

AN EXPERIMENT IN THE RECORDING OF SURGICAL AND ANESTHETIC DATA IN MILITARY SERVICE

THE ADAPTATION OF HOLLERITH PUNCH CARDS, USED AT SECOND ARMY MANEUVERS, 1940 *

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IN 1936, the Educational Committee of the American Society of Anesthetists, Inc., realizing the chaotic state of reported anesthetic statistics, appointed a committee to devise a system for collecting and tabulating data with standardized interpretations that might be of value to members of the society who were interested in preparing statistical studies (1). A system was recommended which had been in use since 1932 (2, 3). This system facilitates the convenient collection of pertinent clinical data and enables rapid, accurate, mechanical tabulation. It provides complete factual material for statistical analysis of actual clinical experience. During the intervening years, the method has been modified and improved through the efforts of the committee. It is now suggested that by placing the anesthetic record on the reverse side of the Hollerith punch card, a compact system for the keeping of records may be evolved which will be applicable to field conditions in time of war.

Such cards were printed and used with satisfaction during the Second Army Maneuvers this year for 33 anesthetic administrations.

The code used and the description of the front of the card, with the exception of identifying data pertinent to the Army alone, have previously been described (1, 2).

It is the purpose of the writer to describe the reverse side of the Hollerith punch card which makes it practicable for Army use. (See Figure 1.) The anesthetist's usual graphic chart has been printed with appropriate figures indicating duration along the abscissa in five minute intervals for a two and a half hour period. The figures along the ordinate from 0 to 200 may be used to represent systolic and diastolic blood pressure in millimeters of mercury, respiratory rate per minute, and pulse rate in beats per minute by placing characteristic marks at the proper levels. By common consent check marks indicate systolic and diastolic blood pressure in millimeters of mercury. Small dots are used for pulse rate in beats per minute and small circles indicate respiratory rate per minute. The beginning or end of anesthetic administration is recorded by a properly placed x mark, and a dot inclosed in a circle denotes the beginning or end of the operation. Roman numerals are used

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to indicate time of occurrence of interesting happenings during an administration and are explained by brief remarks to be written in the space at the extreme right of the card. Straight lines connect the above symbols and thus result in a graph running from left to right across the card. Agents which were used may be indicated by a solid line opposite the name or chemical symbol which appears on the extreme left. Plane of anesthesia is indicated by a line running across the card from left to right at the appropriate level opposite the number 1, 2, 3, or 4. The amount of oxygen added per minute is indicated by a line opposite the appropriate figure in the left margin. "10" indicates a flow of 100 cc. of oxygen per minute, "20" indicates 200 cc., etc. The hour of operation is written along the lower line on the card.

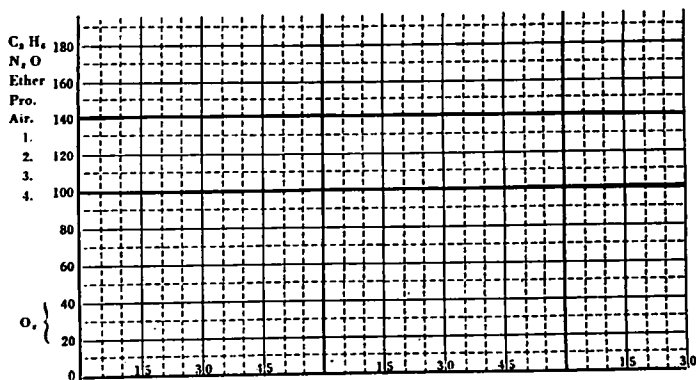


FIG. 1. Back of Hollerith punch card showing anesthesiologist's chart.

The slightest damage to the edge of the cards interferes with their smooth passage through the sorting and calculating machines. For this reason a cellulose acetate frame has been devised to hold the card and permit recording of code numbers on either the front or the reverse side of the card. (See Fig. 2.) The frames are made from used x-ray film punched to fit conveniently into a loose leaf notebook.

A photographic copy of the code in booklet form is available to the anesthesiologist. (See Fig. 3.) When a patient is to be anesthetized, the anesthesiologist should enter the name, Army serial number, rank, company, organization and hospital number on the first line on the front of the card. Geographical location, case number, month, year and day, age, sex, physical status, physical findings (including diagnosis), and premedication with its administration time are also recorded, using proper code numbers.

