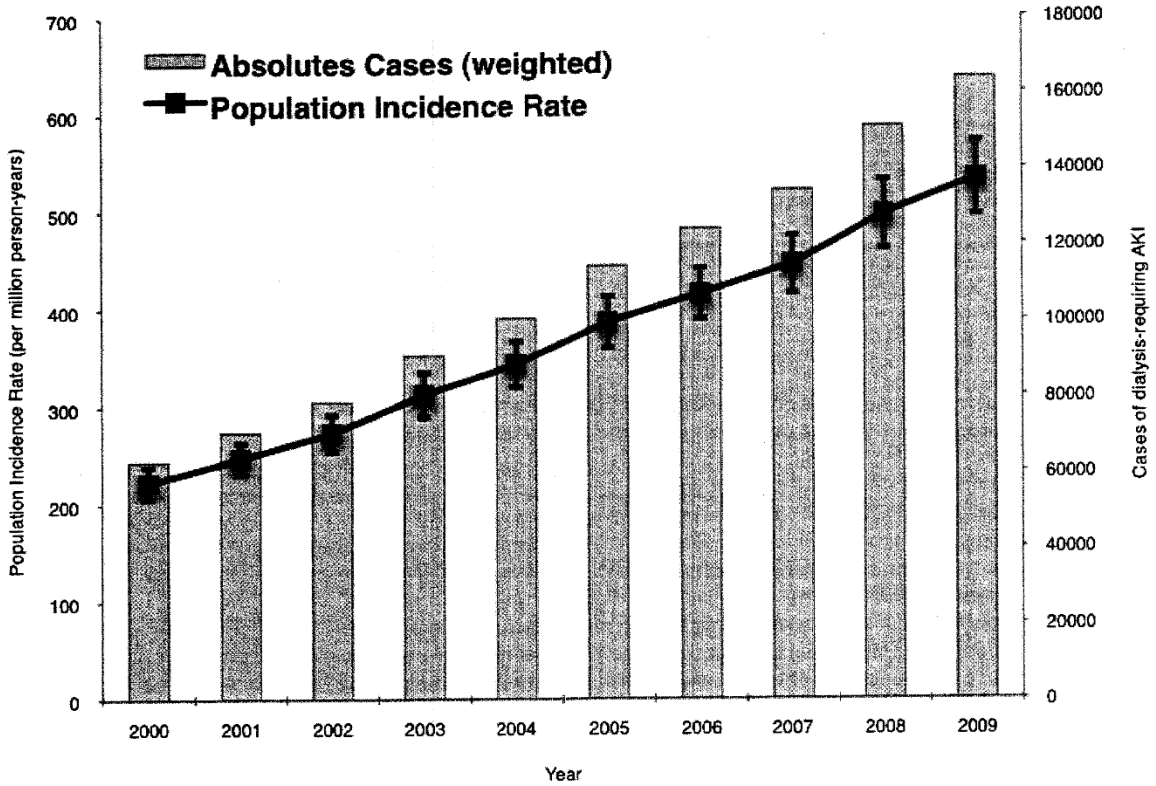
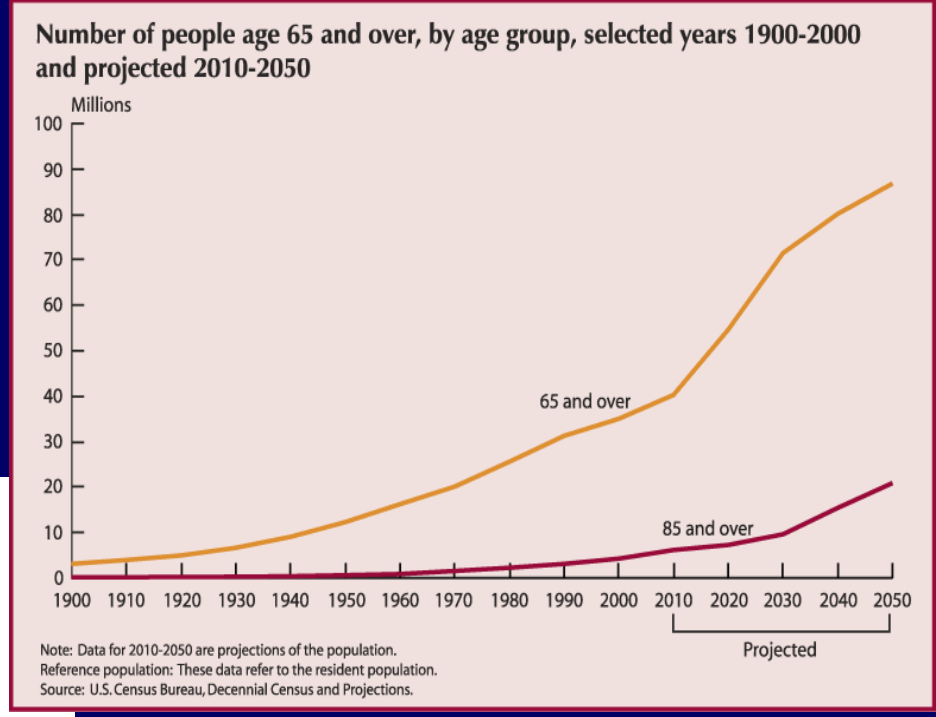


Figure 1. Population incidence of dialysis-requiring AKI in the United States from 2000 to 2009 (absolute count and incidence rate per million person-years). I bars represent 95% CIs for incidence rates. The number of cases of dialysis-requiring AKI increased from 63,000 in 2000 to almost 164,000 in 2009; the population incidence increased at 10% per year from 222 to 533 cases/million person-years.



