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Transplant Epidemiology

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Fall 2008



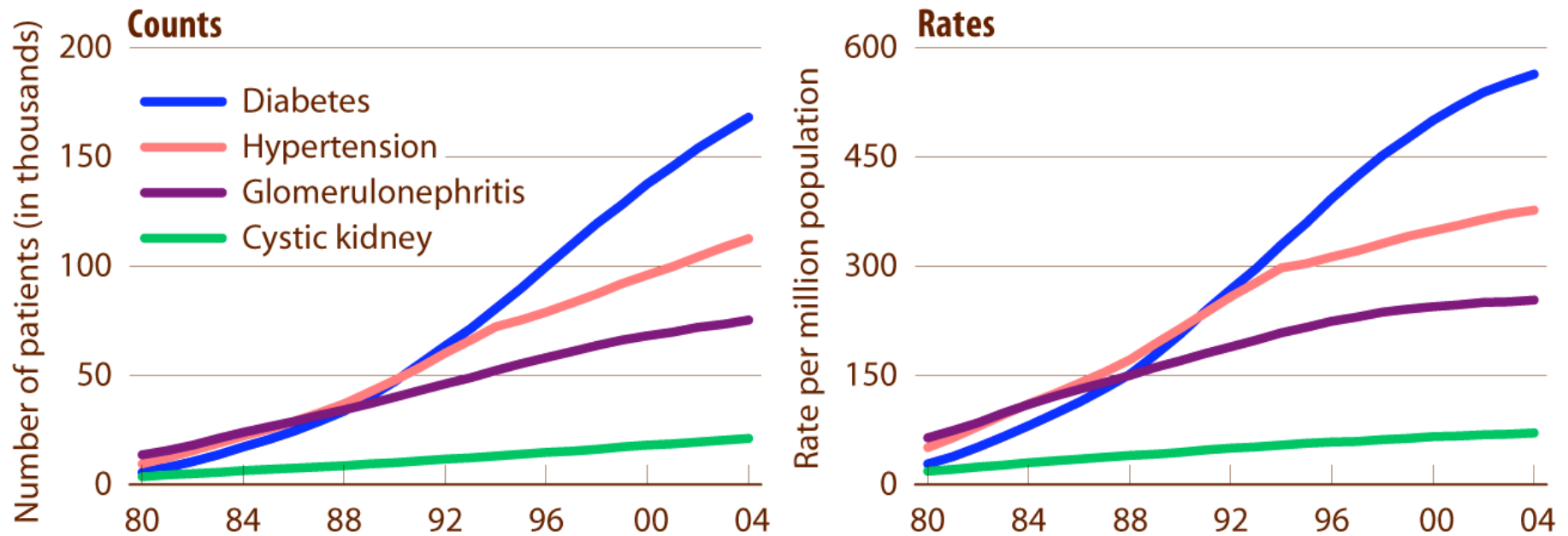
Learning Objectives

- To understand kidney transplantation as superior to other forms of renal replacement therapy (RRT)
- To understand the advantages of living kidney donation
- To understand kidney transplantation as cost-effective over dialysis

