UTHealth
The University of Texas
Health Science Center at Houston
School of Biomedical Informatics

SHARPC
NCCD

Cognitive Support for Clinical Comprehension

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The Status Quo

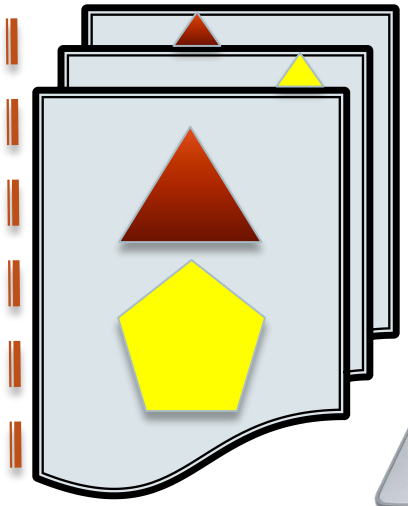
- Finite attention
- Limited time

SYNTHESIS

AGGREGATION

SEARCH

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



Redistributing Cognition

PROBLEM SOLVING

COMPREHENSION

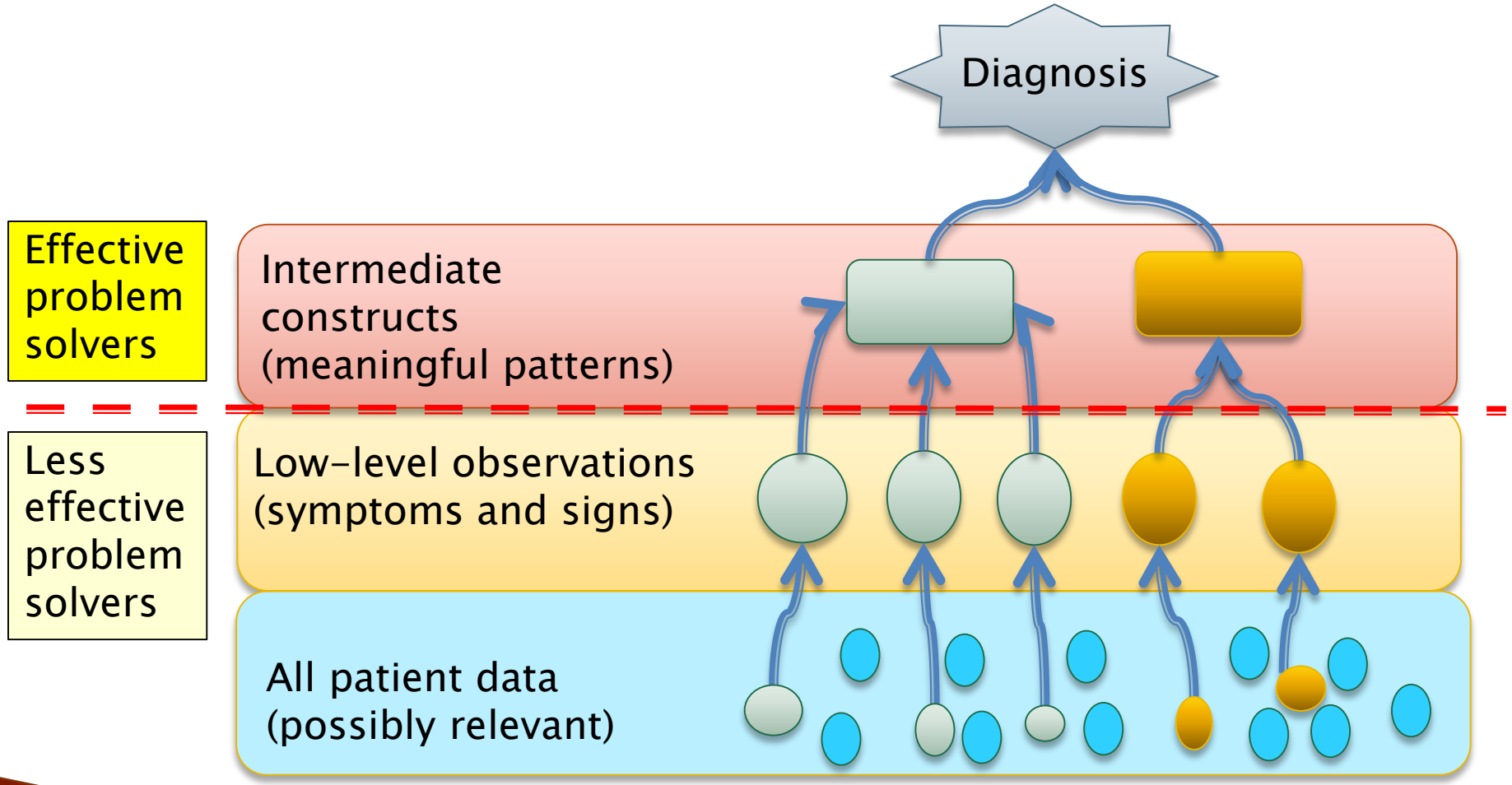
SYNTHESIS

AGGREGATION

SEARCH

STORAGE / RETRIEVAL

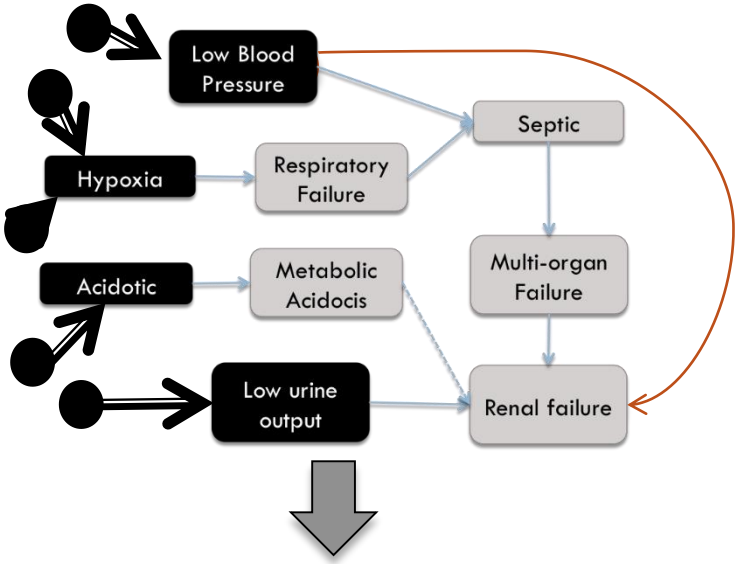
