SleepXML - XML Application For Polysomnographic Data Storage And Exchange

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SleepXML
XML dialect to describe PSG Data

- What does *SleepXML* do?
  - Uses XML Schema Definition Language - for Sleep Event Definitions.

    SleepXML Schema specifies the events' structure, such as what events are allowed, what types and classes they have, what parameters of what kind they have, etc.
  - Converts Event Data between event definitions /displays (XSLT).
  - Generates PSG reports statistics by processing Event Data
  - Creates and links with databases

SleepXML
XML dialect to describe PSG Data

- What *SleepXML* does NOT do?

- ***SleepXML*** does NOT attempt to define a structure of PSG events that all PSG equipment makers and users have to accept. This is hard to accomplish because:

a) the field of polysomnography is still in developing stage;

b) every major PSG equipment manufacturer has it's own structure of PSG events;

b) every major Sleep Disorders Research lab has developed a custom set of events and annotations that describe the best that particularly lab's way of scoring PSG recordings.

SleepXML
Event definition

- **SleepXML Schema:** XML document defining structure of PSG Events:
  - defines PSG channel types (Airflow, SpO2, etc.);
  - defines PSG events on those channels (respiratory, arousals, etc.);
  - defines event parameters (time, duration, SpO2 drop, stage, position).

```
<xs:element name="Respiratory" SleepXML:Color="0,225,240" sql:relation="RespEvent">
    <xs:complexType>
        <xs:all>
            <xs:element name="RecordGUID" minOccurs="0" sql:hide="true"/>
            <xs:element name="Classification" default="Other Respiratory Event" minOccurs="1" sql:field="Classification">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="Obstructive Apnea" SleepXML:Color="25,15,255" />
                        <xs:enumeration value="Flow Hypopnea" SleepXML:Color="25,125,240" />
                        <xs:enumeration value="Obstructive Non A. Non H." SleepXML:Color="225,0,240" />
                        <xs:enumeration value="Central Apnea" />
                        <xs:enumeration value="Central Hypopnea" />
                        <xs:enumeration value="Central Non A. Non H." />
                        <xs:enumeration value="Other Respiratory Event" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
```

Fragment of NYU SDC
Respiratory Event Definition.

SleepXML

Converting Respiratory Events

Chicago Criteria
Hypopnea = Reduced amplitude with >3% desaturation or arousal

Medicare Criteria
Hypopnea = 30% or more reduced amplitude with at least 4% desaturation

NYU Clinical Sleep Lab
Events stored in local format

Physiobank Database
Events in Physiobank format.

SleepXML
Viewer Implementation

- **SleepXML Viewer application:**
  - Uses EDF for raw samples storage and calibration;
  - Uses HL-7 for Patient Demographics;
  - Loads SleepXML Schema from the PSG study folder and analyzes Event Set structure;
  - Loads XSLT template for the current Event Set Presentation;
  - Displays PSG Events on the waveforms and as a list;
  - The Events could be scored, deleted or edited

SleepXML
Other Tools Available

- **SleepXML Event Set Schema Tool:**
  - Available online: www.SleepXML.org
  - Allows to create Event Set, add and modify PSG Events;
  - Event Set is downloadable after editing;
- **Conversion Tools:**
  - Respironics Alice Events to SleepXML;
  - Compumedics ProFusion Events to SleepXML;
  - Physionet Events to SleepXML
- **Database upload module: MS SQL Server-compatible**

SleepXML
Advantages

- **Openness:** No proprietary Data/Report formats
- **Flexibility:** No hard-coded Event/Statistic/Report definitions; Event definitions could be designed for a particular Clinical Study or research needs
- **Interchangeability:** Enable Sleep Labs to freely exchange PSG data while maintaining their individuality in defining PSG events
- **Cross-Platform:** Web browser-based data presentation
- **Automatic** report generation
- **Compatibility** with SQL-server for data storage

SleepXML
Conclusion:

SleepXML provides an infrastructure for the interchange, reformatting, presentation and archiving of PSG data. It is not a rigid PSG Data standard, but a way to describe any PSG data.

www.SleepXML.org