

## NURS 821 Alterations in Reproduction; Alterations in Elimination

### Lecture 10 Part 5 Renal Failure

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### Chronic Renal Failure

- a very slow progressive process which culminates in end-stage renal disease.
- Systemic changes result when renal function is less than 20-25% of normal.

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### Stages of Renal Failure

- Diminished renal reserve – 50% of nephrons are lost.
  - Mildly reduced kidney function
  - Regulatory functions relatively intact
  - Usually asymptomatic unless kidneys are stressed
  - Serum creatinine may be high normal

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### Stages of Renal Failure (cont'd)

- Renal insufficiency – 75% nephron loss.
  - GFR 20% of normal
  - Impaired renal capacity demonstrated by:
    - Mild azotemia (unless marked protein intake)
    - Slightly impaired urinary concentrating ability (loss of diurnal pattern, nocturia, polyuria)
    - Mild anemia
  - Nephron change may be exacerbated by infection, dehydration, drug, and cardiac failure

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### Stages of Renal Failure (cont'd)

3. Chronic Renal Insufficiency
- **Significant renal impairment, but no systemic effects**
  - Typical GFR is 30-75 ml/min
  - Serum creatinine unreliable
    - Slight increase >1.5 mg/dl in men;
    - >1.2 mg/dl in women;
  - age dependent in children



(NIDDK, 2000)

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### Stages of Renal Failure (cont'd)

4. End-stage renal disease – 90% of nephrons are damaged.
- Chronic abnormalities resulting from loss of homeostatic mechanisms.
  - Requires artificial support to sustain life.

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## Chronic Renal Failure

- **GFR** drops to  $<10$  ml/min
- **Altered labs**-increased urea, phosphate, K, Na; metabolic acidosis; decreased RBCs
- **Most- progress to ESRD; irreversible; life-sustaining therapy**
- (NIDDK, 2000)

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## Renal Failure Diagnosis

- GFR normal=100-150 ml/min
- GFR decrease to  $<75$  ml/min=significant renal insufficiency
- GFR  $<10$  ml/min

(NIDDK, 2000)



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## Stages of Renal failure (cont'd)

- Uremic syndrome –
  - the systemic response to the accumulation of uremic waste products and kidney failure.
  - The actual configuration of manifestations demonstrated by the renal failure patient.

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## Renal Failure

### ■ Systemic manifestations:

- fluid retention
- anemia
- hypertension
- growth failure (kids)
- bone demineralization

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## Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

### Body System : Skin

#### Altered Functions:

- Salt Wasting
- Anemia
- Hyperthyroidism
- Decreased platelet function and bleeding tendencies
- High concentration of metabolic end-products in body fluids

#### Manifestation:

- Dry skin and mucous membranes; edema
- Pale, sallow, gray complexion
- Pruritus
- Ecchymosis and subcutaneous bruises
- poor healing
- Uremic frost
- urochrome on skin and breath

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## Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

### Body System : Body Fluids

#### Altered Functions:

- Compensatory changes in tubular function
- Decreased ability to synthesize ammonia and conserve bicarbonate
- Inability to excrete potassium
- Inability to regulate sodium excretion
- Impaired ability of the kidneys to excrete phosphate
- Hyperphosphatemia and inability of the kidney to activate vitamin D

#### Manifestation:

- Fixed specific gravity of urine; polyuria and nocturia
- Metabolic acidosis
- Hyperkalemia
- Salt wasting or sodium retention
- Hyperphosphatemia
- Hypocalcemia and increased levels of parathyroid hormone

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### Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

#### Body System : Hematopoietic

##### Altered Functions:

- Impaired synthesis of erythropoietin and effects of uremia
- Impaired platelet function

##### Manifestation:

- Anemia
- Bleeding tendencies
- Ecchymoses
- Anemia

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### Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

#### Body System : Cardiovascular

##### Altered Functions:

- Activation of renin-angiotensin mechanism, increased vascular volume, and failure to produce vasodepressor substances
- Fluid retention and hypoalbuminemia
- Excess extra-cellular fluid volume, anemia

##### Manifestation:

- Hypertension
- Edema
- Congestive heart failure; pulmonary edema

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### Cardiovascular - Pulmonary

- ECF overload, RAA dysfunction, metabolic acidosis:
  - Hypertension, pericarditis, cardiomegaly, congestive heart failure, chest pain, pulmonary edema, uremic lung, uremic pleuritis, Kussmaul's respirations.

