Shared Decision-Making Ontology for a Healthcare Team Executing a Workflow, an Instantiation for Metastatic Spinal Cord Compression Management

Enea Parimbelli
University of Ottawa
Twitter: @neneParimbelli
#AMIA2018
Disclosure

I and my spouse/partner, as well as the co-authors have no relevant relationships with commercial interests to disclose.
Learning Objectives

After participating in this session the learner should be better able to:

• *Describe* current challenges in implementing *shared decision-making* in team-based care delivery

• *Identify* main concepts of *shared decision-making* and their relationship with other domains like healthcare process, healthcare teams and patient preferences

• *Implement* the above concepts to the case-study example of metastatic spinal cord compression and describe the benefits of using an ontology to do so
Why Shared Decision Making? (SDM)

- "the patient is the most underutilized resource in healthcare" - Safran C. 2004
- optimal therapy decisions not only need to consider clinical outcomes but should be aligned with patient values and preferences – Eddie 1990 (talking about EBM and clinical guidelines)

- shared decision-making (SDM) has been advocated as the most desirable model for decision-making during medical encounters.
- Evidence-based recommendations also stress the pivotal role that patients should play in medical decisions
- SDM has potential positive impact on patient outcomes, cost of treatment, and satisfaction with care¹,²

SDM implementation challenges

- ad hoc (often unstructured) process not embedded in clinical workflows
- enactment often left to the initiative of the physician leading the encounter
- SDM is a team-sport where several actors need to be involved
- Lack of comprehensive decision-support tools for SDM

E. A. Balas and S. A. Boren, “Managing clinical knowledge for health care improvement,” Yearbook of medical informatics, vol. 2000,
RQ & Objectives

RQ: How to model Shared Decision-Making in team-base care delivery?

• To integrate team-based and evidence-based care delivery domains
• To formalize SDM, situating it as part of team-based care delivery, and incorporate workflow concepts allowing identification of shared decision-making tasks
• To validate our approach using a case-study of metastatic spinal cord compression

We propose a novel shared decision-making ontology (SDMO) that defines and describes the key concepts and relations in shared decision-making and lays the foundation for the formalization and support of SDM.
Workflow-related concepts (BPMN-inspired)

- Workflow
- TaskCollection
- Activity
- Gateway
- Event
- DecisionTask
- NonDecisionTask
- Workflow
- Team
- Person
- Practitioner
- Role
- Status
- Specialty
- Capability
- KnowledgeSource
- KnowledgeModell
- Decision
- DecisionOption
- hasDecisionOption
- selectedOption
- requiresCapability
- hasCapability
- requiresAuthority
- hasAuthority
- requiresMoreKnowledge
- requiresSpecificKnowledge
- requiresSharedKnowledge
- requiresSharedOption
- requiresDomainKnowledge
- requiredDomainKnowledge
- requiresContextKnowledge
- requiresContextSpecificKnowledge
- requiresSpecificKnowledge
- requiresSpecificOption
- requiresKnowledge
- requiresDomainSpecificKnowledge
- requiresDomainSpecificOption
Sarah

- 71 years old
- treated for the breast cancer
- presents to ED with: complaint of increasing nocturnal back pain and progressive difficulty ambulating due to mild leg weakness and numbness
- MRI shows spinal metastasis and soft tissue compression
- non-steroidal anti-inflammatory and dexamethasone to control pain
### MSCC case study: multidisciplinary care plan

- Sarah’s life expectancy is assessed to be approximately 12 months
- Spine surgeon and oncologist involved

<table>
<thead>
<tr>
<th>Option 1: Palliative surgery followed by radiotherapy</th>
<th>Option 2: Radiotherapy alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 3 months of recovery</td>
<td>• may halt or slow neurological deterioration</td>
</tr>
<tr>
<td>• surgical risks</td>
<td>• potential to relieve pain</td>
</tr>
<tr>
<td>• potential to improve mobility, reduce pain and halt neurological deterioration</td>
<td>• avoids surgical risks</td>
</tr>
<tr>
<td></td>
<td>• allows for a quicker recovery</td>
</tr>
<tr>
<td></td>
<td>• pre-operative radiation would increases the risk of wound complications if surgery is eventually required</td>
</tr>
<tr>
<td></td>
<td>• radiation may be less efficacious than surgery at restoring neurological function</td>
</tr>
</tbody>
</table>
MSCC case study: highlights

- A team (of different clinicians with different specialties) is involved in patient care
- Use of evidence-based guideline for MSCC
- Patient preferences should play an important role on therapy selection

**Shared-decision making**
in the context of **team-based care**
and guideline-defined care **process**
Workflow domain

“All decisions on the most appropriate combinations of treatment for pain or preventing paralysis caused by MSCC should be made by relevant spinal specialists in consultation with primary tumour site clinicians and with the full involvement of the patient”

Workflow domain: instances
Team domain: instances

Team: tim_Sarahs_team
- hasMember: pr_Enea
- hasMember: pr_Szymon
- hasMember: pt_Sarah

Practitioner: pr_Enea
- hasLeader: tim_Sarah

Practitioner: pr_Szymon
- hasLeader: tim_Sarah

Patient: pt_Sarah
- executesWorkflow: w_NICE_MSCC_pathway

Workflow: w_NICE_MSCC_pathway

Specialty: s_oncology
- hasSpecialty: pr_Enea
- hasSpecialty: pr_Szymon

Capability: c_plan_radiotherapy
- hasCapability: pr_Enea
- hasCapability: pr_Szymon

Specialty: s_spine_surgery
- hasSpecialty: pr_Enea
- hasSpecialty: pr_Szymon

Capability: c_perform_spinal_stabilization_surgery
- hasCapability: pr_Enea
- hasCapability: pr_Szymon
Decision domain
Decision domain: instances
OWL implementation

http://www.mobiledss.uottawa.ca/sdmo/sdmo.owl

(also contains instance base for MSCC scenario)
What next?

- Validation using other clinical domains/case studies
- Publish on BioPortal/OBO foundry to get additional feedback/contributions
- Explore tools for addressing specific sub-domains and use the ontology as the basis for their integration
- Use this work as a basis for developing CDSS for support of SDM in the MSCC domain at TOH
AMIA is the professional home for more than 5,400 informatics professionals, representing frontline clinicians, researchers, public health experts and educators who bring meaning to data, manage information and generate new knowledge across the research and healthcare enterprise.
Thank you!

Email me at: enea.parimbelli@gmail.com