Online Clearance Monitoring
Impulses to improve quality of life
The quality of dialysis considerably influences the physical condition and the quality of life of patients.

In different studies it could meanwhile be demonstrated that morbidity and mortality rates are closely correlated to the delivered dialysis dose. The efficiency of a dialysis treatment can be measured by means of the removal of uraemic substances. Being quantitatively the most important end product of the protein catabolism the Clearance of the Urea molecule is measured to determine dialysis efficiency. The dialysis dose of a treatment can be defined as the quotient \( Kt/V \) of the product of effective Urea Clearance (\( K \)) and treatment time (\( t \)) related to the Urea Distribution Volume (\( V \)) of the patient.

**Clearance and Kt/V**

However, different treatment specific factors which have a direct influence on \( Kt/V \) remain frequently unidentified and lead to a substantial deviation of the administered from the prescribed dose. A retrospective quantification of the dialysis therapy was up to now only possible by complicated and cost intensive laboratory assays and applying formal Urea Kinetic Modelling. Using Online Clearance Monitoring OCM® effects having a negative influence on Clearance can now easily be detected.

Effective in-vivo Clearance \( K \) is influenced by effective blood flow, blood composition, anticoagulation, UF-Rate, recirculation, dialyser, dialysate flow...

Treatment time \( t \) under certain circumstances reduced due to alarms, bypass conditions or early treatment termination ...

Effective blood flow is influenced by pump segment tolerances, arterial pre-pump pressure, fistula recirculation...

Urea distribution volume \( V \) is among others dependent on the patient's height, weight, age and gender.
Give your patients and yourself the confidence of having a good dialysis

To enable the continuous supervision of dialysis dose in daily practice Fresenius Medical Care developed the Online Clearance Monitoring as an option for the haemodialysis systems 4008 H/S.

- Online monitoring of the effective in-vivo Urea Clearance K
- Online determination of the accumulated cleared plasma Kt
- Online determination of the current dialysis dose administered Kt/V, permitting direct correction of possible deviations during the course of treatment to meet the prescribed therapy goal
- Online determination of the plasma sodium concentration
- No added treatment costs, since the measuring technique requires no extra disposables
- Minimal staff effort required by offering maximum comfort in handling. Clear graphical data presentation and simple operation of the 4008 H/S* haemodialysis machines.

Graphical display of online clearance, Kt/V and plasma sodium concentration

The clear advantages for the dialysis staff and patients of the OCM® method in comparison to the traditional blood sampling method.

The conventional procedure

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Blood samples (expensive)</th>
<th>Monthly/quarterly</th>
<th>Retrospective</th>
<th>Staff, syringes, lab costs, time and energy</th>
<th>6 - 8 %</th>
<th>Inconvenient</th>
<th>For routine use impractical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With OCM® option

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Kt/V ≥ 1.2… 1.8</th>
<th>Frequency</th>
<th>Quality Control</th>
<th>Effort</th>
<th>Accuracy of K</th>
<th>Operation</th>
<th>Quality Assurance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dialysate, K and t, (no added costs) (Continuous, online)

Every session

None

5 %

Automatic

Standard

*The option OCM® is available for the Haemodialysis machines 4008 H/S with Advanced Dialysis Fluid Circuit and CAN-Bus Electronics (production standard since mid 2000)

Technical changes reserved
Progress is what improves the quality of a patient's life.

The innovative technology of the Online Clearance Monitoring is based on the equivalent diffusion coefficients of the sodium ion and the urea molecule which were validated in clinical practice. During the dialysis treatment dynamic conductivity alterations are initiated periodically and recorded by means of two precise measuring systems located in the dialysis fluid circuit prior to and after the dialyser.

All relevant treatment parameters with influence on the dialysis therapy, i.e.,
- effective blood flow
- effective treatment time
- effective dialysis flow as well as algorithms to analyse
- dynamic conductivity pulses together with patient specific factors like
- recirculation are taken into consideration to determine the effective in-vivo Urea Clearance from sodium dialysance. From this, the current
  • \( \text{Kt/V} \) (\( \text{V} \) has to be entered) and
  • plasma sodium concentration are calculated and numerically and graphically displayed in the colour display of the 4008 H/S haemodialysis machines.

The prescribed dialysis therapy goal can be entered into the machine by the user. OCM® subsequently calculates, depending on the current treatment conditions, the required treatment time to meet the predefined \( \text{Kt/V} \) goal.

**Dose Calculation Tool for Haemodialysis**

The easiest method to estimate Urea distribution volume \( \text{V} \) is to use the anthropometric formulae (Watson or Hume-Weyers) which are integrated in the OCM® software. However it is always preferable to enter the measured Urea distribution volume rather than to use \( \text{V} \) from a standardised mean value of a population as a whole.