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Alterations in Body Function That Occur  
with Chronic Renal Failure (cont'd)

**Body System : Gastrointestinal**

Altered Functions:

- Liberation of ammonia
- Decreased platelet function and increased gastric acid secretion due to hyperparathyroidism

Manifestation:

- Anorexia, nausea, vomiting
- Gastrointestinal bleeding

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**Gastrointestinal**

- Anorexia, nausea, vomiting, diarrhea, hiccups, metallic taste, uremic fetor, bleeding anywhere along the GI tract, ulcers, constipation, hepatomegaly, pancreatitis, increased gastrin levels.

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Alterations in Body Function That Occur  
with Chronic Renal Failure (cont'd)

**Body System : Neurological**

Altered Functions:

- Fluid and electrolyte balance
- Increase in metabolic acids and other small, diffusible particles, such as urea

Manifestation:

- Headache
- Signs of uremic encephalopathy: lethargy, decreased alertness, loss of recent memory, delirium, coma, seizures, asterixis, muscle twitching, and tremulousness
- Signs of neuropathy: restless-leg syndrome, paresthesias, muscle weakness, and paralysis

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## Nervous

- Uremic toxin build-up-
  - Encephalopathy, motor coordination loss, confusion, irritability, delusions, hallucinations, depression, apathy, sluggishness, decreased ability to concentrate, memory loss, twitching, fasciculations, peripheral neuropathy stupor, convulsions, coma.

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## Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

### Body System : musculoskeletal

| Altered Functions:                            | Manifestation:              |
|-----------------------------------------------|-----------------------------|
| ■ Hyperphosphatemia                           | ■ Osteomalacia              |
| ■ Hypocalcemia                                | ■ Osteoporosis              |
| ■ Hyperparathyroidism                         | ■ osteodystrophy            |
| ■ Vitamin D deficiency                        | ■ Bone pain and tenderness  |
| ■ Calcium x phosphate product greater than 60 | ■ Spontaneous fractures     |
|                                               | ■ Metastatic calcifications |

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## Alterations in Body Function That Occur with Chronic Renal Failure (cont'd)

### Body System : Genitourinary

| Altered Functions:        | Manifestation:               |
|---------------------------|------------------------------|
| ■ Impaired general health |                              |
| ■ Decreased testosterone  | ■ Impotence and libido loss  |
| ■ Decreased estrogen      | ■ Amenorrhea and libido loss |

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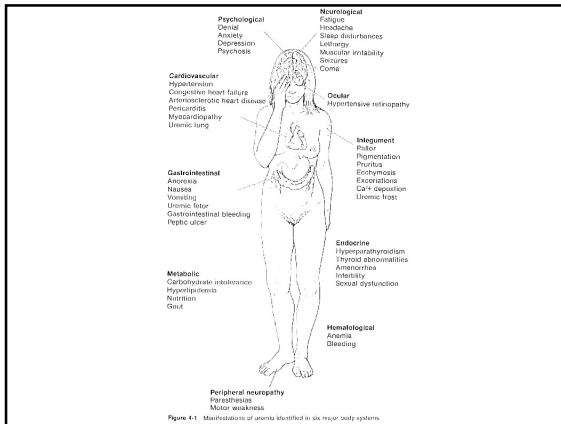
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## RF Case Study

- 7/14 J., 20 mo old M to ER w/ dehydration 2 to N.V. Hydrated and DC
- 7/18 Presented w prog. Abd pain, loose, watery D w mucus and blood q 2h, emesis x 5 d, decreased uo. Lethargic, irritable, sleepy. Poor turgor, soft abd., no hepatosplenomegally, lungs CTA99.4,112,40
- 13.6 kg. WBC 19, hgb 13.3, hct 39.4, platelets 532,000, Na 138, BUN 8, Cr .6. BC pos gram pos rods. IV rocephin.
- 7/21-unimproved. Appeared ill, edematous, oliguric, proteinuric, hematuric, bibasilar rales, dyspnea. Became anuric.

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## RF Case

- Thrombocytopenic, uremic. H+H 5.9, 17%, WBC 15,700. 5% retic. BUN 59, Creat 4.2, Na 121, K 5.6, PO4 2.8, albumin 2.4. Urine ph 5.0. ICU w ARF. UA fine and coarse granular casts, WBC, RBC, epithelial cells. Stool cult- . PD begun.
- Lasix IV x 3. Ferrous sulfate and iron given. Day 4-improved. Placed on 14 gm protein restricted diet. DC DX hemolytic uremic syndrome.

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