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Tabulation of Anesthetic Data: An Improved System

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To date, a comprehensive, generally acceptable system which will produce accurate anesthetic data has not been developed.[1-10] For many anesthesiologists, some sort of record keeping is a "necessary evil"; therefore, a system which will produce accurate, reliable statistics, yet conserve the anesthesiologist's time and provide an incentive to keep pertinent data is continually being sought. Data processing through a computer-oriented approach is the only practical solution, and the anesthetic record is the essential ingredient.

A new anesthetic record has been developed which: (1) can be coded by the anesthetist (physician, nurse, etc.); (2) is flexible, open-ended and adaptable to all types of anesthetic practice; (3) can be employed to compare data from many institutions; (4) improve record keeping; (5) provides for comparison of data; and (6) reduces the amount of space necessary for storage of records. The record is an integral part of a computer-oriented system for processing anesthetic records. The system has been researched since June 1964. From June 1966 it has been our method of tabulating anesthetic data.

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The record presented here is similar to those presently employed by most anesthetists. However, areas for entering data are placed in specific locations. In addition, other boxes for coding are available if the anesthetist desires to use them and subject his material to analysis at any future date. The record is not complex; it is designed specifically for computer analysis, and all data may be transferred directly to 80-column computer cards. The categories are rigidly defined by a dictionary of terms, yet open-ended in all categories, that is, multipurpose-oriented. The record may be used for all age groups, for surgical and obstetrical procedures as well as therapeutic and diagnostic blocks, regardless of whether general or regional anesthetic methods are selected.

The record is printed on three sheets and a cardboard. The first sheet is used for physician billing. The second sheet is the same as the front of the cardboard; when completed at the end of a procedure, it is placed in the patient's chart (fig. 1). The third sheet is designed to contain anesthetic and surgical data necessary to make hospital charges for material. It is completed by the operating room supervisor and sent to the hospital business office for posting on the patient's bill. The first and second sheets may vary, depending on the type of anesthetic practice and hospital requirements for billing of material charges. The cardboard record, which must be standard to accomplish its purpose, is kept

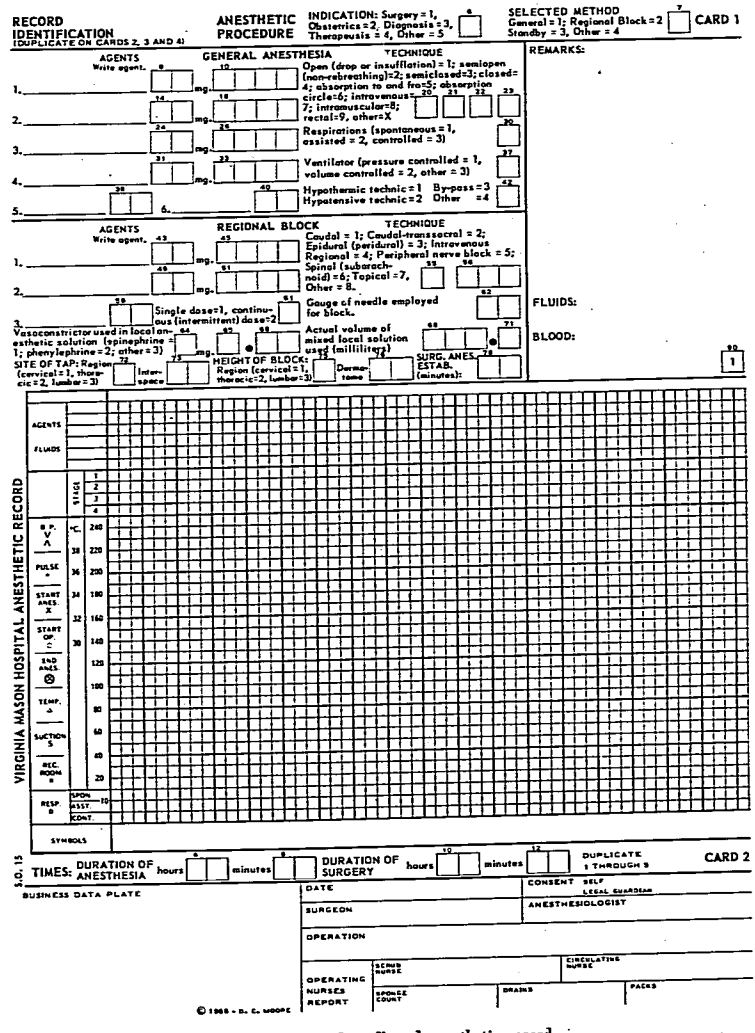

FIG. 1. Front of cardboard anesthetic record.

