Healthcare System Dynamics

http://HealthcareSystemDynamics.org

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Big Data to Knowledge (BD2K), NIH/NCI U01 CA198934
Healthcare System Dynamics

Clinical data reflect both patients’ health AND their interactions with the healthcare system.

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Electronic Health Record Data (EHR)

Patient Pathophysiology

- **Normal**
  - Best Outcomes
  - Moderate Outcomes
- **Abnormal**
  - Moderate Outcomes
  - Worst Outcomes
Daily HSD Cycles in Clinical Data
Weekly HSD Cycles in Clinical Data

Number of WBC by Day of Week
Yearly HSD Cycles in Clinical Data

Number of WBC by Day of Year

- New Years
- Easter
- Memorial Day
- July 4
- Labor Day
- Columbus Day
- Thanksgiving
- Veterans Day
- Christmas

Day of Year
Using HSD To Predict Outcomes
Survival 3 Years After a WBC Test
3-Year Survival After a WBC by Value and Hour
3-Year Survival After a WBC by Value and Weekday
3-Year Survival After a WBC by Value and Interval

Time Interval Since Last Test (Log Scale)

- Normal Value
- High Value
- Low Value
HSD for 277 Common Lab Tests
Predicting Survival Using “Fact Count”
Fact Count (over 8.5 years) by Age & Gender

- **Mean Number of Facts**

- **Patient Age in Years**

- **Lines**:
  - Blue dashed line: Male
  - Red solid line: Female
Fact Count Growth & Survival Chart (Male)

Horizontal blue curves with rectangular labels are five year fact count percentiles. Vertical red curves with hexagonal labels are three year survival curves. Data are from 7/28/2001 to 7/27/2009. All patients had at least one fact between 7/28/2005 and 7/27/2006. The “current” age is the patient age on 7/27/2006. This chart represents only male patients.
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Adding
HSD
To i2b2
HSD Ontology for i2b2
Lines = fact count percentiles of the baseline population; small circles = individual patients in the comparison groups; diamonds = the mean age and fact count of the comparison groups; and, large ovals = the standard deviation of the age and fact count of the comparison groups.
We need your help!

• Try our i2b2 demo & download HSD ontology
  http://HealthcareSystemDynamics.org

• Feedback, suggestions, questions, etc.
  weber@hms.harvard.edu

• Participate in our upcoming Focus Groups

• Incorporate HSD into your research projects