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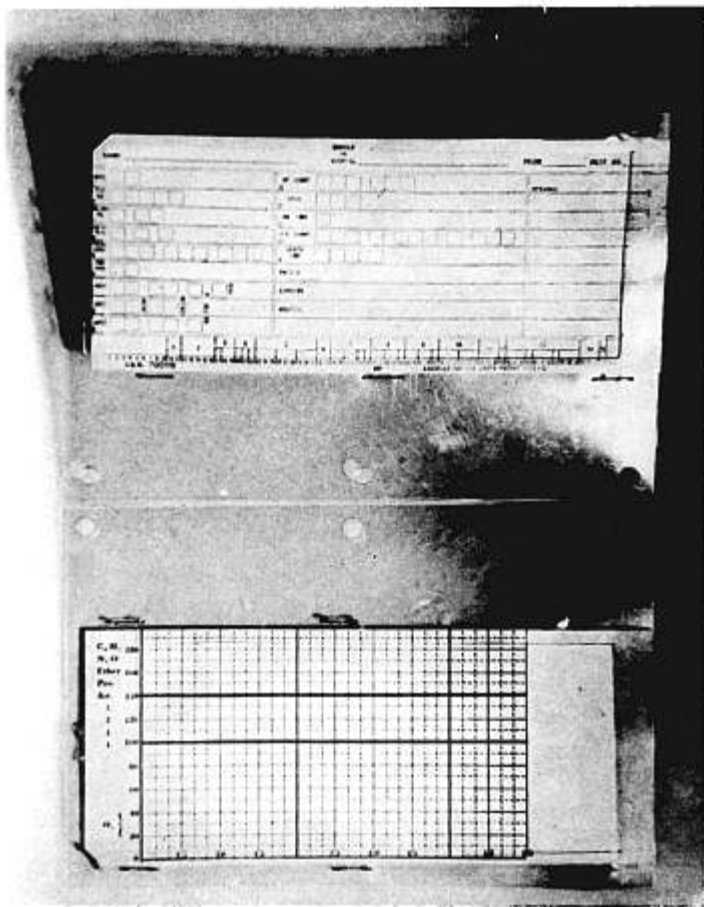


FIG. 2. A cellulose acetate frame devised to protect and hold the card.

The administration is then begun using the reverse side of the card for the recording of pertinent data. Upon completion of the operation and the anesthesia the anesthetist, by placing the appropriate code number in its proper location on the front of the card, records the following: the agent used, operative complications, operation, time of anesthesia, anesthetist, surgeon, conduct of anesthesia, induction com-

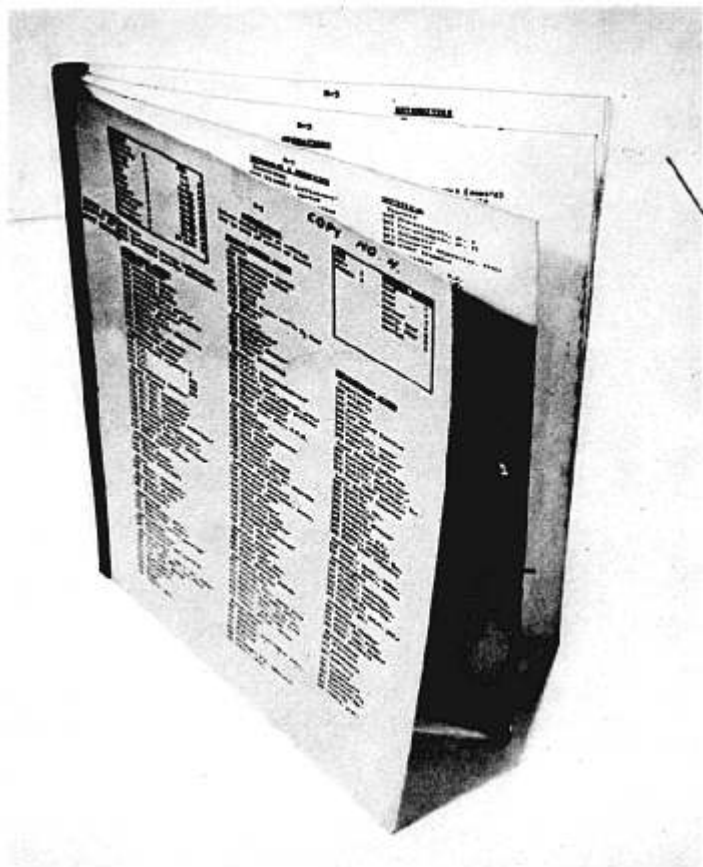


FIG. 3. Code in booklet form for punching card and interpreting punched cards.

plications, beginning of anesthesia to beginning of time of operation, (that is, time from beginning of anesthesia to operation), treatment in operating room, endotracheal technics, position on table, recovery in operating room and data for a special file.

The only vacant spaces now left are for postoperative complications, postoperative treatment in the hospital, cause of death and time of death. The card with its holder is placed in a notebook where it is avail-

able for recording this information when it is obtainable on postoperative rounds.

When the patient is no longer of interest from an anesthetic standpoint, the card may be removed from the cellulose acetate holder and filed in a card box, and the holder is available for a fresh card.

The last step in this system of recording is punching the card from the numbers recorded above with a key punch (provided with the equipment of the tabulating machine method). This may be done by a technician at any convenient time, even years later.