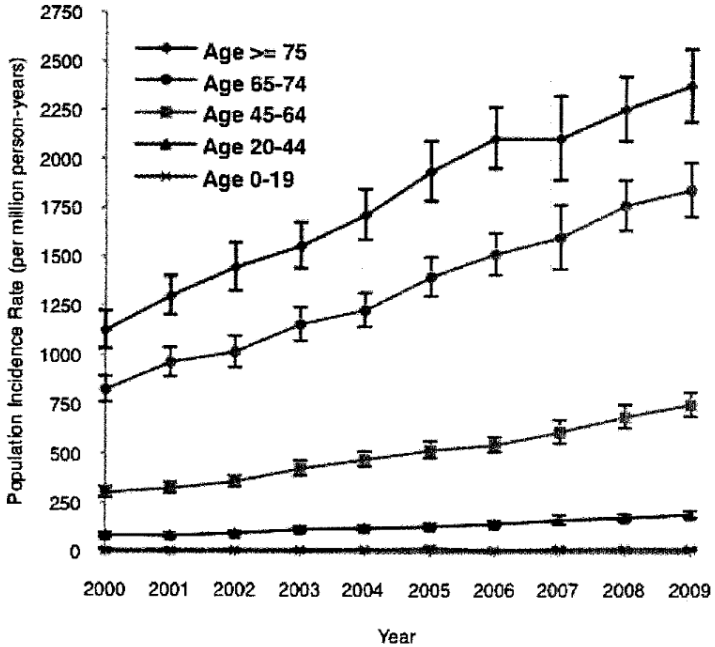
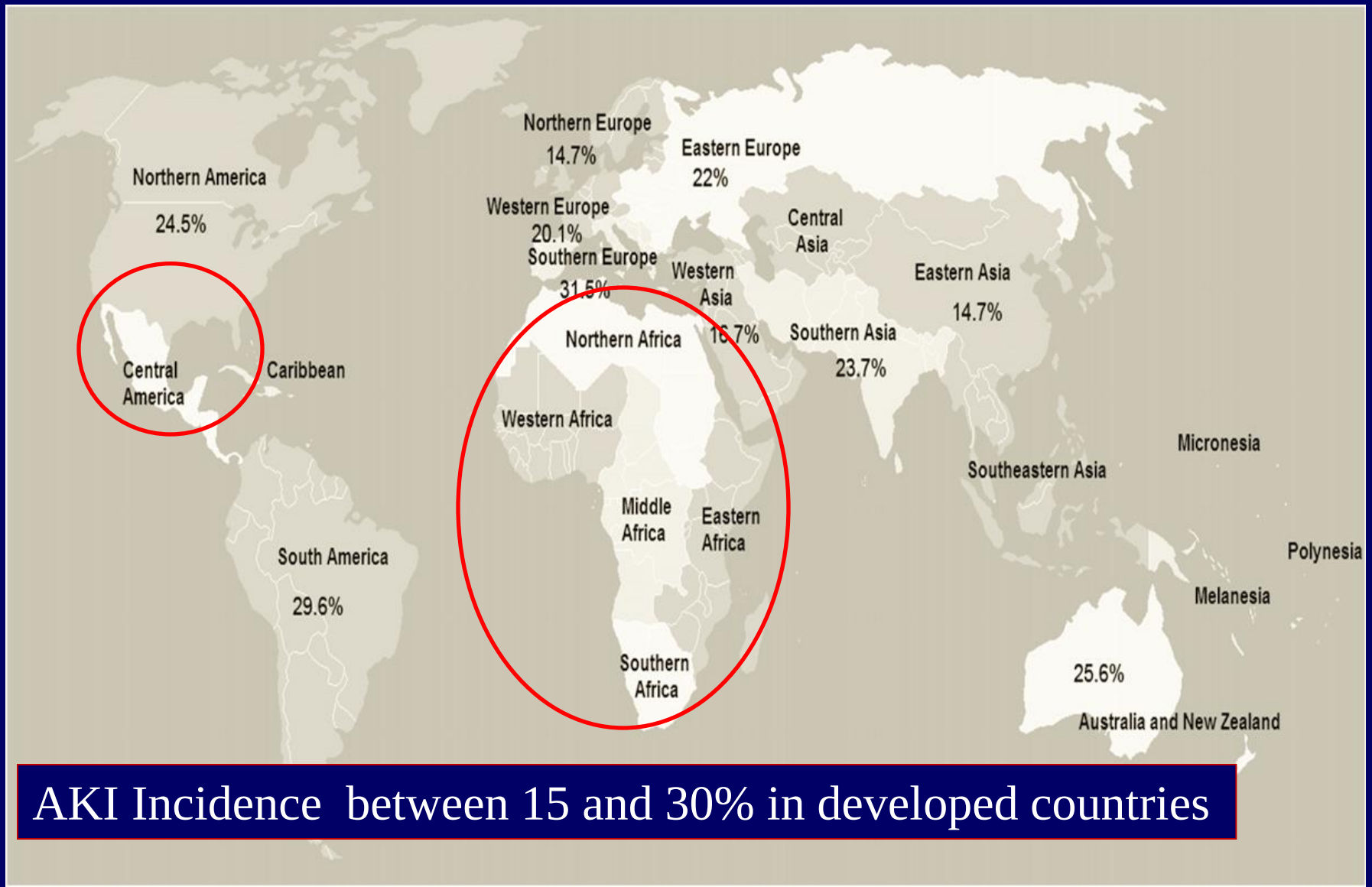


Figure 2. Population incidence of dialysis-requiring AKI in the United States by age groups from 2000 to 2009. I bars represent 95% CIs for incidence rates. All age groups showed a similar pattern of increase in incidence.

Worldwide Incidence of AKI

using K/DIGO creat based definition of AKI

Susantitaphong T et al Clin J Am Soc Nephrol 8: 1482–1493, 2013



AKI Incidence between 15 and 30% in developed countries

ISN “0 by 25”

Proposed by Giuseppe Remuzzi

President, ISN, in Hong Kong, 2013

John Feehally

Coordinator of the Project

ISN "0 by 25" Initiative: *Goals*

<u>Eliminate Preventable Deaths from Acute Kidney Injury (AKI) Worldwide by 2025</u>

- Globally applicable strategies that permit a timely diagnosis of acute kidney injury and provide access to renal replacement therapy for patients with potentially reversible acute kidney diseases.
- Focus on LMIC countries

0 by 25 Recognition and Intervention Study

- Determine barriers for recognition and management of AKI in different settings in resource constrained regions in Africa, Asia and Latin America
- Assess the feasibility of implementing interventions to optimize care of AKI
- Ongoing study: Compare outcomes from AKI with and without interventions

