

**OPTIONS FOR RENAL REPLACEMENT  
THERAPY: TYPE OF RENAL FAILURE,  
INDICATIONS AND TREATMENT  
OPTIONS**

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# **RENAL REPLACEMENT THERAPY**

**WHEN CONFRONTED WITH AN INFANT,  
CHILD OR ADOLESCENT REQUIRING  
RRT, WHAT ARE THE MOST  
IMPORTANT FACTORS DETERMINING  
HOW TO PROCEED?**

# RENAL REPLACEMENT THERAPY

- ❖ DOES THE PATIENT HAVE ARI OR CKD?
- ❖ PATIENT AGE?

# RENAL REPLACEMENT THERAPY

**IF ARI, DOES THE PATIENT HAVE:**

- ❖ **PRE-RENAL ARI**
- ❖ **RENAL ARI**
- ❖ **POST-RENAL ARI**

# RENAL REPLACEMENT THERAPY

**IF PRE-RENAL ARI, HAS THE PATIENT  
RECEIVED ADEQUATE FLUID  
RESUSCITATION?**

# **RENAL REPLACEMENT THERAPY**

**IT IS IMPORTANT TO MINIMIZE FLUID  
OVERLOAD WHEN MANAGING  
PATIENTS WITH PRE-RENAL AND  
RENAL ARI IN ORDER TO AVOID THE  
NEED TO UNDERTAKE EMERGENT RRT!**

# RENAL REPLACEMENT THERAPY

**IF RENAL ARI, DOES IT PRIMARILY INVOLVE THE KIDNEY (POST-INFECTIOUS GN, RPGN, HUS, ETC.) OR IS IT PART OF A SYSTEMIC ILLNESS (SEPTIC SHOCK, CARDIAC FAILURE, LIVER FAILURE, ETC.)**

# RENAL REPLACEMENT THERAPY

**IF IT PRIMARILY INVOLVES THE KIDNEY, IS  
A SPECIFIC DIAGNOSIS REQUIRED IN  
ORDER TO INITIATE SPECIFIC  
TREATMENT (IMMUNOSUPPRESSIVE  
TREATMENT, PLASMAPHERESIS, IVIgG  
RITUXIMAB, ETC. ) ?**



# **RENAL REPLACEMENT THERAPY**

**HOW DO YOU DISTINGUISH BETWEEN  
PRE-RENAL AND RENAL ARI?**

# RENAL REPLACEMENT THERAPY

## FRACTIONAL EXCRETION OF SODIUM (FeNa)!

# RENAL REPLACEMENT THERAPY

	NEONATE		OLDER CHILD/ADULT	
	PRE-RENAL	RENAL	PRE-RENAL	RENAL
$FE_{NA}$	< 2.5	> 2.5	< 1	> 1

# **RENAL REPLACEMENT THERAPY**

**IF POST-RENAL, WILL RELIEF OF  
OBSTRUCTION OBVIATE THE NEED FOR  
RRT?**

**ULTRASOUND EVALUATION SHOULD  
ADDRESS THIS ISSUE!**

# **RENAL REPLACEMENT THERAPY**

**WHAT ARE THE INDICATIONS TO INITIATE  
RRT IN INFANTS, CHILDREN AND  
ADOLESCENTS WITH ARI?**

# RENAL REPLACEMENT THERAPY

## INDICATIONS OF RRT IN ARI

- ❖ **BUN EXCEEDING 100 mg/dl AND INCREASING**
- ❖ **CHF WITH OLIGOANURIA UNRESPONSIVE TO DIURETICS**
- ❖ **HYPERTENSIVE ENCEPHALOPATHY**

# RENAL REPLACEMENT THERAPY

## INDICATIONS OF RRT IN ARI

- ❖ **HYPERKALEMIA WITH EKG ABNORMALITIES**
  - **CALCIUM**
  - **GLUCOSE AND INSULIN**
  - **ALBUTEROL**
  - **KAYEXALATE - > 2 HOURS FOR ONSET OF ACTION**
- ❖ **PERSISTENT SEVERE ACIDOSIS**
- ❖ **SEVERE ANEMIA**

