KIDNEY TRANSPLANT
Nursing education

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Lutheran Hospital Kidney Transplant Program

Objectives
- Discuss End Stage Renal Disease (ESRD) and treatment options
- Brief history of kidney transplantation
- Discuss the indications and selection criteria for kidney transplantation
- Evaluation, workup, listing, waiting on the list, surgery
- Share the first three year results and future plans of Lutheran kidney transplant program

Main functions of the kidneys
a) To filter the blood and remove extra fluid and normal waste products
b) Balance levels of chemicals and salt in the body
c) Assist in the control of blood pressure
d) Produce hormones necessary for bone health and production of red blood cells
ESRD (End Stage Renal Disease)

- Chronic progressive loss of kidney function resulting in azotemia (high BUN/Cr) and uremic symptoms, fluid overload, hypertension, hyperkalemia, metabolic acidosis, anemia, renal osteodystrophy.

Diseases leading to ESRD

- Congenital Disorders
  - Aplasia
  - Hypoplasia
  - Horseshoe kidney
- Metabolic Disorders
  - Hyperoxaluria
  - Nephrocalcinosis
  - Gout
  - Oxalosis
  - Amyloidosis
  - Cystinosis
- Hereditary Nephropathies
  - Alport’s syndrome
  - Polycystic Kidney Disease
  - Medullary Cystic Disease
- Renal Vascular Disease
  - Renal artery occlusion
  - Renal vein thrombosis
- Irreversible Acute Renal Failure
  - Cortical Necrosis
  - Hemolytic Uremic Syndrome
  - Acute and subacute GN
  - Henoch-Schonlein purpura
  - Acute Tubular Necrosis
- Irreversible Chronic Renal Failure
  - Chronic Pyelonephritis
  - Chronic Glomerulonephritis
  - Diabetic Nephropathy
  - Goodpasture’s syndrome
  - Hypertensive nephrosclerosis

Toxic Nephropathies

- Lead nephropathy
- Analgesic nephropathy
- Obstructive Uropathy
  - Acquired
  - Congenital
- Tumors requiring nephrectomy
  - Renal Carcinoma
  - Wilms’ Tumor
  - Tuberous sclerosis

Other

- Multiple myeloma
- Macroglobulinemia
- Wegener’s disease
- Scleroderma
- Lupus erythematosus
- Polyarteritis Nodosa (PAN)
Prevalence of CKD

- Predicted that 20 million have risk factors for CKD in USA
- Another 20 million (1 in 9) have CKD-diagnosed
- > 500,000 people with ESRD (end stage kidney disease: on dialysis or kidney transplant)
ESRD (End Stage Renal Disease)

- Ultimately fatal in all cases unless treated with dialysis (HD=hemodialysis or PD=peritoneal dialysis) or renal transplantation.
Peritoneal Dialysis

- Currently >500,000 dialysis patients
- More than 120,000 new patients/yr.
- Total cost of ESRD = 35 billion/yr. (70% Medicare)
  HD = $75,000 per year
  PD = $55,000 per year
  Average 18 days of hospitalization per year per patient
- First year mortality of HD is 21.7%
- 3 year survival for DM on HD 35%

Dialysis vs. Transplantation

Projected Years of Life

P<0.001
Opening Day Lecture to Entering Students,
Harvard Medical School, Class of 1961

“Gentlemen:
Half of what we are going to teach you is wrong, and half of it is right.
Our problem is that we don’t know which half is which”

George Packer Berry, MD
Dean of Harvard Medical School
September, 1957

Unknown Medical Science
- DNA structure
- Cell biology
- Immune system
- Molecular biology
- Molecular genetics
- Pharmacodynamics

Unavailable Clinical Technology
- Body Imaging (CT, MRI, US)
- Monitoring equipment
- Drug levels
- Immunosuppressive drugs
- Cardiac Surgery (valve, CABG)
- Transplantation

First Kidney Transplant (1954)

Between identical twins by Dr. Joseph Murray (recipient lived 8 years)
Donor & Recipient (after transplant)

First kidney transplant (1954)

Dialysis machine

Herrick Brothers and their surgeons

Nobel Prize for Medicine 1990
Donor & Surgeon (50 years later)

Donor lived 56 years after giving a kidney

Alonzo Mourning (NBA)
Sean Elliott (NBA)
Ivan Klasnic (Soccer)
Jonah Lomu (Rugby)
George Lopez (Comedian)

Denise Lombard of Washington, DC received her father's kidney on 8/30/1967. At age 13 and she is still alive and healthy after 44 years.

