

# P1752 Sleep Schema Subgroup Meeting

Sponsored by IEEE Engineering in Medicine & Biology (EMB) Standards Committee

- 14 Aug 2018
- Teleconference

# Attendance

- **Put your name and affiliation in the chat window for attendance today.**
- If you are joining only via phone, please email [charlotte.chen@philips.com](mailto:charlotte.chen@philips.com) with “P1752 Sleep Schema Subgroup call” as subject
- The document shows attendance is under <https://ieeesa.imeetcentral.com/omh/folder/WzlwLDEwMjY4MDg1XQ/>.
  - If you attended the call, please verify that your name is listed
  - If you name is not listed, either edit the document above or email [charlotte.chen@philips.com](mailto:charlotte.chen@philips.com)

# Agenda

1. Attendance
2. Review deliverables and timeline for stage2
3. Update on the use cases development
4. Overview of schemas
5. Discuss and prepare for schema development
6. Next steps
7. Q&A

# Sleep Schema Subgroup Deliverables

- **Clinically important sleep attributes**
- **Common sleep attributes of the existing relevant devices and apps**
- **Standard Comparison Report (Review and mapping)**
- Proposed sleep schemas (modified and new) and **use cases**
  - (1) Macrostructure
  - (2) Microstructure
  - (3) Subjective sleep experience
  - (4) Other sleep related phenomena

# Timeline for Stage2

**July 23, 2018**

Kick Off

**Oct 22, 2018** Review on Sleep Schemas and use cases

**Nov 9, 2018**

-Propose Sleep Schemas and use cases  
-All the deliverables are ready

# Update on Use Cases Development (1)

- Use case worksheet in iMeet;
- Information included on the worksheet:
  - Sleep Attribute ID;
  - Sleep Attributes;
  - Sleep Attributes Abbreviations;
  - Relevant Schema Categories (Macro/Micro/Subj./Others);
  - Appeared in which stage1 document(s)(Common in devices/apps, Standards, Clinical important);
  - Use case ID;
  - Use cases;
  - References for use cases;

# Update on Use Cases Development (2)

- Example 1 of use cases:

Sleep Attribute ID	Sleep Attributes	Abbrev.	Macro/Micro/Subj/Others	Common in devices/apps	Appeared in standards	Clinical Important	Use Case ID	Use Cases
S3	Time in Bed	TIB	Macro + Subj	yes	yes	no	U3	When a user feels they are not getting enough sleep, the doctor might ask the user: what time did you go to bed? When did you get up in the morning?

# Update on Use Cases Development (3)

- Example 2 of use cases:

Sleep Attribute ID	Sleep Attributes	Abbrev.	Macro/Micro/Subj/Others	Common in devices/apps	Appeared in standards	Clinical Important	Use Case ID	Use Cases
S12	Snore Duration	SD	Subj + Other	no	yes	yes	U12	When a person reports snoring heard by himself or his bed partner, one of the objective measures is snore duration over the night or over a CPAP therapy session.



# Update on Use Cases Development (4)

- Example 3 of use cases:

Sleep Attribute ID	Sleep Attributes	Abbrev.	Macro/Micro/Subj/Others	Common in devices/apps	Appeared in standards	Clinical Important	Use Case ID	Use Cases
S6	Duration of REM	DREM	Macro	yes	yes	yes	U6	When a person reports diurnal mood variation or early morning depression, an objective measure may be REM duration.

## References

<https://www.ncbi.nlm.nih.gov/pubmed/14656450>

# Update on Use Cases Development (5)

- Discussion on the use cases developed:
  - Q&A
  - Suggestions/Comments
- Proposed next steps for use cases development:
  - Finish all the draft use cases as an entire group by 8/21/2018
  - Solicit opinions from sleep expert(s) (**Dr. David P. White**);
  - Review/Comment/Modify by 8/31/2018

# Overview of Schema

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Open mHealth & UCSF

# Schema design principles

- <http://www.openmhealth.org/documentation/#/schema-docs/overview>
- Atomicity
  - Schema represent data at useful granularity for clinical use cases
  - For quantitative measures, schema describes a single measurement or a descriptive statistics of aggregates
- Balancing parsimony and complexity
  - 80/20 rule: comprehensive but not too complex schemas
- Balancing permissiveness and constraints (required vs. optional properties)
- Designing for data liquidity
  - The meaning of data needs to get from sender to receiver
  - Operational metadata (header) and clinical metadata (context)
- Modeling of time
- See slides of March 13 and May 22 WG calls

# Open mHealth Schemas

- <https://github.com/openmhealth/schemas/tree/master/schema/omh>
- A schema structures data and follows [design principles](#)
- Each data point, includes
  - header (data point ID, body schema ID, creation date-time, source, ...)
  - body (typically a measure, i.e. instance of a measure schema)
  - annotation to SNOMED, LOINC, RxNORM, or UCUM

```
"references": [  
  {  
    "description": "The SNOMED code represents Duration of sleep (observable entity)",  
    "url": "http://purl.bioontology.org/ontology/SNOMEDCT/248263006"  
  }  
],
```

