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USE OF COMPUTERS IN HEALTH SERVICES

Report on a Study Visit to Czechoslovakia,
German Democratic Republic, Hungary and Romania

by

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1. Introduction

In accordance with the Health Statistics programme of the Regional Office for Europe of the World Health Organization (Official Records No. 236, page 600), a study was undertaken on the use of computers in the health services and on the organization and functions of medical computing facilities in Member States of the European Region. The present report was prepared by Professor F. Sawicki, who made a study visit in 1976 to Czechoslovakia, the German Democratic Republic, Hungary and Romania, in the capacity of consultant.

2. CZECHOSLOVAKIA

2.1 Background information

The territory of the Czechoslovak Socialist Republic covers an area of 127 900 square kilometres. The population in 1974 was 14 738 000, with a density of 115 persons per square kilometre. The State has a federal structure, and consists of two Republics, the Czech Socialist Republic and the Slovak Socialist Republic. The Czech Socialist Republic is divided into 8 regions and the Slovak Socialist Republic into 4 regions. The regions are divided into districts.

2.2 Health services

The Ministry of Health in each Republic is responsible for health services, i.e. for the organization and supervision of hygienic, preventive and curative services, training of health service personnel, medical research, natural curative spas and sources, industrial health, and for technical and economic developments in the field of health. On the federal level the Council of Health takes decisions on problems requiring a uniform nationwide policy.

At regional level all health services come under the control of the Regional National Committee and its Health Committee, which has executive, advisory and supervisory functions. Administrative responsibility rests with a Regional Institute of National Health (KUNZ) which is directed by a doctor. There is a similar administrative organization at the district level, i.e. the District Institute of National Health (OUNZ). A very small number of health institutions come under the authority of other institutions.

Health services are provided free of charge. Small contributions are required for some services only. Integration of the inpatient and outpatient services does exist, as well as of curative and preventive services linked with the hygiene and epidemiology service.

In 1974 the whole country had 251 general hospitals (including maternity homes) with approximately 115 000 beds and 164 specialized hospitals, i.e. tuberculosis, mental and others, with more than 33 000 beds. There were approximately 10 beds per 1 000 population. In 1974 the whole country had nearly 39 000 doctors (26.4 per 10 000 inhabitants). The number of outpatients treated in the health facilities in 1974 amounted to 193 000 000, while 2 400 000 hospital patients were discharged in the same year.

2.3 Medical research

The medical research programme forms part of the State scientific and technical research programme. Medical research is organized by a Coordinating Committee composed of representatives of both Czech and Slovak Ministries of Health and their Scientific Councils, the Ministry of Education and the Academies of Science. It is carried out at the research institutes of the Ministries of Health and of the Academies of Science, in medical faculties and in teaching hospitals.

2.4 Use of computers in the health service

The Institutes for Health Statistics in Prague and Bratislava, subordinated directly to the Ministries of Health in each Republic, are responsible for the application of computers in the health service.

The use of computers in health services is related to the implementation and development of the health information system. Primary objectives of this system are to provide the managers involved in operating the health service on the national, regional and district level with relevant information. At the lowest level the information on patient-physician relations is collected. This information is sent to the district level (OUNZ), and later to the regional level. At the Regional Institutes of National Health (KUNZ) the data are transferred to punched cards and/or to paper tapes. These are used for the further processing and analysis of data at both regional and national levels.

Data on the following are at present collected, processed and analysed at the national level, i.e. at the Institutes for Health Statistics in Prague and Bratislava:

- (a) newborns with low birth-weight;

- (b) congenital malformations;
- (c) perinatal deaths;
- (d) abortions (both induced and spontaneous);
- (e) suicides and attempted suicides;
- (f) communicable diseases (incidence);
- (g) venereal diseases (incidence, relapses);
- (h) tuberculosis (incidence, relapses, deaths);
- (i) malignant tumours (register);
- (j) sickness absenteeism: analysis of all spells of absenteeism according to 15 diagnostic groups and analysis of 20% sample of terminated spells by groups and single causes in relation to other characteristics;
- (k) hospital morbidity in general hospitals;
- (l) hospital morbidity in mental hospitals and in hospitals for tuberculosis and respiratory diseases (a more detailed analysis than that mentioned above);
- (m) persons treated in spas;
- (n) network of medical facilities in the communities;
- (o) network of hospital establishments and hospital bed occupancy;
- (p) activities of community physicians;
- (q) staff and salaries in the Institutes of National Health;
- (r) register of doctors, dentists and pharmacists;
- (s) follow-up of graduates of medical and pharmaceutical faculties entering jobs.