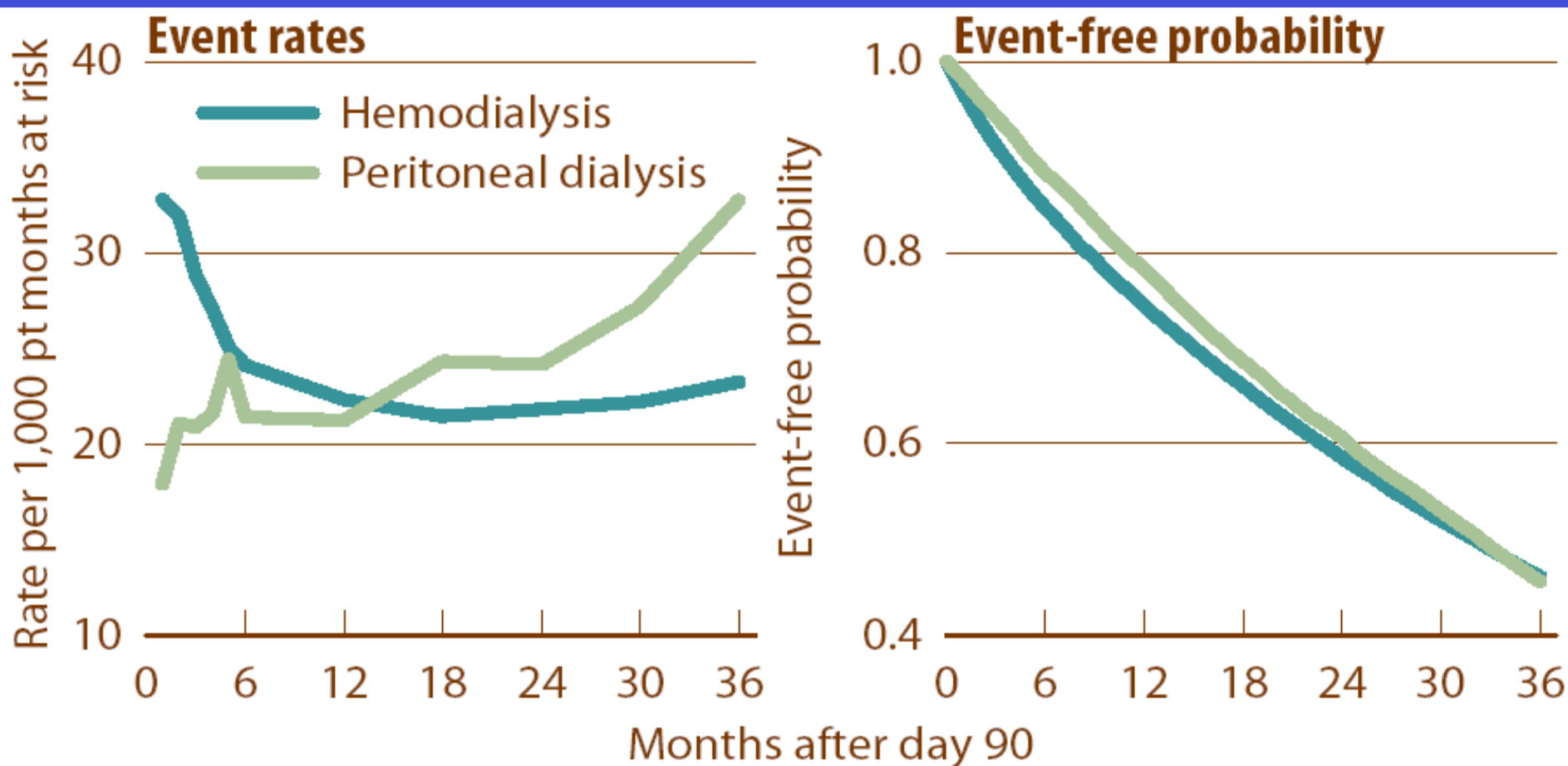
Introduction

- Over 100,000 individuals in the U.S. develop end-stage kidney disease (ESRD) every year
- In the U.S., Diabetes (DM) and Hypertension (HTN) are most common causes of ESRD
- The prevalence of both DM and HTN are increasing leading to an epidemic of ESRD
- Kidney transplantation is a form of RRT that improves survival and quality of life in the ESRD population

Prevalent Counts and Rates of ESRD in the U.S.



Risk for All-Cause Death in ESRD by Modality



Transplant Demographics

- ~70,000 patients on deceased donor waiting list. They are disproportionately African-American, Hispanic and female
- ~25,000 added yearly
- ~3,500 die on waiting list annually without getting a transplant offer
- ~1,000 annually are removed from list b/c they are too sick to transplant
- ~9000 patients transplanted from list annually

Sources of Donors

- Living Donors:
 - Living Related (LRD)
 - Living Unrelated (LURD)
- Deceased Donors:
 - Standard Criteria (SCD)
 - Extended Criteria (ECD)
 - Deceased Cardiac Death (DCD)

Living Donor Selection

- Selection bias towards protecting donor candidate
- Living donors must be altruistic and be healthy
- Living donor contraindications:
 - Diabetes Mellitus (Type 1, Type 2 or gestational*)
 - Hypertension (BP > 140/90)
 - Active malignancies, infections or substance abuse
 - Donor age < 18 or > 60

*Can make exception if gestational DM long ago and candidate is not currently diabetic

Advantages of Living vs. Deceased Donor Transplantation

- Pre-emptive transplantation
- Less rejection
- Better graft function
- Longer graft survival

Deceased Donors

Standard Criteria Donor (SCD)

- Age < 60
- No known kidney or vascular disease
- Brain Death – due to trauma, anoxia, stroke
- Diagnosis:
 - Unresponsive
 - Apneic
 - EEG or blow flow study

Deceased Donors Extended Criteria Donors (ECD)