Sites Selected for Intervention Trial

- Malawi
- Tanzania
- Bolivia
- Nepal

Introduce point of care laboratory testing, educational programs, telecommunication, timely transfer of care, hydration, avoidance of nephrotoxins, etc

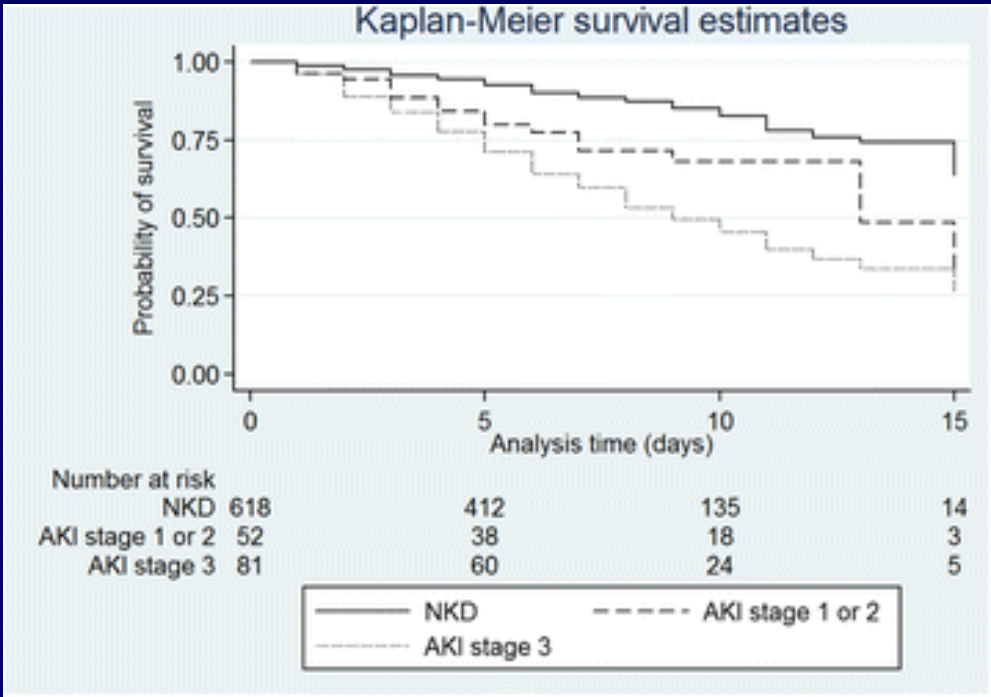
Changes are on the Horizon in Many Low Resource Countries

- The Kenya government has decided to construct dialysis units in each province (n=47)
- An East Africa Renal Institute has been created in Nairobi with funds from the East Africa Development Bank
- The Tanzanian government has decided to pay for dialysis for all government employees
- Projects to manufacture PD solution in Ethiopia and Sudan are under consideration
- Projects to study the incidence of AKI have been done or are ongoing in Uganda, Rwanda, Malawi, Tanzania and elsewhere

AKI in Malawi

Evans et al BMC Nephrol 2017 8:21

892 Admissions
c. 20% with AKI



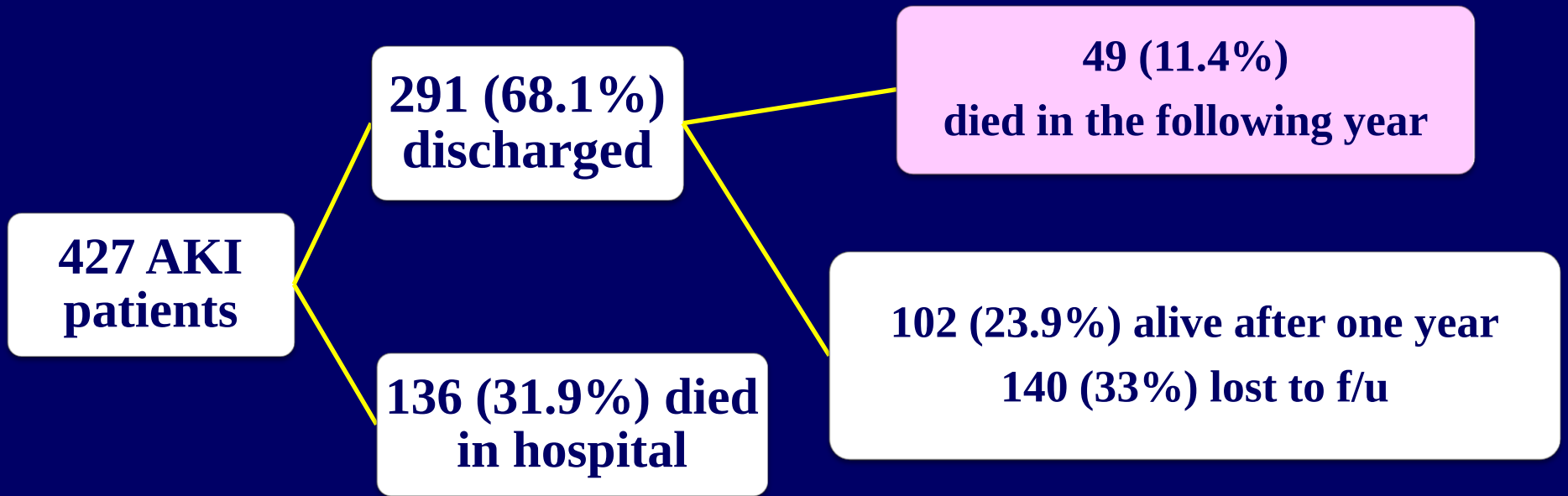
Causes of AKI

- Infections (gastroenteritis (19%), TB (12%), malaria (8%)
- Dehydration-other- (8%)
- CHF (11%)
- Liver failure (5%)