For the purpose of analysis of the health status of the population, these data are supplemented by information on demographic characteristics, causes of death and causes of invalidity. This information is processed in computer units which do not belong to the Ministries of Health.

All these data are tabulated at national level and fed back to the regional and district levels. In addition, some information is processed and analysed at regional level. At the moment card sorters at regional level are mainly used for these purposes. Only some regional institutes, in Prague, Ostrava, Brno and Plzen, use second- or third-generation computers.

Apart from the above-mentioned data which are routinely collected, processed and analysed on an annual basis at the Institutes for Health Statistics, and in some Departments of Statistics of the Regional Institutes of National Health, several special surveys are conducted. The following projects have been realized in recent years:

- (a) analysis of selected economic problems and of the use of technical services in the National Institutes of Health;
- (b) payrolls of the National Institutes of Health staff;
- (c) stock control of equipment in selected hospitals and polyclinics;
- (d) stock control of laboratory equipment;
- (e) Institute of Health Statistics expenditure accounts;
- (f) accidents away from the workplace;
- (g) information system on environmental surveillance;
- (h) survey of the effects of curative diets of hospital patients;
- (i) special surveys for testing new methods of studying the health status of the population and the activities and effectiveness of health services;
- (j) survey of the stock and distribution of drugs, conducted in Prague;
- (k) a pilot study of two information systems (system of notification and statistics of communicable disease, and system on the immunization register and recall system for children) is being conducted at the Regional Institute of National Health in Ostrava;
- (l) a pilot study of the register of blood donors, blood transfusion services (including the stock of stored blood) and related statistical analysis is being conducted at the Regional Institute of Health in Plzen. This study now covers selected districts in the Plzen Region.

In the future, the systems now being tested in Ostrava and Plzen will be extended to the entire country.

At the moment the following equipment is used for data processing.

The Institute for Health Statistics in Prague is equipped with one EC 1030 computer (made in USSR), and two smaller ones, namely, A 100 (made in Czechoslovakia) and Cellatron 8206 (made in GDR). There are 56 employees, including 11 analysts and programmers.

The Institute for Health Statistics in Bratislava is equipped with one A 101 computer. There are 20 employees, and among those a group of 6 persons performs the work of programming and analysis.

All departments of statistics in the Regional Institutes of National Health are equipped with card punchers and card sorters. The Institute in Ostrava is equipped with an EC 1030 computer, the Institute in Plzen uses for some purposes a ZPA 600 computer (made in Czechoslovakia) installed in the local hospital, and the Institute in Brno has a Cellatron 8205 and an ADT 4100 minicomputer. The total number of employees in the departments of statistics of the Regional Institutes amounts to 140, more than 25% of them being analysts and programmers.

2.5 Plan for future development of EDP (electronic data processing) in health services

The programme for the development of EDP until the end of 1980 is related to the implementation of projects related to the designing and implementation of information subsystems for:

- (a) community health and the activities of a community physician,
- (b) outpatient care,
- (c) child care,
- (d) gynaecological care,
- (e) dental care,
- (f) inpatient care,
- (g) care of worker groups,
- (h) dispensary care.

The improvement of processing and analysis of the existing subsystems and the implementation of the new subsystems will require the simultaneous development of computing services. Therefore it is planned to equip the Health Service with computers by the end of 1980 as follows:

The Institutes of Health Statistics in Prague and Bratislava will be equipped with EC 1050 and EC 1030 computers. The Regional Institutes of National Health will be equipped with EC 1030 computers. On the district level it is planned to install input/output terminals for communication with computers situated in Regional Institutes of National Health. It is also planned to link computers at the regional and national levels by means of teletransmission.

2.6 Use of computers in medical research

Several medical research institutions possess various types of computer equipment.

The Institute of Hygiene and Epidemiology in Prague is equipped with two Hewlett-Packard computers (2116 and 2100), which are used mainly for epidemiological and environmental research. There are 14 persons working on these problems, including 6 analysts and programmers.