IDENTIFICATION: ANESTHESIA PERSONNEL AND PATIENT — CARD 2 (Can't.)

ANESTHESIA PERSONNEL — Anesthetist performing anesthesia [14] [15–18] — Anesthetist in attendance [18] [19–21] — Anesthetist supervising [22] [23–25]

HOSPITAL CHART NUMBER [26] — SOCIAL SECURITY NUMBER [27]

PREOPERATIVE SURVEY

YEAR OF PROCEDURE [44] — MONTH OF PROCEDURE [45–46] — SEX Male=1 Female=2 [47] — AGE (see dictionary of terms) [28–29] — HEIGHT feet [32] inches [33–34] — WEIGHT pounds [35–36]

B.P. | TEMP. | PULSE | HG. | HEMATOCRIT | W.B.C. | URINE

Drugs used 1 year prior to surgery (write) [58] [60] [62] [64]

1. _____ 2. _____ 3. _____ 4. _____

DISEASE (Write)

1. _____ [66]
2. _____ [70]
3. _____ [72]
4. _____ [74]

Emergency procedure = 1 [48]

Physical status (American Society of Anesthesiologists rating 1 to 5) [75]

TYPE OF ANESTHESIA CONSENTED TO: _____

COMMENTS (allergies, etc.):

[80] 2

PREOPERATIVE MEDICATION Time given (write) — Method (oral, I.M., etc.) — DUPLICATE 1 THROUGH 3 — CARD 3

Narcotic (write drug and dosage) [8] mg. [9–10]

Barbiturate (write drug and dosage) [17] mg. [19–20]

Miscellaneous drugs (write drug and dosage) [11] mg. [12–13]

Belladonna derivative (write drug and dosage) [21] mg. [22] • [23–24]

OPERATIVE PERIOD

Primary agent [39] — Operation(s) or reason for diagnostic or therapeutic procedure [28–38]

Position of patient during surgery (Jackknife=1, Lateral=2, Knee Chest=3, Lithotomy=4, Other=5, Prone=6, Sitting or Fowlers=7, Supine=8, Trendelenburg=9) [37]

COMPLICATIONS (Write): [38–43]

SUPPLEMENTATION OF REGIONAL BLOCK

Block satisfactory = 1 unsatisfactory = 2 [27]

Technical difficulty with block [49]

Duration of satisfactory block prior to dissipation of local anesthetic agent's effectiveness — hrs. [94–95] min. [96–97]

REASON(S) FOR SUPPLEMENTATION (Write)

1. _____ [50]
2. _____ [51]
3. _____ [52]

MAINTENANCE OF AIRWAY

AIR-WAY: oral=1 nasal=2 [60]

INTUBATION: oral=1 nasal=2 other=3 [61]

direct=1 blind=2 [62]

cuff =1 pack=2 none=3 [63]

tube size (inside diameter in mm.) [64] • [65]

direct connect=1 mask=2 [67]

tech. difficulty=1 trauma (bleeding, etc.)=2 broken teeth=3 [68]

POSTOPERATIVE PERIOD

PATIENT SEEN:

Day of procedure (yes = 1, no = 2, outpatient = 3) [69]

Subsequent days (yes = 1, no = 2, discharged within 24 hours = 4) [70]

COMMENTS AND COMPLICATIONS (record dates, etc.) [71–77] [80] 3

DUPLICATE 1 THROUGH 5 — CARD 4

MISCELLANEOUS

PHYSICAL STATUS OF INFANT AT BIRTH (APGAR RATING)

1 minute [29]

5 minute [47]

TECHNICAL AIDS [13–14] [31–32] [48–51]

OTHER STUDIES (code to be established by institution) [6–12] [15–22] [25–28] [35–44] [53–61]

AREA LOCATION [82] 4 6 0 6 5 0 1 3 — INSTITUTION NUMBER [73–78] 1 — CHART REVISION [79] 1 [80] 4

FIG. 2. Back of cardboard anesthetic record.

by the anesthetist. Information about pre- and postoperative rounds is written on it, as well as the anesthetic method and the course of anesthesia (figs. 1 and 2). When the data are recorded, the chart is stored or sent for computer analysis.

