**DATA STANDARD**

<table>
<thead>
<tr>
<th>Weekly Urea Kt/V for Peritoneal Dialysis or (PD wKt/V) Urea</th>
</tr>
</thead>
</table>

**DESCRIPTION**

The weekly urea Kt/V for peritoneal dialysis is a dimensionless measure of the small molecule removal provided by one week of PD treatments and residual kidney function, where K is the urea clearance, t is the treatment time (one week), and V is the urea distribution volume for the patient. Note that the weekly creatinine clearance in L/wk is an alternative measure of small molecule clearance in PD which can be calculated by replacing urea concentrations with corresponding creatinine concentrations.

**RATIONALE**

Because peritoneal dialysis is performed with variable frequency and prescription, peritoneal dialysis adequacy has historically been measured in terms of a weekly clearance. While weekly creatinine clearance has been used as a PD adequacy measure, the weekly urea clearance offers the advantage that it can be compared to the standard weekly Kt/V for hemodialysis.

**DATA SOURCE(S)**

- Patient-level data
- Lab results

**REQUIRED DATA ELEMENTS**

- Collection time (min) for PD fluid
- Collection volume (ml) for PD fluid
- Urea concentration of collected PD fluid (mg/dL)
- Collection time (min) for urine
- Collection volume (ml) for urine
- Urea concentration of collected urine (mg/dL)
- Plasma urea concentration (mg/dL)
- Estimated dry weight (kg) – for urea distribution volume estimation
- Height (cm) – for urea distribution volume estimation
- Sex (M/F) – for urea distribution volume estimation
- Age (years) – for urea distribution volume estimation using Watson formula

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*The Kidney Health Initiative is a public-private partnership between the American Society of Nephrology, US Food and Drug Administration and over 100 companies and organizations in the kidney community. KHI leadership acknowledges and thanks the workgroup that developed these data standards to support research and development in kidney disease. To learn more about KHI or this project, please visit [www.kidneyhealthinitiative.org](http://www.kidneyhealthinitiative.org).*
CALCULATION METHOD

1. **Total weekly urea clearance (L) = weekly PD urea clearance + weekly urine urea clearance**, where:

\[
\text{Weekly Urine Urea Clearance (L/week)} = \frac{10,080 \text{ min/wk} \times \text{urea concentration (mg/dL)} \times \text{urine timed collection volume (ml)}}{\text{plasma urea concentration (mg/dL)} \times \text{urine timed collection time (min)} \times 1000 \text{ ml/L}}
\]

\[
\text{Weekly PD Urea Clearance (L/week)} = \frac{10,080 \text{ min/wk} \times \text{urea concentration (mg/dL)} \times \text{PD timed collection volume (ml)}}{\text{plasma urea concentration (mg/dL)} \times \text{PD timed collection time (min)} \times 1000 \text{ ml/L}}
\]

2. **Urea distribution volume, estimated using total body water estimate**:

<table>
<thead>
<tr>
<th></th>
<th>Male Total Body Water (L)</th>
<th>Female Total Body Water (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watson(^1)</td>
<td>(V = 0.1074 \times \text{height (cm)} + 0.3362 \times \text{weight (kg)} - 0.09156 \times \text{age (yr)} + 2.447)</td>
<td>(V = 0.1069 \times \text{height (cm)} + 0.2466 \times \text{weight (kg)} - 2.097)</td>
</tr>
<tr>
<td>Hume-Weyers(^2)</td>
<td>(V = 0.194786 \times \text{height (cm)} + 0.296785 \times \text{weight (kg)} - 14.012934)</td>
<td>(V = 0.34454 \times \text{height (cm)} + 0.183809 \times \text{weight (kg)} - 35.270121)</td>
</tr>
</tbody>
</table>

The Watson equation has been reported to overestimate the urea distribution volume by 10-15%. Based on the results of Noori et al., researchers may choose to multiply the Watson volume by 84%-88% for different patient subgroups.\(^3\) A meta-analysis completed in 2020 suggested that the errors in V estimation for individual patients may typically be 12-18% of total body water, thus causing great variation in calculated Kt/V.\(^4\)

3. **Total weekly Kt/V = Total weekly urea clearance (L) / Urea distribution volume**

Urea volume estimate of total body water using the Hume & Weyers or Watson anthropometric equation
### EXCLUSIONS
Pediatric patients should be excluded from the approach described here.