The Institute of Medical Bionics in Bratislava is equipped with 11/50 and 11/40 PDP computers as well as two Hewlett-Packard 2100 computers. These computers are used for several purposes. The main work of the Institute is the designing and implementation of medical care management systems. The system of hospital care is now near completion, and the development of a system of outpatient care is starting. Both systems will be integrated in the future. Another use of computers is to serve the intensive care unit. The system of continuous on-line monitoring of patients treated in this unit is already fully efficient and in the near future will cover a larger number of patients. The computers are also used for the analysis of data collected in various departments of laboratories, e.g. cardiological analysis of ECG curves, pulmonary laboratory data, etc. The institute plays the role of coordinating centre for a computerization of hospitals throughout the country. The Institute employs 103 persons, among them 20 analysts and programmers.

Other units which have developed patient monitoring systems are the Traumatological Hospital in Prague and the Institute of Traumatology in Brno. The former is equipped with a Hewlett-Packard 2116 computer, and the latter with an M 6000 computer (made in USSR).

Some data obtained in the course of clinical, laboratory and experimental research are analysed by means of various computers. The Institute of Physiology of the Czech Academy of Science is equipped with two computers (PDP 11 and PDP 8). The Research Institute of Tuberculosis and Respiratory Disease uses the Meda analogue computer (made in Czechoslovakia), and the Institute of Haematology and Blood Transfusion in Prague uses the EA1 640 hybrid computer. The Institute of

Clinical and Experimental Medicine in Prague is equipped with one Minsk 22 digital computer (made in USSR), and two analogue computers (Solatron and Meda). The Research Institute for Endocrinology in Prague uses two computers (Clary De 600 and Hewlett-Packard 9820A).

The computer ZPA 600, mentioned in the previous section, is used for research purposes as well. In addition, a number of medical research units use, for analysis of the results of their research work, computers belonging to universities or other scientific or industrial institutions.

3. GERMAN DEMOCRATIC REPUBLIC¹

3.1 Background information

The German Democratic Republic (GDR) covers an area of 108 178 square kilometres and had a population of 16 850 000 in 1975. In 1975, there were 155 inhabitants per square kilometre. The GDR is divided into 15 counties, including the capital city of Berlin. The counties are divided into 34 urban and 182 rural districts with a total of 7634 communities, among them 179 municipalities with 2000 and more inhabitants. There are 14 cities with more than 100 000 inhabitants.

3.2 Organization of the national health system in the GDR

The GDR has a unified national health system, the Ministry of Health being the central government authority on all health matters. The country's Constitution guarantees every citizen the right to free medical care and health protection.

At the county and district levels, the Departments of Health and Social Welfare are responsible to the local councils for the management and planning of health services in their areas. The cost of health services is covered by the State and by the social security system.

The national health system of the GDR is structured into hospitals, polyclinics, outpatient centres, State medical practices, dispensaries, health-cure homes and institutions of the State Hygiene Inspectorate.

In 1975, the GDR had 575 hospitals with 182 220 beds, or 10.8 beds per 1000 population. Of these, a total of 113 hospitals with 18 100 beds are attached to universities and medical schools under the Ministry of Higher Education.

In the same year, the GDR had the following institutions for outpatient medical care:

- 522 polyclinics, including 109 factory polyclinics
- 929 outpatient centres, including 290 factory outpatient centres
- 1606 State medical practices
- 946 State dental practices
- 2051 medical aid posts staffed by physicians
- 5061 community nurse posts
- 191 tuberculosis consulting centres
- 205 oncological dispensaries
- 937 antenatal consultation centres
- 254 postnatal consultation centres with
2193 main branch-offices and
7541 branch-offices.

Polyclinics, as the corner-stones of outpatient medical care, are in charge of specialized and superspecialized care and maintain specialized dispensaries for cardiovascular and rheumatic diseases, diabetes, tumours, tuberculosis, etc.

In 1975 the health services employed about 321 500 persons, including 31 300 physicians, 7720 dentists and 3054 pharmacists. This corresponded to 1 physician per 540 inhabitants, 1 dentist per 2183 inhabitants and 1 pharmacist per 5517 inhabitants.

3.3 Conceptual basis of the installation and use of EDP

The use of EDP comes within the executive function of the Minister of Health. The basic objectives of the installation of EDP in the national health system of the GDR are as follows:

- (1) to achieve a higher quality of medical care;
- (2) to achieve a higher quality of decision-making and improved control in the process of management and planning.

¹This section has been revised by Dr J. Otto, Information Officer, and Mr W. Keil, Computer Officer, Ministry of Health of the German Democratic Republic.

In pursuance of those objectives, the installation and use of EDP is concentrated on:

- automatic data handling in the clinical-chemistry laboratory, in functional diagnostics and in nuclear medicine
- automatic patient-related information processing large hospitals
- screenings and specific mass-examinations; automatic call-up and appointment systems under the immunization programme
- establishment of patient registers for selected diseases, e.g. cardiovascular diseases, tuberculosis and tumours.