When compared with chronic dialysis treatments, renal transplant patients have improved survival, better quality of life, and an enhanced body image and sense of health.

Typical patient will live 10 to 15 years longer with a kidney transplant than if kept on dialysis.

Successful transplantation is significantly less expensive than any form of dialysis. Average cost $10,000 vs. $75,000

The biggest challenge facing the field of renal transplant is the imbalance between the number of suitable recipients and the nearly stagnant number of deceased donor organs. Living organ donation has increased the total number of available organs but disparity between donors and recipients continue to increase at an alarming rate.
Estimate of costs of therapy

Waitlist and Transplant Activity for Kidneys, 2000-2009

THAT FANTASTIC BODY OF YOURS—WHY NOT SHARE IT WITH SOMEONE WHO WILL REALLY APPRECIATE IT? BE AN ORGAN DONOR!
Indications

The indication for kidney transplant is End Stage Renal Disease (ESRD), regardless of the primary cause. This is defined as a drop in the glomerular filtration rate (GFR) to 20-25% of normal.

Absolute contraindications

- Disseminated or untreated Ca
- Severe psychiatric disease
- Unresolvable psychosocial problems
- Persistent substance abuse
- Severe mental retardation
- Unreconstructible coronary artery disease or refractory heart failure

Relative contraindications

- Treated malignancy (Ca free interval ≥ to 5 yr. depending on the type and stage)
- Substance abuse (Evidence of rehab involvement > 6 months)
- Chronic liver disease (Hep B – C Biopsy eval.)
- Cardiac disease (cardiac clearance)
- Structural genitourinary abnormality (urology clearance)
- Past psychosocial abnormality (psych eval)
- Aorta-iliac disease (vascular consult)
Recipient evaluation

- Screening evaluation
  - History & Physical exam
  - Laboratory analysis
  - Biochemistry screen (renal funct, liver funct, electrolytes)
  - Complete Blood Count (CBC), platelet count
  - Viral serologies (hepatitis B-C, herpes, CMV, HIV)
  - ABO blood typing
  - Histocompatibility
  - Cytotoxic antibody screen (PRA)
  - PSA (males > 50)
  - CXR
  - Electrocardiogram (EKG)
  - Psychosocial assessment

Recipient evaluation

- Standard examination
  - Dental clearance
  - Flexible sigmoidoscopy (over age 50)
  - Gynecological exam and PAP smear
  - Mammography (standard guidelines)

- As needed evaluation
  - Cardiac (all diabetics and those over 50, others by history)
  - Gastrointestinal (endoscopy as indicated, liver bx. for hepatitis (+))
  - Pulmonary (ABG, PFT, Bronchoscopy)
  - Lower extremity US (ABI)
  - CT abdomen – pelvis / CTA – CTV as needed.

Preoperative evaluation

- Should determine whether a patient is an appropriate candidate for Tx. and adequately prepare the potential recipient to maximize the chances that the Tx. will be successful.
- Not all patients are suitable for Tx. and a patient is denied Tx. if it is felt that the risks outweigh the potential benefits to such a degree that the patient would be better served by remaining on dialysis.
- Another goal is to detect and treat reversible medical conditions that increase the risk of transplantation.
Waiting period:

- Annual evaluation
- Monthly PRA (blood Work) (degree of sensitization)
- Hospitalization while an active candidate
  - Stay on active list
  - Inactive status
  - Removal from list
- If hospitalized or developed a medical condition at any time, notify the transplant center.
- If insurance status changes, notify the transplant center prior to the change. Failure to notify can result in missed opportunities and removal from list.

