

# Cognitive Support for Clinical Comprehension

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# The Status Quo

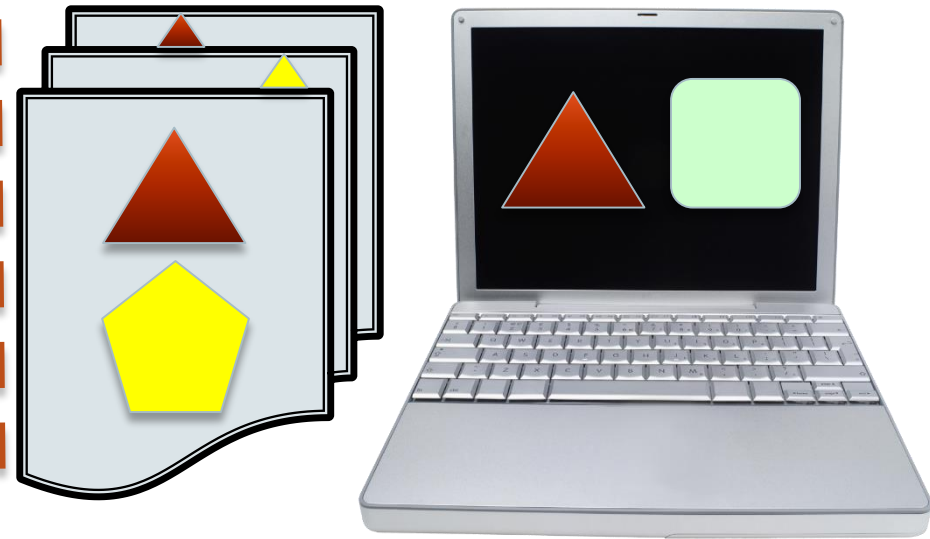
- Finite attention
- Limited time

SYNTHESIS

AGGREGATION

SEARCH

- Redundancy  
(Kannampallil *et al*/ 2013)
- Temporally organized
- Frequently ignored  
(Hripcsak *et al*/ 2011)