Outcome of AKI Patients in Rwanda

Grace Igiraneza, Joseph Ntarindwa, Marla McNight ASN 2016, WCN 2017

- Estimated the incidence of AKI in the four referral hospitals in Rwanda using the KDIGO definition of AKI
- Patients with AKI had significantly longer hospital stays than those without AKI (17.4 ± 18.7 vs 7.1 days, p<.001)
- Patients with AKI had significantly higher in hospital mortality rate than those without AKI (32% vs 4% p<.001)



Saving Young Lives Project (2012 to now)

- Originally funded with a 5 year grant from the Kaplan Foundation with the ISN, ISPD, IPNA, and EuroPD supporting educational programs and the Sustainable Kidney Care Foundation (SKCF) providing supplies.
- Now it is supported with funds from the ISN, ISPD, IPNA, and EuroPD which are responsible for supporting educational programs in low resource countries to provide PD for patients with AKI

PD and Acute Kidney Injury

- 20+ years ago, PD was the standard treatment of AKI
- This changed with the introduction of the central venous catheter for hemodialysis and the proliferation of extra-corporeal therapies and devices

2002

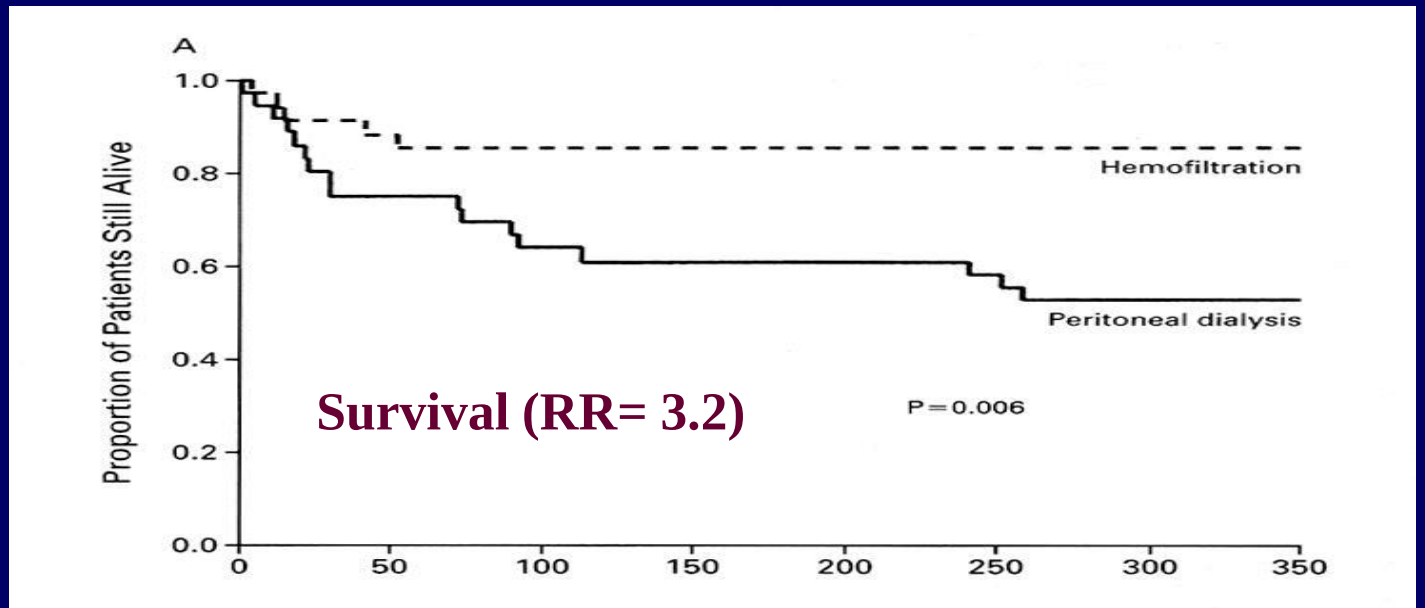
HEMOFILTRATION VERSUS PERITONEAL DIALYSIS IN ACUTE RENAL FAILURE

N Engl J Med 2002;347:895-902

HEMOFILTRATION AND PERITONEAL DIALYSIS IN INFECTION-ASSOCIATED ACUTE RENAL FAILURE IN VIETNAM

NGUYEN HOAN PHU, M.D., TRAN TINH HIEN, M.D., NGUYEN THI HOANG MAI, M.D., TRAN THI HONG CHAU, M.D., LY VAN CHUONG, M.D., PHAM PHU LOC, M.D., CHRISTOPHER WINEARLS, D.PHIL., M.B., JEREMY FARRAR, M.B., D.PHIL., NICHOLAS WHITE, M.D., D.SC., AND NICHOLAS DAY, B.M., B.CH.

- Prospective and randomized study
- 70 patients (PD= 36; HF= 34)
- Protocol was interrupted: mortality rate 47 vs 15%



Kidney International, Vol. 61 (2002), pp. 747–757

2002

Is peritoneal dialysis adequate for hypercatabolic acute renal failure in developing countries?

Vipul Chimanlal Chitalia, Alan Fernandes Almeida, Harinakshi Rai, Mansi Bapat, Kinnari Vipul Chitalia, Vidya N. Acharya, and Ramesh Khanna

Division of Nephrology, Department of Medicine, Renal Laboratory, and Department of Dietetics, Seth G.S. Medical College & King Edward Memorial Hospital, University of Bombay, Mumbai, India; Department of Dietetics, University of New Haven, Yale School of Medicine, New Haven, Connecticut, and Division of Nephrology, Department of Medicine, University of Missouri Health Science Center, Missouri, St. Louis, USA

Both CPD And TPD Are Reasonable Options For Mild-moderate Hypercatabolic AKI

Randomized Trial Comparing Mortality Rates with High Volume PD and Daily HD *Gabriel DP, KI 2008;72:S87-S93*

