

## Dialysis and Transplant for Diabetes Educators

Andrew S. Narva, MD, FASN  
 National Kidney Disease Education Program  
 National Institutes of Health  
 Bethesda, MD

AADE17 Annual Meeting



## Disclosure to Participants

- Nothing to disclose



## Disclosure of ABIM Service: Andrew Narva, MD

- I am a current member of the Nephrology Board.
- To protect the integrity of certification, ABIM enforces strict confidentiality and ownership of exam content.
- As a current member of the Nephrology Board, I agree to keep exam information confidential.
- As is true for any ABIM candidate who has taken an exam for certification, I have signed the Pledge of Honesty in which I have agreed to keep ABIM exam content confidential.
- *No exam questions will be disclosed in my presentation.*

## ESRD for Diabetes Educators

- Identify the treatment choices for kidney failure.
- Describe the challenges to glucose management associated with dialysis and transplant
- Identify medications that may increase risk for new onset diabetes after kidney transplant.

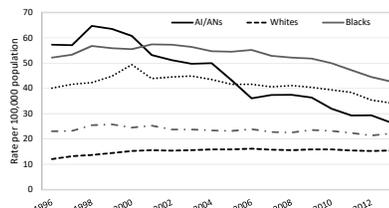


## Kidney failure is an eGFR < 15

- Kidneys cannot maintain homeostasis.
- Kidney failure is associated with fluid, electrolyte, and hormonal imbalances and metabolic abnormalities.
- End-stage renal disease (ESRD) means patient is on dialysis or has a kidney transplant.
- All ESRD patients have kidney failure
- Not all people with kidney failure have ESRD



Incidence\* of diabetes-related end-stage renal disease among adults aged ≥18 years, by race and ethnicity — United States, 1996–2013



\*Rate per 100,000 population and age-adjusted based on the 2000 US standard population. AI/AN—American Indians and Alaska Natives. Racial groups include persons of Hispanic and non-Hispanic origin. Hispanics may be of any race. Source: Data from the US Renal Data System and the US Census.



### Coping with Kidney Disease and Failure is Challenging

- "I feel fine."
  - The signs and symptoms may not be obvious until kidney disease is advanced.
- "Why me?"
  - Just like diabetes, acceptance of kidney disease takes time for most people.
  - Kidney disease may progress to kidney failure.
- Kidney "failure" or "end stage renal disease" sound scary.
  - Grief, fear and depression are not uncommon.



### Most People are Not Prepared for Kidney Failure

- Discuss treatment choices early with progressive kidney disease.
- "Early" depends on the eGFR and the rate of decline.
- People who are not prepared and need treatment do not have much choice. They may start hemodialysis using a temporary vascular access (catheter).
- In 2011, more than 80% of people started hemodialysis with a temporary vascular access.



### Key Issues in Managing CKD

- Ensure the diagnosis is correct
- Implement appropriate therapy:
- Monitor progression/Goals
- Screen for CKD complications
- **Educate the patient about CKD**
- **Prepare appropriately for kidney failure**



### AADE Practice Advisory Recommendations

1. Identify CKD due to diabetes and educate the patient about their kidney test results.
2. Slow progression of DKD: BP, Glucose control, diet
3. Collaborate with PCP to identify and monitor CKD complications.
4. Promote self-management.
  - Talk to patients about CKD
  - Communicate importance of testing
  - Explain progressive nature of CKD
  - **Begin to speak about dialysis and transplantation**

[http://www.diabeteseducator.org/export/sites/aaade/resources/pdf/1nPractice/AADE\\_2013\\_3\\_Revised\\_PracticeAdvKidney.pdf](http://www.diabeteseducator.org/export/sites/aaade/resources/pdf/1nPractice/AADE_2013_3_Revised_PracticeAdvKidney.pdf)



### Kidney disease education is a Medicare benefit

- eGFR < 30
- Medicare B
  - Individual pays 20%, deductible applies
- Qualified providers: physicians, physician assistants, **nurse practitioners**, and **clinical nurse specialists** PAS
- Up to six sessions covered



### There are Three Choices for Treating Kidney Failure

1. Kidney transplant
  - From a living donor
  - From a deceased donor
2. Dialysis
  - Peritoneal dialysis (PD)
    - Continuous cyclic peritoneal dialysis (CCPD)
    - Continuous ambulatory peritoneal dialysis (CAPD)
  - Hemodialysis (HD)
    - In-center (dialysis unit)
    - Home
3. No transplant and no dialysis

