CREATING KNOWLEDGE ARCHIVE IN THE INTERNET MEDICAL CONSULTANT FOR DECISION SUPPORT AT THE POINT OF CARE

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Overview

- Knowledge sharing in medicine
- Collaboration between physicians
- Current state
- Problems
- Communicating knowledge
- Communication model
- Storing knowledge
- Using knowledge at point of care
- Summary
WHY KNOWLEDGE SHARING?

- Extreme complexity of medicine
- Enormous knowledge base
- Fast development of medicine
- Tight dependence on cutting edge technologies
- Need of high level of specialization
- Patient treatment improvement
- Uneven distribution of knowledge in the countries and in the world
COLLABORATION BETWEEN PHYSICIANS...

Inside hospital
- same & different clinical departments
- emergency room & ambulatory treatment
- offices
- diagnostic units
- therapeutic units

Outside hospital
- GP & specialist offices (ambulance care)
- lower, same, higher or different level of specialization
- diagnostic & therapeutic units

How to make this knowledge permanently available?

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CURRENT STATE...

**Generalization**

**Updating**

**Time**

**Matching**

**Machine sources of knowledge**

- Hundreds of books
- Millions of articles
- Search results
- Patient

**Internet**

- Up-to-date knowledge
- Short access time
- Specific problem knowledge
- Matching
- Reliable sources

**Human & machine sources of knowledge**

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PROBLEMS EMERGE...
COMMUNICATING KNOWLEDGE...
COMMUNICATION MODEL...

Individual consultation

Group consultation
STORING KNOWLEDGE...
CREATING AND SEARCHING THE TEST ARCHIVE...

**OHSUMED test collection**
- ohsumed.87.txt
- ohsumed.88.txt
- ohsumed.89.txt
- ohsumed.90.txt
- ohsumed.91.txt
- queries.txt
- drel.ui.txt
- drel.i.txt
- pdrel.ui.txt
- pdrel.i.txt

**OHSUMED files used**
- ohsumed.87.txt
- ohsumed.88.txt
- ohsumed.89.txt
- ohsumed.90.txt
- ohsumed.91.txt
- queries.txt
- drel.i.txt

**queries.txt**
- .I - Sequential identifier
- .U – MEDLINE identifier
- .M – Human assigned MeSH terms
- .T – Title
- .P - Publication type
- .W – Abstract
- .A – Author
- .S – Source

**DOCUMENT**
- .I - Sequential identifier
- .W – Abstract

**DOCUMENT p**

**DOCUMENT q**

... 

**Ranked documents**

| DOCUMENT p |
| DOCUMENT q |
| ... |
| DOCUMENT k |

**FORMULA:**

\[
sim^p(x, y) = \frac{(x, y)^p}{\sqrt{(x, x)^p \cdot (y, y)^p}} \quad (x, y)^p = \sum_{p \in (x)} \sum_{q \in (y)} nc_{value}(p) \cdot nc_{value}(q) \cdot \tau_{p,x} \cdot \tau_{q,y} \cdot s^p(p, q)
\]

\[
sim(query, doc) = \sim^p(W_q, W_d)
\]
Table 1: Test results

Algorithm A uses linguistic filter $LF1: ((A|N)^*|((A|N)^*(N \ p))(A|N)^+)^N$ and doesn’t incorporate NC values. Algorithm B uses LF1 and incorporates NC values. Algorithm C uses $LF2: (A|N)^+N$ and no NC values and algorithm D uses $LF2$ and NC values.

The ranked document retrieval from the algorithms was evaluated according to the document level averages precision. This precision, computed after a given number of documents have been retrieved reflects the actual measured system performance as a user might see it.
**SIMULATION OF THE SYSTEM…**

**QUERY:**

**Problem description + Question**

**FORMULA:**

\[
\text{sim}(\text{query}, \text{tad}) = \text{sim}^p(Q(\text{query}), CQ_{\text{heading} \cup \text{question}}(\text{tad})) + \\
+ \text{sim}^p(PD(\text{query}), CQ_{\text{problem-description}}(\text{tad})) + \text{sim}^p(Q(\text{query}), B(\text{tad}))
\]
AT POINT OF CARE...

Knowledge utilization

Point of care

IMC<sub>web</sub>

IMC<sub>device</sub>

download

accessing knowledge at point of care

preparing knowledge for quick access at point of care

Knowledge organization

Consultation Document

Extract knowledge

Reference Document

Knowledge organization

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• Human knowledge is the most precious knowledge of all, especially when it comes to recognition and interpretation of complex problems, and pointing to knowledge resources as well, based on experience, heuristics and wisdom.

• A consultation system that provides complex consultation structure with textual and non-textual content, eliminating the ambiguity as much as possible, archiving the knowledge generated in the process of consulting and providing the users to search it, store it and organize it for use at the point of care, can improve the decision making process of the physicians.

• The IMC system, which is still a work in progress, is an attempt of achieving that goal.
THANK YOU FOR THE ATTENTION