Levels of Thinking

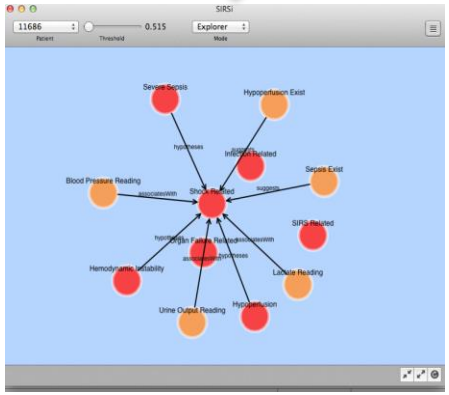


Patel, Arocha, Kaufman 1994

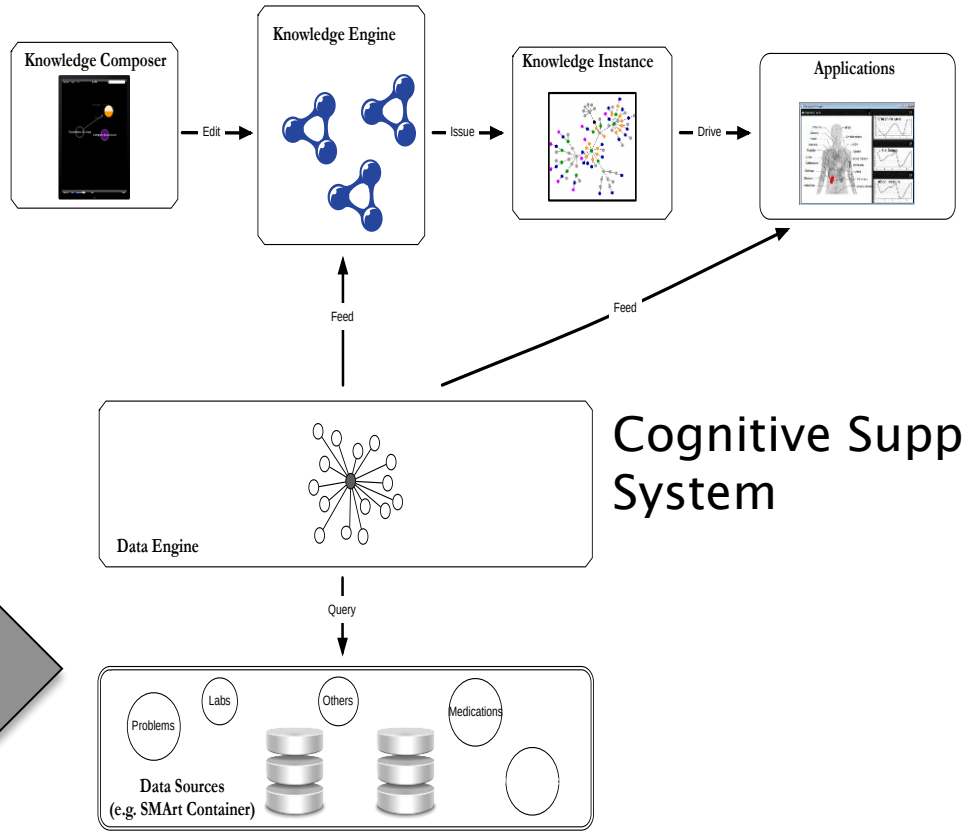
Eliciting Knowledge

Cognitive Support System



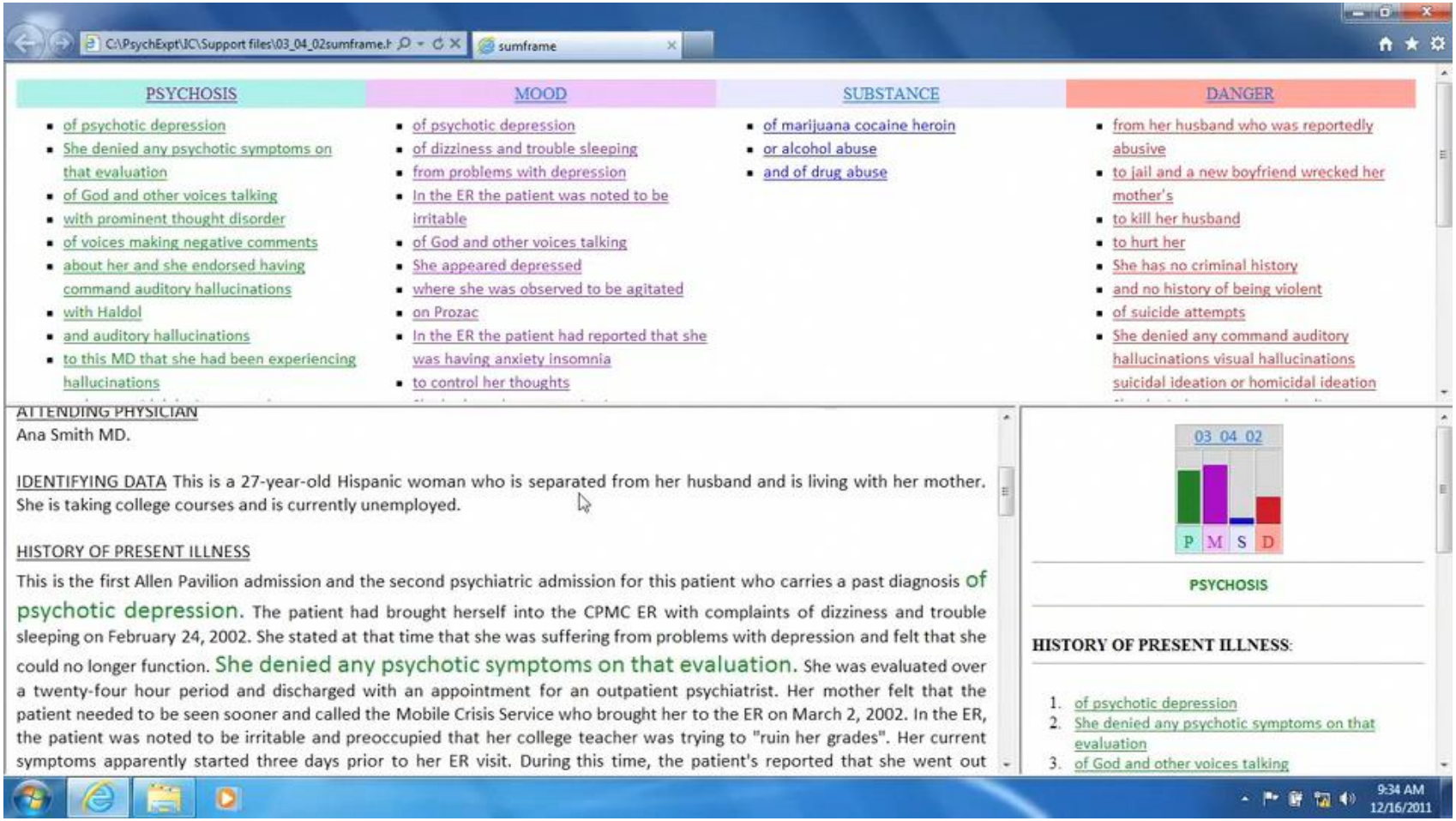


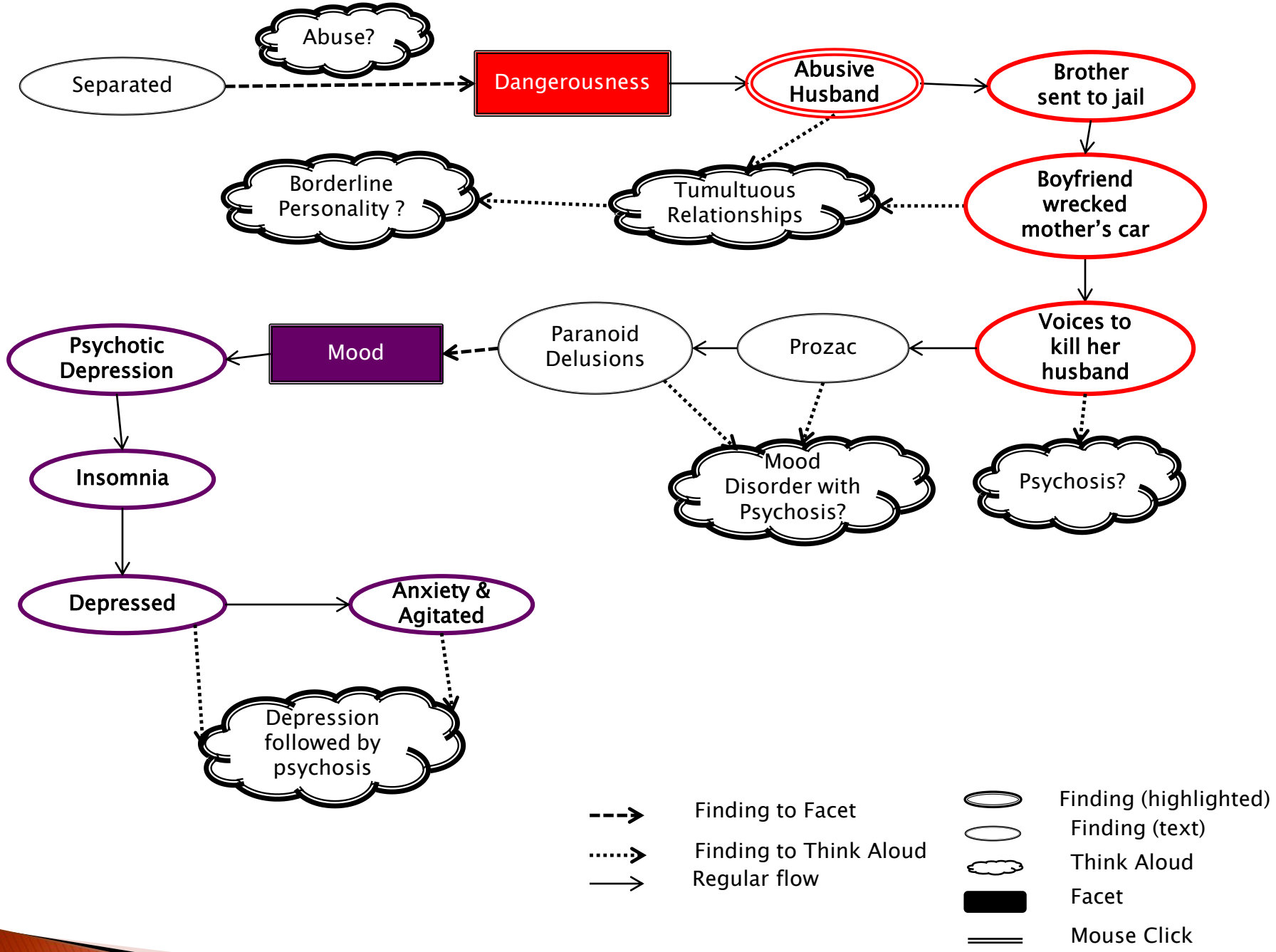
Computer-interpretable Decision Models



Cognitive Support System

Characterizing Cognitive Support




Abuse?
Separated
Dangerousness
Abusive Husband
Brother sent to jail
Borderline Personality ?
Tumultuous Relationships
Boyfriend wrecked mother's car
Psychotic Depression
Mood
Paranoid Delusions
Prozac
Voices to kill her husband
Insomnia
Mood Disorder with Psychosis?
Psychosis?
Depressed
Anxiety & Agitated
Depression followed by psychosis
Finding to Facet
Finding to Think Aloud
Regular flow
Finding (highlighted)
Finding (text)
Think Aloud
Facet
Mouse Click

