On-Line Computer Management of Cardiac Surgical Data

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The surgeon (or one of his assistants) enters, in a computer file, information on open-heart surgical procedures through a remote terminal located in the recovery room. Clinical and historical findings, complications occurring during the immediate postoperative period, and postmortem data when applicable are entered in the course of the hospital stay or after discharge. Relevant information entering the computer system in other hospital departments is automatically incorporated in the open-heart surgery file. A final multicopy operative report is printed in the recovery room shortly after the surgical procedure is completed. All information on patients in the file constitutes a permanent and dynamic data base that is accessible at any time from any remote terminal in the hospital computer system. This data base contains an average of 500 items of information per surgical procedure and is available via an on-line retrieval program for both quality control purposes and extrapolation of prognostic data on new patients.

BACKGROUND

Approximately 400 open-heart surgical procedures were performed during 1977 at the Miami Heart Institute. Of these, 75% were myocardial revascularizations, the remainder being mainly valvular replacements or plastic procedures. Surgical correction of congenital heart defects constitutes a minimal percentage and these cases have been excluded from the computer programs described in this article.

The significant increase in the volume of coronary artery surgery at our institution in recent years highlighted two problems related to the generation and processing of information. First, efficient management of voluminous amounts of data generated by several sources (cardiac catheterization laboratory, operating room, recovery room, intensive care unit) appeared impossible by conventional methods. Second, a need emerged for fast and accurate evaluation of the effectiveness of surgical therapy.

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in a rapidly growing case load. This evaluation could not be realistically accomplished by referring to available literature on the subject because of the inherent problems in comparing different patient populations, facilities, and surgeons. It became obvious to us that the evaluation of the results of various surgical techniques within the institution could be more valuable when recommending surgery and judging prognosis in individual cases, particularly if a sufficiently large data base were available.

Progressive intensification of these two problems, that is, information management and evaluation of surgical therapy, called for the development of new methodology. The availability of a computer-based information system at the Miami Heart Institute, coupled to the existing facilities for software development, prompted the surgeons to explore the implementation of an automated storage-retrieval/reporting subsystem for open-heart surgery. The possibility of reducing developmental expenses by using existing hardware and software made automated management of surgical data an economically attractive proposition in our case. The simultaneous development of a comprehensive software package for the cardiopulmonary laboratory allowed a mating of the two subsystems with marked expansion of the data base.

The objectives of the proposed automated cardiac surgical data management subsystem were defined after several months of planning and other preliminary work. Two primary goals were set: the development of a data base designed to facilitate evaluation of prospective candidates for surgery through prognostic information extrapolated from the corresponding patient profile, and enhancement of existing quality control procedures by simplifying the evaluation of changes in technique or equipment that may be expected to affect indicators such as morbidity or mortality figures.

Secondarily, the subsystem was designed to provide a printed operative report, available on the patient's chart at the completion of the surgical procedure and to referring physicians on discharge. This operative report was to have the advantage of having standardized information available in a predictable format, thus avoiding the confusion of long narrative text in which key information is weighted differently and located in varying positions by individual surgeons. Provisions were made for comments in each of the operative note subsections, which may be typed in by a technician entering information at the written direction of the surgeon. This would permit recording unusual occurrences and would individualize the operative note without obscuring the basic reported data. The operative report would be produced before consolidating in the computer file all the information obtained in the operating room and from various other sources, such as admitting office, clinical and cardiopulmonary laboratories, surgery, and pathology. This information enters the computer system at various points such as admission, cardiac catheterization, and operative and preoperative periods. The subsystem was also expected to provide easy on-line access to information on current and past cases at any time from any location in the hospital without the need to retrieve patient charts, a feature of great importance in older charts that had been microfilmed.

The specifications also included provisions for upgrading the software without major interruption in service whenever modification of existing or addition of new program sections became desirable.