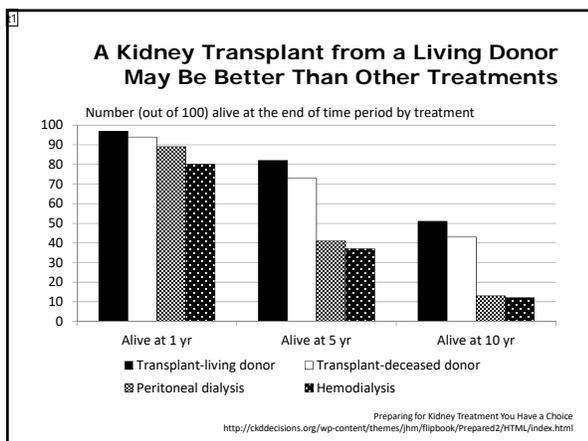


JHM

## Slide 11

---

**PA3** extra space between colon and "physicians" in both  
Presentation Account, 11/4/2011



### Kidney Transplant May Be a Choice for an Individual Who:

- Is healthy enough for surgery that can last up to 8 hours.
- Finds a living donor or gets on the National Kidney Registry (transplant list) for a deceased donor kidney.
- Is willing to take anti-rejection medications every day for the rest of their life.

NKDEP  
 National Kidney Disease Education Program

Preparing for Kidney Treatment You Have a Choice  
<http://ckddecisions.org/wp-content/themes/jhm/flipbook/Prepared2/HTML/index.html>

### Peritoneal Dialysis May Be a Choice for an Individual Who:

- Has no contraindicating abdominal pathology.
- Wants to do their own treatments at home.
- Is willing to do treatments every day.
- Has room to store supplies at home.

NKDEP  
 National Kidney Disease Education Program

Preparing for Kidney Treatment You Have a Choice  
<http://ckddecisions.org/wp-content/themes/jhm/flipbook/Prepared2/HTML/index.html>

### In-center Hemodialysis May Be a Choice for an Individual Who:

- Can travel to a dialysis center 3 times a week for scheduled treatments.
- Prefers trained staff to handle their treatments.
- Does not mind needle sticks.
- Is willing to follow a diet that includes numerous restrictions.

NKDEP  
 National Kidney Disease Education Program

Preparing for Kidney Treatment You Have a Choice  
<http://ckddecisions.org/wp-content/themes/jhm/flipbook/Prepared2/HTML/index.html>

### Home Hemodialysis May Be a Choice for an Individual Who:

- Wants to do their treatments at home.
- Has someone who is willing to be trained to help them with treatments at home.
- Is willing to do treatments most days of the week.
- Has room for the machine and to store the supplies.
- Does not mind needle sticks and self-cannulation.

NKDEP  
 National Kidney Disease Education Program

Preparing for Kidney Treatment You Have a Choice  
<http://ckddecisions.org/wp-content/themes/jhm/flipbook/Prepared2/HTML/index.html>

### No Treatment and No Dialysis May be the Choice for an Individual Who:

- Feels treatment will not improve their health.
- Feels they have done what they wanted to do in life.
- Has family and friends who are in support of this decision.

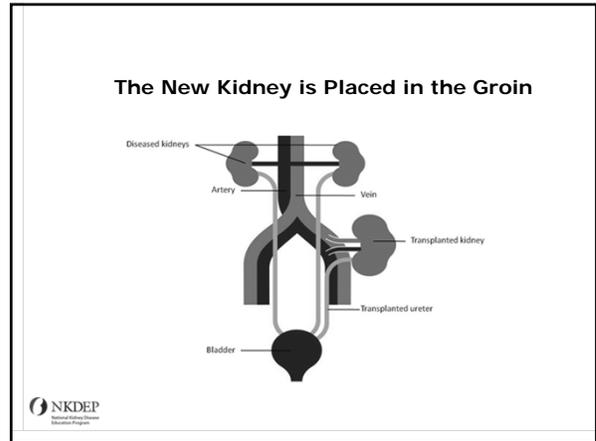
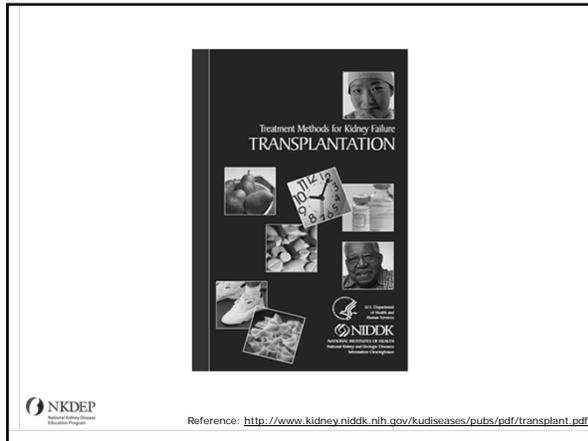
NKDEP  
 National Kidney Disease Education Program

