Quantitative Urine Analysis

The impact of measuring!

WKBWV

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Content

1. GFR and CKD: pledge and impact of the aMDRD formula
2. Proteinuria: spot - or 24 h analysis?
3. Quantitative glucosuria; what to do with the figures?
GFR and CKD

- March 2004: Prof. Vanholder launched a demand for better kidney function monitoring to the WKBWV (Evergem)
- June 2004: ISN launched consensus guidelines for prevention and progression of renal disease (Hongkong)
- March 8th 2007: 2nd World kidney day
GFR and CKD

March 8th 2007: 2nd World kidney day.
The purpose of World Kidney Day is to raise awareness about the importance of our kidneys and to spread the message that kidney disease is common, harmful and treatable.
GFR and CKD

- It were indeed the third world countries that made nephrologists aware of this increasing pathology.
- Shift in the causes of endstage renal insufficiency; causes as pyelonephritis and diabetes 1 disappear while atherosclerosis and diabetes 2 are nowadays most responsible for nephropathology.
GFR and CKD

Chronic kidney diseases (CKD) and cardiovascular diseases will kill 36 million people by the year 2015.
Fortunately, we can detect chronic kidney disease early on, and detection is easy. Simple, routine tests of our urine, blood and blood pressure can show early signs of kidney problems. And the good news is that once we know these problems, we can slow down and even stop chronic kidney disease, by taking medicines and changing some of our living habits.
CKD definitions

“CKD is defined as either kidney damage or GFR < 60 ml/min/1.73 m² for ≥ 3 months.” (NKF, 2002)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR (ml/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Damage but normal GFR</td>
<td>≥ 90</td>
</tr>
<tr>
<td>2</td>
<td>Damage with decr. GFR</td>
<td>60 - 89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate decr. GFR</td>
<td>30 - 59</td>
</tr>
<tr>
<td>4</td>
<td>Severe decr. GFR</td>
<td>15 - 29</td>
</tr>
<tr>
<td>5</td>
<td>Kidney failure</td>
<td>&lt; 15 (or dialysis)</td>
</tr>
</tbody>
</table>
**GFR:**
reference ranges (ml/min/1.73 m2)

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 29</td>
<td>77 – 179</td>
<td>71 – 165</td>
</tr>
<tr>
<td>30 – 39</td>
<td>70 – 162</td>
<td>64 – 149</td>
</tr>
<tr>
<td>40 – 49</td>
<td>63 – 147</td>
<td>58 – 135</td>
</tr>
<tr>
<td>50 – 59</td>
<td>56 – 130</td>
<td>51 – 120</td>
</tr>
<tr>
<td>60 – 69</td>
<td>49 – 113</td>
<td>45 – 104</td>
</tr>
<tr>
<td>70 – 79</td>
<td>42 – 98</td>
<td>39 – 90</td>
</tr>
<tr>
<td>80 – 89</td>
<td>35 – 81</td>
<td>32 – 75</td>
</tr>
</tbody>
</table>

*Ref: Gross JL et al., Diabetes care 2005;28:176-88*
GFR estimations

- **Serum creatinine**: insensitive for the detection of mild to moderate reduction in GFR
- **Creatinine clearance**: timed urinary collections are a cumbersome procedure and susceptible to error
- **Predictive equations**
GFR: predictive equations

- Cockroft – Gault
- Schwartz (children)
- Counahan-Barrat prediction (children)
- MDRD (The Modification of Diet in Renal Disease Study Group; NEJM, 1994)
MDRD’s

Different formules are published!

Simplified MDRD (= aMDRD) =

$$186 \times [SCr]^{-1.154} \times [age]^{-0.203} \times (0.742 \text{ female}) \times (1.212 \text{ black})$$

aMDRD (2005) =

$$175 \times [\text{standardised SCr}]^{-1.154} \times [age]^{-0.203} \times (0.742 \text{ female}) \times (1.212 \text{ black})$$
But ....

“A questionable test”

Published in March 2007 in the Financial Times by an English GP. Reason?

- People are told they have a problem with no descent solution
- Tremendous increase in ACE prescriptions
But ...

Belgian researchers at the UZ Ghent examined the serum creatinine values of 20,108 patients in their region. According to the CKD classification, about 2,000 per 100,000 inhabitants (= 2%) patients would have a stage 4 CKD and another 10,000 patients would be at stage 3.

This would lead to an overload of the Belgian nephrology capacities!
The problem is ...

1. creatinine measurement is not yet full standardized (cfr. colleague Martens)
2. Cut off value of < 60 ml/min/1.72m²

*For this reasons, consider also another important urinary parameter ...*
According to the above mentioned Fin. Times article, Mss. Mc Cartney (GP) states that “the benefit of the ACE inhibitor drugs may be limited to the minority of patients with excess protein loss in the urine. This being a sign of kidney disease.”
Proteinuria

Quid methodology?
Total protein or just albumin?
Spot or 24 h analysis?

Ask the audience!
Proteinuria

“It is important to consider the timing of urine specimens and the methods for detection of urine proteins” (NKF K/DOQI guidelines)

- Orthostatic proteinuria may excrete more than 1 g protein during walking hours!! For that reason, a comparison of protein excretion (day/night) has to be considered!
Proteinuria

Since a fixed time collection is cumbersome for many patients, the NKF guidelines stipulate that a protein or albumin to creatinine excretion in an untimed “spot” urine specimen is a more convenient method for assessing protein and albumin excretion.

A Working Group proposes that the time has come to forego the traditional “timed urine collections” and adopt the use of “spot” urine measurements.
Proteinuria and albuminuria: use correct normal values!

<table>
<thead>
<tr>
<th>Classification</th>
<th>mg/24 h</th>
<th>mg/g creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>&lt; 300</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>Clin. proteinuria</td>
<td>&gt; 300</td>
<td>&gt; 200</td>
</tr>
<tr>
<td><strong>Albumin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>&lt; 30</td>
<td>&lt; 17 (men)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 25 (women)</td>
</tr>
<tr>
<td>Microalbumin</td>
<td>30 – 300</td>
<td>17 – 250 (men)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 – 355 (women)</td>
</tr>
<tr>
<td>Clin.albuminuria</td>
<td>&gt; 300</td>
<td>&gt; 300</td>
</tr>
</tbody>
</table>
**Albuminuria**

- For the diagnosis of CKD in adults, measurement of albuminuria is preferred to that of proteinuria.
- Total protein is more appropriate in children in order to identify both albuminuria and low molecular weight proteinuria.
- A first morning specimen is preferred but random specimens are acceptable.
Proteinuria: methodology

- Clinicians have to be cognizant of causes of false positive and more importantly false negative results!!
Quantitative glucosuria.

What is the clinical relevance of a quantitative glucose measurement in urine?

Ask the audience.
Conclusions

- Quantitative urinalysis ...
  - much to agree
  - much to follow up considering the clinical impact
  - much to standardize (cfr. creatinine)
  - much to do for the WKBWV?
Conclusions

“…We urgently need to proceed from providing proof of diagnostic performance of our tests to excellence in measuring the impact of IVD contributions on the overall value chain in health care processes.…”
(Prof. N. Blanckaert, KUL 2007)
I am ready for your questions....