- All donors age ≥ 60 regardless of co-morbidities
- Donors between the ages of 50-59 who have at least 2 of the 3 following criteria:
 - Stroke
 - Hypertension
 - Serum creatinine >1.5
- Generally still brain dead donors

Deceased Donors

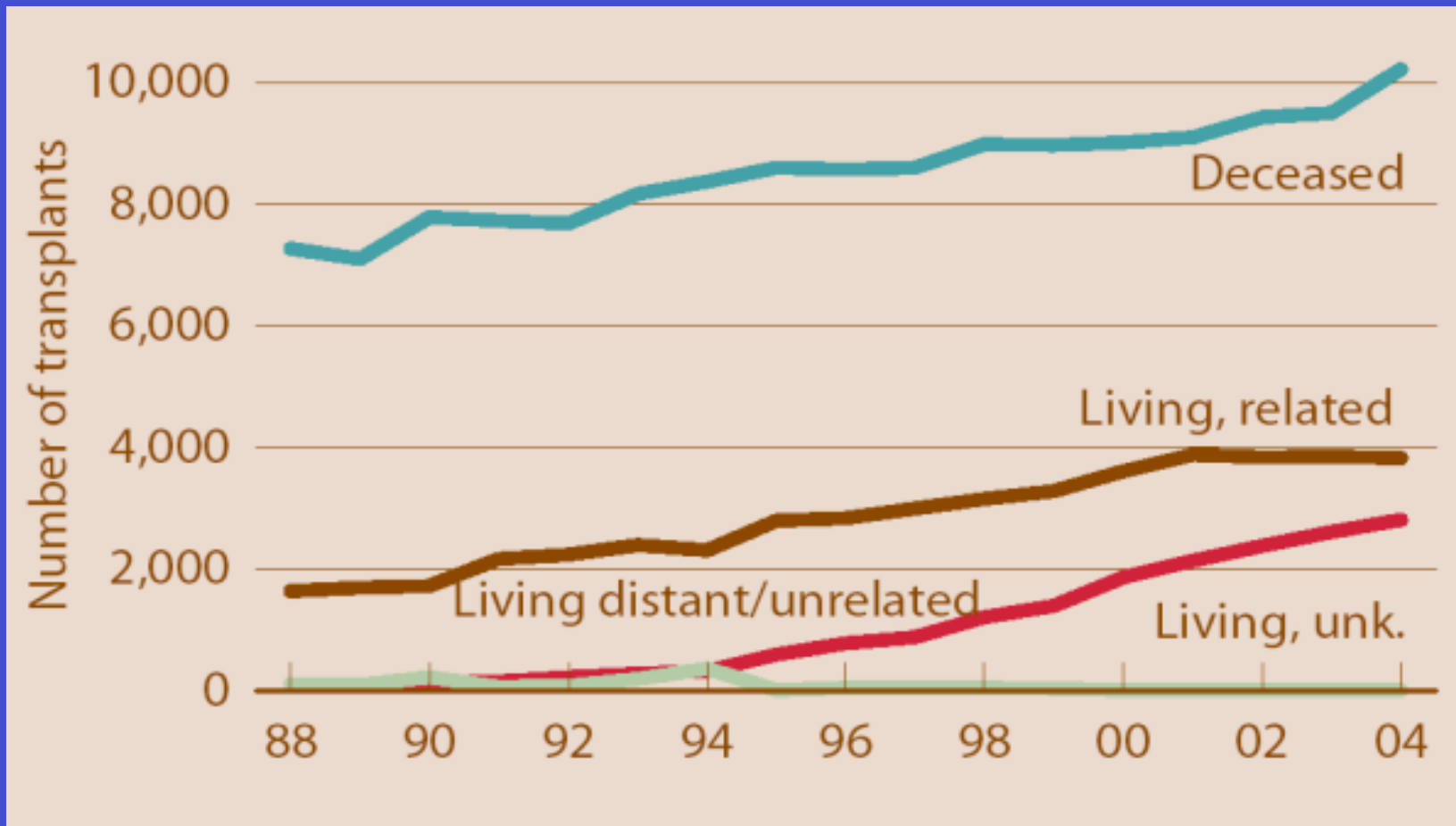
Deceased Cardiac Death (DCD)

- Cardiac death (on life support), but not brain dead
 - No chance of recovery
 - Family decides to withdrawal life support
 - Physician caring for patient declares them dead
 - Wait 5 minutes and proceed with donation