# RENAL REPLACEMENT THERAPY

**WHY IS IT IMPORTANT TO  
DISTINGUISH ARI FROM CKD IN  
THE PATIENT REQUIRING RRT?**



# **RENAL REPLACEMENT THERAPY**

**IF ARI, RRT IS TEMPORARY WITH  
POTENTIAL FOR FULL RECOVERY  
OF RENAL FUNCTION;  
IF CKD, RRT WILL LIKELY BE  
PERMANENT UNTIL SUCCESSFUL  
RENAL TRANSPLANTATION IS  
ACHIEVED!**

# **RENAL REPLACEMENT THERAPY**

**WHY IS IT IMPORTANT TO DISTINGUISH  
TEMPORARY FROM PERMANENT ARI?**

# RENAL REPLACEMENT THERAPY

## DISCUSSION WITH FAMILY REGARDING:

- ❖ CONSEQUENCES OF VARIOUS TYPES OF RRT – HEMODIALYSIS/PERITONEAL DIALYSIS:
- ❖ CONSEQUENCES OF TRANSPLANTATION – ESPECIALLY WITH INFANTS (GROWTH AND COGNITIVE DEVELOPMENT):

# **RENAL REPLACEMENT THERAPY**

**THEREFORE, TYPE OF RRT AS WELL AS  
TYPE OF ACCESS FOR RRT WILL BE  
INFLUENCED BY THE ETIOLOGY OF  
RENAL DYSFUNCTION – ARI OR CKD!**

# RENAL REPLACEMENT THERAPY

## TYPES OF RRT

- ❖ **CAVH/CVVH/ WITH D**
- ❖ **PERTIONEAL DIALYSIS**
  - **CONTINUOUS**
  - **INTERMITTENT**
  - **AUTOMATED**
- ❖ **HEMODIALYSIS**
  - **FREQUENCY**
  - **LENGTH OF PROCEDURE**

# RENAL REPLACEMENT THERAPY

## TYPES OF RRT

### ❖ ARI

#### ■ CAVH/CVVH

- FLUID REMOVAL FACILITATES OPTIMAL NUTRITION AND IS CONTINUOUS
- CAN ADD “D” FOR UREA OF ELECTROLYTE REMOVAL

# RENAL REPLACEMENT THERAPY

- ❖ **PD- IF VASCULAR ACCESS IS DIFFICULT OR SIGNIFICANT SOLUTE REMOVAL IS REQUIRED ESPECIALLY IN INFANTS AND SMALL CHILDREN**
- ❖ **HEMODIALYSIS – SCHOOL-AGED CHILDREN AND ADOLESCENTS**

# RENAL REPLACEMENT THERAPY

## ❖ CKD

- PD: IS IDEAL FOR INFANTS, CHILDREN AND ADOLESCENTS ESPECIALLY AUTOMATED PD
- HEMODIALYSIS: IF PD FAILS OR FOR ADOLESCENTS

