MEDLARS / MEDLINE

Reflection on Development and Status in Scandinavia

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It is December 2003! After having visited the head librarian at KIB (Karolinska Insitutet Library) Per Olsson, I went over to the main library and sat down in the reading area of the four-storey building. What a difference compared to 30-40 years ago! Thoughts went back - the library was much smaller and localities where different in those days. Only professors, teachers and students with an interest in research from the different Departments of the Institute came there to read or to pick up ordered articles and books. Today, all seats at reading tables are occupied, students coming and going all the time, standing and discussing in groups or entering and going to work at a number of PC-terminals available. That is technology in informatics – that´s the difference! This chapter will deal with aspects of this change.

Background

In 1864 the 27 year old assistant military surgeon John Shaw Billings in USA was called to the Surgeon General´s offices in Washington D.C. In October 1864 the first catalogue of medical literature was published by them. However, the collections of books and journals grew rapidly and it was decided that the young officer should be in charge. The book lover Billings got the task of collecting journals and books, to acquire as complete collections in the library as possible. Another result of his work was the first printed catalogue issued in 1873-1874, rather limited in size but supplemented with another catalogue on index cards. At about the same time Billings started work on a subject index, and as a test of its utility the first major bibliography was published – the subject being Cholera.

It is important to point out that already at that time the library should be a reference and not a lending library. Billings was collecting material for his thesis on the Surgical Treatment of Epilepsy back to 1859 but found it quite difficult to find all original articles and therefore turned to his brother officers at different Army Hospitals for help. Out of this he prepared index cards which made up the start of the Index-Catalogue which was ready for printing in 1880. Billings proposed a model for a bibliography of Medicine and at this time started to refer to the collection as the "National Medical Library" which, however, was not accepted as an official name. The Index-Catalogue was continually published until 1861. From this time on the Index was followed by a periodical list of current medical articles, books, reports and other literature – this became Index Medicus, a name suggested by the publisher. Billings obtained permission to have the library's index-catalogue, cards, and articles to provide the text for Index Medicus. Its first issue appeared in January 1879 (fig.1). In those days most of the medical scientific publications were issued in Europe and sent to the US for inclusion into Index Medicus. Dr. Billings extraordinary labour quickly established his international reputation and in 1880-1881 he was invited to give the general address before the International Medical Congress, the first American ever to do this. Billings was the head librarian between 1865 and 1895, having the major responsibility for the further development of Index Medicus but also for the collections and their location. The collections of the library grew quickly during this time. However, it was difficult to find funds for a building to be built on Capitol Hill, close to the Library of Congress. Later, the decision was taken to have a new building, the Library-Museum and this was opened in the year 1888. One must remember the tremendous work performed to publish Index Medicus monthly because there was no electricity at hand until the early 1900. There was also a continued demand for more space during the following decades. Finally, in 1941 a new building was planned on Capitol Hill, but as the US had entered the Second World War the same year this plan was overruled by concern for the safety of the collections. Of great help now was the microfilm technique (developed by Atherton Seidell, a biochemist) and in the next few years most of the library collections were on microfilm. The US contribution to medical science was continuously increasing and when the war was over the library also had to set out collecting relevant literature published in the enemy countries during the conflict.

The library buildings on the Mall were in great need of modernization and enlargement and after many debates the Surgeon General in 1949 decided that the library should be moved to Bethesda. Ten years later in June 1959 the ground breaking ceremony could be held on the site to mark the start of the construction (Senator Lester Hill).

By December 1961 the building was completed to about 90% and the collections could be moved to Bethesda. During these years there were also discussions concerning the name of the library and some alternatives were considered, but in 1956 it was decided under a new bill that the library would became an independent agency named the National Library of Medicine (NLM), a name which the library has carried since then and probably will continue to carry because its has got a worldwide reputation for its services. Thus, the biomedical world owes a lot to the man John Shaw Billings as scientist, librarian and clinician.