Deceased Donor Kidney Allocation

- Waiting time
 - From time of acceptance at a transplant center
- Matching
- Panel Reactive Antibodies > 80%
- Pediatric candidate
- Prior living kidney donor

Number of Transplants/Year by Donor Type



Recipient Selection

- Selection criteria
 - Bias toward offering transplant when possible
 - Standard of care for all causes of ESRD
- Contraindications
 - Severe coronary artery disease not amenable to intervention
 - Severe peripheral vascular occlusive disease
 - Severe pulmonary disease
 - Active malignancies or infections
 - Non-adherence to medical regimen
 - Severe obesity or malnutrition

Advantages of Kidney Transplantation

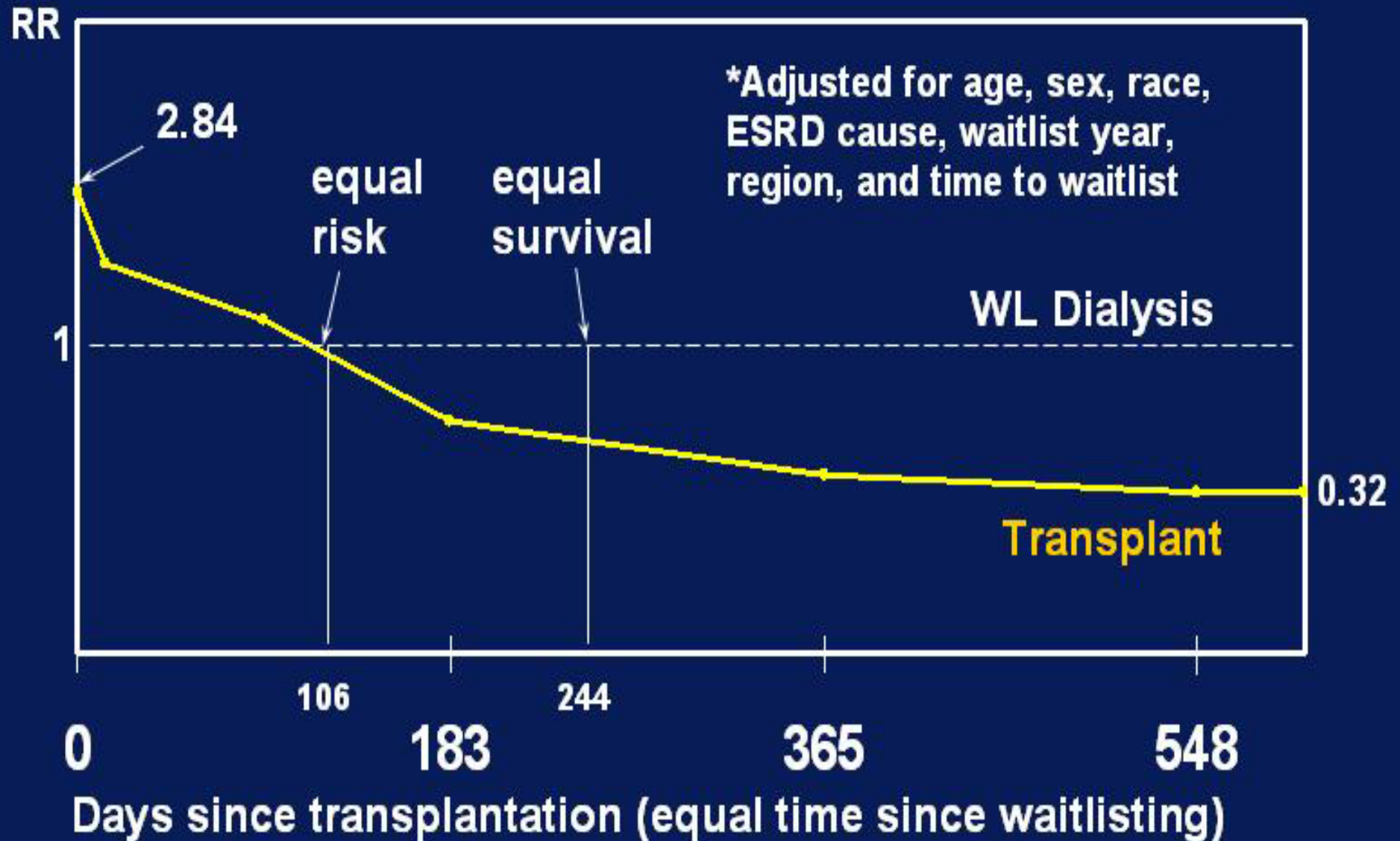
- Improved patient survival
- Improved quality of life
- Cost effective