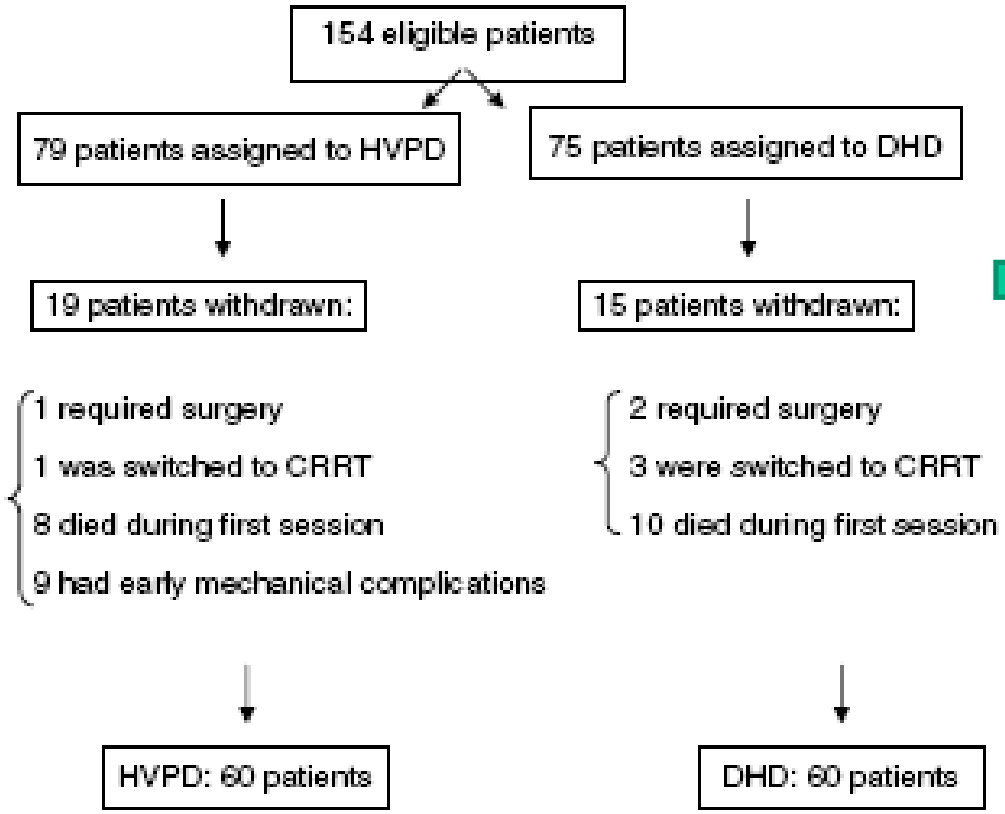


Figure 1 | Patients enrolled in the study, assigned to HVPD or DHD and included in the analysis.

Table 1 | Patient characteristics at enrollment

Characteristics	HVPD (*n*=60)	DHD (*n*=60)	*P*-value
Male	72%	66%	0.52
Age (years)	64.2±19.8	62.5±21.2	0.3
Volemia (l)	34.9±10.1	35.8±9.2	0.81
Oliguria	54%	58.6%	0.73
ATN-ISS	0.69 (0.6–0.78)	0.68 (0.42–0.77)	0.43
ICU	73.3%	81.7%	0.38
APACHE II	26.9±8.9	24.1±8.2	0.13
Mechanical ventilation	68%	75%	0.54
Hemodynamic instability	61%	63%	0.84
Sessions (number)	5.5 (4–5)	7.5 (5–4)	0.022
Pre BUN (mg per 100 ml)	116.4±33.6	112.6±36.8	0.78
Pre creatinine (mg per 100 ml)	5.8±1.9	5.9±1.4	0.71
Cause of AKI (%)			
Sepsis	42	47	0.71
Heart failure	25	22	0.58
Post-surgery	11	16	0.55
Etiology of ATN (%)			
Ischemic	83	78	0.38
Mixed	15	20	0.59
Indication of dialysis (%)			
Uremic symptoms or azotemia	61	63	0.73
Volume overload	19	18	0.81

ATN-ISS, Acute Tubular Necrosis—Index Specific Score; APACHE II, Acute Physiology, Age and Chronic Healthy Evaluation Score; AKI, acute kidney injury; ATN, acute tubular necrosis; DHD, daily hemodialysis; HVPD, high volume PD; ICU, intensive care units; Volemia, volume of body urea distribution in liters by Watson's formula.

Weekly delivered Kt/V was 3.6+/-0.6 in HVPD and 4.7+/-0.6 in DHD

Patient Outcomes

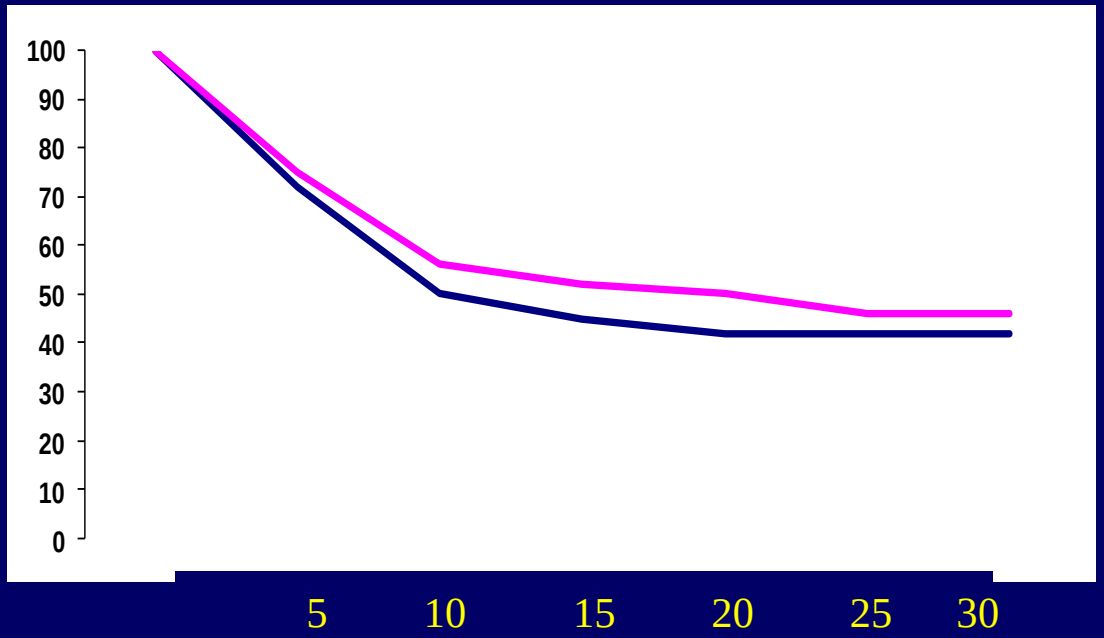


Table 2 | Outcomes according to treatment group

	HVPD (n=60)	DHD (n=60)	P-value
Mortality (%)	58	53	0.71
Recovery of kidney function (%)	83	77	0.84
Duration of treatment (days)	5.5 ± 2.7	7.5 ± 3.1	0.02
Resolution of acute kidney injury (days)	7.2 ± 2.6	10.6 ± 4.7	0.04

DHD, daily hemodialysis; HVPD, high volume peritoneal dialysis.
Recovery and resolution of kidney function of survivors.