Swedish research and biomedical documentation

In this connection especially two men should be mentioned and honored, Martin M. Cummings and Sune Bergström. In 1964 Dr. Cummings was named Director of NLM and his successor at his retirement became Dr. Donald A. Lindberg, still the Director of NLM. During Dr. Cummings era great steps were taken in the advancement of the library in becoming the International Biomedical Communication Center, such as the establishment of the regional medical library network for the US, the program for the awarding of grants and contracts, a proportion of these being history grants, and the establishment of a History of Medicine Division at the library, the establishment of Specialized Information Services including the Toxicology Information Program, the converting of the library from a traditional medical library into an active information centre that was inaugurated in 1970 as the Lester Hill National Center for Biomedical Communication, the planning for the Biomedical Communications Network through the development of AM-TWX, MEDLARS-Medline, the National Medical Audiovisual Center, etc.

During his time at NIH as associate director of research grants Dr. Cummings also visited Sweden to review research projects and became interested also in other aspects of research at Karolinska Institutet (KI).

Swedish medical research as this time held a leading position internationally and Professor Sune Bergström, head of the Department of Chemistry, realized that in order for Sweden to maintain that position it would be fundamental that Swedish researchers had quick access to the international medical literature. As Dean of the Faculty of Medicine, professor Bergström worked actively to bring the MEDLARS system to Sweden, Index Medicus was already used by researchers at the different medical libraries. Actually, in the fifties and sixties most of the Swedish medical research was supported by the Rockefeller Foundation, the Swedish Medical Research Council and/or NIH grants to Sweden. During the later part of the sixties the contribution of the Swedish Medical Research Council increased markedly which was followed almost in parallel by a decrease in NIH grants. As late as 1971 the percentage of total NIH research grants to Sweden amounted to about 15% of Swedish medical research efforts. However, there was also a tendency within NIH to switch from grants to contracts in medical research. It could also be worthwhile mentioning that the creation of the Nobel Foundation in Sweden in 1900 constituted the first systematic, international effort to support scientific work worldwide. Thus, it could be said that the Swedish Nobel Prize awarding bodies functioned as the first International Research Councils, the idea being to give the laureates a significant amount of money to release them from personal economic problems but it also gave the Research Council Members a possibility to communicate with outstanding experts around the world. However, today the Nobel Prize does no longer play the same direct economic role for the laureates as it once did.

MEDLARS

In the early sixties, with the arrival of the electronic data technology the NLM developed the computerized bibliographic information storage and retrieval system MEDLARS – which is an acronym for Medical Literature Analysis and Retrieval System. This was necessary to cope with the ever-increasing volume of the biomedical literature and to be able to respond to the needs of the health profession. The purpose of the MEDLARS system was mainly to get a tool for the monthly publication of IM (Index Medicus) and the publication of the hierarchical controlled vocabulary MESH (Medical Subject Headings) but it was also the key tool for publishing recurring bibliographies and later on even retrieve subject citations from journals by "searches on demand". From now on the National Library of Medicine acquired a number of functions that were atypical for a library and created the fundaments of the worlds largest biomedical service system. To avoid an overflow of demands for computer searches, that were coming nation wide, and to develop partnerships with other US medical libraries MEDLARS was formally centralized according to the Medical Library Assistant Act 1965, and eleven regional medical libraries were established over the United States. Today, the National Library of Medicine has developed from a national resource into an organization with a major international impact. Initially, subject searches were provided through MEDLARS by so called batch search. In 1991, the original medical library was transformed into the National

Network of Libraries of Medicine, made up of eight regional medical libraries and a number of resource libraries, access libraries at the health science schools, hospital libraries etc, in a hierarchical structure.

In the next few years computer technology developed further and made it possible for NLM to promote its information services to the end-users. By 1997 Medline was accessible on the Web at no cost. And via the web interface, the Pub Med and the Entrez systems replaced Elhill as the basic Medline retrieval system.