# Redistributing Cognition

PROBLEM SOLVING

COMPREHENSION

SYNTHESIS

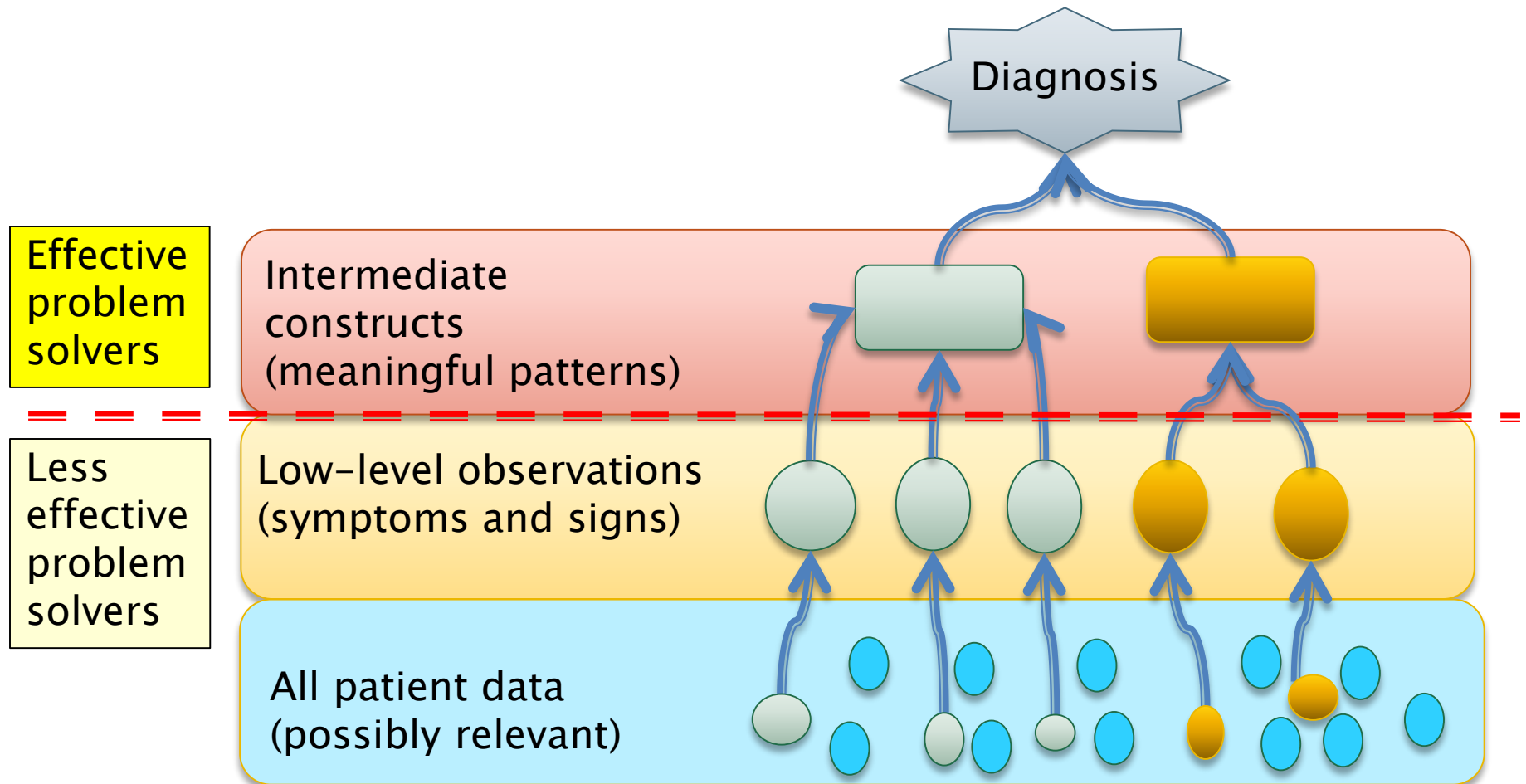
AGGREGATION

SEARCH