Preparing for Kidney Treatment You Have a Choice  
<http://ckddecisions.org/wp-content/themes/jhm/flipbook/Prepared2/HTML/index.html>

## Slide 13

---

- t1** I don't have the publication(s) that this info is derived from. Couldn't find any references in the JHM booklet.  
therese, 2/10/2014



### Kidney Transplant: Pros and Cons

<p><b>PROS</b></p> <ul style="list-style-type: none"> <li>A transplanted kidney is a normal, functioning kidney.</li> <li>Fewer diet restrictions are needed.</li> <li>A successful transplant may mean a longer life.</li> <li>The recipient may have better quality of life.</li> </ul>	<p><b>CONS</b></p> <ul style="list-style-type: none"> <li>The waiting list is long for a deceased donor.</li> <li>Rejection is a possibility.</li> <li>Anti-rejection medications suppress the immune system.</li> <li>Medications and weight gain may make diabetes harder to control.</li> <li>New onset diabetes after transplant is a possibility.</li> </ul>
---	---

NKDEP  
National Kidney Disease Education Program

### Anti-rejection Medications Should be Taken as Directed

Prednisone	Azathiopine	Mycophenolate
Weight gain Hyperglycemia Hypertension Hyperlipidemia Mood changes Osteoporosis Poor wound healing	Stomach upset Muscle pain	Decreased blood counts Diarrhea Upset stomach
High doses may be prescribed right after the transplant occurs; dose may be reduced over time.	Take once or twice a day after meals, about the same time every day.	Take on a regular schedule 1 hour before or 2 hours after eating or drinking, about 12 hours apart.

### Anti-rejection Medications Should be Taken as Directed

Cyclosporine	Tacrolimus	Sirolimus
Hypertension Hyperlipidemia Tremors, headaches Excess gum growth Excess hair growth Hyperkalemia Kidney toxicity	Hyperglycemia Hypertension Tremors, headaches Diarrhea Hair loss Trouble sleeping Hyperkalemia Hypophosphatemia Kidney toxicity	Swelling Hyperlipidemia Poor wound healing Proteinuria
Take on a regular schedule at the same time each day.  Do not eat grapefruit or drink grapefruit juice.	Take on an empty stomach and regular schedule daily.  Do not eat grapefruit or drink grapefruit juice.	Take once a day, take it the same way, with or without food. Do not take with grapefruit juice.

### The Risk Factors for New Onset Diabetes after a Kidney Transplant Include:

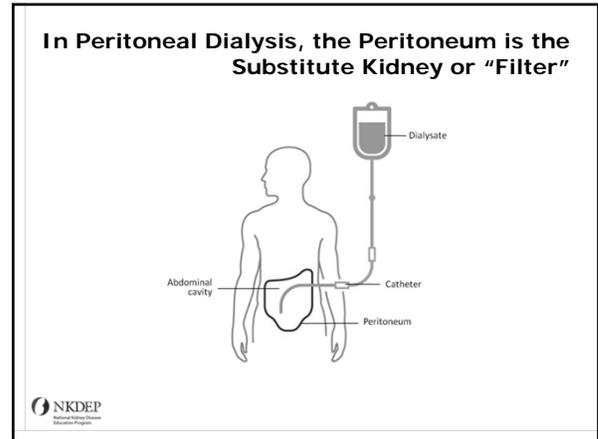
- Older age
- Ethnicity
  - African Americans and Hispanics > Whites
- Family history of diabetes
- Weight
- Positive Hepatitis C
- Immunosuppressant medication
  - Corticosteroids (prednisone)
  - Tacrolimus > cyclosporine

