Approaching Healthcare with Cognitive Systems Thinking: An Application of "Frame-Systems"

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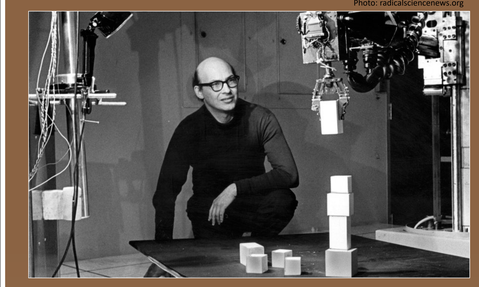
A. Background

Cognitive systems thinking[1] applies theories of cognition (e.g. Schema Theory)[2,3] to better understand and construct 'intelligent' systems. Assessing intelligence of a system (e.g. healthcare) using a cognitive systems framework involves questioning how the system **learns** (i.e., gathers information) and **effectively responds** (i.e., makes decisions) within changing environments.

B. Frame-Systems

The frame-systems concept has been used to represent intelligence in machines (e.g. machine-vision) and has been suggested as useful in other systems.[4] I propose use of frame-systems in the healthcare system as a helpful strategy for learning and effectively responding to changing environments. The strategy entails finding **representations** of a scenario within which problems are easier to discover and solve.[4]

Photo: radicalsciencenews.org



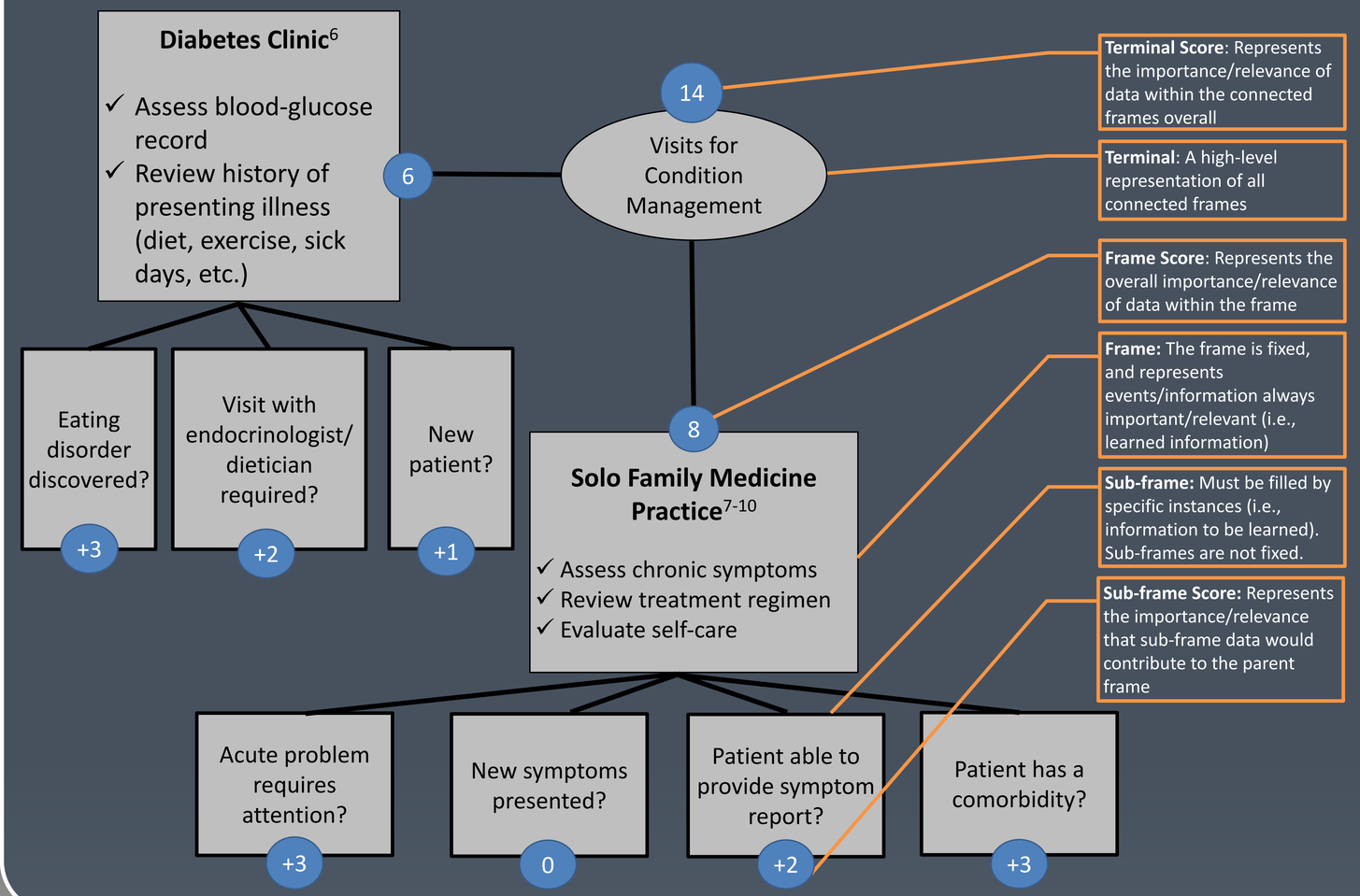
Marvin Minsky (Co-Founder of the M.I.T. Artificial Intelligence Research Lab; Coined the term 'Frame-Systems')

A frame-system relevant to healthcare would be able to:

- Explore a scenario/problem space[5]
- Model decision-making (cause and effect scenarios)
- Measure information flow
- Assess common needs in the system

C. Applying the Frame-Systems Concept

A frame is a collection of questions to be asked about a hypothetical situation: it specifies issues to be raised and methods to be used in dealing with them. Frame-systems are collections of related frames.[4] Here, the frame-systems concept is used to model the relevance/importance of data for discovering and answering questions regarding management of chronic disease. Note the diagram numbers: *higher* numbers represent data that is more important for answering the research question. In this example, the research question has not been specified, so the numbers are arbitrary. The frame-system legend is outlined in **orange** and ways to approach a frame-system are in section ***D.***



D. How to Approach a Frame-System

A theoretical notion in cognitive science is that questions arise from a point of view.[11] Frame-systems thinking may provide points of view that generate novel questions/considerations in health care.

Frame-systems thinking primarily entails asking questions,[4] such as:

1. **What additional frames could be added to the terminal to improve perspective of the scenario/problem space?**
2. **Is there a frame that could be replaced by a better frame?**
3. **How important is the data in a sub-frame? Will sub-frame data be more, or less important in the future?**
4. **Is there a better way to organize the frame-system?**
5. **How might the frame-system be organized [x] years from now?**
6. **Are collections of data in the sub-frames important enough to warrant revisions in the parent frame?**

E. Guiding Questions Around Implementation

The frame-systems concept will be used to guide questions around implementation of the Global Assessment of Severity of Illness Scale (GASI),[12] a single-item scale that can be used to measure severity in multiple conditions. Frame-systems questions will explore where application of the GASI can have the greatest impact in research and clinical practice.

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