• **DXplain** is a clinical diagnostic decision-support system with the characteristics of an electronic medical textbook, a medical reference system and a decision support tool. It contains crude probabilities of over 5200 clinical manifestations associated with over 2460 different diseases. One of the most commonly used functions is Case Analysis. In this mode, the program produces a ranked list of diagnoses which might explain the clinical findings entered by the user. **DXplain** provides justification for each disease, suggests what further clinical information would be useful to collect for each disease and lists what clinical manifestations, if any, would be unusual or atypical for a specific disease.

• Another mode allows the user to search the **DXplain** knowledge base for information about Diseases and Findings. The program can list those findings which occur in a selected disease, or those diseases in which a particular clinical finding is seen. **DXplain** is able to display this information in ranked order e.g. based on how often findings are present in a disease or how strongly a finding suggests a disease. This ordering is an important and educational way in which to view the clinical data, and is usually unavailable in textbooks or other traditional knowledge resources.
The user logs in to the DXplain application on this page. The email address is used only as a unique identifier for our logging. It allows a user to save a case and allows the developers to respond to user questions. Under no circumstances are email addresses ever provided to anyone outside of the Laboratory of Computer Science, Massachusetts General Hospital (LCS, MGH). All members of LCS/MGH sign and adhere to a strict confidentiality policy.
For all cases presented to DXplain, we recommend that you provide the patient's age and gender and a rough estimate of the duration of the disease.

You will describe the patient by entering clinical findings. DXplain provides a wide variety of findings, including demographic, history, physical, laboratory and imaging results.

Though optional, the authors suggest you enter patient age, gender and duration of symptoms using the drop-down menus in the upper left hand portion of the page.

Use the blank "Finding Lookup" box to enter findings one at a time. After you type 2 or more characters, DXplain will display findings that contain your entry. Click on the term that best matches the finding you wish to enter. Where applicable, DXplain will display a list of more specific terms for the finding you selected and you may pick one of these if you so wish.

To indicate that a finding is ABSENT, rather than present, click the "No" checkbox before selecting a finding from the match list.

Clinical manifestations are entered by typing the first few characters of a finding name into the Finding Lookup box. As you type each character, the system displays those terms that contain the characters you typed. Once you see the choice you want, click on it to select it.

To indicate the absence of a finding, such as “No Fever”, Click the “No” checkbox prior to selecting your finding.
As findings are selected, they appear in the Case Findings Window. DXplain displays lists of Common and Rare diseases that are associated with some or all of the case findings. These lists are dynamically refreshed each time a new case finding is entered.
Based on the initial findings entered, DXplain lists a broad differential including infection and cancer. The “--” mark indicates diagnoses that are only minimally supported.

DXplain prompts the user for clinical findings that may help to distinguish among possible diagnoses. The User can choose to indicate that one of the suggested clinical manifestations is present (Y), or is known to be absent (N), or that there is no information about the presence of a particular finding (Unk).

By clicking on the question mark, the user can query the system as to how the presence or absence of a particular presented finding (‘vocal cord paralysis’ in this example) will affect DXplain’s differential. This is shown in the yellow box at right.

Note that “vocal cord paralysis” is important in metastatic lung CA.

This ability of DXplain to explain its disease selections is a significant feature.
When the user clicks on ‘Hodgkins disease,’ this will bring up DXplain’s Evidence for Hodgkins disease, as shown on the next screen.

The current finding list is too long to fit on this screen; in the actual DXplain program, a scrolling window reveals the entire list.

After additional clinical findings have been entered, a revised list shows that several diagnoses are now supported.
Listed first are the findings the user has entered which support "Hodgkins Disease".

Listed below are relevant findings of the disease which have not been entered nor noted as absent.

To add any of these findings to the case, the user can click the check box(es) and then the "ADD selected finding(s) to Case" button.
The Disease Description page lists the findings found in a particular disease in order of the frequency with which they occur. The user can click on “Evidence of Disease” to toggle back to that page.

DXplain provides links to selected Medline references.

The Disease Differential feature displays a differential diagnosis for the selected disease, as shown on the next screen.
When thinking about disease "HODGKINS DISEASE", you may also want to consider the following:

- Sarcoidosis
- Lymphocytic lymphoma
- Tuberculosis, miliary
- Infectious mononucleosis
- Aneurysm, aorta, thoracic
- Goiter, substernal
- Thymoma
- Actinomycosis
- Leukemia, lymphocytic, chronic
- Superior vena cava syndrome
- Castleman's disease, unicentric
- Adult Still's disease
- Lung carcinoma, small cell
- Histiocytosis, malignant
Evidence of "HODGKINS DISEASE"  (COMMON)

The following findings strongly support this disease:
  hepatomegaly

The following findings support this disease:
  weight loss
  anorexia
  spleen palpable
  fever

The following findings are not part of DXplain's description of this disease:
  back tenderness, lower

ADD selected finding[s] to Case

OPTIONAL: Any of the findings below may be added to the current case by clicking the box(es) next to the finding(s) and then clicking the 'ADD selected finding(s) to Case' button.