After the Second World War it became obvious that the various services provided by NLM were a national resource that might have international impact. It might be a scientific tool for the benefit of the world but could also be an instrument in foreign policy and, in fact, it was used as such in some periods during the following decades. These aspects precipitated conflicts between different government agencies and the lack of coordination caused delays in many international programs. The US Government was after the Second World War active in a number of international organizations such as UN, WHO (created 1948), PASO (Pan American Sanitary Organization, 1947) and within the next decades such programs became bigger and more differentiated and economically more resource demanding. As an example let us mention that the number of member states of the WHO increased from fifty-six 1948 to one hundred and fifty-three in 1979. The advance of different programs became dependent on where the various presidents wanted to put the major emphasis. However, the focus was always kept on the health care programs of the nations of the world and the eradication of tropical diseases, such as malaria, cholera and smallpox. As a result of this coordinated efforts WHO could declare smallpox eradicated globally in October 1979. Another such program is the program on human reproduction started in 1972, which in the following five to ten years meant an enormous increase of grants for research in different countries where this was a serious problem. For Europe the establishment of the Marshall plan in 1948 was of fundamental importance. In days of the so-called "Cold War", programs and services provided by NLM were important parts of the bilateral agreements with Russia and Japan (a former enemy). However, some years later it was decided that international cooperation should work not primarily through the State Department but with HEW (Health, Education and Welfare) and through NIH (National Institutes of Health).

The Swedish MEDLARS era

The MEDLARS database and Index Medicus are international in character and many countries were interested in obtaining MEDLARS computer tapes when the system became operational in 1964. The NLM began international cooperation with the United Kingdom and Sweden for their experimental testing of the new computerized system. As these two countries moved closer to an operational status and to providing services it became clear to NLM that definitive bilateral arrangements were feasible. In 1961 the OECD (Organization for Economic Co-operation and Development) was formally established as a successor of the Marshall Plan organization OEEC. Therefore, it was natural that the American Government invited the OECD to start a MEDLARS branch somewhere in Europe, even more so as some OECD members over the years had discussed establishing science-related programs and had created a scientific directorate. Initially, the idea was to set up such a new Centre in Paris. However, after a number of unfruitful meetings over a few years, the decision was to have bilateral agreements with individual countries instead. Professor Sune Bergström participated in three such meetings as the Swedish representative and he of course had a rather strong case since already back in 1964 Sweden had ordered as many as 3000 MEDLARS searches. For this reason particularly, it was decided that KI would become the branch MEDLARS Center. At about the same time a similar agreement was made with the British Lending Library at Boston SPA. Even though many countries applied for becoming a MEDLARS Center, NLM did not make the choice but the countries themselves as they had to comply with certain technical criteria established by NLM. The country had a choice of alternative MEDLARS arrangements. Sweden and the United Kingdom were to receive tapes and to develop the software, Germany initially just to receive tapes and France to go online to NLM as soon as that could be possible Two functions had to be maintained by all centres, namely searching and training, and both Sweden and the United Kingdom were especially active in this respect. NLM also arranged for MEDLARS services through such large organizations as UNESCO and WHO between 1965 and 1972. However, it turned out that the majority of MEDLARS searches in WHO where performed for staff members rather than for projects within members states.

Development of the Swedish MEDLARS Center

The MEDLARS Center was established in the spring of 1965. This was preceded by negotiations in 1964 between professor Sune Bergström and Martin M. Cummings, director of NLM. It is fair to say that the successful outcome of the negotiations was due partly to the fact that these two gentlemen had known each other for years.

Naturally, the start of the Documentation Center at KI had to be formalized with regard to the conditions between the two organizations and to which services the MEDLARS Center Stockholm could and would provide to other European countries and organizations. The National Library of Medicine started so-called "Quid-pro-quo"-programme arrangements with countries and organizations that wanted access to the MEDLARS programs and files. Such a contract was signed in the spring of 1965 between NLM, MFR and KI. This meant that NLM agreed to make all MEDLARS material continuously available to KI. In return KI would provide training in indexing and prepare the actual indexing of the Nordic literature for the system.

By a decision of the Swedish Government the project was initially to be financially supported by MFR – the Swedish Medical Research Council – since it was of national importance. Therefore, MFR in the same year formed its own documentation committee made up of representatives of MFR, KI and the Universities of Uppsala, Lund and Gothenburg. And this represented a good coverage of the Swedish scientific community. KI was given responsibility for the operation of the centre, but otherwise the centre, given the name of Biomedical Documentation Center (BMDC), stood under the supervision of the MFR Documentation Committee. During the development phase, the Center could rely on grants and donations, but in the long run it would have to be profit-driven. In the beginning it would have to exist on a MFR budget , which meant an uncertain future.

