ICS Standard for Digital Exchange of Urodynamic Study Data

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INTRODUCTION

In 1997, the ICS standard for digital exchange of pressure-flow study data was published (Neurourol. Urodyn. 1997;16:9–18) with the intention of enabling the exchange of urodynamic data and curves between equipment of different manufacturers. Initially, the purpose of the standard was to make it possible to carry out multi-centre trials with different brands of equipment in the different centres, but with central data processing. The standard makes it possible to copy a pressure-flow study performed with a specific brand of urodynamic equipment to a transportable medium, for instance a floppy disc or e-mail, and subsequently import it into the PC of another brand of urodynamic equipment. Not only the resulting parameters, such as the maximum flowrate are copied, but also the tracings. Re-analysis of the study on the second set-up is therefore possible. Up to now, import and export of ICS standard urodynamic files has been implemented in the equipment of Andromeda Medical Systems, Medtronic Functional Diagnostics and Medical Measurement Systems. These implementations have been verified by the authors. Lifetech and Laborie have both announced that they will support the standard.

This document updates the standard, listing revisions and additions. The revised version of the standard will be posted in its entirety on the ICS web site: www.icsoffice.org

CHANGE OF SCOPE OF STANDARD, VERSION NUMBER, WARNING

Initially, the standard was intended for the exchange of pressure-flow study data. In the meantime, the scope has changed, in the sense that the standard may also be used for the exchange of other types of urodynamic study, for example, urethral pressure profiles. Therefore, the standard is now renamed the “ICS Standard for Digital Exchange of Urodynamic Study Data”. Accordingly, the minimum requirements described in section A6 only apply to pressure flow studies. For other types of study, the requirements may be different. For example, if a urethral pressure profile is to be stored in the ICS format, the flow rate channel need not be stored, as it is not relevant to this particular measurement.

The version number of the ICS Standard for Digital Exchange of Urodynamic Study Data, including the changes proposed in this update is 8.0.

Accordingly, files structured according to this updated standard should contain the number 80 in the field “measurement type” in Record type 19 “The ICS measurement description record”.

There is a small inconsistency in the specification of record type 15 in the standard. The fields “sex index” and “comments index” are in an order different from the subsequent fields “comments” and “sex”. For reasons of compatibility, this is not changed. Implementation of the standard assuming that all indices are in the same order as the associated strings might generate errors. Therefore, attention should be paid to the different order of these fields in record type 15.

STORAGE OF DELAY TIME WITH EACH CHANNEL

To correct for the distance between the urinary flow transducer and the pressure transducer(s), which causes the flow rate signal to be delayed relative to the pressure signals, a time-shift may need to be applied to some of the stored signals. Sometimes, this time-shift has already been applied to the signals stored according to this standard. In this case, a byte is added to record type 14 to contain the number of samples, the stored channel has been delayed, relative to those channels that have not been delayed. The default value for this parameter is zero, and at least one of the stored channels must have a delay of zero. The complete description of Record Type 14 therefore becomes:

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The structure of record type 14 differs in this new version 8.0 from that in version 7.0. In practice, however, there will be no difficulty in reading either version, since “Blocksize” indicates whether the last byte “delay” is present or not.

**STORAGE OF INFUSED FLOW RATE**

The following signal description is added to A9. Addendum:

<table>
<thead>
<tr>
<th>Signal ID</th>
<th>Signal name</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Qinf</td>
<td>ml/min</td>
</tr>
</tbody>
</table>

**POSITION OF MARKERS**

Records of type 8 describe markers set during the measurement, by the user, or by the measurement program, for instance “start of filling”. The “position” field contains the number of the sample (16-bit word) with which the marker and comment are associated. If different channels are stored at different sample rates, the number of the sample should refer to the channel with the highest sample rate.

**UNIFIED MARKER TYPES IN RECORD TYPE 8**

The following marker types are defined:

<table>
<thead>
<tr>
<th>Description of marker</th>
<th>Marker type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information-user definable</td>
<td>0</td>
</tr>
<tr>
<td>Start of automatically started flow measurement</td>
<td>1</td>
</tr>
<tr>
<td>Pump on (see also 155)</td>
<td>3</td>
</tr>
<tr>
<td>Pump off (can occur repeatedly-see also 93)</td>
<td>4</td>
</tr>
<tr>
<td>Puller on</td>
<td>5</td>
</tr>
<tr>
<td>Puller off</td>
<td>6</td>
</tr>
<tr>
<td>First desire to void</td>
<td>7</td>
</tr>
<tr>
<td>Normal desire to void (see also 40 and 151-153)</td>
<td>8</td>
</tr>
<tr>
<td>Contraction (see also 154)</td>
<td>9</td>
</tr>
<tr>
<td>Cough</td>
<td>10</td>
</tr>
</tbody>
</table>

Artifact-information for user only, not for calculations 11
Leakage 12
Event-user definable 32–39
Strong desire to void (see also 8 and 151-153) 40
Video 48
Start of Video Sequence 49
Stop of Video Sequence 50
Start of flowrate 64
End of flowrate 65
Maximum flowrate 66
For compliance calculation at pump start 67
For compliance calculation at first sensation 68
For compliance calculation at normal desire 69
For compliance calculation at pump stop 70
Start of resting urethral profile 71
End of resting urethral profile 72
Start of stress urethral profile 73
End of stress urethral profile 74
Start of detrusor contraction in voiding phase 75
Maximum detrusor pressure 76
Maximum intravesical pressure 77
Maximum abdominal pressure 78
Pressure transducer leaves urethra 79
Maximum urethral pressure 80
Maximum urethral closure pressure 81
30% of Maximum urethral closure pressure 82
70% of Maximum urethral closure pressure 83
Compliance calculation start 84
Compliance calculation stop 85
Start of detrusor instability (detrusor overactivity) 86
End of detrusor instability (detrusor overactivity) 87
Start of artefact- to be excluded from display and calculation 88
End of artefact- to be excluded from display and calculation 89
Zero set (any channel, or all channels, unspecified) 90
Maximum cystometric capacity 91
Pause 92
End of filling phase (in contrast to pump-off (4) only once) 93
Position sitting 94
Position supine 95
Position standing 96
Valsalva 97
Zero set specific channel (marker type = 100 + channel ID) 101–150
First sensation of bladder filling 151
Urgency 152
Permission to void 153
Involuntary contraction (detrusor overactivity) 154
Start of filling (not necessarily with a pump) 155

Notice that some markers show an overlap in function. This is unavoidable as different manufacturers have implemented functions in a different way.