The following clinical manifestations (if present) would also support this disease:

- mental nerve neuropathy
- alcohol intolerance
- dermatitis, exfoliative
- epistrochlear lymph node enlargement
- inguinal lymph node enlargement
- liver mass
- vena cava obstruction, superior
- vena cava obstruction, inferior
- femoral lymph node enlargement
- popliteal lymph node enlargement
- Pemberton sign positive
- fever, Pel-Ebstein
- ascites, chylous
- axillary lymph node enlargement
- erythema multiforme
- erythema nodosum
- hepatosplenomegaly
- mesenteric lymph node enlargement
- paraplegia
- positive

The user can click on any finding to see a list of diseases associated with that finding. In this example, the user clicks on “Superior Vena Cava Obstruction”.
"VENA CAVA OBSTRUCTION, SUPERIOR" is a very important finding which should be explained by at least one disease in the differential diagnosis.

Additional Information: Obstruction of the superior vena cava is most commonly caused by neoplasm, particularly lung cancer. It can also be caused by thrombosis, aneurysm, or external compression. It causes suffusion and/or cyanosis of the face, neck, and upper arms. If slow in development, collateral circulation can lessen some of the manifestations. For an interesting perspective, see: Plekker D et al 'Clinical and radiologic grading of SVC obstruction' Respiration, 2007.

Note that the position of each disease in a group is arbitrary and does not indicate the degree of support.

The following disease(s) should always be considered given this finding:

Common Disease(s) 
Rare Disease(s) Superior vena cava syndrome

This finding very strongly supports the following disease(s):

Common Disease(s)
Lung carcinoma, bronchogenic
Lung carcinoma, small cell

Rare Disease(s)

This finding strongly supports the following disease(s):

Common Disease(s)
Lymphocytic lymphoma
Histoplasmosis, primary acute
Hodgkins disease

Rare Disease(s)
Aneurysm, aorta, thoracic
Aorta, thoracic, rupture, spontaneous
Pancoast syndrome
Pleurac, mesothelioma, primary
Thymoma

This finding supports the following disease(s):

Common Disease(s)
Breast, carcinoma
Sarcoidosis
Tuberculosis, pulmonary
Hereditary breast and ovarian cancer syndrome

Rare Disease(s)
Goiter, substernal
Lymphoma, Burkitt
Mycosis fungoides

On the next screen, the demo returns to the Case Analysis of the clinical problem solving exercise.

Some findings have additional finding information associated with them. This may include a definition, picture, or other pertinent information, as shown above.
Returning to the Case Analysis, the user can click on ‘Brucellosis’ (the case diagnosis of this New England Journal CPC). This will result in the display of DXplain’s Evidence for this diagnosis, as well as the option to view other resources to obtain reference information, as shown on the next slide.
Evidence of Disease

Evidence of “BRUCELLOSIS” (RARE)

The following findings strongly support this disease:
- spleen palpable
- a type of back tenderness
- sheep exposure

The following findings support this disease:
- weight loss
- intermittent
- anorexia
- hepatomegaly
- fever
- butcher

ADD selected finding[s] to Case

OPTIONAL: Any of the findings below may be added to the current case by clicking the next to the finding(s) and then clicking the ‘ADD selected finding(s) to Case’ button.

The following clinical manifestations (if present) would also support this disease:
- orchitis
- Middle East
- spleen tenderness
- testicular pain
- testicular enlargement
- perspiration malodorus
- biological warfare
- raw milk ingestion

The following lab data (if present) would be useful in establishing the presence of the disease:
- thrombocytopenia marked
- granulomas on biopsy

Examples of the PubMed and Google searches are shown on the next two slides.

One of the more important features of DXplain is the ability for users to send comments, questions and criticisms directly to the developers via the Feedback link. The developers will try to respond promptly.

The ‘Help’ feature, available from each screen, provides page-specific help for all features found on that page. A summary of DXplain’s main functions and features can also be retrieved using ‘Help.’
After the user selects “PubMed Search,” DXplain sends a search strategy to the National Library of Medicine’s PubMed that is designed to retrieve relevant clinical articles for the chosen disease. This screen shows the results.

By clicking on the reference link, one can see the complete abstract.
When the user clicks on Google Search link, DXplain sends a search strategy to Google that results in the display of links to selected medical websites for the chosen disease.
End of DXplain Demo