Of great importance for the success of this project was that the secretary of MFR at that time, professor Bengt Gustafsson, got very interested. He made sure that funds were allocated not only for leasing a suitable computer or computer-time but also that means were available to get access to the Scandinavian journals for indexing.

The operation of BMDC was further formalized by a decision of the Swedish Parliament (Riksdagen) whereby one position as principal administrative officer and three positions as senior administrative officers were to be financed through MFR. Further staff-members were hired by KI and paid by MFR. The administration of BMDC became the same as for any other Department at KI with both a Department head and an executive committee and the Senate of the Institute created a statement of purpose for the Center in the beginning of 1969.

During this time KI sent people to NLM in Bethesda for getting acquainted both with the actual running and developing of the computer programs and for training in literature indexing. This was actually the basis for the possibility of BMDC to arrange courses in indexing for scientists from different European universities and organizations and also to interact and help in resolving local software problems and computer operations.

Purposes and software development

In the early days of the sixties computer searches of medical and chemical literature were started on a commercial basis in some countries in Europe. Department heads of KI realized the importance for basic and clinical medical research to be involved in this new technique. Through a donation by the Wenner-Gren Foundation, Karolinska Institutet acquired a Wegematic which became the first computer of the Institute but also the first one on which to try the MEDLARS tapes. Bruno Lundberg, head of BMDC at that time, with a large interest and skills in this field managed this period together with interested persons at the Institute and at MFR. The major obstacles for a more rapid development and the introduction of new features were the lack of computer capacity and funds. Key persons in the project were professor Arne Engström, Department of Medical Physics, professor Bengt Gustafsson, secretary of MFR, and naturally professor Sune Bergström, now President of Karolinska Institutet.

The MEDLARS system itself grew quickly and the files became larger and larger, demanding more and more computer capacity. After approval of the Swedish Public Management Agency (Statskontoret) the arrangements where made to lease an IBM 1401 which was installed at the Medical School of KI in late 1965. However, it was soon apparent that its capacity was too limited, which caused long delivery delays for the customers. The following years the MEDLARS procedure was carried out in three phases, namely the input phase on the KI IBM 1401 or the 360/40 (located at the Karolinska Hospital); the search phase on the IBM 7090 (located at QZ, the common University Computer Centre in Stockholm) and the print-out phase on the IBM 360/40. This made the operation geographically complicated and time consuming.

The waiting times for the results of searches were almost unacceptable and caused considerable irritation. For more than 90% of the retrospective searches the waiting time was more than 40 days. It ought not to be more than a week.

To try to solve this problem the Documentation Center first used the University computer IBM 360/75 at QZ, Still however, there was too little memory capacity for the files and it was not until the offer by Karolinska Institutet itself in 1975 to provide own funds for more memory disks that this was resolved.

It lasted until 1989 before a computer was acquired for documentation activities at KI. A computer IBM 4381 mainframe could be installed thanks to a donation by the Swedish bank "Handelsbanken" and a substantial loan from the institute. The new computer had a processor capacity that was three times greater than that used by BMDC/MIC * earlier and had advanced communications equipment that allowed connections from all sizes of computers. The storage capacity was 40 gigabytes. The new computer became operational on April 1,1989, and was operational with surprisingly few complications from the very beginning. A few months later a seminar and reception with a formal guest from NLM was arranged to celebrate that the database MEDLARS now was run on its own computer housed within the premises of KI. Invited to this occasion were also representatives of the foremost Swedish co-operative partners such as the Drug Information Center of Huddinge University Hospital, the Swedish Institute of Occupational Health (Arbetsmiljöinstitutet), the Swedish National Chemical Inspectorate (Kemikalieinspektionen) and the Association of Swedish Engineering Industries (Sveriges Verkstadsindustrier), etc. All of these had databases operating at MIC –Medical Information Center - and another advantage was that the customers of these organizations could search all the databases with the same search language.