### ADDITIONAL DESIRABLE DATA ELEMENTS FOR COLLECTION
Method of urea distribution volume (or total body water volume) estimation

### NOTES
- In the absence of a urine collection, the urine urea clearance is assumed to be zero.
- It is preferable that PD fluid and urine be collected over the same 24-hour period. Because of potential loss of residual kidney function after initiating dialysis, it is recommended that the urine collection date be within 6 months of the dialysate collection date for inclusion in the total weekly urea clearance. However, researchers may choose to alter this restriction to within the last 3 months or some other timeframe.
- Both methods of estimating the total body water require correction for large limb amputation. For example, consecutive amputations of a foot, a lower leg, and an upper leg were reported to reduce body water by 1.8%, 5.3%, and 11.6%, respectively, while correction for a single above-the-knee amputation from an intact leg was reported as 18.5%. For a bilateral amputee, the pre-amputation height should be used to estimate the pre-amputation volume, and then the appropriate reduction should be applied.
- For the purposes of research, the individual data elements and the calculated Kt/V PD should be collected.

### EXAMPLE MEASURE CALCULATION

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-year-old man</td>
<td></td>
</tr>
<tr>
<td>PD fluid collection: volume 12,000 ml, urea concentration 50 mg/dL, time 1440 min</td>
<td></td>
</tr>
<tr>
<td>Urine collection: volume 500 ml, urea concentration 600 mg/dL, time 1440 min</td>
<td></td>
</tr>
<tr>
<td>Plasma urea concentration: 60 mg/dL</td>
<td></td>
</tr>
<tr>
<td><strong>Weekly PD urea clearance</strong></td>
<td>70 L/week</td>
</tr>
<tr>
<td>(\text{Weekly PD urea clearance} = \frac{10,080 \text{ min/wk} \times 50 \text{ mg/dL} \times 12,000 \text{ ml}}{60 \text{ mg/dL} \times 1440 \text{ min} \times 1000 \text{ ml/L}})</td>
<td></td>
</tr>
<tr>
<td><strong>Weekly urine urea clearance</strong></td>
<td>35 L/week</td>
</tr>
<tr>
<td>(\text{Weekly urine urea clearance} = \frac{10,080 \text{ min/wk} \times 600 \text{ mg/dL} \times 500 \text{ ml}}{60 \text{ mg/dL} \times 1440 \text{ min} \times 1000 \text{ ml/L}})</td>
<td></td>
</tr>
</tbody>
</table>

Weekly Urea Kt/V for Peritoneal Dialysis or (PD wKt/V) Urea
EXAMPLE MEASURE CALCULATION (Cont’d)

Watson¹  |  Hume-Weyers²
---|---
**Male Total Body Water (L)** | **Male Total Body Water (L)**
\[ V = 0.1074 \times 170 \text{ (cm)} + 0.3362 \times 80 \text{ (kg)} - 0.09156 \times 65 \text{ (yr)} + 2.447 = 39.2 \text{ L} \] & \[ V = 0.194786 \times 170 \text{ (cm)} + 0.296785 \times 80 \text{ (kg)} - 14.012934 = 42.8 \text{ L} \]

**Total Weekly Kt/V** | **Total Weekly Kt/V**
\[ (70 + 35) / 39.2 = 2.7 \] & \[ (70 + 35) / 42.8 = 2.5 \]

ACRONYMS
PD: Peritoneal Dialysis

REFERENCES
Our thanks to the ESKD Data Standards Workgroup for their tireless and diligent work.

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