Ghizdal et al, Diabetes Care, 2012  
<http://care.diabetesjournals.org/content/35/1/181.full.pdf+html>

Treatment Methods for Kidney Failure  
**PERITONEAL DIALYSIS**

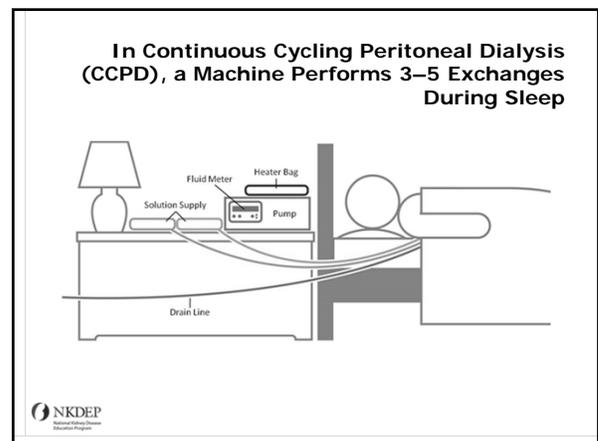
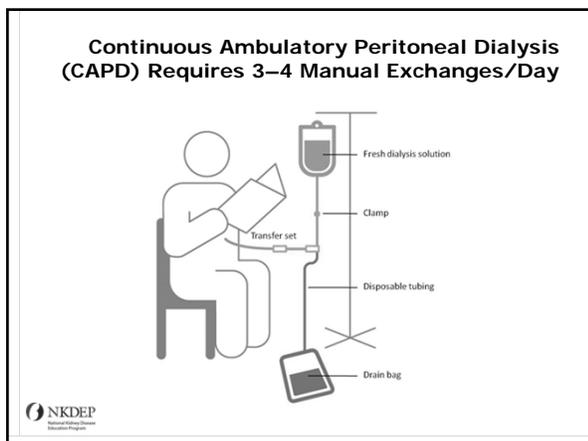
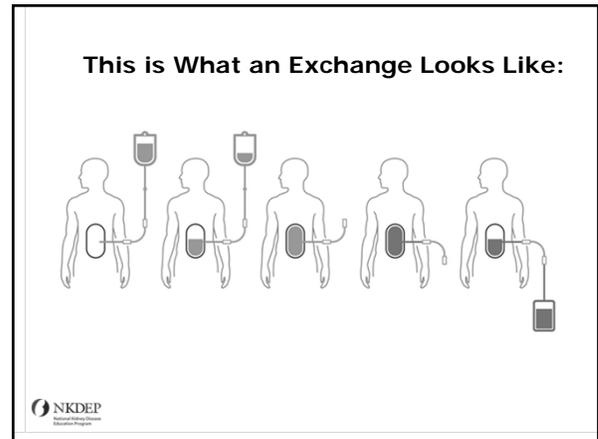
U.S. Department of Health and Human Services  
**NIDDK**  
NATIONAL INSTITUTES OF HEALTH  
DIAGNOSIS AND PREVENTION OF KIDNEY DISEASES

Reference: <http://3.kidney.niddk.nih.gov/KIDScases/pubs/peritoneal/index.aspx>



### What is a PD "Exchange"?

- Dialysis solution with dextrose flows into the abdominal cavity.
- The solution remains for a prescribed time period, also known as the dwell time.
- Substances and fluid pass from the capillaries in the peritoneum into the solution.
- Dextrose enters the blood; and substances and fluid enter the solution.
- The solution is drained at the end of the dwell.



### PD Dextrose Solutions are a Source of Carbohydrate

- The dextrose concentrations vary:
  - 1.25%, 2.5%, 4.25%
- The size of the bags vary:
  - 2-liter, 2.5-liter, 3-liter
- In CAPD, 60–70% is absorbed. The amount is higher due to longer dwell times.
- In CCPD, 40–50% is absorbed.
- Insulin requirements may increase.



Reference: McCann, 2009

### Intra-peritoneal Insulin May be an Option

- Insulin may be injected into the bags of PD solution.
- The required dose may double or triple.
- Some insulin adheres to the bag and tubing.
- Lipids may be harder to control.