Living vs. Cadaveric kidney transplant

- Advantages
  Better short term results (95% vs. 85% 1 year survival)
  Better long term results (half life 15-20 years vs. 8-10 years.)
  More consistent early function and ease of management
  Avoidance of long wait for cadaver transplant
  Ability to schedule transplant for medical and personal convenience
  Immunosuppressive regimen may be less aggressive
  Helps relieve stress on national cadaver donor supply
  Emotional gain to donor.
  Thorough medical workup of donor.
- Disadvantages
  Psychological stress to donor and family
  Inconvenience and risk of evaluation process

Exclusion criteria for living donors

- Age <18 or >65
- Hypertension (>140/90 or necessity for medication)
- Diabetes (or abnormal GTT)
- Proteinuria (>250 mg/24 hr.)
- Recent or recurrent kidney stones
- Abnormal glomerular filtration rate (CrCl < 80 mL/min.)
- Microscopic hematuria
- Urologic abnormalities
- Significant medical illness (chronic CV or lung disease, recent malignancy)
- Obesity (30% above ideal weight)
- History of thrombosis or thromboembolism
- Psychiatric contraindications including active substance abuse.
Sequence of events before the transplant:

- Local OPO calls the coordinator on call with a kidney offer
- Coordinator discusses with the dialysis center and the transplant surgeon
- Transplant surgeon discusses with the potential recipient’s doctor and makes the decision whether to provisionally accept the kidney
- O.R. time is scheduled for donor surgery
- Recipient is notified
- Kidney is procured
- Kidney is transported to the transplant center
After living donor laparoscopic surgery

What happens to living kidney donors in the long run?

Long-Term Survival: Solitary Kidney Without Renal Disease

Long-term survival rates for living kidney donors compared to the general population. The graph illustrates that living donors have a higher survival rate than expected.
Renal Transplantation
Surgical Procedure (recipient)

- Patient in Surgery for about 2-4 hours
- Native kidneys are not removed unless there are medical conditions such as, infection, bleeding, pain or size. They are removed in a surgery either prior to or after transplant.
- New kidney is placed in the pelvis (extra peritoneal), the new vessels are sewn into the pelvic vessels. (renal artery to iliac artery, renal vein to iliac vein)
- Ureter sewn onto recipients bladder over a stent
- Right or left lower quadrant incision with staples.
Kidney making urine in the O.R.

MRI shows a normal kidney

**Immunosuppressives (anti-rejection medications)**

- Glucocorticoids (solumedrol, prednisone)
- Purine analogs
  - Azathioprine (immuran)
- Calcineurin Inhibitors
  - Cyclosporine (neoral)
  - Tacrolimus (Prograf, FK 506)
- Other T-lymphocyte inhibitors
  - Mycophenolate Mofetil (Cell Cept)
  - Sirolimus (rapamycin)
- Antibodies
  - Polyclonal (Thymoglobulin)
  - Monoclonal (Simulect)
Evolution in Kidney Transplant Outcomes

<table>
<thead>
<tr>
<th>Years</th>
<th>Immunosuppression</th>
<th>Graft Survival % (1 and 3 year)</th>
</tr>
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<tbody>
<tr>
<td>1968-75</td>
<td>Azathioprine</td>
<td>54/42</td>
</tr>
<tr>
<td>1984-86</td>
<td>Cyclosporin</td>
<td>69/52</td>
</tr>
<tr>
<td>1987-94</td>
<td>ALG/OKT3</td>
<td>78/66</td>
</tr>
<tr>
<td>1993-98</td>
<td>OKT3</td>
<td>90/78</td>
</tr>
<tr>
<td>1998-03</td>
<td>Cyclosporine/Tacrolimus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell Copt / Corticosteroids</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALG/Daclizumab</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyclosporine/Tacrolimus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell Copt (–/+) Corticosteroids</td>
<td></td>
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Post Transplant problems

- **Early**
  - Surgical
  - Wound infection
  - Lymphoedema
  - Vascular compromise
  - Ureteral Obstruction/Leak
  - Bleeding
- **Medical**
  - Acute Rejection
  - Calcineurin toxicity
  - Hypovolemia
  - Drug Toxicity
  - Infections

- **Late**
  - Medical
  - Acute Rejection
  - Chronic Rejection
  - Drug Toxicities
  - Recurrent disease
  - Obstruction
  - Renovascular disease
  - Non-compliance
  - Infections
    - Common
    - Opportunistic
    - Uncommon