SIRS

Infection

SIRS

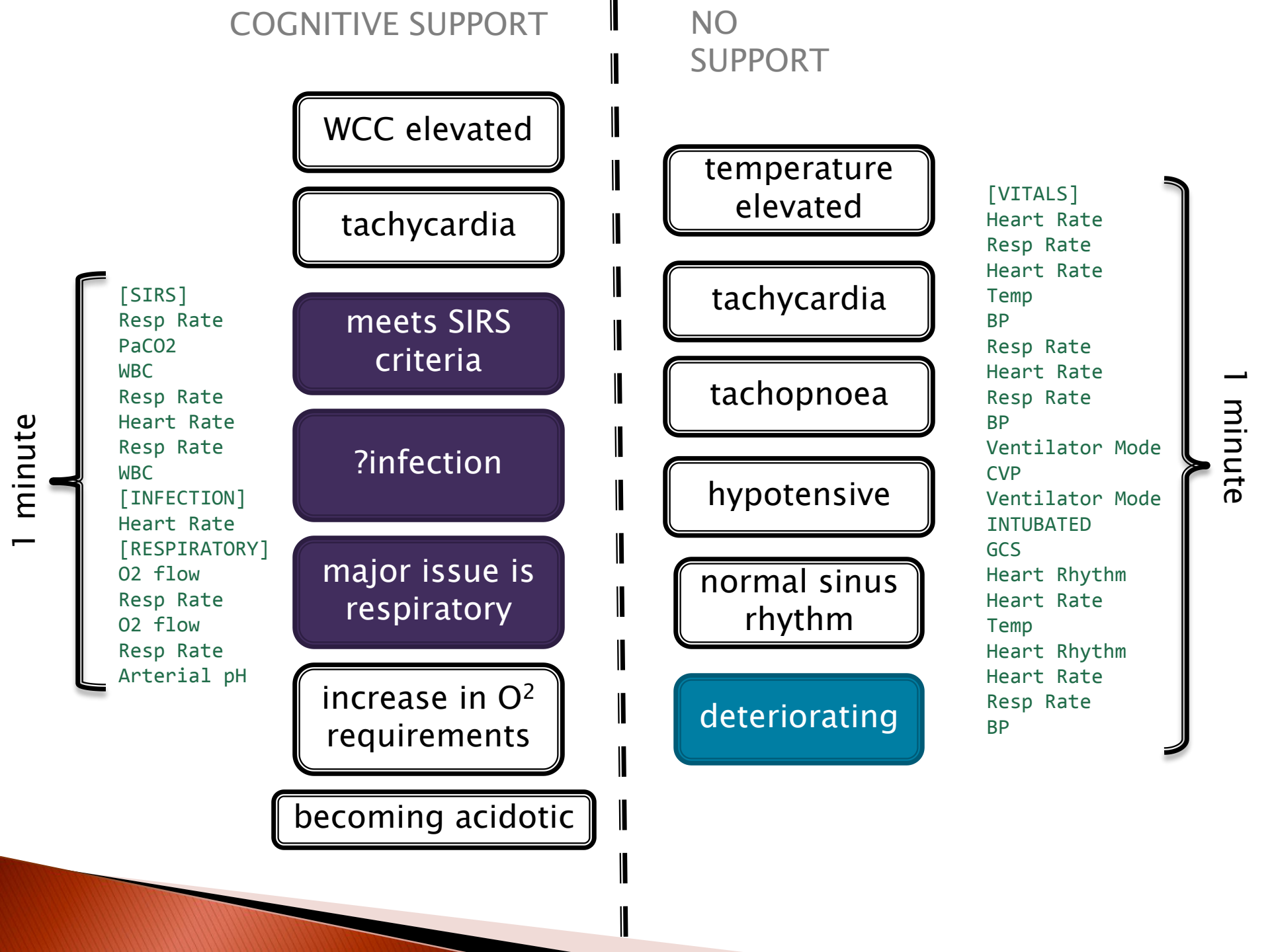
Renal System

Respiratory System

Central Nervous System

Hepatic System

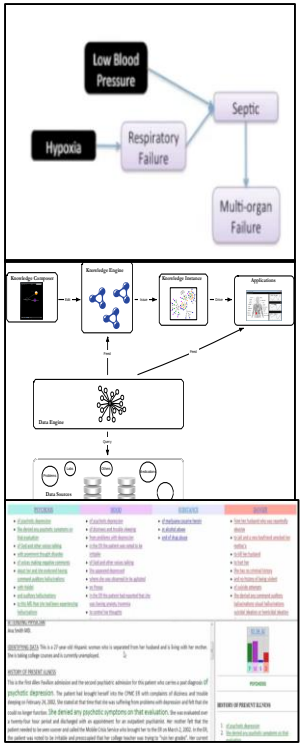
Cardiovascular System


COGNITIVE SUPPORT
NO SUPPORT
WCC elevated
tachycardia
meets SIRS criteria
?infection
major issue is respiratory
increase in O2 requirements
becoming acidotic
temperature elevated
tachycardia
tachopnoea
hypotensive
normal sinus rhythm
deteriorating
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
[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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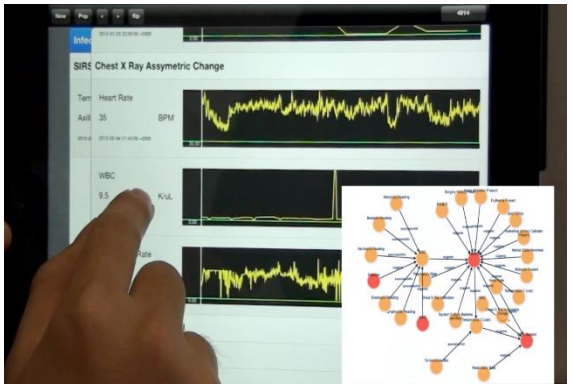

Thanks to:
Mimic 2 Google Web Toolkit

Thank you!

www.sharpc.org

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