STORAGE / RETRIEVAL



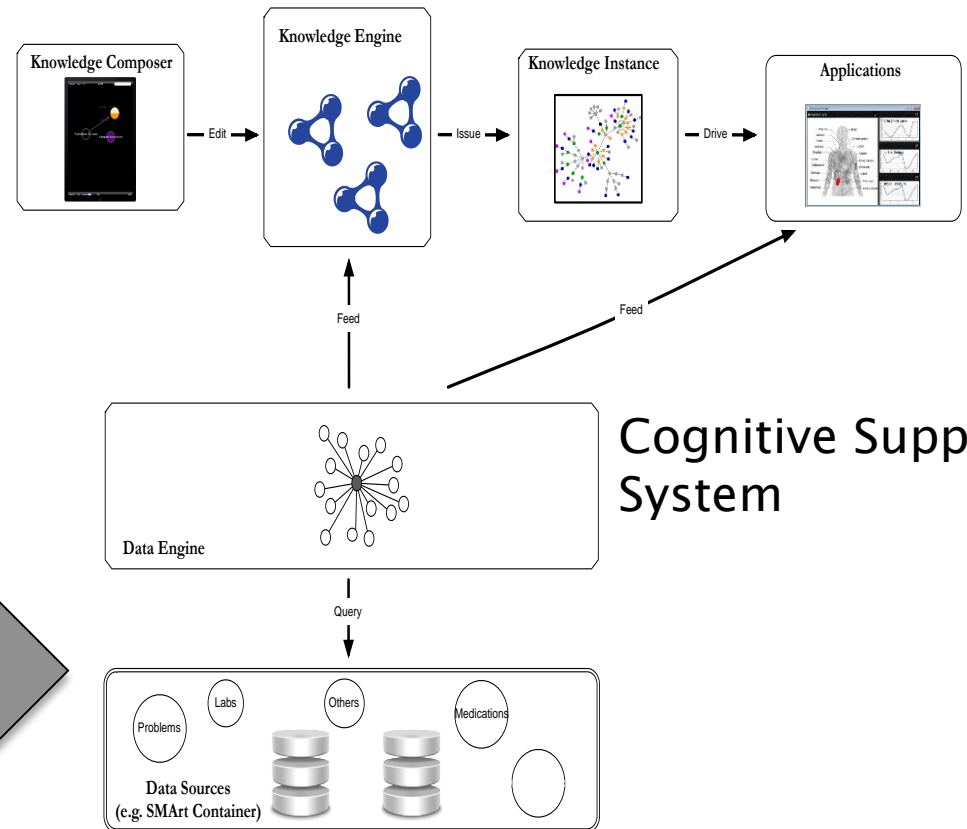
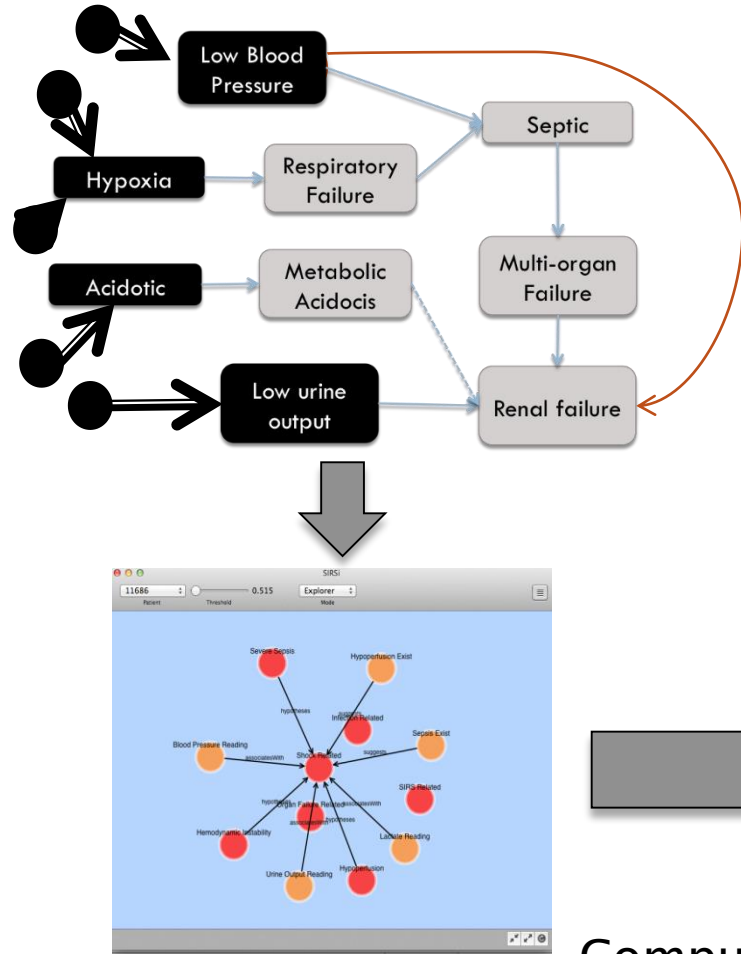
# Levels of Thinking



