

VisualDx™: Visual Informatics

Real-time Knowledge for the ED.

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Visual clues to diagnosis abound in medical practice. The existence of hundreds of image atlases, dating back to the beginnings of medical publishing, substantiates the importance of recognizing visual signs in the practice of medicine. It has been estimated that 10% of all emergency department visits include at least one skin complaint as either the chief or secondary complaint. Pediatric emergency medicine has an even greater percentage of skin complaints; one study reported greater than 30% of visits were skin related. It is fair to state that emergency practitioners make diagnostic and therapeutic decisions on a daily basis concerning the eye, skin, hair, nails, and genitals without referring to an ophthalmologist, dermatologist, otolaryngologist, infectious disease physician or gynecologist. The need for further training and development of expertise in dermatology goes without challenge. However, with the explosion of knowledge in medical care, it is unlikely that time will be made available in the already crowded training years to solve this problem. Most of us are stuck with using dermatology atlases on a day-to-day basis as our sole diagnostic reference.

Example: Fever and a Rash

Consider an acutely ill patient with the problem of fever and a rash presenting to an E.P. Serious consequences can result from delayed diagnosis. A febrile patient with a rash could have a problem ranging from a simple viral exanthem to one that is potentially lethal, such as Meningococemia or Rocky Mountain Spotted Fever. When broadly defined, including those diagnoses with either a minimal fever and/or localized skin findings, approximately 136 possible diagnoses encompass



Comparing & contrasting images of different diagnoses in VisualDx™

the differential diagnosis. These diagnoses each have objective visual findings that may point to a correct diagnosis and in some cases near pathognomonic. The concentric ring-like plaque of Lyme disease (Erythema Chronica Migrans), the target-like lesions of Erythema Multiforme, and the tense, lower extremity bullae of vibrio sepsis are examples of visual findings that have strong diagnostic power. Proper morphologic recognition can often lead to almost immediate diagnosis.

Knowledge sources for the diagnostic work-up of the patient presenting with a fever and a rash are typically incomplete and located across many separate texts and journal references. These texts are most often illustrated by few, if any, clinical images, and are organized only by diagnosis or treatment, making interactive cross-referencing and quick decision-making next to impossible.

Infectious causes of cases presenting with fever and a rash total at least 56 diagnoses as described in Principles and Practices of Infectious Disease. Non-infectious causes have been described in review and can also be found in textbooks of dermatology, emergency medicine, and internal medicine. Despite the lack of surveys, it is widely appreciated that the average hospital emergency department typically has at most few textbook sources beyond basic dermatology.

How does the busy practitioner problem solve when complexity is high, time is short, and the diagnosis lies outside the boundaries of the practitioner's knowledge? Currently, they look up information in various reference materials such as medical textbooks or an atlas, or they consult a colleague with more expertise.

What if practitioners could quickly and easily review thousands of medical photographs, sorted on a presenting patient's visual clues, symptoms, and other findings such as occupation, recent travel, exposures, family history, medications, etc.? What if they then could compare and contrast the narrowed down selection of images to their patient to more accurately arrive at a diagnosis and treatment?

VisualDx™, a new software tool created by Logical Images, Inc. does just this. It's an authoritative, single source software reference system designed to support the practitioner constrained by the real world where an expert is unavailable and visual information needs are immediate.

Logical Images owns one of the world's largest digital clinical image libraries. This library has been developed over many years with contributions from an international network of highly respected physicians and major universities, including the New York University Department of Dermatology archive of 1,000,000 professionally photographed medical images. The collection spans over 1600 diagnoses and captures the variation of presentation of human disease.

The digital image library is accompanied by an associated knowledge base that ties clinical diagnostic knowledge to the images. This includes comprehensive descriptive and categorization information, case history, diagnosis detail, signs/symptoms/findings, tests, treatments, relations, references, etc.

The big advantage that this system has over most other image databases is that this system is designed to aid the search for images when the diagnosis is NOT already established. The VisualDx™ system allows the non-expert to use graphical representations of skin findings, distribution or patterns of rashes, symptoms, signs, exposures, past medical history, etc. as selectors for viewing possible relevant diagnoses and their images. The system dynamically presents diagnoses and related images to the user. By organizing the images within diagnostic "stacks" or clusters, multiple high quality images can be viewed quickly for distinguishing and comparative features. Thus the images serve as a powerful reference source and aid in establishing the diagnosis itself. Such clusters of images are usually lacking in traditional references.

Research in the fields of human-computer interaction, interface design, and software design has pointed to the effectiveness of "visual definitions" and visual search cues. For example, instead of using a text word such as "vesicle" (i.e., blister) to search for a lesion type, VisualDx™ uses a graphical representation of a vesicle. A search for possible diagnoses is made by choosing the representation without necessarily knowing that the lesion pictured is called a vesicle. It's what I humbly call Dermatology for Dummies. **In practical terms, this means that everyone can have a consistent, high-quality pictorial reference to guide a difficult diagnostic work-up. I believe it to be a highly useful tool in our efforts to efficiently make correct visual diagnoses. I highly recommend it.**

For more information, including a list of footnotes to this article, contact Art Papier, MD, Chief Scientific Officer, Logical Images, Inc., Suite 212, 3445 Winton Place, Rochester, NY 14623; 716-273-8228; apapier@logicalimages.com.