Outcomes of Kidney Transplantation

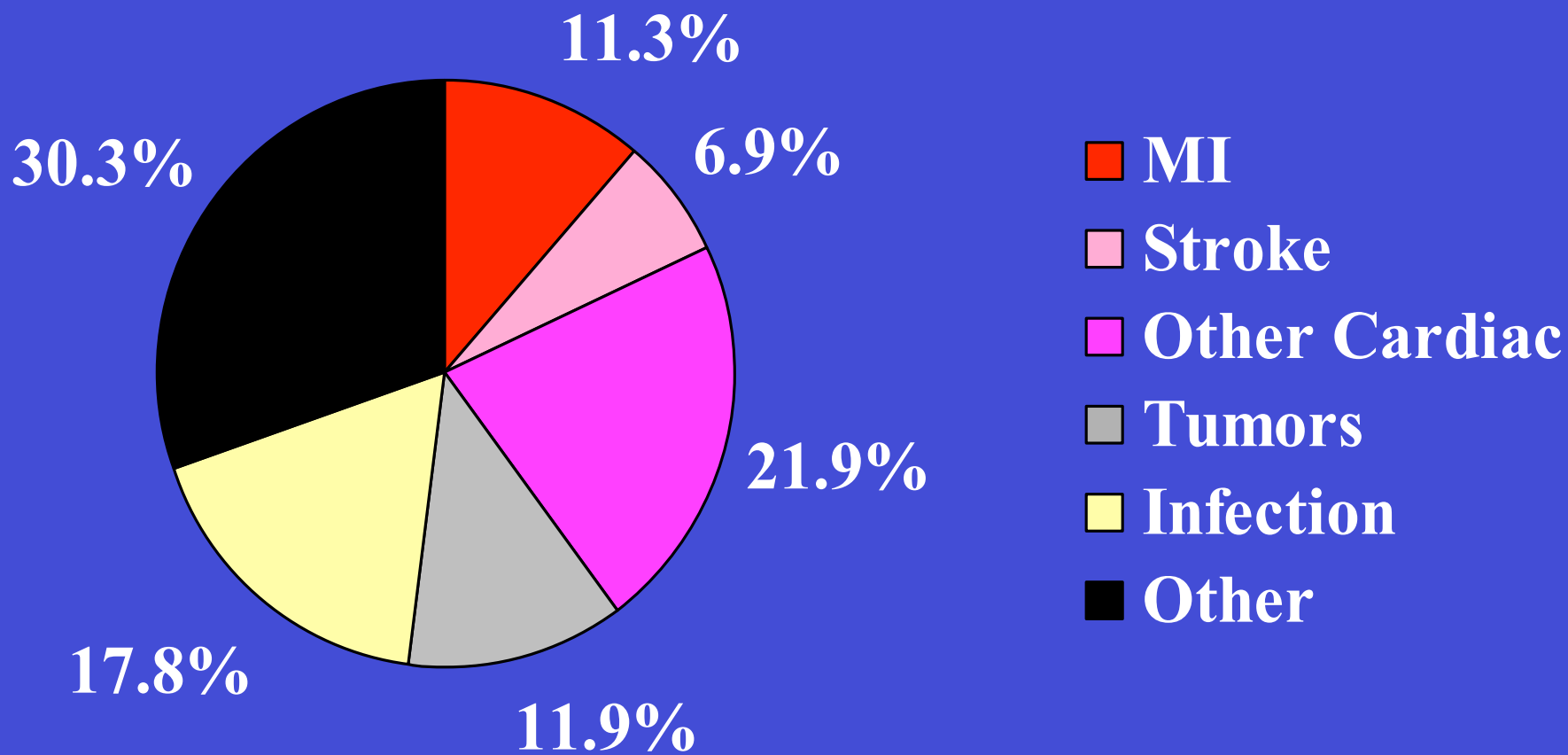
- One year patient survival > 95%
- One year living donor graft survival about 95%
- One year deceased donor graft survival 85-90%
- Transplant half-lives (years)
 - Living: ~20yrs
 - Deceased: ~10yrs