Lutheran Hospital Kidney Transplant Program

- **Patients evaluated** – 400+
- **Transplanted** – 100
  - Allen (42)
  - DeKalb (6)
  - Lagrange (5)
  - Kosciusko (5)
  - Wabash (5)
  - Wells (5)
  - Fulton (1)
  - Elkhart (1)
  - Huntington (4)
  - Noble (1)
  - Stroben (5)
  - Whitley (1)
  - Grant (1)
  - Miami (1)
  - Branch (1)
  - Hillsdale (1)
  - Blackford (1)
  - Will (1)
  - Putnam (1)
  - Defiance (3)
  - Van Wert (3)
  - Williams (2)
  - Miami (1)
  - Illinois (1)

- **Listed** – 80
- **Workup not complete** – 34
- **Post-transplant clinic** – 350
Demographics / Results

<table>
<thead>
<tr>
<th></th>
<th>Total = 100</th>
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<tbody>
<tr>
<td>Patient &amp; Graft Survival (%)</td>
<td>95 - 94</td>
</tr>
<tr>
<td>Age in years (median, range)</td>
<td>53 (22 – 78)</td>
</tr>
<tr>
<td>Gender – Female, n (%)</td>
<td>37%</td>
</tr>
<tr>
<td>Ethnicity – C/AA/Others</td>
<td>84/7/9</td>
</tr>
<tr>
<td>LD, n (%)</td>
<td>51%</td>
</tr>
<tr>
<td>DM, n (%)</td>
<td>33%</td>
</tr>
<tr>
<td>HTN, n (%)</td>
<td>44%</td>
</tr>
<tr>
<td>&gt; 1 Transplant, n (%)</td>
<td>5%</td>
</tr>
<tr>
<td>High-risk, n (%)</td>
<td>25%</td>
</tr>
<tr>
<td>Acute Rejection, n (%)</td>
<td>5%</td>
</tr>
<tr>
<td>DGF – RD, n (%)</td>
<td>7%</td>
</tr>
<tr>
<td>Steroid-free, n (%)</td>
<td>60%</td>
</tr>
<tr>
<td>S. Creatinine (median, range)</td>
<td>1.25 (0.8 – 2.7) mg/dl</td>
</tr>
<tr>
<td>Follow-up (median, range)</td>
<td>904 (129 – 1481) days</td>
</tr>
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<thead>
<tr>
<th>State</th>
<th>Hospital</th>
<th>Number of Candidates</th>
<th>Median Wait Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL</td>
<td>Loyola University Medical Center, Maywood, IL</td>
<td>549</td>
<td>&gt; 72 months</td>
</tr>
<tr>
<td></td>
<td>IL Memorial Medical Center, Springfield, IL</td>
<td>121</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>Northwestern University Medical Center, Chicago, IL</td>
<td>1,120</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>Rush University Medical Center, Chicago, IL</td>
<td>916</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>OSF Saint Francis Medical Center, Peoria, IL</td>
<td>324</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>University of Chicago Medical Center, Chicago, IL</td>
<td>598</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>University of Illinois Medical Center, Chicago, IL</td>
<td>456</td>
<td>72 months</td>
</tr>
<tr>
<td>IN</td>
<td>Clarian Health/Methodist/Indiana U/Riley, Indianapolis, IN</td>
<td>942</td>
<td>72 months</td>
</tr>
<tr>
<td></td>
<td>Lutheran Hospital of Fort Wayne, Ft Wayne, IN</td>
<td>72</td>
<td>18 months</td>
</tr>
<tr>
<td></td>
<td>St Vincent Hospital and Health Care Center, Indianapolis, IN</td>
<td>99</td>
<td>18 months</td>
</tr>
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- 8 bed (telemetry) transplant unit (CVIC-east) with dedicated nursing staff trained in heart and kidney transplantation.

- 24/7 coverage
  Surgical coverage: Kizilisik, Scavo, IOH
  Living Donor: Dahagia, North East Urology
  Medical coverage: Ducker, Pintar, Lutheran Medical Group (NANI)

- Clinic: Lutheran Hospital MOB2, Suite 200
  2 Dr, 4 Coord, 1 Outreach, 2 Social, 1 Pharm, 1 Diet, 1 Data & QA, 1 HIPPA & Secr.
Future Plans & Goals

- Continue having excellent results.
- Increase no. of transplants to 50-60/year with living donors > 50 %
- Establish referral system from other Lutheran Network Hospitals.
- Increase referrals from NE Indiana, neighboring MI and OH counties.
- Start Kidney & Pancreas Transplant Program.