ABC of Computing

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COMPUTERS IN THE MEDICAL LIBRARY

The library user has two basic requirements: firstly, to find the references to papers and textbooks giving the required information, and, secondly, to locate physically the relevant texts. Computerised library catalogues and stock control systems help the reader and librarian locate the desired information quickly and efficiently.

Computer assisted searching

Computerised searching of biomedical literature has been well established for many years. Databases created by orderly indexing and computer storage of references to biomedical published papers now span several years and are available to medical libraries via computer terminals. As well as the general database files such as Medline and Excerpta Medica, which cover the whole area of medicine, there are more specialised files such as Cancerline, Enviroline, and RTECS (Registry of Toxic Effects of Chemical Substances). The latter will give concrete information such as the LD₅₀ of any substance, so that the inquirer may not have actually to find the relevant publication. Most of the databases, however, do not offer hard facts, such as might be found in a pharmacopoeia or index of differential diagnosis, but provide the users with a list of references relevant to their inquiries. The amount of information available in the reference varies with each database, but a standard minimum consists of author, title, and source of reference. Sometimes abstracts may also be provided. The usefulness of the final list of references to the inquirer depends largely on how precisely the search topic is described to the librarian. Since the librarian is an expert in information provision rather than medicine, he or she cannot be expected to produce a useful list of references when the initial topic is still ill defined in the inquirer's mind.

The databases

- Medline
- Cancerline
- Excerpta Medica
- Biosis
- Toxline
- Chemline
- Psychological Abstracts
- Scisearch
- RTECS
- Pollution Abstracts
- Enviroline
- Popline
- Bioethicsline
- Health Planning and Administration

The most commonly used database in medicine is Medline, which is *Index Medicus* on line plus the contents of special indexing journals such as the *Index to Dental Literature* and the *International Nursing Index*. It covers over 3000 of the world's medical journals. These are indexed at the British Library at Boston Spa and at the National Library of Medicine, Washington, DC. The bibliographic details and indexing terms for every paper in these journals are stored in a computer file every month. The resulting file is kept separately on line to enable libraries to offer a monthly updating service of literature searches, and it is also used to generate the printed monthly copy of *Index Medicus*.

Indexing

The key to the indexing of Medline is a controlled vocabulary system known as MESH (medical subject headings). The indexer looks at the concepts in the paper and assigns the appropriate MESH term to each concept. Indexing is not just a matter of picking keywords from the title and abstract of the article: it is the concepts that matter. Once the concepts have been converted to MESH terms it becomes much easier to search the references on file because there is no need to worry about synonyms or variant spellings. For example, chickenpox is always indexed under the heading Chickenpox even though it may have been called varicella in some papers.

If necessary up to 15 MESH terms may be assigned to one paper to express all the concepts. In the written *Index Medicus* the paper will be listed under the two or three major headings, giving the possibility of finding only papers which have dealt with the search topic in some depth; on Medline the paper is accessible by any of the 15 headings.

Search strategy

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SS 1 /C?
USER:
LUPUS ERYTHEMATOSUS, SYSTEMIC AND PREGNANCY COMPLICATIONS AND
PROG:
CNT 1

USER:
INFANT, NEWBORN, DISEASES
PROG:
SS (1) PSTG (4)

SS 2 /C?
USER:
FETAL COMER
PROG:

1
AU - LEVY IL
TI - FETAL-NEONATAL INVOLVEMENT IN MATERNAL AUTOIMMUNE DISEASE.
SO - OBSTET GYNECOL SURV 1982 FEB;37(2):122-7

2
AU - HERAMOWSKY LP
TI - LUPUS ERYTHEMATOSUS, THE PLACENTA, AND PREGNANCY: A NATURAL
EXPERIMENT IN IMMUNOLOGICALLY MEDIATED REPRODUCTIVE FAILURE.
SO - PROG CLIN BIOL RES 1981;78:389-20

3
AU - MIYAGAWA S ; KITAMURA W ; YOSHIOKA J ; SAKAMOTO K
TI - PLACENTAL TRANSFER OF ANTICYTOTOPLASMIC ANTIBODIES IN ANNULAR
ERYTHEMA OF NEWBORNS.
SO - ARCH DERMATOL 1981 SEP;117(9):569-72

4
TI - SYSTEMIC LUPUS ERYTHEMATOSUS IN PREGNANCY.
SO - ANN INTERN MED 1981 MAY;94(5):667-77

SS 2 /C?
USER:
FILE SDILINE
PROG:
YOU ARE NOW CONNECTED TO THE SDILINE FILE.

SS 1 /C?
USER:
PREGNANCY AND OBESITY
PROG:
SS (1) PSTG (4)

SS 2 /C?
USER:
PREGNANCY OR OBESITY
PROG:
SS (2) PSTG (1199)

SS 3 /C?
USER:
PREGNANCY AND NOT OBESITY
PROG:
SS (3) PSTG (1091)

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The main advantage of such accessibility occurs when cross relating several search terms. Using two or more MESH terms it is possible to specify a complex set of interrelations. For example, to search for papers on obesity in pregnancy in the printed *Index Medicus* the inquirer would have to search the section on Obesity for papers mentioning pregnancy or the section Pregnancy Complications for papers mentioning obesity. This would have to be repeated for each monthly issue for the current year and for all the annual cumulations as far back as required. Using the Medline computer files, however, he or she would have only to enter "Pregnancy Complications and Obesity" and in a matter of seconds the system would produce the number of references available. To reduce the size of the final list of references the searcher can limit the search to articles in the English language or to review articles. Searching the databases of several years takes the computer only a few minutes.