Diabetes, Obesity and Metabolism, 2008

### Peritoneal Dialysis: Pros and Cons

#### PROS

- PD preserves residual renal function better.
- They do it on their own.
- They choose the time and place.
- They do not travel to a unit.
- Toxins are removed daily
- The diet is not as restricted as hemodialysis.

#### CONS

- They must plan treatments around their activities.
- They need to adhere to the prescription for adequate treatment.
- They must follow instructions to keep the risk of infection low.
- They need to take supplies when traveling.
- They generally gain weight.
- Diabetes may be harder to control due to the carbohydrate in the dialysate.



### Peritoneal Dialysis and Diet

- The diet may not be as strict as the diet for hemodialysis.
- The wastes products are removed daily.
- Amino acids lost during the exchanges must be replaced; dietary protein needs are higher.
- Absorbed dextrose calories may add weight.
- People with diabetes are never really "fasting."

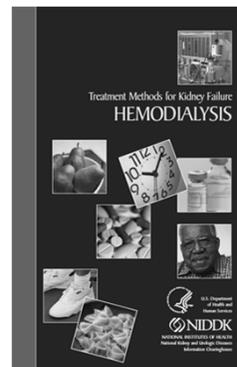


### Nutrition Prescription: Peritoneal Dialysis

- Protein: 1.2–1.3 g/kg
- Calories: 30–35 kcal/kg
  - **Includes calories from dextrose solutions**
- Sodium: 2,000–4,000 mg
- Potassium: 3,000–4,000 mg
- Phosphorus: 800–1,000 mg
  - Still need binders
- Fluid restriction—as needed



Reference: Shiro-Harvey, 2002

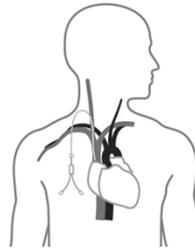
Reference: [www.kidney.niddk.nih.gov/kudiseases/pubs/hemodialysis/hemodialysis\\_508.pdf](http://www.kidney.niddk.nih.gov/kudiseases/pubs/hemodialysis/hemodialysis_508.pdf)

### Hemodialysis (HD) Requires Vascular Access

- A temporary access is the least desirable type.
- A permanent vascular access is required.
  - This access is usually placed in the non-dominant arm.
- Protect blood vessels in both arms!
  - Avoid venipuncture and IV catheter placement above the wrist.



### Most People Start Hemodialysis with a Temporary Vascular Access

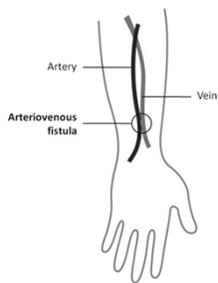


Catheter for temporary access

- No needles are used.
- Blood flow rates are lower.
- They will need additional surgery to place permanent access.



### An AV Fistula is the Preferred Access



- An artery is surgically connected to a vein.
- This type of access takes time to mature and cannot be used immediately.
- A fistula is less likely to clot.



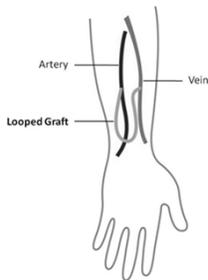
### Healthy People 2020 Objectives: Improve Vascular Access for Adult HD Patients

- Increase the proportion of patients who use arteriovenous fistulas as the primary mode of vascular access.
- Reduce the proportion of patients who use catheters as the only mode of vascular access.
- Increase the proportion of patients who use arteriovenous fistulas or have a maturing fistula as the primary mode of vascular access at the start of renal replacement therapy.
- Educate the patients early in the course of the disease so they will be ready for treatment.



<http://www.healthypeople.gov/2020/Topics/Objectives2020/objectiveslist.aspx?topicid=6>

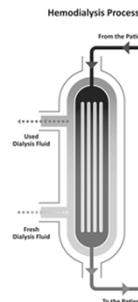
### An AV Graft Will Work for Hemodialysis



- A synthetic tube connects the artery and vein.
- The graft takes less time to mature compared to a fistula.
- A graft is more likely to become infected or clot.