Review of Brazilian Experience of PD for AKI

(Ponce D et al: CJASN 7:887, 2012)

- 204 patients with AKI treated with PD
- 54 patients withdrawn within 24 hours (34 died, 20 early mechanical complications)
- Mean age 64 +/- 16 years
- 70% in the ICU
- Prescribed KT/V of 0.6 per day and delivered KT/V of 0.5/day (3.5 +/- 0.7/week)
- 16-22 exchanges/24 hours (32-44 Liters)
- 57% died and 12% developed peritonitis

Chionh et al:
Use of peritoneal dialysis in AKI: a systematic review
CJASN 8:1649, 2013

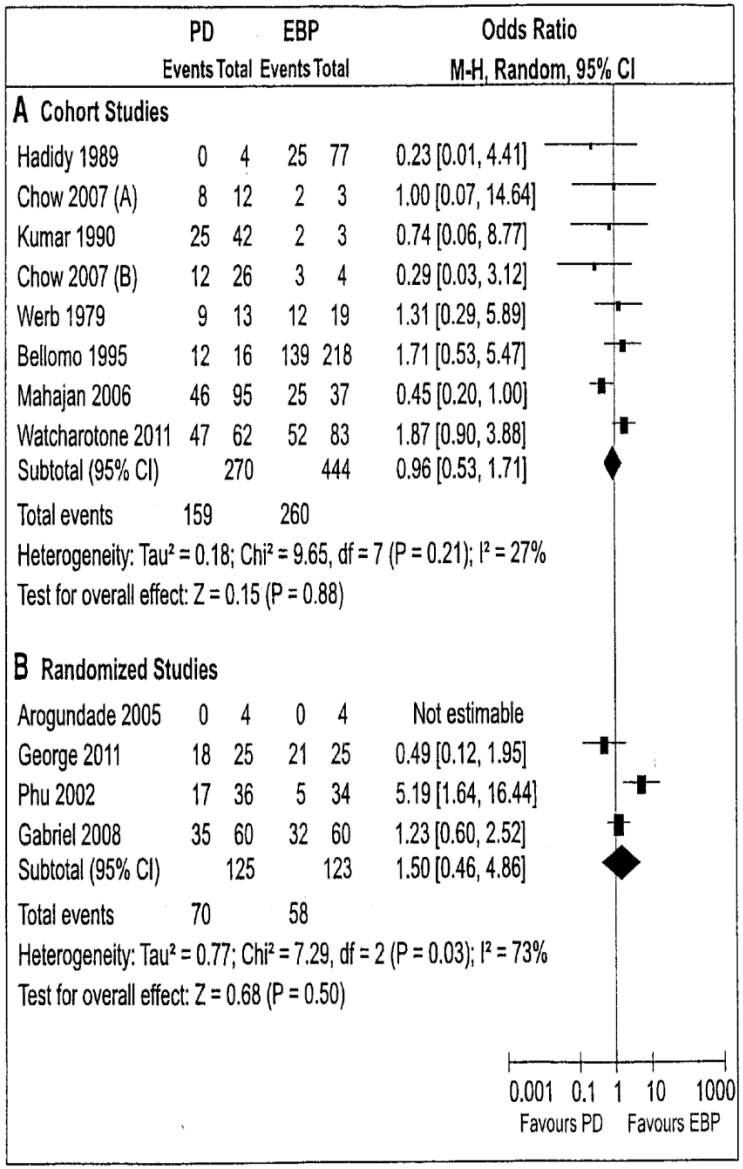


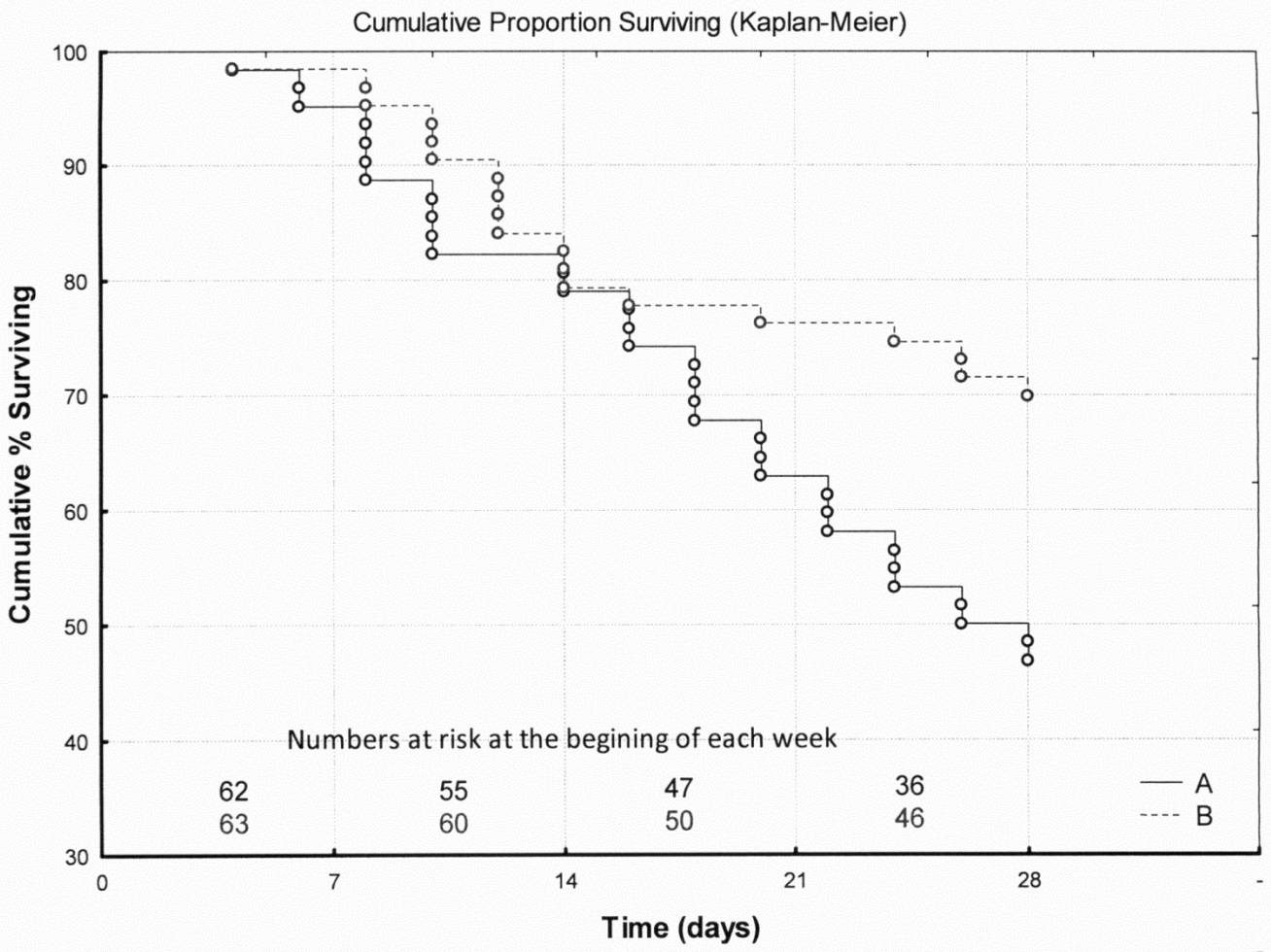