## ❖ TRANSPLANTATION

- PRE-EMPTIVE
  - SUPERIOR OUTCOME
- LIVE-RELATED DONOR
- LIVE –UNRELATED DONOR
- DECEASED DONOR



# RENAL REPLACEMENT THERAPY

## PERCENT ONE YEAR GRAFT SURVIVAL

	LIVING DONOR	DECEASED DONOR
1987-90	89.4	75.1
1991-94	91.7	85.2
1995-98	94.0	90.7
1999-02	96.0	92.8
2003-10	96.5	95.1





# RENAL REPLACEMENT THERAPY

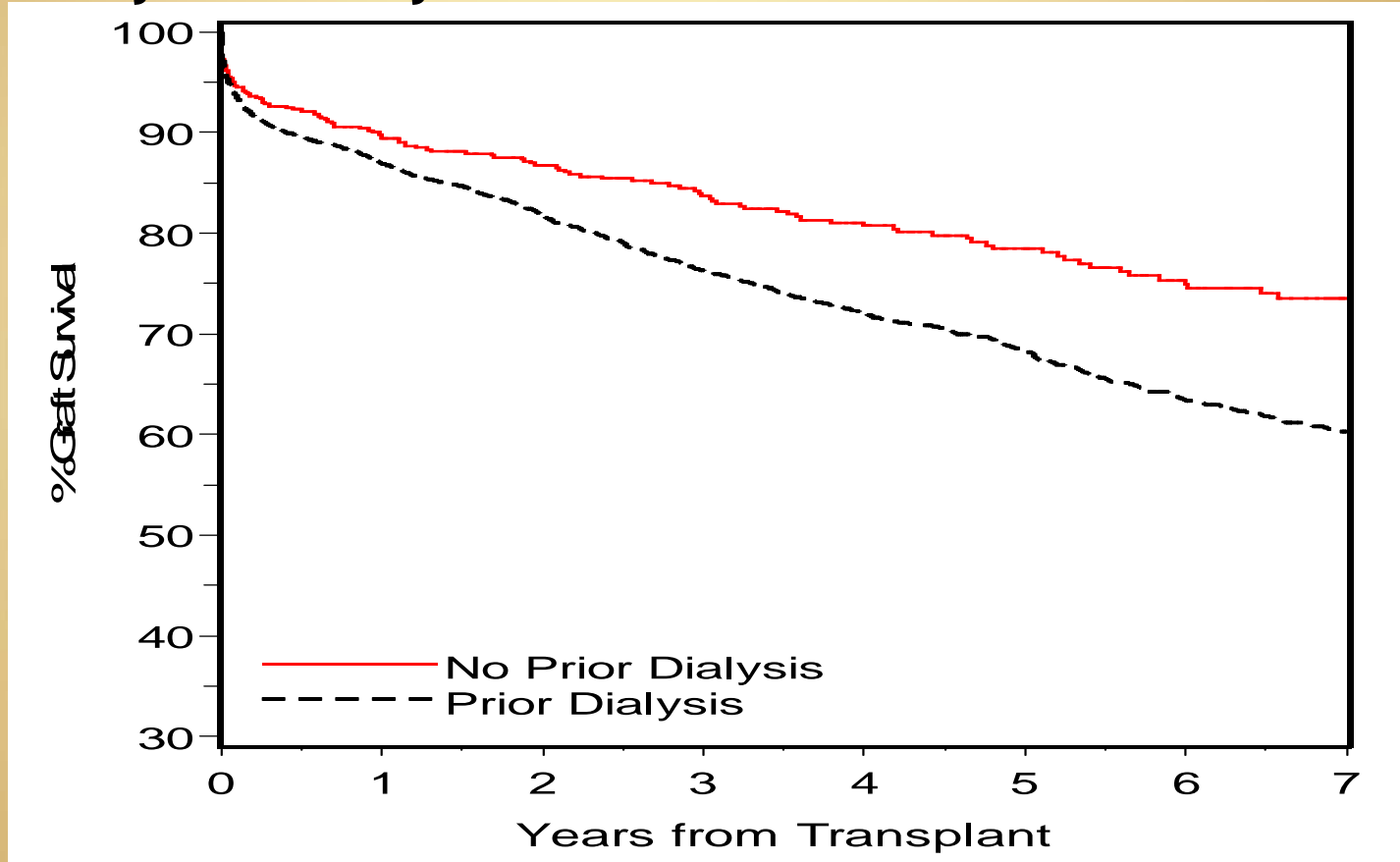
## GRAFT SURVIVAL BY ALLOGRAFT SOURCE AND TRANSPLANT YEAR

	Years Post Transplant							
	Year 1		Year 3		Year 5		Year 7	
	%	SE	%	SE	%	SE	%	SE
Living Donor 1987 - 1995	91.2	0.59	84.6	0.76	78.9	0.89	72.3	1.05
Living Donor 1996 - 2010	95.5	0.37	91.3	0.56	85.7	0.81	80.5	1.13
Deceased Donor 1987 - 1995	80.7	0.81	70.5	0.96	62.4	1.06	56.3	1.15
Deceased Donor 1996 - 2010	93.9	0.50	84.3	0.88	78.4	1.15	67.9	1.71