Apart from its direct benefit to medical care, the collected data is also used for medical research purposes. A total of 11 EDP installations are now used for data handling in medical establishments.

The EDP project "Patient-related information system" is in routine operation in four large hospitals. EDP projects for call-up systems exist for:

- blood donation
- cervical carcinoma
- diabetes
- immunization.

These projects are operated in several districts which meet the corresponding requirements. The National Tuberculosis Register has been operating in the GDR as a central EDP project since January 1977. The Register will also serve as a prototype for other central registers on the health status of the population of the GDR.

In the field of management and planning, the use of EDP is concentrated on the following priorities:

- (1) evidence of capacities for structural and site planning;
- (2) staff records for an inventory of health services staff and the streamlining of staff patterns;
- (3) accounting of performance and cost for sector-specific planning in the framework of national economy plans and for assessing the quality of medical care;
- (4) streamlining the procurement of medical equipment, devices used in the care of physical impairment or disability and consumable material for the national health system.

An EDP project is under preparation which will cover all health and social service institutions of the GDR, collecting such characteristic data as address, category, subordination, attachment to industrial sectors, place in the budgetary system, etc. The project will be the core of the proposed automatic accounting system for performance and cost and is scheduled for introduction towards the end of 1978.

Data on professional manpower in the health and social services (physicians, dentists, pharmacists, etc., a total of 40 000) have been stored since 1974. For each person the stored data includes the address, age, sex, professional training, scientific qualification, occupation, etc. The information is updated every three months. These data form an important basis for the adequate placement and selection of manpower. In combination with other specific parameters, e.g. disability, mortality rate, attainment of the age limit, they constitute the basis for determining the short-term and long-term manpower replacement and expansion needs.

A data storage unit is under preparation for the collection of person-related information on the working life of the total manpower of health and social services. The establishment of the unit will have been completed by the end of 1979.

Work is now under way on a project for the streamlining of reports, still dealt with manually, from the areas of the national health and social welfare system for the accounting of performance and cost. The project will be based on experience gathered from the computer-based routine processing of certain area reports.

Special mention should be made of the fact that since 1969 all cases of inpatient care (about 2 300 000 annually) have been recorded and evaluated with a view to assessing the performance of

hospitals and supporting epidemiological studies. Important prerequisites are thus created for the improved management of the national health system.

A project has been developed to streamline the storage, demand planning and procurement of typical and non-typical commodities and consumable material. The project is carried out by the Supply Organization for Pharmaceutical and Medical Equipment, which is directly responsible to the Ministry of Health. All supply depots for pharmaceutical and medical equipment in the GDR are attached to the Organization and are incorporated in the project through telex transmission of data.

An EDP project has been introduced for the adequate procurement of devices required in the care of physical impairment and disability (artificial limbs, hearing aids, etc.), every event from the physician's prescription to the supply of the device being recorded and controlled by EDP.

In spite of the varied and wide use of EDP in the health system, any unwarranted additional outlay of manual work (e.g. clerical) or of material (e.g. paper) is strictly ruled out at all stages from the collection to the output of data, as are any disruptions in the physician-patient relationship and in collaboration between health workers.

3.4 Management, planning and organization of the use of EDP in the health and social welfare system

As indicated above, the use of EDP is part of the executive function of the Minister of Health. The Minister decides on the fields of use, the ranking and order of tasks, the type and number of computers to be installed in the institutions of the health system, and the contents and ways of international collaboration on problems involved in the use of EDP.

Decisions are based on a document on the use of EDP drawn up by scientists and experienced field workers under the guidance of the Ministry of Health. The document is now under further development for the period ending 1990. The objectives and tasks contained in the document are broken down and implemented in the process of sector-specific annual and long-term planning. The managerial responsibility for this process lies with the Ministry of Health and the County Departments of Health and Social Welfare.

The Ministry of Health is permanently supported and advised on problems of the use of EDP in medical care and the management and planning of public health by the Carl Gustav Carus Medical School in Dresden and the Institute of Social Hygiene and Public Health Organization in Berlin, respectively. The two institutions have the status of guidance centres for the use of EDP in the health system.

In each county an officer for EDP is responsible for coordinating and implementing EDP activities. He reports to the County Medical Officer of Health and to the Ministry of Health.

