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GENERAL DATA HANDLING
(things the system lets you do)

- ✓ A. put data in the patient record
1. manually from any terminal
 - a) nurses
 - b) laboratory technicians
 - c) clerks
 - d) physicians
 2. automatically
- ✓ B. correct errors
- ✓ C. get data out
1. see any patient data at any terminal
 2. printed copy of data
 3. retrieve data across patients for research or administrative statistics (archival storage and retrieval) [future -- pending time and programming support]
 4. display of data on color CRT [future -- experimenting now]
- ✓ D. compute I & O of fluids and electrolytes
- ✓ E. calculate indices
1. from stored data and store the results
 2. from entered data with results displayed only

Nurse trainers learning
Lab people know

Phys + nurses → ongoing training

Slide/tape show is being worked on

PATIENT DATA ORGANIZATION

Types of Data

- A. number (like blood pressure or hematocrit)
- B. coded choice - 1 choice picked from a menu list
- C. multi-coded choices - one or more things picked from a single menu list
- D. typed-in line (e.g., name and address)
- E. typed-in note

Higher level types of data

A. CHARTS

Any of the basic data types above can be combined into a CHART. A Blood Gases Chart can consist of FiO_2 , PaO_2 , O_2 sat, pH, $PaCO_2$, base excess, and standard bicarbonate. This group can be displayed as a unit, much like the usual flow sheet.

What is different is that the same pH might be part of another Metabolic Chart, and displayed as part of that chart as well. It does not have to be entered on each one to be on each one.

B. SPECIAL NOTES

Standard assessment notes can consist of a series of choices from standard lists so that assessment and reporting follow a specified scheme. The neurosurgery department has organized its examination data in this way, and a test prototype of a nursing assessment chart has been prepared. One can also include a short typed-in note in this special note for those individualized items that cannot be anticipated.

The Special Note is really a chart consisting of Coded Choices and a Note.

ITEMS

Each piece of data in the system is called an ITEM.

Each ITEM has:

1. an ITEM number
2. a Proper Name ("PNAME") or Print Name (because this is the 20 character name put onto charts, no matter what synonym was used)
3. SYNONYMS

If you want to get any ITEM (say, blood pressure or the Blood Gases Chart) you can ask for it by:

1. its ITEM number
2. its Proper Name (PNAME)
3. any of its SYNONYMS

Some of these numbers and names appear in a LIST of common names and charts. They all can be found, and the correct spelling checked, by using the DICTIONARY in the system.

ITEM DEFINITION

All the ITEMS and CHART ITEMS in the system are put there by the staff who uses them. They can be defined in any way that is thought to be useful.

The current ITEM DESCRIPTOR FILE, which contains all the PNAMEs and SYNONYMS of allowable ITEMS, has been developed as one that is useful enough in itself to let the system be of some value now and which can serve to illustrate some of the possibilities. The system is ready to be used AND MODIFIED by the medical, nursing, and laboratory staffs, through requests to the computer staff.

The ITEM numbers are assigned by a pre-processing computer program.

DATA ENTRY -- GENERAL CONCEPTS

All numeric data can be entered and reviewed COMPLETELY from the small NUMERIC PAD on the right side of the terminal keyboard.

In most cases this is the most convenient and rapid way.

If one uses P NAMES and SYNONYMS, the typewriter keyboard must be used.

The steps are:

1. Enter code for INPUT, OUTPUT, or desired function.
2. Enter code for desired chart from the displayed LIST.
3. If special options are offered, select what is desired.
4. On INPUT, enter the numeric value as each ITEM appears, or enter the number of the desired choice if it is a menu selection ITEM.

DATA DISPLAY
on
Cathode Ray Tube ("CRT") Terminal

There are several ways to see data:

1. OUTPUT

When you OUTPUT an ITEM or CHART of ITEMS, you can choose

a) HORIZONTAL display, which has time running horizontally and the names of the tests down the side. This gives you 15 items visible, over 8 time periods.

b) VERTICAL display, which has time running vertically down the left side and the items across the top. You can see 8 items over 15 time periods.

c) COLUMNAR display mode. This is a special mode which is necessary because some ITEMS on a chart (like NOTES or MULTICODED choices) will not fit in the 6 columns allowed in the other two display modes.

2. TREND

Up to 3 variables may be plotted over time on the CRT. The computer asks the user for:

- a) name of each
- b) the graph bounds of each (it suggests defaults)
- c) the time of the plot (e.g., latest data?)
- d) the width of the plot (a day, 40 hours, 2 weeks?, etc)

3. GRAPH

Two variables may be plotted against each other. Since there is no time axis, each pair is numbered sequentially as it occurs, and those numbers are plotted.

