P1752.2
Cardiorespiratory Subgroup Teleconference

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

June 30, 2022
15:00 UTC

P1752.2
Cardiorespiratory Subgroup

Agenda _____ June 30, 2022

Attendance

Review of prior minutes

Discussion: Proposal of use cases

- *Quantified self*
- *Health care: Burden of AF*

Tasks : Discussion of next steps

Other business

- *Repository of references, resources, drafts*
- *Stakeholders update*
- *Next meeting*

P1752.2
Cardiorespiratory Subgroup

Approval of Prior Minutes?

- (nuts & bolts: summarization of data repository options)
- May 26, 2022

P1752.2 Standard for Mobile Health Data

Cardiorespiratory Subgroup

Scope

The P1752.2 Cardio–Respiratory (CR) Subgroup will review Open mHealth schemas related to CR measures and propose updates and additional schemas as needed. The scope includes but is not restricted to the following measures of CR health: blood pressure, heart rate, heart rate variability, RR interval, respiratory rate, and O2 saturation. *The focus of this Subgroup's work is on modeling data pertaining to CR function, not on current or future individual devices or apps that measure various aspects of CR health*.

Duties

By reviewing the clinical aspects of cardio–respiratory health and existing relevant devices and apps, the Subgroup shall deliver a list of common attributes as well as a list of clinically important attributes in the cardio–respiratory domain as scoped above. The Subgroup shall propose modified and new schemas relating to CR health, including examples as informed by use cases and the list of common and clinically important attributes. Finally, the Subgroup shall deliver a review of mappings and/or relationships to non–Open mHealth CR schemas.

https://sagroups.ieee.org/1752/cardio-respiratory-subgroup/

Important Cardiorespiratory Health Measures

(*Relevance of Each Access Use Cases*)

Associated Health Condition	*Blood pressure*	*Heart rate*	*RR interval*	*Heart rate Variability*	*O2 saturation*	*Respiratory rate*	*…*	
QUANTIFIED SELF								*…*
FITNESS								*…*
								…
AF Burden								*…*
								…
								…
								…

Use Cases

… and add other clinically important attributes identified

Use case paradigms for developing P1752.2

Athleticism

Fitness
Performance

Self Care

Health Maintenance
Wellness

Health Care

Chronic Disease Monitoring
Post-Intervention Recovery

Maintain alignment with existing

DiMe Society Playbook

- Clinical Research
- Clinical Care
- Public Health

DiMe Society

https://www.dimesociety.org/communication-education/library-of-digital-endpoints/

Zoll	Mean nocturnal HR <70	90 days	Heart rate monitor	Device ("*Lifevest*") : (3 studies)
Edifice	Change in HR variability	Study duration	Heart rate monitor	Drug
Marrek	% atrial fibrillation	24-48 hr	Heart rate monitor	Other
UltraGenyx	Seizure detection via change in HR	Up to 8.5 months	PPG (heart rate monitor)	Drug
Avazzia	Change in physio stress response	?	PPG (heart rate monitor)	Device

Heart rate digital end point reported in 7 of 325 studies listed

SNOMED CT

Cardiovascular Observable

Last uploaded: June 10, 2022

Summary | Classes | Properties

Jump to:

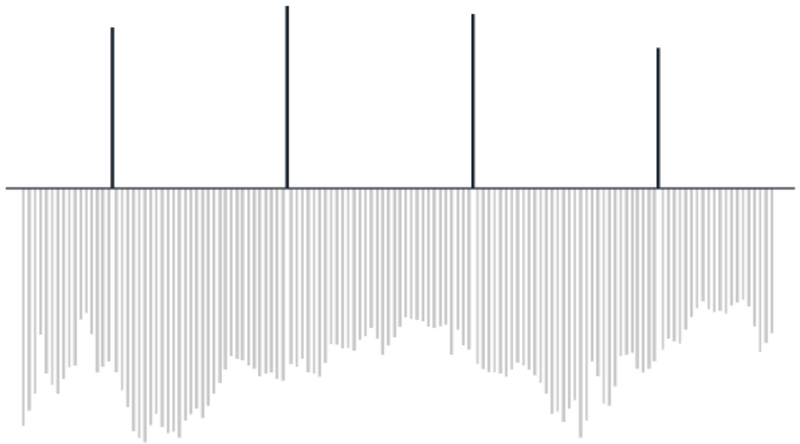
- Body structure
- Clinical finding
- Environment or geographical location
- Event
- **Observable entity**
- Organism
- Pharmaceutical / biologic product
- Physical force
- Physical object
- Procedure
- Qualifier value
- Record artifact
- Situation with explicit context
- SNOMED CT Model Component
- Social context
- Special concept
- Specimen
- Staging and scales
- Substance