The medical research associations are very important for creating a backlog of knowledge. Associations for the following fields exist: cardiovascular diseases, medical diagnostics and health protection of populations at risk, immunology, tumours, and occupational medicine.

In the context of their medical research activities, the associations are also responsible for research into possible medical applications of EDP. They are guided by a research plan approved by the Minister of Health. EDP projects and programmes are drawn up by the associations and the guidance centres acting in close collaboration; use is made of the programming capacities of the data processing centres operated on a service basis in the principal cities of all counties.

With a view to avoiding duplication and overlapping in the development of EDP projects, all research associations, institutes and other institutions developing such projects are bound by law to submit them to a programmes and projects centre.

The programmes and projects centre for the health system is established at the Organizational and Computer Centre of the Medical School in Dresden.

A search for existing identical or similar solutions is made with the aid of a Robotron 300 computer and a projects and programmes inventory. If a negative result is obtained, the submitted project is released for the use of EDP by the Ministry of Health.

Historically speaking, the use of EDP, especially in the medical sector, is still in its

infancy. Studies and experiments carried out so far have met a material need since they have helped to amass experience gained in the installation and use of EDP in the health system. That approach has resulted in a more realistic and accurate definition of the content, scope and limits of the use of EDP in the health system and has prevented the development of EDP systems which are impractical and of no use in medical care.

The utilization of international experience and of the knowledge and results of WHO Member States has been of particular significance in this respect. The accumulation of information was accelerated by the attendance of representatives of the GDR's national health system at scientific meetings organized by WHO, by study visits to leading users of EDP and by very close contacts with the socialist countries, especially with the health system of the USSR. The above-mentioned activities also enabled us to adopt findings that had been verified internationally.

Great importance is also attached to the exchange of experience at the national level. The Medical School in Dresden, on behalf of the Ministry of Health, organizes annual conferences on the progress of the use of EDP in the health system of the GDR. The conferences are attended by medical and computer experts and representatives of health authorities. Their main purpose is to present and summarize experience and results and to consider further developments in the use of EDP. These conferences will in the future be open to international participation.

3.5 Installation and use of computers in the health system

The installation and use of computers in the health system of the GDR is predominantly and directly aimed at improving the quality and efficiency of medical care. Hence, computers are mainly used for on-line data handling in clinical-chemistry laboratories. They are installed in large-scale hospitals which also perform laboratory diagnostics activities for other medical facilities in their area. The Research Association for Medical Diagnostics, in collaboration with a major hospital in the county of Schwerin, has constructed a territorial model for the efficient collection of data and the feedback of the results of analysis.

The Research Associations for Cardiovascular Diseases, Occupational Medicine and Medical Diagnostics are working on the use of computers for enhancing the quality and quantity of functional diagnostics. The most important research establishments in this field are at the Medical School in Erfurt, the Charité in Berlin, the University Hospitals in Rostock and Leipzig and the Municipal Hospital in Berlin-Buch.

Research activities in these establishments are mainly directed at automatic ECH evaluation in mass screenings, at EEG evaluation and the use of computers in nuclear medicine.

Other fields of computer-based data handling for research purposes are:

- analysis of tonograms
- evaluation of microscope and X-ray photographs
- evaluation electromyograms
- analysis of peripheral circulatory disturbances.

The Medical School in Dresden has become a centre for patient-related information processing.

The EDP project "Basic processes of patient-related information processing" was introduced in all clinical departments of the Medical School in Dresden in 1972. With the aid of a Robotron 300 EDP installation, data on about 25 000 patients annually are collected, stored and analysed. Modified versions of the patient-related information system are used in the large-scale hospital in Cottbus, in a specialized hospital in Arnsdorf and in the Municipal Hospital in Berlin-Friedrichshain.

An essential proportion of computer capacities for the health system is provided by the Association of Nationally-owned Computer Centres. The Association operates major centres equipped with a great potential of large-scale computers, mainly in the ESER range, on a service basis in the principal cities of all countries. Working groups of analysts and programmers have been set up in some of these centres, especially for EDP projects commissioned by the health system. The computing capacities of the centres are used for patient-related information processing, computerized data handling, the establishment and use of registers, call-up and appointment systems and for data processing in the field of management and planning of health services.

This report does not pretend to describe all the results achieved in the installation and use of electronic data processing in the national health system of the German Democratic Republic. It does, however, outline the general framework of present and future activities in this field.

4. HUNGARY

4.1 Background information

The People's Republic of Hungary has an area of 93 030 square kilometres. The population in 1974 was 10 460 000 and the population density was 112 persons per square kilometre. The country is divided into 19 departments, 4 municipalities and the capital city, Budapest.