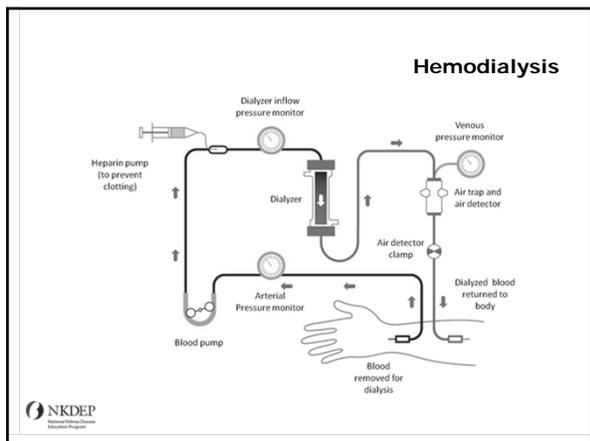
### The Dialyzer is the Artificial Kidney in Hemodialysis



- Removal is based on size.
- Some nutrients are removed:
  - Glucose
  - Amino acids
  - Water-soluble vitamins
- Protein-bound substances, including many medications, are not efficiently removed.



Reference: Descombes et al. *Artif Organs* 2000; 24(10):773-778.



### Home Hemodialysis Requires Training and Support

- Conventional home hemodialysis (most common)
  - Three times per week
- Daily home hemodialysis
  - 2-3 hours, 5-6 days per week
- Nocturnal hemodialysis
  - 6-8 hours, 3 or more days per week

NKDEP  
Nephrology & Dialysis  
Education Program

Reference: <http://www.homedialysis.org/>

### In-center Hemodialysis: Pros and Cons

PROS	CONS
<ul style="list-style-type: none"> <li>▪ Some people prefer the social setting.</li> <li>▪ Facilities are found nationwide.</li> <li>▪ Staff does the work:                             <ul style="list-style-type: none"> <li>- Place and remove the needles</li> <li>- Monitor treatment</li> <li>- Maintain the equipment</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ The diet is very strict.</li> <li>▪ They have to follow a schedule.</li> <li>▪ They must travel to the unit.</li> <li>▪ They may take more medications.</li> <li>▪ They may feel fatigued.</li> <li>▪ Some nutrients are removed during treatment.</li> </ul>

NKDEP  
Nephrology & Dialysis  
Education Program

### Home Hemodialysis: Pros and Cons

PROS	CONS
<ul style="list-style-type: none"> <li>▪ Diet is less restrictive with more frequent treatments.</li> <li>▪ They decide the time schedule.</li> <li>▪ No travel to the unit is needed.</li> <li>▪ The newer machines are small.</li> <li>▪ Fewer ups and downs occur.</li> </ul>	<ul style="list-style-type: none"> <li>▪ They must have a partner.</li> <li>▪ Partner burn-out is a possibility.</li> <li>▪ They need space for treatment: machine, supplies, access to water and drainage, and electricity.</li> <li>▪ They insert the needles.</li> <li>▪ They need time off from work for initial training.</li> <li>▪ Training is not offered everywhere.</li> </ul>

NKDEP  
Nephrology & Dialysis  
Education Program

### A1c In Dialysis Patients

- A1c is affected by red cell survival
- In dialysis patients increased red cell turnover gives falsely low results
- Carbamylated hemoglobin is formed in uremic patients and can result in false elevations in the A1c

NKDEP  
Nephrology & Dialysis  
Education Program

### No Transplant and No Dialysis

- This is usually described as supportive care.
- The complications can be treated.
- Medications are still continued.
- The goal is to maintain quality of life.
- Encourage the patient to include family in decision making.

NKDEP  
Nephrology & Dialysis  
Education Program

**Summary: Treatment Choices**

- Discuss the choices early to allow time for the patient to adjust and make a decision.
- Transplant requires daily immunosuppressant medications.
- Dextrose solutions used in peritoneal dialysis contribute to carbohydrate load. Insulin requirements increase.
- Hemodialysis has the most restrictive diet.



**Resources**

- NKDEP <https://www.niddk.nih.gov/health-information/health-communication-programs/nkdep/learn/living/kidney-failure/Pages/kidney-failure.aspx>
- PREPARED <http://ckddecisions.org>
- AAKP <https://aakp.org>
- NKF <https://www.kidney.org>
- CMS <https://www.medicare.gov/people-like-me/esrd/dialysis-information.html>
- MEI <https://meiresearch.org>



**NKDEP Resources**

Search: niddk catalog

**Questions & Comments**



[andrew.narva@nih.gov](mailto:andrew.narva@nih.gov)

All materials available at:

<http://nkdep.nih.gov/>

