OntoWoH

The OntoWoH Ontology - a Women’s Health Reference
Ontology Detailing the Fragment of Climacteric and Menopause

Authors: Cilenir Carla de Carvalho, Andreia Soprani dos Santos, Silvia das Dores Rissino, Susana Bubach and Maria das Graças da Silva Teixeira
Contact: cilenir.carvalho@gmail.com, andreia.s.santos@ufes.br, silvia.rissino@ufes.br, susana.bubach@ufes.br, maria.teixeira@ufes.br
Filiation: Federal University of Espírito Santo (UFES), BR-101, Km 60, Litorâneo, 29932-540, São Mateus, ES, Brazil
Outline

01
Introduction

02
Theoretical Foundation and Methodological Aspects

03
Result: The Reference Ontology for Women’s Health (OntoWoH)

04
Conclusion
Introduction

- **What**: HealthCare Information System (HCIS) (future project). First step: conceptual model
- **Why**: To support decision-making in health care services
- **Some challenges**:
  - Knowledge understanding and sharing;
  - Communication flowing between agents (human and artificial);
  - Integration between databases of a HCIS network.

- Ontologies are one solution to solve such challenges. Among its benefits:
  - To establish a terminology;
  - To assist in the development of understandable, integrable, reusable, expandable knowledge bases.
The reference ontology named Ontology of Woman Health, OntoWoH, represents the complex and extensive domain of women's health, focusing on climacteric and menopause aspects in its version 1.0.
Theoretical Foundation and Methodological Aspects
Phases of a Woman’s Life
Theoretical Foundation and Methodological Aspects

The domain of women’s health

- Phases of interest:
  - Reproductive stage.
    - Menstrual cycle;
    - Why menopause occurs;
  - Climacteric and menopause stage.
    - What are the existing terminology? Examples: Stages of Reproductive Aging Workshop (STRAW and STRAW+10);
    - Symptomatology and treatment of some problems.
Theoretical Foundation and Methodological Aspects

- Women are the majority of the Brazilian population and the main users of the Brazilian Public Health Care System;
- Due to the increase in women’s life expectancy, the importance of studies focused on the phases of a woman's life from the climacteric and post menopause are highlighted;
- Personal motivation.
Women's Health

• Until the 1970s, actions related to women's health had a restricted view of women - their biological specificity and their social role as mothers and housewives, responsible for raising, educating and caring for their children and other family members health;

• Despite advances, there are still gaps in relation to women's health in Brazil, for example, to better understand and offer support to climacteric / menopause stage.
Menstrual Cycle

Understanding why menopause happens

- Decrease in the number of follicles in the ovaries;
- Progressive drop in estrogen, estradiol (E2) and progesterone concentrations in the woman’s body;
- The ovaries begin to respond less to the stimulation of Follicle-Stimulating (FSH) and Luteinizing (LH) hormones.

Source: Adapted from Bardine (2022). In Portuguese.
Climacteric and Menopause

The climacteric is a biological phase of a woman’s life, and not a pathological process, comprising the transition between the reproductive and non-reproductive periods of a woman’s life. Menopause is a milestone of this phase and corresponds to the last menstrual cycle, being recognized as so only after twelve months of its occurrence (BRASIL, 2008).
<table>
<thead>
<tr>
<th>Stage</th>
<th>TERMINOLOGY</th>
<th>REPRODUCTIVE</th>
<th>MENOPAUSAL TRANSITION</th>
<th>POSTMENOPAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>Menarche</td>
<td>Early</td>
<td>Early</td>
<td>Early</td>
</tr>
<tr>
<td>-4</td>
<td></td>
<td>Peak</td>
<td>Late</td>
<td>Late</td>
</tr>
<tr>
<td>-3b</td>
<td></td>
<td>Late</td>
<td>Early</td>
<td>Late</td>
</tr>
<tr>
<td>-3a</td>
<td></td>
<td></td>
<td>Perimenopause</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1 a</td>
<td></td>
<td></td>
<td></td>
<td>Remaining lifespan</td>
</tr>
<tr>
<td>+1 b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1 c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Duration**
- Variable
- Variable
- 1-3 years
- 2 years (1+1)
- 3-6 years
- Remaining lifespan

