DXplain
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• Computer-based, web-based medical
decision support system - designed to help
health professionals make clinical decisions
• Accept a list of clinical manifestations and
proposes diagnostic hypotheses. NOT
Greek Oracle – not claim CORRECT DX
• Explains interpretations, offers suggestions
for further work up
• Access medical knowledge, references

Symptoms
• Backache
• Diarrhea
• Generalized abdominal pain
• Hematemesis (vomiting of blood)
• Pain in epigastrium (mid-upper abdomen)
• Fever

• ?? What is diagnosis
• What set of diagnoses should be considered

Computer-Assisted Decision Support
Examples of functionalities
• Generic information access tools (e.g., Medline)
• Patient-specific consultation systems
  – Advice regarding diagnosis (DXplain)
  – Advice regarding optimal workup
  – Advice regarding therapy or patient management
  – Critiques: reactions to users' hypotheses regarding patients
    and their proper management
• Browsing tools that mix generic and patient-specific
  elements (e.g., “electronic textbooks of medicine”)
• Monitoring tools that generate warnings or advice as
  needed (advice as a byproduct of patient care and data
  recording)

The Hypothetico-Deductive
Approach  [Shortliffe]

The Hypothetico-Deductive
Approach  [Shortliffe]

Bayes – Clinical Manifestations
Disease

Typical Assumptions with the
Use of Bayes' Theorem
• Completeness (for example, all men either have or
do not have prostate cancer; there are no other
possibilities)
• Mutual exclusivity (for example, if a man has
prostate cancer, he cannot simultaneously NOT
have prostate cancer)
• Conditional independence (for example, acid
phosphatase and a biopsy result ARE conditionally
independent tests; rectal exams and acid
phosphatase may NOT be conditionally
independent)
DXplain is a clinical diagnostic decision-support system which contains crude probabilities of over 5000 clinical manifestations associated with over 2000 different diseases. These data describe the relationships between symptoms, signs and lab findings, and the diseases of which they are a part. Because of the large amount of quantitative clinical information contained in its knowledge base, DXplain can provide a variety of clinical support functions. One of the most commonly used functions is Case Analysis. In this mode, the program produces a ranked list of diagnoses which might explain (or be associated with) the clinical findings entered by the user.

Other commonly used functions of DXplain are Disease and Finding information. After the user types in a disease or finding name, the program will list those findings which occur in the disease, or those diseases in which the clinical finding is seen. Because of the quantitative information relating the findings to diseases, DXplain is able to display disease and finding information in a ranked order with the most common occurring first. This ordering is an important and educational way in which to view the clinical data, as such ordering is usually unavailable in textbooks or other traditional knowledge resources.

DXplain Quick Demo

DXplain and DXplain Vocabulary Copyright 1987-2002
Massachusetts General Hospital

Use the buttons above for navigation

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Some more findings have been added to the case, and the disease list has been updated. The disease Rocky Mountain Spotted Fever is now strongly supported by the findings entered (indicated by ++), five more are suggested (+), and others are worth consideration.

The user selects a disease name from the list, and the "Disease Description" function to see a disease description generated from DXplain's database. DXplain's "textbook" description of RMSF is presented. The description is generated from DXplain's knowledge base. References follow the description.

Since the disease description is too long to fit on one page of this demo, the next screen will show the remainder.

This is a continuation of DXplain's Disease Description of Rocky Mountain Spotted Fever. Physical and Laboratory findings have been omitted to save space in this demo. The most recent Medline references can be retrieved in real time by clicking here.

The user can retrieve the full PubMed reference (including abstract if available) by clicking a link shown. This is a PubMed citation with abstract from the National Library of Medicine. Clicking on the button above closes the window and returns the user to the DXplain program.

Issues Challenges - Development

- Nomenclature - Finding
  - Symptom, Sign, Clinical Manifestation
- Disease
  - Stage, severity, complication, duration
- How interact user
  - Spelling, synonym, specificity
- Frequency of Finding in Disease
  - Pathology, pathophysiology
- Textbooks, literature
- Clinical databases
- Conditional dependency: sex, race, age, culture, other diseases, geographical location, travel
### Important features
- User Interface – no training necessary
- Ability to recognize/convert user entries
- Flexibility interaction – no limits user entry
- Ability to suggest findings to enter
- Ability to explain/defend interpretations
- Links to other knowledge resources
- Modular design – interaction separate from analysis
  - Links to medical record systems
- Evolution, dynamic changes
- User support, input, suggestions
- Combines consultation with teaching
- Stable long term web-based support, relatively inexpensive

### So what - future
- Continue expand, improve database
- Enhance algorithm
  - cluster clinical manifestations
  - temporal reasoning
- Multimedia
- Integrate electronic medical record
- Evaluation – impact on accuracy, timeliness, efficiency clinical care

### DXplain Use – Web
- Since 1996 – medical schools/hospitals
  - Users 18838
  - Sessions 50317
- Since 2001 – physicians
  - Users 14351
  - Sessions 40164
- **Total Users – 33,189**
- **Total Sessions – 90,481**

### DXplain access
- DXplain annotated ‘canned demo’
  - http://dxplain.mgh.harvard.edu/dxp/dxp.sdemo.pl
- DXplain limited interactive program
  - http://dxplain.org/dxp
  - account: webhst  password: hst421