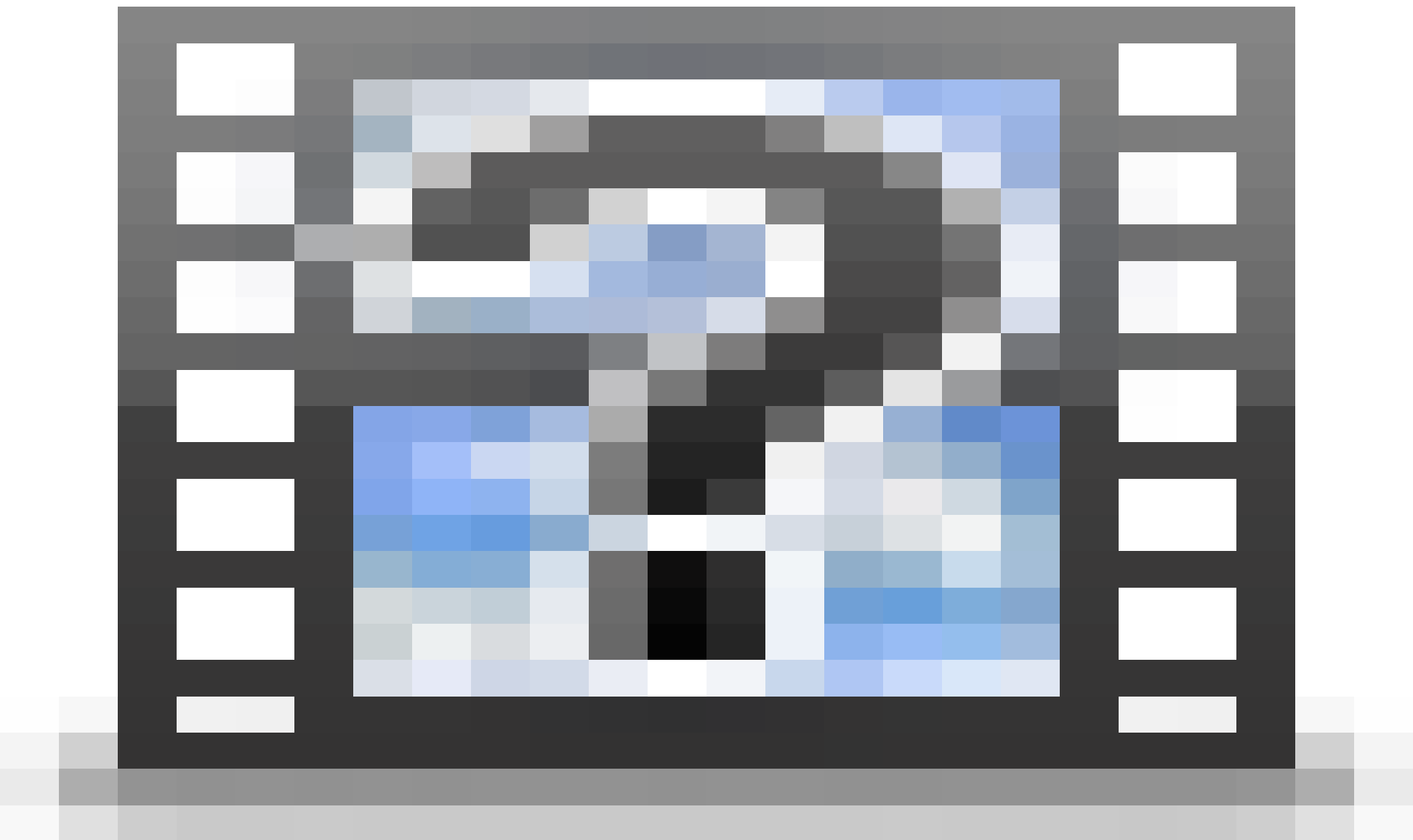
# Eliciting Knowledge



# Cognitive Support System



Computer-interpretable  
Decision Models





# Characterizing Cognitive Support

sumframe

PSYCHOSIS	MOOD	SUBSTANCE	ANGER
<ul style="list-style-type: none"> <li>of psychotic depression</li> <li>She denied any psychotic symptoms on that evaluation</li> <li>of God and other voices talking</li> <li>with prominent thought disorder</li> <li>of voices making negative comments about her and she endorsed having command auditory hallucinations</li> <li>with Haldol</li> <li>and auditory hallucinations</li> <li>to this MD that she had been experiencing hallucinations</li> </ul>	<ul style="list-style-type: none"> <li>of psychotic depression</li> <li>of dizziness and trouble sleeping</li> <li>from problems with depression</li> <li>In the ER the patient was noted to be irritable</li> <li>of God and other voices talking</li> <li>She appeared depressed</li> <li>where she was observed to be agitated</li> <li>on Prozac</li> <li>In the ER the patient had reported that she was having anxiety insomnia</li> <li>to control her thoughts</li> </ul>	<ul style="list-style-type: none"> <li>of marijuana cocaine heroin</li> <li>or alcohol abuse</li> <li>and of drug abuse</li> </ul>	<ul style="list-style-type: none"> <li>from her husband who was reportedly abusive</li> <li>to jail and a new boyfriend wrecked her mother's</li> <li>to kill her husband</li> <li>to hurt her</li> <li>She has no criminal history</li> <li>and no history of being violent</li> <li>of suicide attempts</li> <li>She denied any command auditory hallucinations visual hallucinations suicidal ideation or homicidal ideation</li> </ul>

**ATTENDING PHYSICIAN**  
Ana Smith MD.

**IDENTIFYING DATA** This is a 27-year-old Hispanic woman who is separated from her husband and is living with her mother. She is taking college courses and is currently unemployed.

