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MIDRIB Medical Images Digitised Reference Information Bank

What is MIDRIB?

MIDRIB is a project being undertaken by staff of St George's Hospital Medical School (University of London) in collaboration with the Wellcome Trust.

Begun in April 1996, its aim is to create, maintain and deliver a comprehensive collection of medical images in digital form, for use in teaching and research. The project will gather the best of existing collections from respected professional sources, and draw them together into a coherent resource. This will be available free to medical

and healthcare faculties of UK Universities and teaching hospitals. It will be accessible via the SuperJanet higher-education network, from a single World Wide Web site. Images will also be made available on CD-ROM.

Why images?

Images are essential to medicine - a picture is worth a thousand words, providing concentrated, accurate information available in no other way. The field of medicine uses a vast quantity and variety of images, some familiar to the layperson, such as X-rays, CTs, ECGs, and ultrasound scans, and others less familiar, microscopic slides, MR scans and angiograms for example. Diagnosis and treatment of medical conditions frequently depends on the production and interpretation of images such as those outlined above. Images are vital for medical education - Medical and Healthcare professionals need to be familiar with such pictures from an early stage and will use them throughout their careers.

So how will this project help?

Recent curriculum changes in medical education place more emphasis on the use of problem-solving scenarios involving real cases with the associated diagnostic imaging that this implies. This aims to encourage students to understand the mechanisms of normality and disease by their own investigations, and so students will have an even greater need for access to a comprehensive range of relevant images. With the trend towards treating patients in the community or as day cases without hospitalisation,

medical students now have reduced contact with patients and can thus only gain exposure to many medical conditions through the use of pictures and multimedia resources. However the availability of such images to students is currently very limited, as they are hard to find and costly to reproduce. MIDRIB will provide access to images, immediately and without cost, via the WWW or a local network.

Why is a centralised digital resource necessary?

The images ordinarily in use by most clinicians and academics in the field are stored individually and in their original raw format (i.e. on microscope slides, paper, film, etc.). In this form these collections can only be made available for use within the originating departments or borrowed at some inconvenience. The interdisciplinary nature of medicine means that these collections are also of interest to practitioners in a wide range of related subjects allied to medicine. A centralised bank of digital images will make such resources accessible to all. Medical faculties throughout the UK are building up their own collections of images, which leads to an enormous duplication of effort. MIDRIB will remove the need for this, transferring images rapidly to all medical schools in the country via the high-speed SuperJanet inter-university network.

What will the project achieve?

As well as the resulting collection of many thousands of high quality images, the project will provide teaching sets of key images, and a series of tools to enable sub-sets of images to be put together. These will form case-studies for teaching, research and discussion purposes. MIDRIB will also create a number of ancillary products to be used with the images, including on-line slide-atlases, overlays and annotations, virtual tours, presentation and authoring templates. The project will make these available via the interface, where appropriate.

A number of workshops and seminars will be arranged to train members of the medical community to turn their own material into digital form, thereby providing them with valuable expertise and enabling them to contribute their material to the MIDRIB resource in the most valuable format. Workshops will also be held to communicate non-subject specific experience to those engaged in similar work in other disciplines. MIDRIB will generate experience and expertise in a number of other issues and techniques. Since

many of these will be of a generic nature and not confined to medicine, the project will have a wide application and impact. They include:

- * copyright of on-line materials
- * classification of images
- * security of controversial images
- * the financial position of contributors, etc.
- * patient permission
- * a registration procedure which will help to prevent unauthorised access and improper use.
- * the technical considerations involved in the efficient acquisition, maintenance and Internet delivery of a very large distributed image database

As this project matures during the next couple of years, this resource has the potential to become the natural repository for collections of images produced by individuals and departments throughout the Higher Education sector - an easily-accessible, comprehensive and continually growing store of medical images.

The full text of the original proposal for the project

A proposal to JISC as part of the Follett Implementation Group on and with the collaboration of the Information Technology programme (Area Wellcome Trust. The project will 3, Digitisation) submitted in response make available nationally, across to JISC circular 4/94. MIDRIB is a networks, a comprehensive project proposed jointly by the Library collection of medical images for and Computer Departments of St George's use in teaching and research, in Hospital Medical School (SGHMS) as lead medical and healthcare faculties site, with the Educational Technology of Universities and teaching Service (ETS) of Bristol University and hospitals. The bank of images the CTI Centre for Medicine (CTICM) will build on existing based at Bristol, collections at SGHMS and Bristol.

1 Introduction - the need for a national image resource

An image speaks a thousand words. Images are fundamental to the study and practice of medicine.

Diagnosis and treatment of medical conditions frequently depends on the production and interpretation of images. These may be X-rays, histological preparations, ECGs, ultrasound and many others. Healthcare professionals need to be familiar with such pictures from an early stage and will use them throughout their careers. All British medical schools and colleges of nursing are currently evaluating, modernising and adapting their curricula to the needs of the doctor of the 21st century. The General Medical Council's publication *Tomorrow's Doctors* gives the guidelines which form the basis of the new methods: "The application of new sciences and the advent of new techniques require constant readjustment of our methods of approach to all aspects of medicine." Project 2000 nursing courses require a similar approach.