INTAKE AND OUTPUT

In order to keep track of intake and output, the computer must know what are the kinds of input and output to keep track of. There are two commands for this:

1. ACTIVATE

This tells the system to keep track of a particular fluid input, of an intake like NG tube, or an output like urine or a drain or chest tube.

It does not have to be done for each shift or day. Once put in, it will stay on the active list for tallies until it is removed.

For now, the fluid desired must be entered by using the PNAME or SYNONYM, until we have a handy menu implemented for using a choice list or the ITEM numbers.

2. DEACTIVATE

Once a fluid is stopped and it is desired to remove it from the current tally list, this command is used.

3. CURRENT

This command gives a detailed list of active fluids, together with all the things that have been added to them (like KCl). On the standard tally, the name of the main fluid appears, with stars(****) to show that there is more.

ENTERING INPUT AMOUNTS (I, I & O RECORDING)

As the shift proceeds, the nurse would keep track of I&O as often as ordered, and enter it as often as necessary.

The procedure for entering a FLUID amount is:

A. INPUT FLUIDS (or INPUT [FLUID ITEM NUMBER FROM MENU LIST])

This will cause first input fluid, with its additives, to appear.

B. Enter amount in cc's.

Next fluid will appear, and repeat.

DISPLAYING SHIFT TOTALS

At any time, the fluid balance can be shown or printed.

To do this:

A. OUTPUT FLUIDS

The fluid tallies for the shift selected will appear.

B. ROLL

Use the ROLL key to see shifts before or after the one shown.

DISPLAYING COMPONENT TOTALS (ELECTROLYTES, CALORIES)

Each type of fluid is characterized by:

1. Electrolyte composition
2. Carbohydrate, Nitrogen, and Fat composition
3. Caloric content

Moreover, these components may be added to the standard fluid.

The system will keep a tally of the COMPONENTS.

To display that tally:

A. OUTPUT COMPONENTS

The totals for the shift will appear.

B. ROLL

Other shifts will appear by using the ROLL key.

COMPUTE FUNCTION

There are computational programs for:

- A. AMINOGLYCOSIDE DOSAGE
- B. CARDIOVASCULAR INDICES
- C. PULMONARY
- D. CARBON MONOXIDE

At the moment, these are strictly single use only. Input values must be entered for each run, and the results are not stored.

Soon we will have storage and retrieval of a wide variety of derived indices, including the trauma indices.

The procedure for use will be:

- A. Enter all values needed for the calculation into the data base, using the standard system methods. Usually one would INPUT a short chart of values.
- B. COMPUTE command
This will get the COMPUTE mode.
- C. SELECT the INDEX option.
This will go through the data base for the patient and compute all indices that can be done, including the one the user is interested in.
- D. OUTPUT (CHART CONTAINING THE RESULTS)

There will be at least one chart containing various TRAUMA INDICES.

MONITOR FUNCTION

In order to implement automatic data collection, it is necessary to have:

A. Computer programs incorporated in the system. This has been done. Programs have been tested as much as can be done using simulated data and using limited real data.

B. Analogue-to-Digital signal converter. The one which was purchased with the system proved to be entirely worthless. We are in the process of obtaining a replacement microprocessor which will serve that function.

C. Analogue Multiplexer. This was built to our specifications. It will sample up to 16 channels of data from 12 beds, on command from the computer.

D. Installation of wiring to connect to the multiplexer. This has not been initiated.

An alternative approach, which seems less desirable at this time, is to have sampling and display done at bedside by peripheral microcomputers, with coordination and permanent storage of selected data points by a central computer. If this should become desirable, the computer software has been written to accommodate it.

THE PROBLEM / EVENTS CHART
and
THE TST ASSESSMENT CHART

There are two prototype charts which should be highlighted because they illustrate ideas of the ways in which charts can be used.

PROBLEM / EVENTS

It is always problematic to keep track of what are the active considerations in a patient. This is particularly true in making them known to a physician who is not the primary one, and also for the one who must dictate the discharge summary.

One might, then, maintain a running list of:

- A. chronic and acute problems
- B. important events in the hospital course
- C. procedures performed
- D. drug therapeutic failures and successes

As one way of approaching this, a chart called the PROBLEMS/EVENTS CHART is provided. It provides for entries to include, for each problem:

- A. Time of entry onto list
- B. Time of removal from list
- C. Nature of problem (a few typewritten words -- one line of text)

TST ASSESSMENT CHART

Standardization of examination and reporting can be valuable in improving completeness and uniformity of PROGRESS NOTES.

An illustration of the possibilities is included in this chart, which consists of a series of coded and multiple-coded choices, which can comprise 95% of a note, followed by a short typed-in note to convey special considerations not covered in the standard list.

Such an approach to nursing notes should make them more legible and meaningful, and faster to record.