- **Observable entity**
  - Age AND/OR growth period
  - Assessment score
  - Body product observable
  - Clinical history/examination observable
  - Clinical performance measure
  - Detection of Severe acute respiratory syndrome coronavirus 2
  - Detection of Severe acute respiratory syndrome coronavirus 2 antibody
  - Disease activity score using 28 joint count
  - Drug therapy observable
  - Environment observable
  - Feature of entity
  - Function
  - General clinical state
  - Hematology observable
  - Histologic grade of dysplasia at proximal surgical margin
  - Identification code
  - Imaging observable
  - Interpretation of findings
  - Laboratory biosafety level
  - Lymph node observable
  - Measurement of Severe acute respiratory syndrome coronavirus 2 antibody
  - Measurement of Severe acute respiratory syndrome coronavirus 2 antigen
  - Molecular, genetic AND/OR cellular observable
  - Monitoring features
  - Number of occurrences observable
  - Parameter
  - Percentage of primary malignant neoplasm of prostate in resected prostate
  - Population statistic
  - Prescription observable
  - Process
  - Proliferative mass observable
  - Radiation therapy observable
  - Social / personal history observable
  - Specimen observable
  - Substance observable
  - Temporal observable

- Cardiovascular observable
  - Atherosclerotic cardiovascular disease risk assessment score
  - Blood vessel feature
  - Canadian Cardiovascular Society grading of angina pectoris grade
  - Cardiac conduction system feature
  - Cardiac feature
    - Awareness of heart beat
    - Cardiac activity
    - Cardiac end-diastolic volume
    - Cardiac end-systolic volume
    - Cardiac physiological function
    - Cardiac vasomotor reflexes
    - Characteristic of heart sound
    - Feature of apex beat
    - Feature of heart rhythm
      - Cardiac rhythm type
      - Fetal heart rhythm
      - Regularity of heart rhythm
    - Feature of left atrium
    - Feature of left ventricle
    - Feature of right ventricle
    - Fetal heart feature
      - Feature of fetal heart rate
      - Feature of fetal heart sounds
      - Fetal heart rhythm
    - Heart beat
    - Heart murmur
    - Heart rate
      - Fetal heart rate
      - Heart rate on admission
      - Pulse rate
      - Resting heart rate
    - Heart valve feature
    - Myocardial feature
    - Pericardial feature
    - Ventricular septum appearance
  - Cardiac investigative observable
  - Cardiac resuscitation outcome
  - Cardiovascular Limitations and Symptoms Profile angina score
  - Cardiovascular Limitations and Symptoms Profile ankle swelling score
  - Cardiovascular Limitations and Symptoms Profile shortness of breath score
  - Cardiovascular measure
  - Cardiovascular orifice observable
  - Cardiovascular shunt feature
  - Coronary reperfusion type
  - ECG feature
  - Extent of cardiac perfusion defect
  - Extent of myocardial stress ischemia
  - New York Heart Association Classification class
  - Pocock death from cardiovascular disease risk score
  - Pulmonary valve flow
  - QRISK cardiovascular disease 10 year risk calculator score
  - QRISK2 cardiovascular disease 10 year risk score
  - Regurgitant flow
  - Regurgitant fraction

https://bioportal.bioontology.org/ontologies/SNOMEDCT

Measuring health using digital sensing products offers *a more holistic view* of a person's lived experience



Visible Data Points
(episodic)

Invisible Data Points
(continuous)

Data collected from **traditional** visits to hospitals, clinics, and sites

Data collected during **everyday life**

Source: "Visible vs. Invisible Data" chart designed by Evidation Health, re-worked by Elektra Labs, Playbook team analysis

https://www.dimesociety.org/

Open mHealth

JSON Schema

Jump to sample data

```
{
    "$schema": "http://json-schema.org/draft-07/schema#",

    "description": "This schema represents a person's heart rate.",
    "type": "object",
    "references": [
        {
            "description": "The SNOMED code represents Pulse rate (observable entity)",
            "url": "http://purl.bioontology.org/ontology/SNOMEDCT/78564009"
        }
    ],

    "definitions": {
        "unit_value": {
             "$ref": "unit-value-1.x.json"
        },
        "time_frame": {
            "$ref": "time-frame-1.x.json"
        },
        "descriptive_statistic": {
            "$ref": "descriptive-statistic-1.x.json"
        },
        "temporal_relationship_to_physical_activity": {
            "$ref": "temporal-relationship-to-physical-activity-1.x.json"
        },
        "temporal_relationship_to_sleep": {
            "$ref": "temporal-relationship-to-sleep-1.x.json"
        }
    },
```

```
    "properties": {
        "heart_rate": {
            "allOf": [
                {
                    "$ref": "#/definitions/unit_value"
                },
                {
                    "properties": {
                        "unit": {
                            "enum": [
                                "beats/min"
                            ]
                        }
                    }
                }
            ]
        },
        "effective_time_frame": {
            "$ref": "#/definitions/time_frame"
        },
        "descriptive_statistic": {
            "$ref": "#/definitions/descriptive_statistic"
        },
        "temporal_relationship_to_physical_activity": {
            "$ref": "#/definitions/temporal_relationship_to_physical_activity"
        },
        "temporal_relationship_to_sleep": {
            "$ref": "#/definitions/temporal_relationship_to_sleep"
        }
    },

    "required": [
        "heart_rate",
        "effective_time_frame"
    ]
}
```

Schema: Heart Rate - (v2.0)