**HISTORY OF PRESENT ILLNESS**  
This is the first Allen Pavilion admission and the second psychiatric admission for this patient who carries a past diagnosis of **psychotic depression**. The patient had brought herself into the CPMC ER with complaints of dizziness and trouble sleeping on February 24, 2002. She stated at that time that she was suffering from problems with depression and felt that she could no longer function. **She denied any psychotic symptoms on that evaluation.** She was evaluated over a twenty-four hour period and discharged with an appointment for an outpatient psychiatrist. Her mother felt that the patient needed to be seen sooner and called the Mobile Crisis Service who brought her to the ER on March 2, 2002. In the ER, the patient was noted to be irritable and preoccupied that her college teacher was trying to "ruin her grades". Her current symptoms apparently started three days prior to her ER visit. During this time, the patient's reported that she went out

03 04 02

P M S D

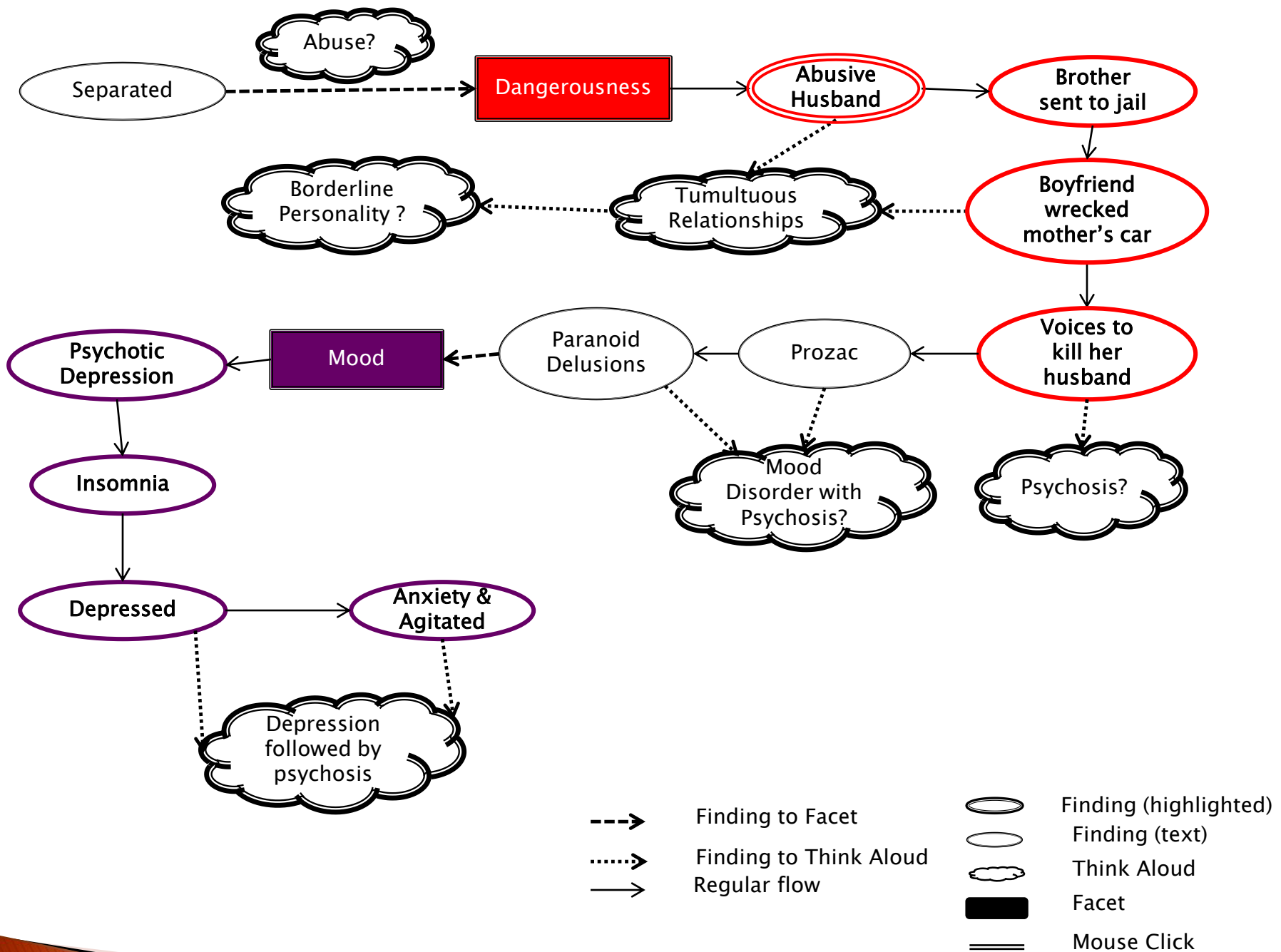
**PSYCHOSIS**

**HISTORY OF PRESENT ILLNESS:**

- of psychotic depression
- She denied any psychotic symptoms on that evaluation
- of God and other voices talking

9:34 AM  
12/16/2011





Infection  
SIRS  
Renal System  
Respiratory System  
Central Nervous System  
Hepatic System  
Cardiovascular System