Figure 3. | Effect of renal replacement therapy modality on mortality in patients with AKI grouped by study design. The pooled odds ratio with

Randomized Trial from Saudi Arabia

Abdullah Al-Hwiesh, Ther Apher Dial. 2018, in press

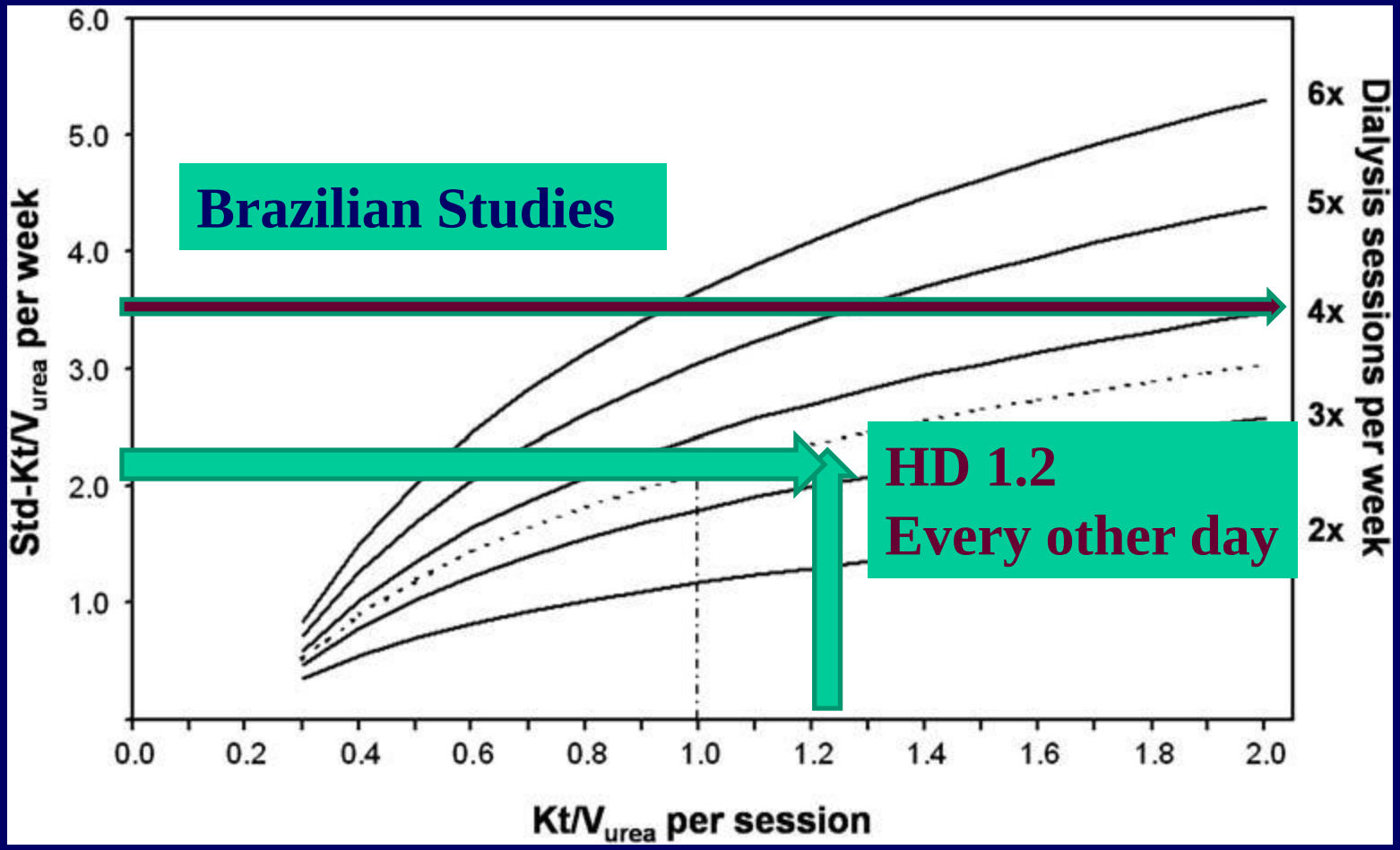
- Compared acute PD with CVVH-D in critically ill patients in Dammam, Saudi Arabia
- Better survival and shorter duration of dialysis in those patients treated with PD
- 75 patients in each group

Figure 3: Survival of patients treated with CVVHDF vs. TPD after 4 weeks of treatment.
Group-A: CVVHDF, Group-B: TPD.