Open mHealth

JSON Schema

Jump to sample data

```
{
    "$schema": "http://json-schema.org/draft-04/schema#",

    "description": "This schema represents the time measurement between the R wave of a person's successive heartbeats.",
    "type": "object",
    "references": [
        {
            "description": "The NCIT code represents the time measurement between the R wave of successive heartbeats as measured in milliseconds.",
            "url": "https://ncim.nci.nih.gov/ncimbrowser/ConceptReport.jsp?dictionary=NCI%20MetaThesaurus&code=C0489636"
        }
    ],

    "definitions": {
        "duration_unit_value": {
            "$ref": "duration-unit-value-1.x.json"
        },
        "time_frame": {
            "$ref": "time-frame-1.x.json"
        },
        "descriptive_statistic": {
            "$ref": "descriptive-statistic-1.x.json"
        },
        "temporal_relationship_to_physical_activity": {
            "$ref": "temporal-relationship-to-physical-activity-1.x.json"
        }
    },

    "properties": {
        "rr_interval": {
            "allOf": [
                {
                    "$ref": "#/definitions/duration_unit_value"
                },
                {
                    "properties": {
                        "unit": {
                            "enum": [
                                "ms"
                            ]
                        }
                    }
                }
            ]
        },
        "effective_time_frame": {
            "$ref": "#/definitions/time_frame"
        },
        "descriptive_statistic": {
            "$ref": "#/definitions/descriptive_statistic"
        },
        "temporal_relationship_to_physical_activity": {
            "$ref": "#/definitions/temporal_relationship_to_physical_activity"
        }
    },

    "required": ["rr_interval"]
}
```

Schema: Rr Interval - (v1.0)

Open mHealth

Schemas: **Granola** - (v1.1)

(Apple HealthKit)

Hk blood type
Hk category sample
Hkcategory type
Hk correlation
Hk correlation type
Hk metadata
Hk quantity sample
Hk quantity type → "**HKQuantityTypeIdentifierHeartRate**"
Hk workout

- one of 57 enumerated quantity types

P1752.2 Cardio-Respiratory Subgroup

Tasks / Deliverables

1. Deliver a list of common attributes as well as a list of clinically important attributes in the cardio–respiratory domain.

2. Propose modified and new schemas relating to cardiorespiratory health, including examples as informed by use cases and the lists of common attributes and clinically important attributes.

3. Deliver a review of mappings and/or relationships to other existing cardiorespiratory schemas other than that of Open mHealth.

https://sagroups.ieee.org/1752/cardio-respiratory-subgroup/

Cardiorespiratory Use Cases

Athleticism (fitness and performance)

Wellness & health maintenance (self care)

Health care

- Clinical care
- Public Health
- Clinical research

examples →

Atrial fibrillation burden
Palpitations
COPD
Asthma
Hypertension
Heart failure
Presyncope & syncope
Post-operative recovery monitoring
Post-stroke monitoring
…

Important Cardiorespiratory Health Measures

(*Relevance of Each Access Use Cases*)

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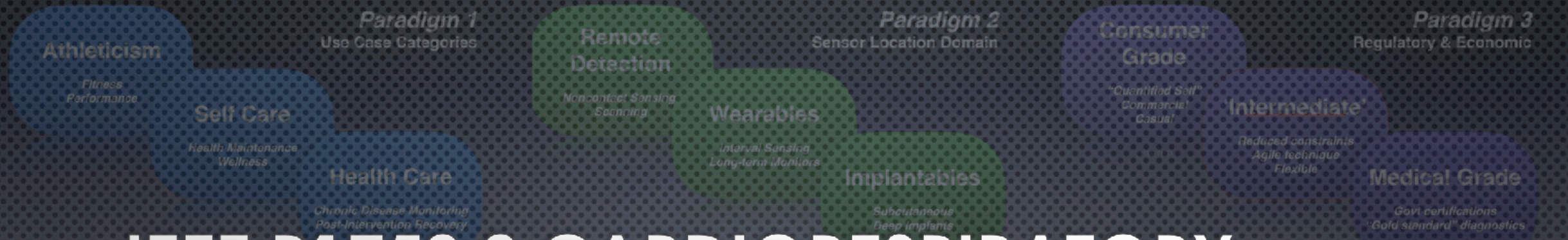
QUANTIFIED SELF								*…*
FITNESS								*…*
								…
AF Burden								*…*
								…
								…
								…

Use Cases

… and add other clinically important attributes identified



IEEE P1752.2 CARDIORESPIRATORY
- *SCHEMA DEVELOPMENT*

IEEE STANDARDS ASSOCIATION IEEE

- USAGE CASES UNDER ACTIVE DEVELOPMENT — *Heath & wellness, Fitness & performance, Disease monitoring*
- FOCUS ON IDENTIFICATION OF KEY DATA TYPES
- COHERENT ACROSS BROAD USAGE PARADIGMS
- IDENTIFY AND BROADEN PARTICIPATION OF STAKEHOLDERS

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Tasks : Discussion of next steps

Other business

- *Repository of references, resources, drafts*
- *Stakeholders update*
- *Next meeting*

Next meeting July 28 (15:00 UTC)