The record uses a business (addressograph) plate and employs a carbonless duplication system. The dictionary of terms for the items which are not self-explanatory is present on the back of the first three sheets, and wherever possible, employs standard nomenclature.[11]

Advantages

Conservation of Anesthesiologist's Time: The "write-it-once" system, along with the business (addressograph) plate, conserves time and avoids mistakes. The dictionary of terms on the back of the first three sheets is a rapid reference for code numbers so that all coding, with the exception of postoperative rounds, can be done prior to and during the operative period. For all studies, but for routine reports in particular, i.e., hospital accreditation, American Board of Anesthesiologists' information, etc., this system is a time-saver, because once the record is coded, the computer will provide the necessary information.

Flexibility: The system may be used for all types of anesthetic practice. The record which is the principle part of the system is similar to those used by most anesthetists. Although the record is designed for coding, it need not be used for that purpose. Space is available to write in all data required on anesthetic records now in use.

Uniformity: The data obtained are current, not retrospective. Any or all institutions in the United States, as well as those over the world, could thus compare data, provided a standard dictionary of terms is agreed upon. This would permit large-scale studies to be done in many institutions and allow for the accumulation of a large series of cases as was done in the National Halothane Study.[12]

Security: Area code number and institutional number, as well as the record identification number, could be placed on the record by the manufacturer prior to distribution to an institution. The institution would then assign numbers to personnel. The distributor of the record, but no one else, would know the institution; and only that institution, not the distributor, would be able to identify specific personnel.

Improved Standard of Record Keeping and Practice: Data must be entered in specific areas to complete the record. If the records are turned in when postoperative rounds are completed, and a secretary checks the records for boxes which are left uncoded, the record can be returned to the anesthetist and data recovered while the procedure is still fresh in memory. Furthermore, requesting specific items makes the anesthetist aware of the details of his practice.

Storage of Records Eliminated: The tapes used in our system, on reels which are approximately one inch wide and ten inches in diameter, will accommodate approximately 10,000 records. Obviously, tapes will require less space than cardboard records.

Type of Computer: Most computers may be employed. All of our programming to date has been for a relatively low-powered business-type computer with magnetic disc storage. Any digital computer having auxiliary storage is adequate for tabulating data from this chart.

Disadvantages

Unfortunately, the computer itself is often identified as the problem rather than the following set of factors leading up to the use of the computer.

Errors of Omission: In filling out comprehensive forms, there are often errors of omission. For this reason, an entry is required in every category on the record, if for no other reason than to insure that negative entries are intentional and not lapses in memory.

Errors of Commission: Most of these are introduced through: (1) illegibility or the writer applying insufficient pressure in writing to give a clear duplicate copy; (2) entries not recorded according to stated instructions; and (3) entry of false, surmised, or unknown data. It should be apparent that if meaningless data are read into the computer, meaningless results will emerge.

Errors by Keypunch Operator: Although most keypunching facilities include verification of the individual punching by a second operator, where interpretation plays a major role it is quite possible for the same mistake to be made twice.

Programming: Because of the large amount of data available from the record, the number of program possibilities is almost limitless. The only problem to be met is that of communication between the clinician and the programmer. As with most other data analysis systems, however, if the record becomes available through a national or international distributor, "canned programs" for the routine types of data analysis would also be available. The individual institutions and distributor would then be faced primarily with the programming of special studies.

Summary

A thorough analysis of relatively large numbers of records cannot be accomplished with conventional sorting and tabulating equipment, and certainly not by manual methods. At the present state of data processing, the anesthesiologist who wishes to search the records rapidly and exhaustively will find the only practical solution through a computer-oriented approach. However, the computer approach is not a panacea for all data-processing ills, for the computer introduces problems of its own. The usefulness of any data produced by a computer system rests with the integrity of the persons using it.

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