4.2 Health services

The Ministry of Health is responsible for health and social welfare policy. The Ministry is assisted in these activities by the Health Scientific Council. In the departments, municipalities and in the capital city the health services are run by the Boards of Health of the local health authorities.

All health services are provided free of charge. The costs of medical care and social insurance benefits are covered by the social insurance scheme. The health centres carry out both curative and preventive care, the latter being often provided also by specialized units. Environmental health work is conducted as a part of the activities of the Boards of Health.

In 1974 the number of beds in inpatient institutions amounted to 87 250 (8.3 beds per 1000 population). In 1974 the number of doctors was 23 095, i.e. 22.3 per 10 000 inhabitants. Sixty-six million outpatients were treated in 1974 in the health facilities and 1 800 000 persons were discharged from inpatient institutions.

4.3 Medical research

Coordination of research in the medical field is the responsibility of the Ministry of Health and the Academy of Science. Research activities are mainly carried out at the Research Institutes of the Ministry of Health and the Academy of Science, and at the universities. The other health institutions carry out research work to a limited extent. The research programme for the years up to 1985 covers, among other topics, the application of computers in public health.

4.4 Organization and coordination of computing services in medicine

The Committee for the Utilization of Computer Technics at the Ministry of Health is responsible for the coordination, control and implementation of research, development and organization relating to the use of computers in the health services. The Committee has set up three special subcommittees, consisting of Committee members and other specialists. These groups deal with problems of organization and direction, health care, training and research.

The work of the Committee and its groups is supported by other institutions, mainly by the Organization, Planning and Information Centre, the Computer Centre of the Semmelweis Medical School and by the Institute for Postgraduate Training of Physicians.

4.5 Use of computers in the health service

According to the established long-term programme, computers will be used in the management of health services as well as for health care purposes. The projected health information system will be composed of the following parts:

- (a) information on the health status of the population;
- (b) information on factors influencing health status;
- (c) information on the organization and activities of health facilities;
- (d) information on the work and training of health personnel;
- (e) information on material and technical supplies;
- (f) information on economic and financial activities of the health institutions.

It is planned to include in the health information system the following data:

- (a) data on activities of the health institutions;
- (b) health data from reporting systems and from special surveys;

- (c) data on sickness absenteeism (in cooperation with the Trade Unions Council);
- (d) demographic data (in cooperation with the Central Statistical Office);
- (e) data on national income, economic structure, etc. (in cooperation with the Central Planning Board);
- (f) data on manpower in the country (in cooperation with the Ministry of Labour);
- (g) data on the budget and the national economic balance (in cooperation with the Ministry of Finance).

This information system will be developed and implemented by the Organization, Planning and Information Centre of the Ministry of Health, situated in Budapest. The Centre now has a staff of 163, including a computer group. It is equipped with an EC 1020 computer (made in USSR) and an interscan 2100 terminal linked with the Honeywell-Bull 6000 computer owned by the State Administration Service for Computer Technics. The terminal has additionally a 64 K core processor.

At present the following data are being processed and analysed in the Centre:

- (a) budget and financial reports from the health service institutions;
- (b) stock of equipment of health facilities;
- (c) sickness absenteeism data;
- (d) manpower register;
- (e) hospital morbidity (10% sample of discharged inpatients);
- (f) infectious diseases statistics;
- (g) results of selected mass-screening examinations.

In the near future the Centre, in cooperation with other institutions, will start a study of the health status of a sample of the Hungarian population. These data will be included in the health information system.

4.6 Plans for the future development of EDP in the health service

The programme for the development of the use of EDP in medicine provides for both the installation of a limited number of computers in the medical institutions and a more extended use of the network of computers at regional levels. This network belongs to the State Administration Service for Computer Technics. The health institutions will be linked with this network by means of input/output terminals. The development is, of course, dependent on the availability of both funds and qualified staff.

4.7 Use of computers in medical research

The Computer Centre of the Semmelweis Medical School is responsible for the development and use of computers in medical research institutions. It has a staff of 45 persons (20 research workers and 25 technicians) and is equipped with an EC 1020 computer and a TPA analogue computer.