**PRINCIPAL CRITERIA**

<table>
<thead>
<tr>
<th>Menstrual Cycle</th>
<th>Terminology</th>
<th>Reproductive</th>
<th>Menopausal Transition</th>
<th>Postmenopause</th>
</tr>
</thead>
</table>
| Menstrual Cycle | Variable to regular | Regular | Regular | Variable Length Persistent 
|                |             | Subtle changes in Flow/Length | 7- day difference in length of consecutive cycles | 14 days | |
| Amenorrhea     | 3+60 days   | Interval of amenorrhea of >=60 days | |

**SUPPORTIVE CRITERIA**

<table>
<thead>
<tr>
<th>Endocrine</th>
<th>Terminology</th>
<th>Reproductive</th>
<th>Menopausal Transition</th>
<th>Postmenopause</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSH</td>
<td>Low</td>
<td>Low</td>
<td>Variable*</td>
<td>Variable*</td>
</tr>
<tr>
<td>AMH</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Inhibin B</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**ANTRAL FOLLCLE COUNT**
- Low

**DESCRIPTIVE CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Terminology</th>
<th>Reproductive</th>
<th>Menopausal Transition</th>
<th>Postmenopause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasomotor symptoms</td>
<td>Likely</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasomotor symptoms</td>
<td>Most Likely</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Blood draw on cycle days 2-5 = elevated
**Approximate expected level based on assays using current international pituitary standard

Source: Harlow et al. (2012).
Climacteric Syndrome
Symptomatology

Main factor
Endogenous
- Decreased endogenous estrogen
- Health condition

Exogenous
- Sociocultural environment
- Personal situation (psychological, romantic-sexual, family, professional status)
- Lifestyle
Climacteric Syndrome Treatment

- Pharmacological approach.
  - Hormone therapy;
  - Non-hormonal therapy;

- Non-pharmacological approach.
Ontology & Ontology Engineering

- An ontology is a formal representation of relevant concepts and relationships of a system, which allows sharing and reuse of acquired and represented knowledge (Guarino, Oberle, Staab, 2009);

- The Ontology Engineering field seeks to improve the development of ontologies, as it enables the identification and development of a common standard that can be used in the construction of several ontologies, through the establishment of processes, techniques, guidelines and tools that can be applied to fullfil this goal.
Ontology Classification

Where OntoWoH is?

Regarding Aspects
- Reference Ontology (conceptual expressiveness)
- Operational Ontology (computational efficiency)

Regarding Abstraction Levels
- Foundational Ontology (generic)
- Core Ontology (intermediate)
- Domain Ontology (specific)

Source: Adapted from Da Silva Teixeira (2020).
**Unified Foundational Ontology (UFO) and Where OntoWoH is?**

- **UFO-A (Structural Aspects)**
  - Objects and their types, wholePart relations, roles, relational and intrinsic properties, ...

- **UFO-B (Dynamic aspects)**
  - Events and their parts, Relations between events, Participation of Objects and Agents in events, Temporal Parts of Entities, Time, ...

- **UFO-C (Social Aspects)**
  - Agents, Intentional States, Goals, Actions, Norms, Social Commitments, ...

- **OntoWoH**
- **OntoGender**
- **OntoTB**
- **OntoSaúde**

- **UFO-L (Legal Ontology)**
- **UFO-S (Service Ontology)**

Source: Adapted from Da Silva Teixeira (2020).
OntoWoH Development Process
SABiO Approach

- Purpose and Possible Uses of OntoWoH;
- Competency questions;

- General Aspects
  - Quality control:
    - Modeling decisions;
    - Verification;
    - Validation.

- Graphical representation (diagrams);
- Textual description;
- Glossary of terms.

Source: Falbo (2014).
 OntoWoH’s Competency Questions (CQ)  
Some Examples

- CQ1: What are the particularly feminine events and at what stages of a woman's life can such events occur?
- CQ2: Which stages of women's reproductive aging are considered in STRAW + 10?
Result: OntoWoH’s Graphical Representation

- OntoWoH overview diagram;
- Some OntoWoh detailed diagrams.
OntoWoH Overview
Woman’s Life Phases Diagram
Female Reproductive Aging Staging System Diagram
Conclusion

- The product;
- Were the proposed goals achieved?
- Lessons learned;
- Next chapters:
  - OWL;
  - OBO Foundry;
  - Reuse;
  - Expansion;
  - ...

Main References


Thanks!

Let’s discuss it!!!

For further information, please contact us

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