One early problem was that all the MEDLARS programs were written for a Honeywell computer and there were no such computers in Sweden. The programs had to be rewritten for the IBM machine. This was time consuming but successful and stirred up an interest also in US because most American universities had IBM machines as well. In fact, in 1968 the Head of the Information Center, Bruno Lundberg, was invited to Harvard and gave a highly appreciated demonstration of the Swedish programme version. Of course, this was also of considerable interest to other countries outside the US that planned to run the MEDLARS tapes. The German Documentation Institute (DIMDI) in Cologne signed a leasing contract, and began running MEDLARS in 1970 with the use of BMDC software programmes. Also in 1970, BMDC negotiated a contract with the Australian Government according to which they bought the MEDLARS programmes from KI. During this time there were also discussions on whether BMDC would provide MEDLARS services to the Eastern European States. In 1969 the director of NLM offered the possibility of a limited-time license for that purpose via BMDC. However, this was not used at that time. Later on, a new license was agreed upon and was used by Poland from 1974 and by East Germany from 1981.

The initial contract with NLM was followed by a number of amendments over the following years, related to the extension of the data base (MEDLARS II), software (Ellhill), indexing procedure and other European Centers (1974), etc. The development of on-line access to the different files required specific amendments and agreements, in our case for Medline, Toxline, Chemline (1976), Cancerline at NLM (1978) and other interesting biomedical databases. By the end of 1997 the agreement was formally terminated, which unfortunately in some respects meant that the relation between KI and NLM has become less intense in later years in this field.

Many individuals from DMDC, both indexers to be and system analysts passed through NLM in Washington DC during these years. Stories could be told about many of them but let me just refer to one very capable young system analyst (Rune Isaksson) who spent some periods over there. Staff members at NLM were interested not only by his knowledge but also by the fact that he did not say much. Of course, they wanted him to have an impressive view not only of NLM but of the US as well. Every time when he was showed something or they took him out to visit a place, the answer was: "I know of a better place". – Now, what could this marvelous place be? Of course, the fellows at NLM were curious and I was asked about it a couple of times on my visits. The answer – a small tiny village some Swedish miles from Kiruna far up North!

Not only MEDLARS _ _ _ _ _

As early as 1965 a significant body of information in biomedicine for researchers was found within the area of biochemistry and the Department of Chemistry at KI started to subscribe to Chemical Titles (CT) . It was,however , the intention of the information center (BMDC) to expand its services and an opportunity occurred in 1967 when the US Government offered all member-countries of the OECD to use all computerized Chemical Abstracts information material for one year free of charge as soon as the individual country could have the hardware operational.The capacity to operate the material was at hand at KI due to the subscription for some years. Department of Chemistry also subscribed to Chemical Biological Activities (CBAC) and on the European scene there were subscribers also in Germany, Holland and England.

In 1967 the Council for Engineering Research (TFR) did provide funding for a study visit of associate professor Anders Kallner and their documentation committee allocated some Swedish money for staff and operating costs of CT, CBAC, Basic Journal Abstracts (BJA) and Chemical Abstracts Condensates (CAC) at BMDC. Financial support for the chemistry project was also provided by the Swedish Council for Scientic Information and Documentation (SINFDOK). Besides at KI Chemical Abstracts Services was also provided for other groups of academic researchers by the Library at the Royal High School of Technology.

When the Swedish Parliament (Riksdagen) in 1969 decided about four positions at BMDC especially in activities of biomedical information the center developed quickly and later on became the second largest provider of such information Europe.Staff members during the next years were Bruno Lundberg, Anders Kallner, Christina Olivecrona and Gunvor Svartz-Malmberg. It was fundamental to have such a capable staff and for the first time material from the three major sources on tapes were run together within the same the same organization.This provided the basis for a large integrated system to cover in depth the whole published biomedical field. No other organization in Scandinavia was at this time able to provide this. In 1970 the access to the American data base Psychological Abstracts was also acquired (operated at BMDC by Berit Aschberg).