Some database computers hold only current files on line, enabling the references to be shown on a visual display unit or to be printed out at the library terminal. Older references requested through the user's terminal are often printed off line at the host computer and sent by post, as are larger batches of references which would be too expensive to print on line.

There is no limit to the number of headings that can be crossrelated in one search, and they can be linked in the search strategy by the use of the logical operators and, or, and not. Logical operators are used to associate and interrelate ideas and to build more complex ideas. The and operator, for example, can be used to link Obesity and Pregnancy Complications to retrieve references containing both these concepts. Obesity or Pregnancy would produce lists of all the papers mentioning either obesity or pregnancy, and Obesity, not Pregnancy would produce a list of all papers under the heading of obesity that did not also fall under the heading of pregnancy.

Obesity

Pregnancy

Obesity or pregnancyObesity and pregnancy

Obesity, not pregnancy

On Medline it is also possible to use free text searching—that is, to search for keywords from the title or abstract of an article. These words can be used either on their own or in combination with MESH terms. Some other databases use only this form of searching. Its advantage is that new syndromes for which there is no established MESH term—for example Rubik cubist's thumb—can be sought. There are, however, pitfalls: all possible synonyms must be entered, including British and American spellings and singular and plural variants.

The problems of computerised searching—Some subject areas are not well served by MESH terms but are awkward to define by keywords because there are so many alternatives. One such area is that of patient assessment. All the keywords based on assessment, evaluation, and quantification are terms which may be used very loosely in many irrelevant papers. Another problem is that of MESH headings which cross relate in an unexpected way. Thus a search for maternal lupus erythematosus causing any unspecified neonatal disease will require the Medline search strategy:

Lupus Erythematosus, Systemic *and* Pregnancy Complications *and* Infant, Newborn, Diseases

But as well as producing the required references this search will also generate references on any maternal disease in pregnancy that is followed by the neonate suffering from systemic lupus erythematosus. Nevertheless, it is still much easier to scan a list containing some irrelevant references than to search pages of *Index Medicus* for one relevant one. Computerised literature searching may not yet be a panacea for all information problems but it has gone a long way towards it.

All major medical libraries, and many postgraduate centres, have on line access to computerised literature searching. Each will be able to access a number of databases depending on the host system that they subscribe to. A subscriber to the British Library Automated Information Service (BLAISE), for example, will be able to access about 20 files, including Medline, and Cancerline. The Lockhead Dialog system, on the other hand, allows access to over 100 files including Psychinfo (Psychological abstracts), Biosis (Biological abstracts on-line), Scisearch (Search Citation Index), and many others. Scisearch is used with caution, however, as it is expensive to use.

Computers in library stock control

One of the most common uses of computers in libraries is for controlling the circulation of the stock. The basic concept is simple: when a book is borrowed its unique number is entered in the computer together with the borrower's unique number. These can be entered automatically, through a light pen reading the bar codes or the non-magnetic, metallic labels attached to the books. The borrower's ticket can be identified in a similar way. The computer holding the file of what is on loan to whom can then generate letters asking for the return of books that are overdue or required by another reader.

Initially circulation control systems were off line, with the identification numbers being stored on magnetic or punched tape for later loading into the computer in batches. Nowadays larger libraries are switching to the use of on line systems, which offer increasing sophistication. For example, files can be interrogated on line via visual display units which can show instantly who has reserved a book or when a book is due back. For systems to respond to such questions with not just book or borrower numbers, but with either bibliographical details or the borrower's name and address, large back up files are necessary. The borrower file is created when a reader registers with the library and if the system is on line it can be amended at any time—for example, when an address is changed.

Book files giving brief author and title information may be especially generated for the circulation system but are sometimes the result of a computer based catalogue system. Most libraries using machine-readable cataloguing (MARC) subscribe to one of the centralised cataloguing services. These provide catalogue records for all British and American books as they are published. The participating library requests a record for every book purchased and specifies the local information to be added—shelf mark and library location. The cataloguing service then adds the relevant records to the library's catalogue file and produces a new catalogue in the required format.

Computerised catalogues

As with circulation systems, computerised cataloguing has been progressing from an off line process to on line process. Thus libraries can tell instantly whether there is a record available on the centralised file or whether they need to create one, and they can make instant amendments—for example, if a book is moved from one branch to another. A few libraries have moved from having catalogues in hard copy, such as microform (microfilm or microfiche), to having them available to the public for on line interrogation using a visual display unit.

One of the advantages of MARC is the availability of the files for literature searches. The centralised files can be searched by subject, supplementing the searching of periodicals available through databases such as Medline. Information from an on line computer search of the library's holding can be much more specific than with a manual search through a subject catalogue because it is possible to crossrelate several subjects. Several organisations which started as centralised cataloguing agencies now offer whole library systems covering circulation, cataloguing, and book ordering.

The centralised MARC files can be used to provide the bibliographic details required by the bookseller. When the order is placed the library includes codes for the fund to be debited. The computer will then send the order to the appropriate bookseller. A file is kept of current orders and, as with notices for overdue books, the computer will send letters chasing an order if it is not fulfilled within a given time. In addition, the computer can perform housekeeping operations such as automatically debiting the purchase price from the necessary fund, keeping statistics relating to purchasing policy, and producing lists of new additions to the library.

In the future the library may be able to link into a bookseller's terminal and take advantage of teleordering. This system enables the bookseller to key in information about books required, and a central computer channels it directly to the publisher. The time saved is of great benefit to the library and, of course, to the reader.

Other computer applications in the library may be less far-reaching but are no less beneficial. Word processors have their usual office applications and have also made the updating of booklists and library handouts much easier. The same terminal used for literature searching can be used to key in requests for loans from the British Library Lending Division. This means a request can be dealt with at the British Library on the same day that it was made in a library at the other end of the country.

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