# Header + Body = Data Point

---

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "description": "This schema represents a data point.",

  "definitions": {
    "header": {
      "$ref": "header-1.x.json"
    }
  },

  "properties": {
    "header": {
      "description": "The header of the data point.",
      "$ref": "#/definitions/header"
    },
    "body": {
      "description": "The body of the data point. This object should conform to the schema identifier in the header property.",
      "type": "object"
    }
  },
  "required": ["header", "body"]
}
```

---

# Example Header Instance

```
{  
  "id": "123e4567-e89b-12d3-a456-426655440000",  
  "creation_date_time": "2013-02-05T07:25:00Z",  
  "schema_id": {  
    "namespace": "omh",  
    "name": "physical-activity",  
    "version": "1.1"  
  },  
  "acquisition_provenance": {  
    "source_name": "RunKeeper",  
    "source_creation_date_time": "2013-02-05T07:25:00Z",  
    "source_data_point_id": "1493623920",  
    "modality": "sensed"  
  },  
  "user_id": "user1432"  
}
```

# Example Measure Instance

```
{
  "blood_glucose": {
    "unit": "mg/dL"
    "value": 95
  },
  "effective_time_frame": {
    "date_time": "2015-02-05T07:25:00Z"
  },
  "temporal_relationship_to_meal": "fasting"
}
```

Fasting blood glucose of 95 mg / dL on Feb 5, 2015



# Example Measure Instance

```
{
  "blood_glucose": {
    "unit": "mg/dL" ← required
    "value": 95
  },
  "effective_time_frame": {
    "date_time": "2015-02-05T07:25:00Z"
  },
  "temporal_relationship_to_meal": "fasting" ← optional, but recommended
}
```

Fasting blood glucose of 95 mg / dL on Feb 5, 2015

# Example Measure Instance

```
{
  "blood_glucose": {
    "unit": "mg/dL",
    "value": 128
  },
  "effective_time_frame": {
    "time_interval": {
      "start_date_time": "2015-02-05T07:25:00Z",
      "end_date_time": "2015-06-05T07:25:00Z"
    }
  },
  "temporal_relationship_to_meal": "fasting",
  "temporal_relationship_to_sleep": "on waking",
  "descriptive_statistic": "average"
}
```

← required

← optional

Average fasting blood glucose on waking of 128 mg / dL between Feb 5 and June 5, 2015.

# Sleep-related Open mHealth Schemas

- [http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh\\_sleep-episode](http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh_sleep-episode)
- [http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh\\_sleep-duration](http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh_sleep-duration)

# Discuss and Prepare for Schema Development

- Schema development tasks
- Discuss the proposed approach

# Schema Development Tasks (1)

## ❖ Review and Understand the Existing Work

### ➤ Open mHealth Schemas Design

- Design principles:

<http://www.openmhealth.org/documentation/#/schema-docs/schema-design-principles>

- Existing templates for various schemas:

<http://www.openmhealth.org/documentation/#/schema-docs/write-a-schema>

- quantitative schema
- unit-value schema
- time-frame schema
- descriptive-statistic schema

# Schema Development Tasks (2)

## ➤ Sleep Schemas Example

- Existing sleep schemas:

<http://www.openmhealth.org/schema/omh/sleep-duration-2.0.json>

[http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh\\_sleep-episode](http://www.openmhealth.org/documentation/#/schema-docs/schema-library/schemas/omh_sleep-episode)

# Schema Development Tasks (3)

## ❖ Propose Modified and New Sleep Schemas

- Determine the sleep attributes for schema development
  - Determine the mappings between a schema and sleep attribute(s) based on the use case worksheet: (output: a list of schema names vs sleep attribute(s))
    - one to one mapping (a schema contains a single sleep attribute)
    - one to multiple mapping (a schema contains more than one sleep attributes)
  - Choose a name for each proposed schema
  - Categorize the schemas into 4 areas
- For each schema name in the list above, create/modify it to include the necessary sections:
  - schema header (“reference” section: SNOMED, LOINC, RxNORM, or UCUM)
  - “definitions”
  - “properties”
  - “required”

# Proposed Approaches

## ➤ Create a list of mapping between a schema name and sleep attribute(s)

- Entire team

## ➤ Draft Schemas (Two Approaches)

(1) Create a volunteer based ad hoc team to draft all the schemas

(2) Divide into possibly two groups to develop schemas:

---Macrostructure and microstructure

---Subjective sleep experience and other sleep related phenomena

## ➤ Review/Comment

- Entire team





# Action Items

- Complete the draft of use cases by Aug 21,2018
- Review/Comment (use cases) done by Aug 31,2018
- Complete the list of mapping (schema vs. sleep attribute(s)) by Sept. 10, 2018
  - Draft schemas done by Oct. 22, 2018
  - Review schemas completed by Nov. 2, 2018
  - Propose the schemas with use cases on Nov. 9, 2018

# Future Meetings

- Continue with Tuesdays at 8:30 AM Pacific / 11:30 AM Eastern
- Upcoming meetings
  - Sept 11, 2018
  - Oct 9, 2018

Adjournment