What About the Dose of PD That Provides An Acceptable Level of Care?

Conversion from Intermittent HD to a Standardized KT/V



Acute peritoneal dialysis: what is the 'adequate' dose for acute kidney injury?

Chionh CY, Ronco C, Finkelstein FO, Soni1 SS, Cruz DN NDT 2010 25: 3155

- No data exist on the optimal dose of PD for AKI treatment
- Although the data to support this target are limited, it might be reasonable to suggest a minimum weekly std-Kt/Vurea of 2.1
- A higher clearance should be considered if the patient is markedly catabolic.
- In addition, attention needs to be paid to achieving adequate volume control and middle-molecule clearances.

Randomized Trial from Thailand

Parapiboon et al PDI 2017

- 92 patients randomized to high dose (36 L/day) vs low dose (18 L/day) PD for initial 2 days of therapy
- 75 patients analyzed
- Prescribed Kt/V of 4.3 vs 2.7, but delivered of 3.5 and 2.1
- No difference in outcomes

ISPD Guideline: Peritoneal Dialysis for Acute Kidney Injury, Perit Dial Int 34:494-517, 2014

Brett Cullis [1,2] Mohamed Abdelraheem [3] Georgi Abraham[4] Andre Balbi[5]

Dinna Cruz [6] Yaakov Frishberg [7] Vera Koch [8] Mignon McCulloch [9] Alp Numanoglu [10] Peter Nourse [9] Roberto Pecoits-Filho [11] Daniela Ponce [5] Bradley Warady [12] Karen Yeates [13] Fredric O Finkelstein [14]

- [1] Renal Unit, Greys Hospital, Pietermaritzburg South Africa [2] Renal and Intensive Care Units, Royal Devon and Exeter Hospital, Exeter, United Kingdom [3] Paediatric Nephrology Unit, Soba University Hospital, University of Khartoum, Sudan [4] Pondicherry Institute of Medical Sciences and Madras Medical Mission, Chennai, India [5] Department of Medicine, Botucatu School of Medicine, Sao Paulo, Brazil [6] Division of Nephrology-Hypertension, University of California, San Diego, USA [7] Division of Paediatric Nephrology, Shaare Zedek Medical Center Jerusalem, Israel [8] Paediatric Nephrology Unit-Instituto da Criança of the Hospital das Clinicas of the University of Sao Paulo Medical School, Sao Paulo, Brazil [9] Paediatric Nephrology Department, Red Cross War Memorial Childrens Hospital, University of Cape Town, Cape Town, South Africa [10] Department of Surgery, Red Cross War Memorial Childrens Hospital, University of Cape Town, Cape Town, South Africa [11] School of Medicine
- Pontificia Universidade Catolica do Parana, Curitiba, Brazil [12]Division of Paediatric Nephrology, University of Missouri-Kansas City School of Medicine, Kansas City, USA [13] Division of Nephrology, Queen's University, Kingston, Canada [14] Yale University, New Haven, USA

Adult and Pediatric Guidelines

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1. Peritoneal dialysis should be considered as a suitable method of renal replacement therapy in patients with acute kidney injury [1B]
2. Flexible, tunneled PD catheters are preferred
3. There is no “ideal” method of catheter insertion
4. Dose of PD should be targeted for a weekly KT/V of 2.1– higher if the patient is very catabolic

Sites That Have Developed (n=16)

- Tanzania (Moshi n=26)
- Cameroon (Mbingo n=68)
- Benin (Cotonou n=34)
- Ghana (Kumasi n=116)
- Ghana (Accra n=8)
- Cambodia (Phnom Penh n=3+)
- The Dem Rep of the Congo (Goma n=3+)
- Ivory Coast (Abidjan n=24)
- Tanzania (Dar) n=?100)
- Tanzania (Mwanza ?)
- Ethiopia (Addis: n=12)
- Uganda (Kampala n=1)
- Malawi (Blantyre n=12)
- Nigeria (Lagos n=??)
- Nigeria (Owo, Ondo State n=6+)
- Dem Rep of the Congo (Kinshasha n=??)

Overall Results

- Well over 400 patients with AKI treated with acute PD
- Mortality rate in hospital: 25%
- Mean age 10.1 years (range 1 to 60)
- Mean creatinine at start of dialysis 11.3 mg %
- Mean duration of dialysis: 12.8 days
- 84% used single cuff catheters; 16% double cuffed– all placed by nephrologists (except Cameroon)
- About 85% of patients used commercially prepared solutions

Impact of 0 by 25 and Saving Young Lives

- Increased awareness of the importance of AKI
- Increased awareness of kidney disease in general– not just AKI
- Expansion of nephrology services for AKI, CKD, and ESRD globally
- Expanded training programs for doctors, nurses, and technicians
- Expanded educational programs
- Reevaluation of the role of PD in managing patients with AKI

Advantages of PD

- Avoid problems of hypotension and complications associated with drops in BP
- It provides a continuous therapy
- Metabolic, volume control can be finely tuned

Problems with HD

- Central venous catheters
- Blood exposed to plastic for 12+ hours/week
- Dialysis hypotension
  - --Myocardial stunning
  - --Endotoxemia
  - -- CNS inijury

Why Is PD Not Used More Often in High Resource Countries?

Barriers

- Perception that is not as good as HD or CVVH
- Challenges of catheter placement
- Nursing issues
- Risk of peritonitis
- Metabolic control
- Concern that is may not work well

Solutions

- Not true
- Easy to do; we have trained large #s of non-nephrologists
- Cyclers can be used
- Low with good protocols
- Can use high volume PD with cycler therapy
- The major problem perhaps: but very low risk in patients without abdominal problems or surgery

Are you using PD to treat patients with AKI?