# RENAL REPLACEMENT THERAPY

## GRAFT SURVIVAL

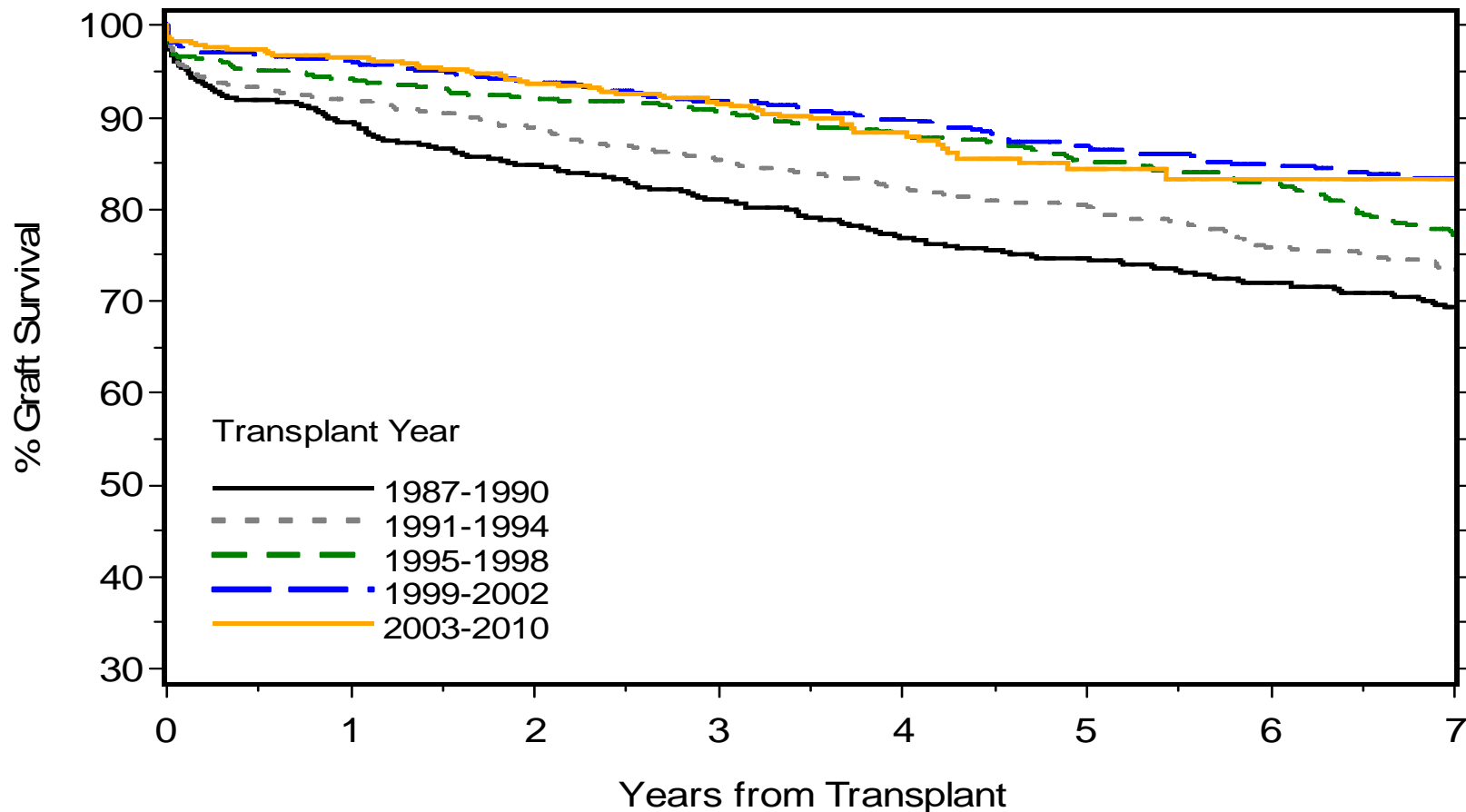
### Dialysis History



# RENAL REPLACEMENT THERAPY

## Graft Survival by Transplant Year

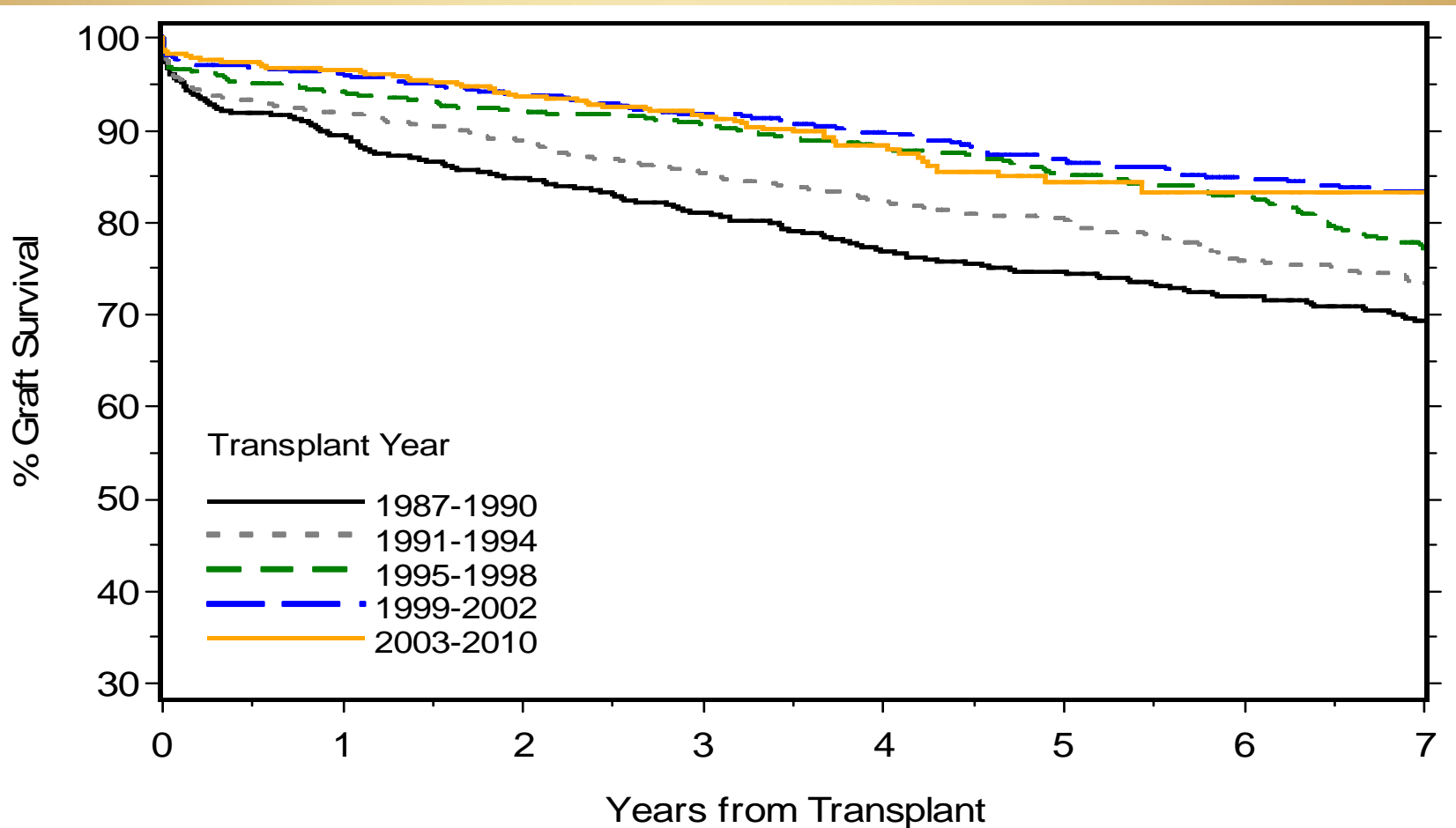
### Living Donor



# RENAL REPLACEMENT THERAPY

## Graft Survival by Transplant Year

Deceased Donor



# RENAL REPLACEMENT THERAPY

## CONCLUSION

- ❖ **WHEN CONFRONTED WITH A PATIENT WHO NEEDS RRT, IT IS IMPERATIVE TO ASSESS WHETHER OR NOT THE PATIENT HAS ARI OR CKD**
- ❖ **IF PATIENT HAS ARI, IS IT DUE TO PRE-RENAL, RENAL, OR POST-RENAL ARI?**

# RENAL REPLACEMENT THERAPY

## CONCLUSION

- ❖ **PRE-RENAL ARI CAN BE DISTINGUISHED FROM RENAL ARI WITH THE USE OF FRACTIONAL EXCRETION OF SODIUM (FeNa)**
- ❖ **IF PATIENT HAS PRE-RENAL ARI, MAKE SURE THAT ADEQUATE FLUID RESUSCITATION HAS OCCURRED**

# RENAL REPLACEMENT THERAPY

## CONCLUSION

- ❖ IN PATIENTS WITH PRE-RENAL AND RENAL ARI, MINIMIZE FLUID OVERLOAD IN ORDER TO AVOID EMERGENT RRT
- ❖ IF RENAL ARI INVOLVES PRIMARILY THE KIDNEY, IS A SPECIFIC DIAGNOSIS REQUIRED (RENAL BIOPSY) IN ORDER TO INITIATE SPECIFIC TREATMENT?
- ❖ TYPE OF RRT CHOSEN WILL BE DEPENDENT UPON PRESENCE OF ARI OR CKD