## COGNITIVE SUPPORT

## NO SUPPORT

1 minute

[SIRS]  
Resp Rate  
PaCO2  
WBC  
Resp Rate  
Heart Rate  
Resp Rate  
WBC  
[INFECTION]  
Heart Rate  
[RESPIRATORY]  
O2 flow  
Resp Rate  
O2 flow  
Resp Rate  
Arterial pH

WCC elevated

tachycardia

meets SIRS  
criteria

?infection

major issue is  
respiratory

increase in O<sup>2</sup>  
requirements

becoming acidotic

temperature  
elevated

tachycardia

tachopnoea

hypotensive

normal sinus  
rhythm

deteriorating

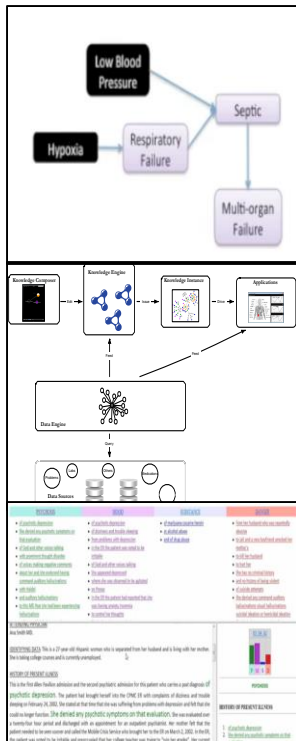
[VITALS]  
Heart Rate  
Resp Rate  
Heart Rate  
Temp  
BP  
Resp Rate  
Heart Rate  
Resp Rate  
BP  
Ventilator Mode  
CVP  
Ventilator Mode  
INTUBATED  
GCS  
Heart Rhythm  
Heart Rate  
Temp  
Heart Rhythm  
Heart Rate  
Resp Rate  
BP

1 minute

# Summary and conclusion

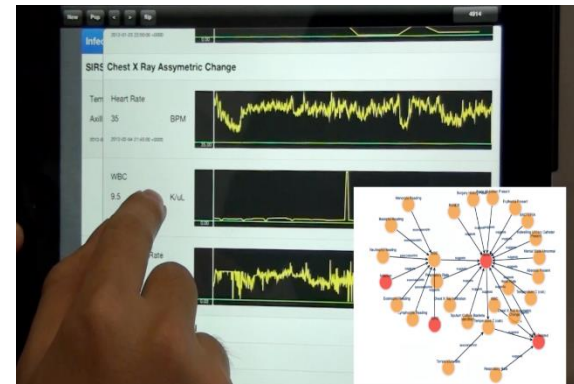
- ▶ **Cognitive support for clinical comprehension**
  - Arrange in accordance with elicited decision models
  - Intermediate constructs
- ▶ **Cognitive support in action**
  - Support high-level reasoning
  - Dynamic interplay with emerging hypothesis
- ▶ **Cognition consistent with imposed structure**
  - Conforms to canonical model
  - These effects may persist (Patel et al., 2000)

# Collaborators and Contributors



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Thanks to:  
Mimic 2 Google Web  
Toolkit

# Thank you!

[www.sharpc.org](http://www.sharpc.org)