The main task of the Centre is to introduce and apply EDP in research work, clinical sciences, and educational work. The staff of the Centre give mathematical, statistical and computational advice to physicians involved in medical research. At the moment the Centre is concentrating on research work performed in cooperation with other medical institutions. The following problems were dealt with recently:

- (a) biological system identification, and analysis of the function of some parts of the nervous system;
- (b) analysis of analogue signals, with quantitative evaluation of these signals;
- (c) physiology of sleep;
- (d) monitoring of obstetric patients;
- (e) radiotherapy planning; determination of isodose curves;
- (f) analysis of the results of a survey of causes of premature births;
- (g) analysis of data from a study on chronic nonspecific respiratory disease;
- (h) analysis of data on psychiatric outpatients and inpatients, and of the results of special surveys of psychiatric diseases.

The Medical School in Szeged is equipped with the EC 1010 minicomputer (made in Hungary) and the IRIS C 11 (made in France), which are used for various medical research problems. An R 1010 minicomputer will be installed in the near future at the Medical School in Pecs. This School now

uses for its analysis of clinical and laboratory data a computer belonging to an industrial enterprise.

In a number of hospitals in Budapest and other cities computers which belong to other institutions are used for computerized diagnosis in cardiovascular diseases, thyroid diseases, etc. The hospital in Szekszard is equipped with an EC 1010 minicomputer which is used for compiling the inpatient register, monitoring patients treated in the intensive care unit and analysing laboratory results.

The Research Institute of Cardiology uses the CDC computer which belongs to the Academy of Science for analysis of ECG curves, analysis of results of epidemiological studies, for the surgical inpatient register and for analysis of the results of follow-up of these patients, as well as for the register of cardiac infarction cases in an area of Budapest.

The Institute for Postgraduate Teaching of Physicians, using the computer which belongs to an industrial enterprise, performs analysis of ECG curves and designs isotopic therapy.

The Institute for Pulmonology also uses a computer belonging to an industrial enterprise for modelling and simulation of the cardiovascular system and for compiling a register of tuberculosis inpatients.

5. ROMANIA

5.1 Background information

The Socialist Republic of Romania covers an area of 237 500 square kilometres and had a population of 21 245 000 in 1975. The density of population was 89 persons per square kilometre. The republic is divided into 40 regions, including the capital city, Bucharest.

5.2 Health services

The Ministry of Health is responsible for all activities in the field of health, including medical education and research.

At the regional level the health activities are under the control of Health Directorates. The Health Directorates are subordinate to the local People's Council and to the Ministry of Health. The health activities on the local basis include medical care, preventive work, active medical surveillance, occupational health and environmental health.

In 1975 there were 174 696 hospital beds, i.e. 8.2 beds per 1000 inhabitants. The number of doctors in 1973 was 34 055, i.e. 16 per 10 000 population. In 1975 more than 174 000 000 out-patients were treated in the health facilities and 4 700 000 inpatients were discharged from hospitals.

5.3 Medical research

The priority topics of public health research are set by the Ministry of Health for the Institute of Hygiene and Public Health in Bucharest. This Institute is also a reference centre and a source of technical advice for the Ministry. Medical research is carried out in many other specialized research institutes and at the universities. Research work is coordinated by the Ministry of Health in cooperation with the Academy of Science.

5.4 Organization of computer services in Romania

The Central Institute for Management and Informatics in Bucharest is responsible for the designing, development, implementation and control of the computer network in the entire country. Apart from the Central Institute in Bucharest there are 19 branches of this Institute in various regions. The Institute and its branches conduct the following activities:

- (a) research on the development of programme packages, programme library, the development of hardware, the use of mathematical models, etc;
- (b) design of a macroeconomic system for the entire country;
- (c) design of specific systems relating to various economic, industrial and other problems;
- (d) assistance and advice to all computer centres and training of the staff of those centres (the training is performed in cooperation with the Ministry of Education);
- (e) coordination of all computer activities in the country and distribution of computers for all institutions and enterprises;
- (f) organization and arrangement of international cooperation related to all hardware and software problems.

The Central Institute employs in Bucharest about 600 persons involved in research, economic problems, computation technics, programming, etc. In each branch of the Institute there are 200 to 300 employees. The Central Institute is equipped with a French IRIS 50 computer, two Felix C 256 and Felix C 32 Romanian computers and two Varian 73 minicomputers. The branches each have one or two Felix C 256 computers. A teletransmission network which will in the future link the centre with its branches is under construction.

The Institute and its branches serve other institutions, enterprises, ministries, etc. with both programming and computer time. Its many customers include medical institutions also. For example, at the Institute in Bucharest recently a register of tuberculosis patients was put into operation. This register is available for treatment purposes and statistical analysis. In cooperation with the National Centre for Heart Diseases the register of cardiovascular patients and some diagnostic programmes are prepared.