In 1973 and 1975 KI was awarded grants to develop a documentation system in reproduction research (the "Human Reproduction Project").

The Medline era

In the 60th MEDLARS didarticles from about 2.500 journals. A concentrated computer database system of the most significant ones were then developed by NLM and in October 1971 put into operation in the US and accessed online by telephone and called Medline – "MEDLARS on line" – BMDC was the first regional Center outside the US to get access to

this program package.The system was installed during the winter months 1971-72 at BMDC and QZ (Stockholm University Computer) by the computer and data expert Robert Burchit from SDC in Los Angeles,California. It was an exiting moment when the first trial-night the system became operational between the two localities in Stockholm,apart from each other. Even more fascinating was the opportunity 1-2 months later to demonstrate the system for the first time outside the Stockholm area at a clinical conference, Dept of Internal medicine, regional University Hospital Linköping about 200 km to the south. By July 1972 ,the system was installed on a temporarily leased computer and after just a few months eight terminals were regularly connected to the system over the country.

At about the same time a contract was signed for operating Medline on the QZ IBM 360/75. The database then covered a three-year period and contained about 320.000 references from the 1200 biomedical journals and increased yearly by 140.000 new references corresponding to an updating of about 10.000 monthly.

Medline at that time allowed the user a direct dialog with the computer through a typewriter terminal, meaning that the end user (the physician or the librarian) had to learn their own searching.- This made it necessary for BMDC to arrange courses and information meetings. It became apparent the Medline eventually would replace MEDLARS and a project to create a Nordic Network for medical information based on theis systemwas approved by the Nordic Co-operative Agency,Norddok. The Biomedical Library of Gothenburg became the first non-KI online user and was followed in 1973 by the Central Medical Library in Helsinki and the University libraries of Oslo and Copenhagen.

The Nordic Research Organization, Nordforsk ,initiated the first asynchronous Data Communication Network, Scannet , and Medline was one of the first five online services to be included. The network used leased telephone lines,started in 1976 with nodes in the four Nordic Capitals and Gothenburg. Nordforsk covered operational costs through 1979 while communication via the network was free of charge for users. The number of online customers increased quickly to around 1600 in1979.

Retrieval functions in MEDLARS and Medline

The basis for the functioning of the two data files is a controlled vocabulary, MeSH –Medical Subject Headings –a hierarchically controlled vocabulary thesaurus . The first issue of MeSH 1960 hold about 10.000 terms but today the vocabulary contains more than 19.0000 terms and is annually updated to reflect changes in the medical sciences. The alphabetical list is also arranged hierarchically by subject categories with broad terminology on top and the more specific,narrower terms at the bottom. A specially designed group within the Library works on definitions of suggested terms and many terms are defined and worked out within the system but do not appear in the printed Index Medicus. These so called "provisional headings" or"qualifier" in the computer are often defined in cooperation with specialized,leased groups and /or scientific organizations outside NLM. In the mean

time the frequency and usefulness of these terms is carefully followed and sooner or later they may become full MeSH-terms. The system was initially built to produce Index Medicus . Skilled subject analysts examine the journal articles and design to each one the most specific MeSH terms applicable, usually between 10 to 12 applying the vocabulary, whatever may have been the author´s words or suggested index terms and this makes sure that all material is uniformly entered into the system.

The capability of the system was found to allow broadening to produce material for recurring bibliographic lists on special medical topics and also to retrieve subject specific journal citations., so called "the demand search".

The searching procedure allows different terms to be combined automatically via an AND search in various fields of the citation. The search strategy may also include the Boolean operators -AND, OR ,NOT – and they have to be in upper case.The search procedure may be further improved by usage of the "MeSH subheadings",which are used to help describe more completely a particular aspect of a subject