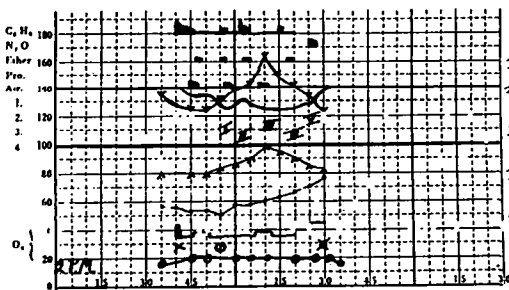
Figure 4 indicates a card, both front and back, as it would appear

Beta A-222 Serial Number _____ Name _____

MacLeod Robert RLEA-134 Y Corps (Kinch Wn) Olive Div. No. 125

DATE [22]	OP. COMP. [7][0][0][0]	REPLY
[0][0][0][0]	OPER. [3][5][0]	0
[0][4][0][22]	AN. TIME [3]	0
[3][1][7][5][2]	P.B. COMP. [5][0][4][7][0][0][0][0][0][0]	0 3
[5][5][0][0][0][0]	ANESTH. [20]	0
[12][16][1/2][Sub][1/2]	SURGEON [14]	0
[12][20][2][0]	HOSPITAL [3]	0
[15][20][0]		0
[19][20][5]		0

FRONT OF PUNCHED CARD



- I Airway.
- II Peritoneum opened.
- III Canister changed.
- IV Appendix out.
- V Peritoneum closed.

FIG. 4. Completed front and back of card.

when punched, with an explanation of the code numbers and what they represent. This card is the record of a patient on whom an appendectomy was performed during Second Army Maneuvers, August, 1940.

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NUMBERS ON CARD IN FIGURE FOUR DECODED

Geog.	22	Geographical location; No. 22. (Number assigned for each location.)
Case No.	18	Case number; 18.
Mo. & yr.	8-40-22	Date; 8 month, 40 year, 22 day.
Age. Sex. Ph. St.	3-1-5-21	Age; 20-30; male, physical status, good; done as an emergency; age 21.
Preop. Comp.	550-000-000	Preoperative complication; acute appendicitis, no other complication.
Premed.	26	Premedication, morphine and scopolamine (1/6 and 1/150 at 1 P.M.).
Anest.	12-20-2-0	Agent, cyclopropane; absorption technic; 2nd plane anesthesia; by choice of anesthetist.
Anest.	15-20-0	Ether, absorption technic; by choice of anesthetist.
Anest.	19-20-5	Nitrous oxide, absorption technic, for comfort of patient.
Op. Comp.	780-000	Complication during operation: carbon dioxide excess; no other complication.
Oper.	350	Operation: appendectomy without drain.
An. Time	3	Anesthetic time: between 30 and 60 min.
P. O. Comp.	584-1-000-000	Postoperative complication: nausea and emesis 12 hours or less postoperative; no other complications.
Death Time	000-0	No death.
Anesth.	20	Anesthetist: Wangeman.
Surgeon	14	Surgeon: Curreri.
Hospital	3	Hospital treatment: Opiates.
	0	Conduct of anesthesia: satisfactory.
	0	Induction complications: none.
	3	Beginning of anesthesia to beginning of operating time: 10-15 min.
	0	Treatment in operating room: none.
	0	Endotracheal technic: none.
	0	Position: supine.
	0	No changes of position on table, tourniquet or gall bladder rest.
	1	Recovery in operating room: yes, reflexes present without complications.
	0	Not for special file.

DISCUSSION

The use during Second Army Maneuvers of the modified Hollerith punch card has been described. It does not indicate the flexibility of the method. A short list of additional possibilities are outlined.

1. With the mechanical equipment now in existence, duplication of card once punched may be made electrically by placing a card in a duplicating machine.

2. There are available spaces on the card for additional information. It is also obvious that certain spaces now used could be used to better advantage for Army purposes, by changing the interpretation of the code; that is, columns 1, 3, 7, 8, 9, 76, 78, etc.

3. The available spaces on the card could be used to advantage to describe more completely surgical procedures or treatment. If desired the entire medical record could be recorded on this card.

4. The cellulose acetate card holder has been made to fit into the hospital jacket (Form 52d Army Medical Department), and if necessary

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the postoperative condition of the patient along with any desired additional information could be coded by the ward masters.

5. By writing on the front of the card any information not found in the code, complete details of material not codable may be recorded.

CONCLUSIONS

The Hollerith punch card with modifications is a satisfactory, concise, practical and convenient means of preserving clinical information concerning surgical operations during war. Storage space for such records will be minimal.

The use of such a card system will make possible accurate statistical studies at any future time.

REFERENCES

1. Saklad, M.; Rovenstine, E. A., and Taylor, I. B.: Interpretation of 1939 Code by Committee on Records and Statistics of the American Society of Anesthetists, Inc. Mimeographed Pamphlet.
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4. Saklad, M.: A Method for the Collection and Tabulation of Anesthetic Data, *Anesth. & Analg.* 10: 184-196 (July-Aug.) 1940.

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A committee has been set up by the National Fire Protection Association to draft safe practice recommendations for operating rooms.