Survival With Different Forms of RRT

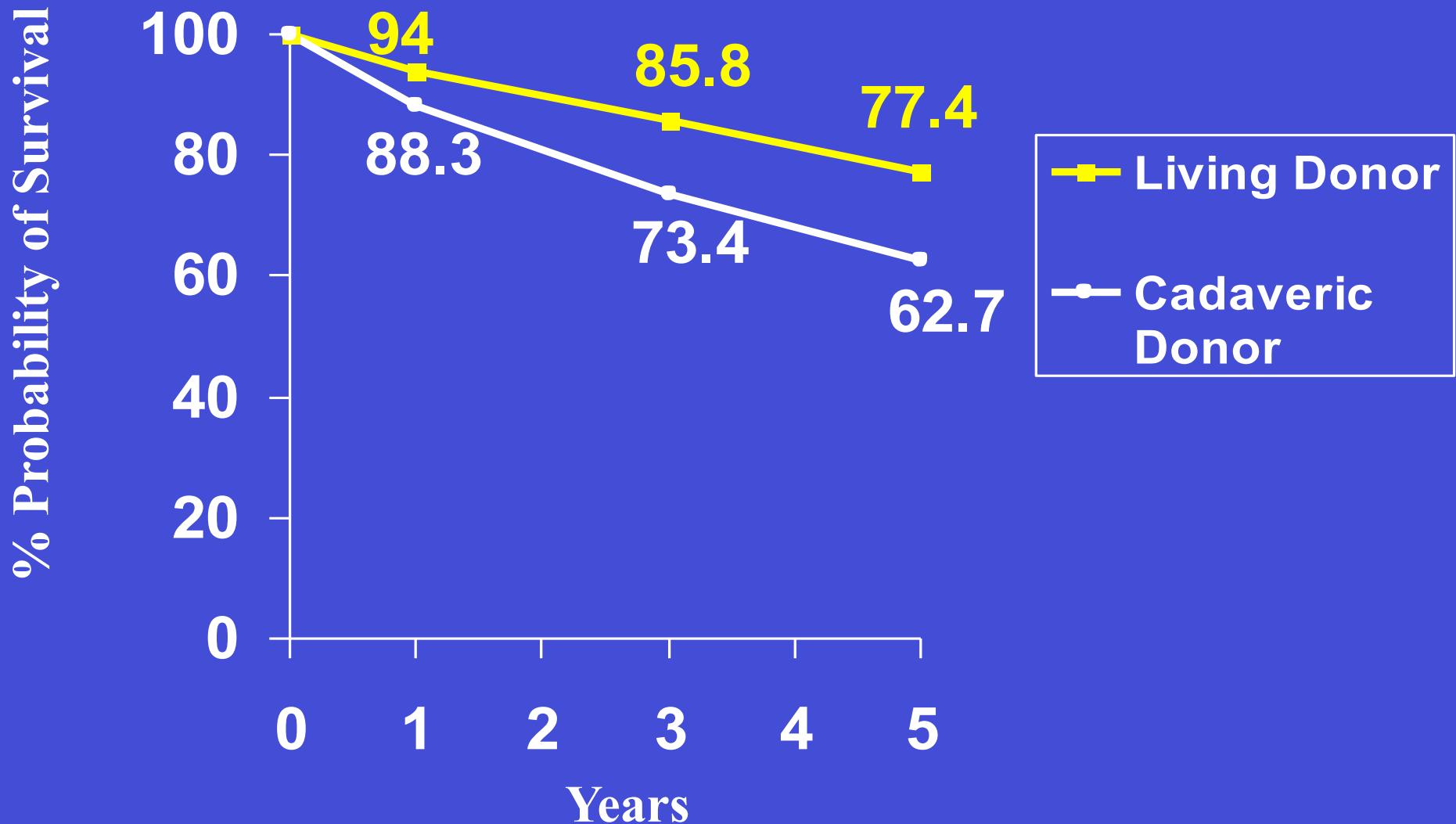
Survival After Kidney Transplant



Causes of Death After Kidney Transplant

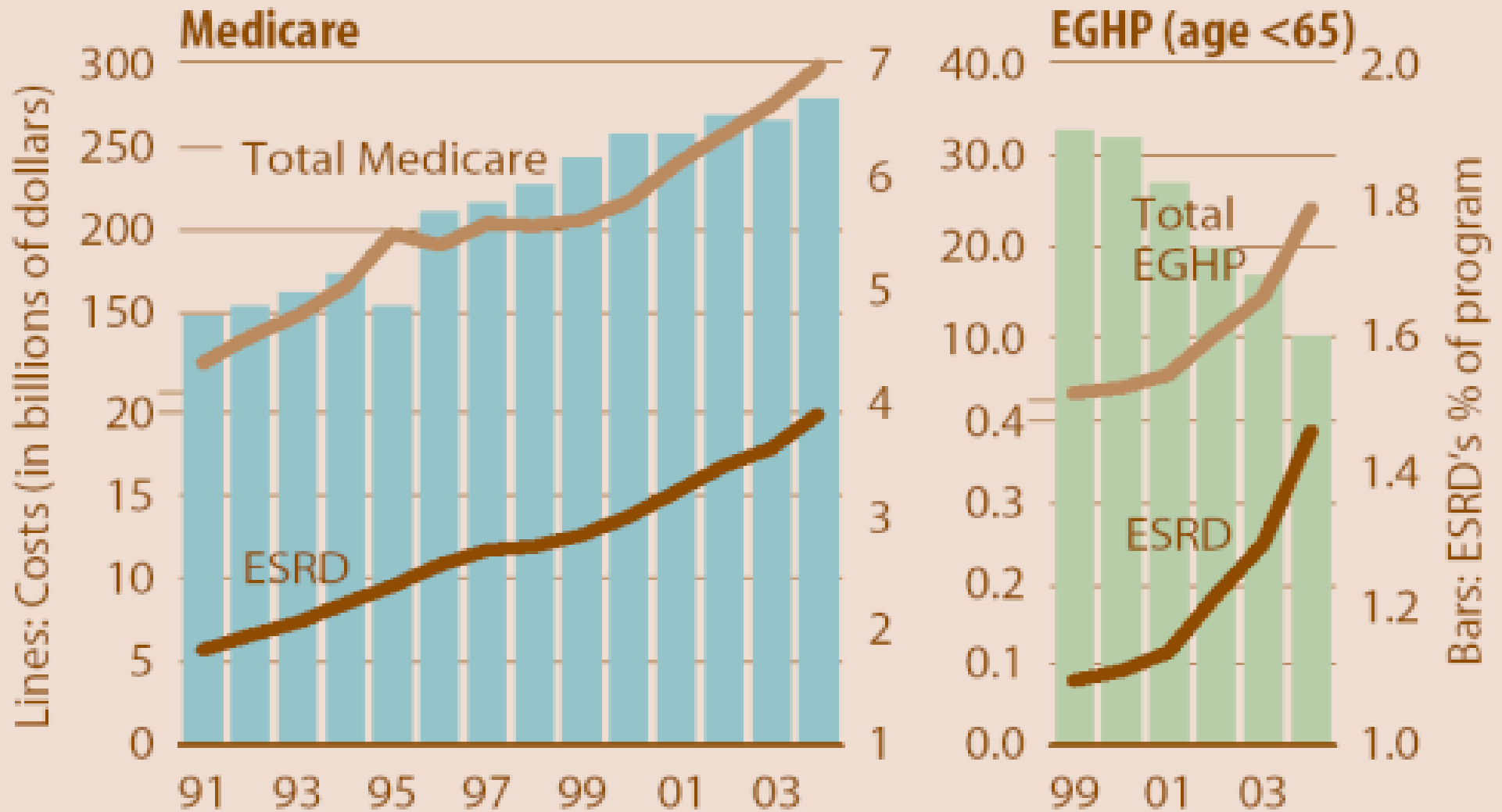


Renal Allograft Survival by Donor Type

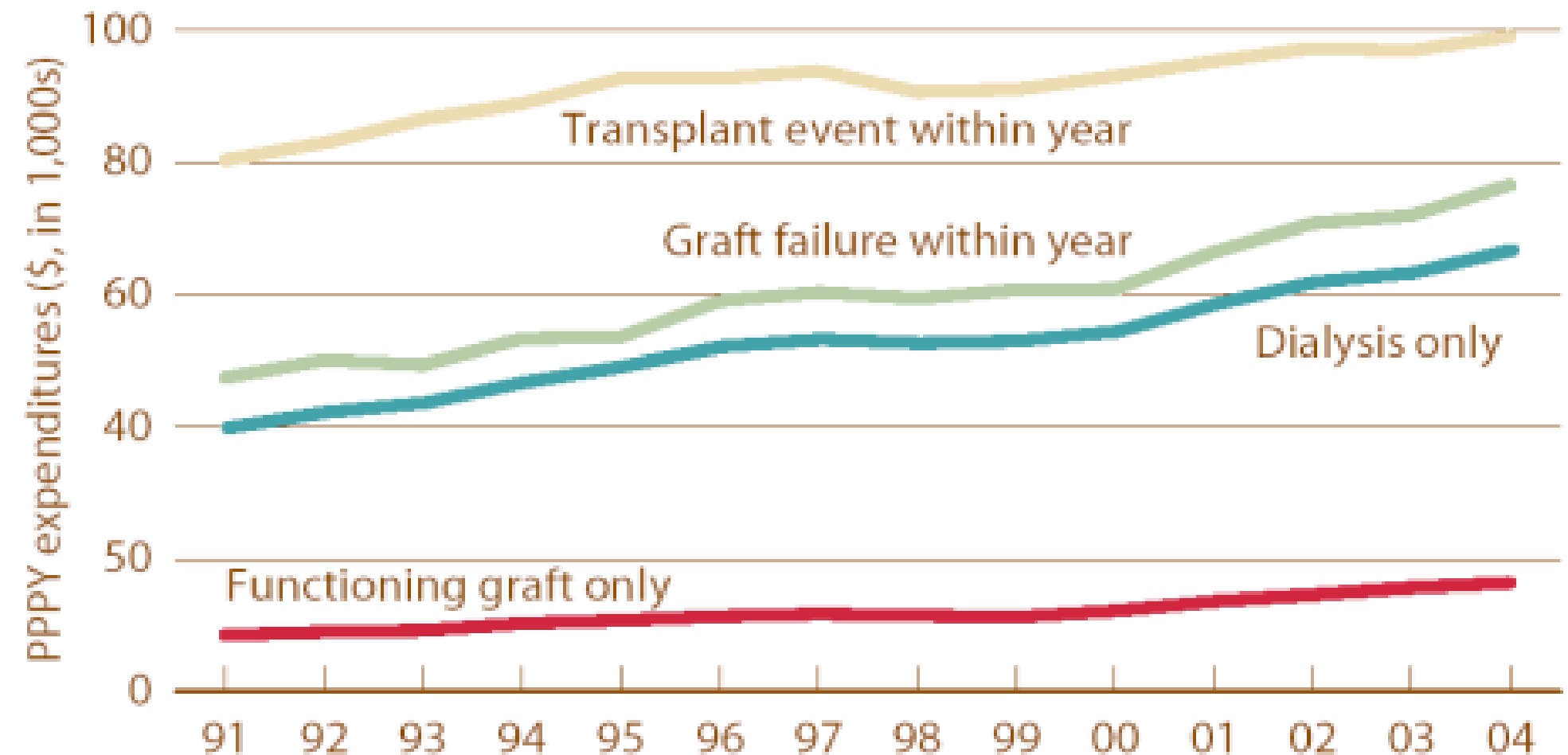


Annual Cost of ESRD to Medicare

Annual Cost of ESRD



Annual Cost of RRT by Modality



Disadvantages of Kidney Transplantation

- Organ shortage leads to long wait times on the deceased donor list
- Morbidity associated with operation
- Negative effects of Immunosuppression
 - Cardiovascular disease
 - Infection
 - Malignancy
 - Bone disease

Pancreas Transplantation