5.5 Use of computers in the health service

The Centre of Mathematics and Sanitary Statistics of the Ministry of Health in Bucharest is responsible for the existing health information system. The system includes information on the health of the population, on the activities of the health facilities, on the staff, etc. In the near future the Centre will be responsible for the installation of computers in all health institutions.

So far the information system includes data on the following:

- (a) tuberculosis (incidence and prevalence);
- (b) venereal diseases (incidence);
- (c) communicable diseases (incidence);
- (d) sickness absenteeism;
- (e) hospital morbidity (6.6% sample of admitted patients);
- (f) perinatal mortality (50% sample);
- (g) maternal mortality;
- (h) activities of outpatient clinics, consultations, vaccinations, revaccinations, etc.;
- (i) activities of hospitals, use of hospital beds, mortality in hospitals;
- (j) persons treated in spas;
- (k) staff, number of doctors, nurses, etc.;
- (l) stock of selected medical equipment in health institutions.

These data are collected within the routine reporting system.

The information is supplemented by the following data collected in specially designed surveys:

- (a) venereal diseases in relation to some socio-economic characteristics;
- (b) population fertility study;
- (c) study on occupational diseases (mainly silicosis);
- (d) study on psychiatric diseases;
- (e) study on disseminated sclerosis;
- (f) study on cancer;
- (g) study on the physical development of boys and girls aged 4-19 years.

The demographic data are collected, processed and analysed by the Central Statistical Office.

Apart from the above-mentioned surveys conducted by the Centre in cooperation with other medical institutions, the research work of the Centre is concentrated on preparing a number of registers, such as a register of cancer patients, a register of persons with silicosis, a register of highly qualified staff, an inventory of selected equipment, etc.

The Centre has a staff of 160 and is equipped with card sorters and tabulators. It uses an IBM 360/40 computer belonging to another institution. In the future the Centre will be equipped with a Felix C 256 computer. Part of the data collected in 40 regional laboratories which are technically subordinated to the Centre is transferred to special forms mailed to the Centre and part is sent by the telex system. Each of these laboratories has its own telex machine.

At present the Centre uses 500-600 hours of time (per year) of an IBM 360/40 computer for processing and analysis of the following data:

- (a) register of doctors and other highly qualified staff in the health institutions;
- (b) data on training and specialization of this staff;
- (c) inventory of selected equipment in the health institutions;
- (d) data from special surveys referred to above;
- (e) register of cancer, silicosis and psychiatric patients.

5.6 Plan for future development of EDP in the health service

The project for the future development of the use of EDP in health services provides for the installation of new computers in parallel to the increase in real needs. The preliminary project calls for the instalment at hospitals of minicomputers or input/output terminals linked to large computers. These will be used primarily for hospital management.

Other projects are related to the use of computers for the central blood donors register and for processing and analysis of the data from the national morbidity survey. Also taken into account is the introduction of the computer-based national register of diabetes mellitus, demyelinating diseases of the spinal cord, and various clinical charts.

5.7 Use of computers in medical research

Medical research institutions in Romania usually use computers belonging to universities or other institutions.

The Institute of Hygiene and Public Health has realized several research projects using the IBM 360/40 computers owned by Bucharest University, or the Felix C 256 computer owned by the Polytechnic High School. The staff of the Institute prepares programmes and analyses the data. The following projects were carried out:

- (a) model of medical care utilization;
- (b) study on the amount of irradiation from the medical sources on a sample population;
- (c) study on the long-term effects of air pollution on the health of children;
- (d) study on the levels of air pollution in various parts of the country;
- (e) pilot study on an immunization register and recall system;
- (f) study on the effects of urbanization on the health of a sample of children aged up to 3 years;
- (g) pilot study aiming at compiling a hospital patients register;
- (h) pilot study on the prevalence of chronic disease in a sample of the adult population;
- (i) programme for analysis of ECG curves.

In the Emergency Hospital in Bucharest a register of inpatients was compiled using a Felix C 256 computer. This project is being treated as a pilot study for routine use in other hospitals in the future.

The Institute of Internal Medicine, using the IBM 360/40 computer, performed a study on the results of treatment and follow-up of 20 000 patients affected by various chronic diseases.

The Institutes of Oncology in Bucharest and Cluj use computers to assess the results of treatment of cancer patients and for calculating isodoses in radiotherapy.