P1752.2
Cardiorespiratory Subgroup Teleconference

Working Group Sponsored by IEEE Engineering in Medicine & Biology Standards Committee

March 23, 2023
UTC 4:00 PM
Agenda
March 23, 2023

Attendance & Introductions

Items:

✓ Preparation (session March 7, 2023):
  • Review JSON schema coding
  • Informed by IEEE 1751.1 schemas
    • Esp familiarize with “Metadata” and “Utility” schemas
    • Consider: Samples -> Schemas
  ✓ Assessing dependencies: Organization of CR schema

Other business

✓ Interests for schema groupings
✓ Schema timeline / initial draft target
✓ Next meeting: April 27, 2023
Impactful Healthcare

Relevance

Morbidity & mortality

... WHO category of highest prevalence

Preventative medicine

... overall intervention of highest impact

Health economics

... as yet unmet need:
  semantic interoperability
  contextuality

Cardiovascular disease #1
  cerebrovascular
  heart failure
  dysrhythmias

Physical activity & mvt
  CV fitness *

Apps

Wearables & ext. detectors

Internal/implant sensors *

PRSteiner - Dartmouth
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Impacts & Relevance:

- WHO category of highest consequence
- Overall intervention of highest impact
- As yet unmet need:
  - Semantic interoperability
  - Contextuality
IEEE 1752 Standard for Mobile Health Data

Expansion of Mobile Health Data overlapping into the Digital Biomarker Space...

- Apps
- Wearables & ext. detectors
- Internal/implant sensors

- Internal/implant sensors
- Wearables & ext. detectors
- Apps
### Standard Patch Rhythm Monitor

- **Medical grade**
- **2 electrodes**
- **Continuous data up to 2 weeks**
- **Atrial and ventricular signals**
- **Morphologic analysis (limited)**
- **Time of day, clustering**
- **Dysrhythmia auto-triggering**
- **Symptom log**
- **Option for real-time alerts**
- **Encrypted communications**

![Standard Patch Rhythm Monitor Image]

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### Zio® Patch Report for Report #1, Training

<table>
<thead>
<tr>
<th>Date of Birth</th>
<th>Patient ID</th>
<th>Gender</th>
<th>Primary Indication</th>
<th>Atrial Fibrillation</th>
<th>Ventricular Tachycardia (AT)</th>
<th>Supraventricular Tachycardia (SVT)</th>
<th>PVCs</th>
<th>Ventricular Bigeminy</th>
<th>Ectopy</th>
<th>Dysonrhythmia</th>
<th>Symptom Log</th>
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### Heart Rate

- **Maximum HR**: 222 bpm
- **Minimum HR**: 29 bpm
- **Average HR**: 72 bpm

### Patient Events

- **Number of Triggered Events**: 3
- **Findings within a 48 sec of Trigger**:
  - AV Block, Supraventricular Tachycardia, Atrial Fibrillation, Ventricularbigeminy
  - Supraventricular ectopic beats

### Ectopics

- **PVCs**:
  - Rame < 1.0%, 1.0%
  - Couplet < 1.0%, 1.0%
  - Triplet < 1.0%

### Final Interpretation

1. Fibrillation, atrial fibrillation, AV block, second-degree AV block, atrial tachycardia, PACs, PVCs, and atrial flutter with atrial fibrillation.
2. The patient's diagnostic criteria include:
   - Atrial fibrillation confirmed by ECG
   - PVCs detected
   - AV block confirmed

Signed by Dr. Example Physician on 03/10/2013 at 9:15 PM (CT)
Mobile Health Data: Example

Wearable “Long-term” Monitoring

Over 50% of arrhythmias are missed by Holter monitors.²

Over 99%

Detected by Zio XT in 14 days²

vs

47%

Detected by Holter in 2 days²
Mobile Health Data: Wearable “Long-term” Monitoring

A) Fastest SVT (HR Range 203-255 bpm, Avg 236 bpm) No. of Episodes: 1

B) Fastest VT (HR Range 99-118 bpm, Avg 109 bpm) No. of Episodes: 1

C) Slowest AV Block - 3rd* (30 bpm)

D) Longest Pause (3.3 s, 18 bpm) No. of Episodes: 8

Events:
- Days 1 & 2
- AF per day
- VT
- Pauses
- AF burden
- Fastest SVT
- Slowest AV Block
- Longest Pause

AF Burden:
- Time spent in AF (% of Analyzable ECG)
- Time (0-1 min, 0-15 min, 0-30 min, etc.)

AF:
- Increase in burden
- Total AF hours: 4.19 hrs
- Average AF hours: 0.97 hrs
- Range: 50-154 bpm
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Wearables  Apps  Implantables

PHR  EHR  AI & DL
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Insertable Cardiac Monitor

Sinus

Atrial Tachycardia

Atrial Fibrillation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume</td>
<td>$1.4 \text{ cm}^3$</td>
</tr>
<tr>
<td>Mass</td>
<td>$3.4 \text{ g}$</td>
</tr>
<tr>
<td>Dimensions H x W x D</td>
<td>$45.1 \text{ mm x 8.0 mm x 4.2 mm}$</td>
</tr>
<tr>
<td>Surface area of device electrode</td>
<td>$15.0 \text{ mm}^2$</td>
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<tr>
<td>Distance between the electrodes, centroid-to-centroid</td>
<td>$40 \text{ mm}$</td>
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