The curricular emphasis is on integration, with core subjects supplemented by themes and topics, especially in Special Study Modules. These studies will require multidisciplinary approaches, particularly using key cases - problem-solving scenarios which use real cases with associated diagnostic imaging to encourage students to understand the mechanisms of normality and disease by their own investigations - the Self-Directed Learning (SDL) approach to Evidence-Based Medicine (EBM). Images and multimedia resources will become increasingly important, with the need to treat patients in the community without hospitalisation, restricting students' exposure to a wide range of medical conditions.

We propose to digitise, catalogue and make available on the Internet a comprehensive archive of medical images, covering all disciplines in medicine and the allied health arena. Images are the essential vocabulary of medicine, through which diagnoses are made; teaching and research follow. The digitisation of ECGs (from paper), CT, MR and X-ray (from film), microscopic preparations, 35mm slides, moving ultrasound scans, etc., can make these valuable resources available to all members of the academic community. The core archive will be built from existing collections at SGHMS and the Bristol University Teaching Hospitals, covering a large proportion of medical and allied disciplines. As the project matures, we

envisage the resource becoming the natural repository for collections of images, produced by individuals and departments throughout the HE sector.

Although moves towards electronic distribution are slowly being made by some forward-looking holders of medical image collections, the vast majority of such initiatives are subject specific, small and highly specialised. A good sample of such projects can be seen through the OMNI gateway.

The images ordinarily in use by most academics in the field are stored individually and in their original raw format (i.e. on microscope slides, paper or film). They are used almost exclusively by the originating departments, but due to the interdisciplinary nature of medicine these collections have a wide appeal to related subjects allied to medicine. As a result medical faculties throughout the UK are building up collections which duplicate work elsewhere, despite the coming-of-age of inter-university networking, the arrival of SuperJanet and the ability to transfer images rapidly.

An electronic image library of this kind will be a valuable resource, ideal for all UK medical faculties who are reorganising their curricula to reflect the use of Self Directed Learning as prescribed by the General Medical Council. It will also be valuable to the other healthcare communities particularly Nursing, where the move into higher education and the emphasis on Project 2000 courses demonstrates the need for a high quality image bank. Medical and healthcare professionals require constant updating of their information and techniques to be able to respond to changes in treatment regimes and particularly the introduction of improved drugs. This image bank will provide a resource for individuals and their teachers to update as part of the programme of Continuing Medical Education.

2 The project

2.1 Mission statement

To foster education, diagnosis and research in medical and allied healthcare professionals through the creation, maintenance and delivery of a comprehensive digital medical images archive.

2.2 Project objectives

- * a) create a coherent, readily accessible, comprehensive resource for medical images.
- * b) develop a peer-reviewed image collection
- * c) assist teaching in the classroom and the community in the creation of informative teaching aids, from overheads to Computer-Aided Learning (CAL).
- * d) provide a uniquely wide-ranging image resource for students engaged in Self Directed Learning
- * e) assist teachers by providing a fast and comprehensive database which may be used in postgraduate education and as a visual diagnostic tool.
- * f) facilitate the introduction of new medical curricula throughout the UK, via the assistance given to teachers, students and clinicians from an image resource.

3 Technical

3.1 The Distributed Database

MIDRIB will be accessible via the Internet using World Wide Web and database technology. The project will develop a distributed electronic library of medical images and multimedia resources, building on systems currently being developed by the proposers under the New Technologies Initiative Network Access to Multimedia Resources (NTI/40) and Hewlett Packard's Distance Learning Initiative. Experiences and results from other projects currently under way within HE such as UNITE (Unified Network InformaTics for Education, USA) and HyperG will be exploited. The database will be capable of holding a variety of resource types (mainly images and video but also sound, animation and 3D models) all of which are valuable for teaching and research in medicine. The system will also include links to other sites holding relevant medically related image archives where they exist.

Several approaches to the implementation of distributed database architectures will be studied and will include replication, caching, multi-domain, and object-oriented techniques. Many factors affect the choice of philosophy implemented and include, among others, required query speed,

index size, authentication of authorised users, copyright status of material, network capacity and cost. For video and other resources demanding high bandwidth in terms of the network, user machines (CPU capacity) and graphic display cards all need to be considered. For this reason, we propose the purchase of two servers, one at SGHMS and one at Bristol. This dual server arrangement will reduce the network congestion that will result in having a single point of contact and will also allow us to mirror all collections at each site to minimise any problems due to downtime. MIDRIB will provide guidelines on specifications for client machines; however, today's Pentium-based PCs do have the processing power to handle video and 3D objects and the software to view and manipulate them.

Sophisticated browsing and search and retrieval techniques will be further developed to assist in the location of required resources. The project will also investigate concept-based linking and use of thesauri and synonym tables. The project will experiment with the Unified Medical Language System (UMLS) developed by the National Library of Medicine in the United States. UMLS is a subject of relevance to MIDRIB, OMNI and the Wellcome Trust; the Wellcome are facilitating a collaboration between the projects in this area.

The project will also investigate user profiling by logging and analysing information on individual users. In this way the system can assist users in finding information by looking at previous requests by other users. For example, the user's current search criteria can be matched with that of past users and suggest additional search terms. These options together with those mentioned above would be for the more experienced user (see Interface below). MIDRIB partners will continue to work with current HE projects concerned with resource discovery such as the SOSIG, OMNI and ROADS projects funded by the eLib Programme of the JISC with a view to using a common set of tools.

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