The Drug Literature Program

In 1962 it was suggested by prominent persons in a presidential committee that a National Drug Information Clearinghouse be established at NLM and this was further strenghthened

by the President´s Science Advisory Committee 1966 which recommended formation of a computer-based file of toxicological information in their report ("Handling of Toxicological Information"). This program was established within the Department of Health, Education and Welfare. Then,as a result of the first group´s proposal a special program had been operational for a few years looking on data of new drugs and their adverse effects.This was supported by professional associations and societies and they also assisted in developing drug terminology for NLM within the "DLP" (Drug Literature Program,head,Ms Winifred Sewell with a long time experience on drugs and drug information) and she was supported in her work by a team of trained pharmacists,chemists and pharmacologists. Two major problems were of concern to the DLP.The first was the deficiencies in chemical terminology. In coordination with the Food and Drug Administration and the Cancer Chemotherapy National Service Center,DLP

funded the Chemical Abstracts Service to register about 30000 compounds related to drugs in order to index journal articles in relation to a specific chemical entity. The second one was to develop terminology relating to drugs and drug actions,adverse effects and toxicity. I myself had the opportunity to work on this as a DLP staff member 1965 – 1968 and under contract through 1970. In cooperation with ASPET (American Society for Pharmacology and Experimental Therapeutics) new subheadings such as "adverse effects, Chemically Induced, Toxicity and Poisoning" and other ones related to drug actions were carefully developed,designed and tried out. Journal retrievals using these subheadings led to the information product entitled the Toxicity Bibliography published between 1968-1978.At my last visit to NLM in 2001 it was observed that almost no changes of subheading definitions had been undertaken over the years and it is my personal belief that this standardized, controlled input to MEDLARS- Medline files is a major factor behind the high quality standard of these files.

Since the activities of the Toxicology Information Program and DLP were similar in nature both programs were organized jointly in a new unit called "Specialized Information Services" and the Drug Literature Program abandoned in 1970.

Summings-up

NLM is perhaps best known for the Bibliographic database Medline. However, the Librarie´s collections are locally available onsite and on the global level through the Internet. Due to the technical development in later decades and an increase in research and published data has given an information explosion in various fields and created a necessity to deal with this. NLM has caught up with this but the basis has always been the categorization, classification and indexing procedure that has gone on for decades and still is developing continuously. One of the more important areas is the drug literature and distribution of drug information.A good example of this is the action of NLM at developing the program of Medline for CD-ROM (SilverPlatter),where a number of universities and organizations were involved in the evaluation of the most feasible system. Drug information is an essential component of online databases to-day. Since 1996 a number are available on the Internet. and NLM has developed specially designed files for various user groups and their needs. To-day Medline contains about 16 million journal articles and abstracts from about 4600 journals in the US and 70 other countries. Figures indicate that 400 million searches of Medline are performed yearly. Examples of drug related files are MEDLINE/PubMed, Genbank, Hazardous Substances Data Bank, AIDSInfo, Toxnet, Specialized Information Services, Medlineplus (for the laymen ,introduced in 1998 –unfortunately not much used in Sweden). Of concern is that Internet is unstructured and not a supervised media which to a large extent is reliable on the quality of input files. NLM seems to a great extent be aware of this.

In 1975 the name of BMDC was changed to MIC (Medical Information Center) to better correspond to the organization orientation towards information. Two years later it was suggested that a "common organization" be created between the Karolinska Institutet Library (KIB) and MIC,which came into being 1979. The Computer question was finally resolved in 1989 when due to an agreement between Karolinska Institutet (KI) and IBM an IBM4381 could be installed on the MIC premises with a capacity that superceded the one on QZ (Stockholm University).

In 1974 I left to become a clinical pharmacologist at the University of Huddinge and to be involved in building up a Drug Information Center. Ten years later -1984 – a drug database named Drugline was formed from the collected material and constructed in a similar way as Medline.To-day this file contains about 14000 records. Since 1996 it is searchable via the Silverplatter program and from 2003 also via a search-module within the Stockholm County Drug Unit.

In the 90ties many more databases than before were available from MIC,14 with MIC as host and 31 via NLM. The same search-language (ELL Hill) could be used for all databases. Also,an automatic electronic link was created between the computers at NLM and MIC (Micgateway).

IN 1988 the cooperative agreement between NLM and KI was formally ended

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*MIC-Medicinska Information Centralen became the new name of BMDC in 1975.