- 10% of kidney transplant recipients
- Indications
 - ESRD from type 1 diabetes mellitus
 - Hypoglycemic unawareness
- Types
 - Simultaneous kidney and pancreas (SPK)
 - Living kidney followed by pancreas (PAK)
 - Pancreas transplant alone (PTA)

Risk and Benefits of Pancreas Transplantation

- Risks
 - Increased risk of surgical complications
 - Increased incidence of infection
 - Potential for pancreas allograft rejection and pancreatitis
- Benefits
 - Protection from hypoglycemia
 - Freedom from insulin, diabetic diet, glucose monitoring
 - Stabilization of retinopathy, neuropathy
 - Reduced future diabetic nephrosclerosis
 - Improved survival?

Results of Pancreas Transplantation

- One-year patient survival > 95%
- One-year pancreas transplant survival
 - SPK 90%
 - PAK 76%
 - PTA 72%
- One-year kidney graft survival with SPK 91%
- Ten-year SPK patient survival 67%

Additional Source Information

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Slide 6: U.S. Renal Data System, ADR 2005, <http://www.usrds.org/>

Slide 7: U.S. Renal Data System, ADR 2005, <http://www.usrds.org/>

Slide 16: U.S. Renal Data System, ADR 2005, <http://www.usrds.org/>

Slide 21: NEJM, 1999

Slide 22: U.S. Renal Data System, <http://www.usrds.org/>

Slide 23: 1999 UNOS Annual Report

Slide 25: Source Undetermined

Slide 26: Source Undetermined