NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY
SUBMARINE BASE, GROTON, CONN.

REPORT NUMBER 1019

COMPUTER ASSISTED DIAGNOSIS
OF
CHEST PAIN

PRELIMINARY MANUAL

by

HMC Mark DECORA and Karen D. FISHERKELLER, M.A.

Naval Medical Research and Development Command
Work Unit #MF-585.27.1Cl-0001

Released by:
William C. Milroy, CAPT, MC, USN
Commanding Officer
Naval Submarine Medical Research Laboratory
27 April 1984

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THE PROBLEM:

To provide a status report on the Computer-Assisted Program for Diagnosis of Chest Pain. This document will serve as the basis for a reference manual and guide to the Chest Pain Patient Management System as it develops.

THE FINDINGS:

Presentation is made of the general aspects of chest pain diagnosis, program capabilities, computer operation, descriptions of program elements, programming flowcharts, programming statements, and general information necessary for system utilization.

APPLICATION:

The information presented will be of value as a reference guide to the present system as it evolves through addition of ECG components, an updated database, and treatment and training modules.

ADMINISTRATIVE INFORMATION

This report was submitted for review in April 1984 and approved for publication on 27 April 1984. It is designated as NAVSUBMEDRSCHLAB Report #1019.
ABSTRACT

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs, in the style of the computer-assisted diagnosis program for acute abdominal pain, to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. The purpose of the present report is to summarize and document the progress to date on the computer-based diagnostic program for chest pain. The disorders considered are: myocardial infarction, angina, pneumonia, pneumothorax, and non-specific (non-life-threatening) chest pain. A very preliminary version of a program to predict outcome of M.I. (myocardial infarction) is also presented.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.
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SECTION 1 - INTRODUCTION

Medical evacuation from a patrolling nuclear submarine is costly in terms of risk to the patient, the expense of evacuation, and the compromise to the mission of the submarine. The medical responsibilities are borne by the Independent Duty (8402) Corpsman who must independently diagnose and manage any illness which presents during patrol. This includes making recommendations regarding evacuation to a shore-based facility. His diagnostic task is complicated by mission constraints which often prevent communication with shore-based medical facilities and by the limited medical diagnostic equipment aboard nuclear submarines; lacking, for example, X-ray facilities as well as many laboratory tests normally relied upon in the hospital or dispensary setting.

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. A program, in the style of the computer-assisted diagnosis program for acute abdominal pain (Arthur, NSMRL Report #974), is under development. The purpose of the present report is to summarize and document the progress to date on the computer-based diagnostic program for chest pain.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.
SECTION 2 - THE DIAGNOSTIC PROGRAM

2.1 INTRODUCTION

To date, there is one component of the computer-assisted diagnosis/management program for chest pain, the diagnostic/prognostic program. This section will detail the function and use of this program.

To avoid redundancies, the reader is directed to NSMRL report #974: Computer-assisted Diagnosis Program for Acute Abdominal Pain by LCDR Donald C. Arthur, MC, USN, which contains an excellent guide to basic computer interaction in section 3.5.

Since the chest pain program is patterned after the abdominal pain program, all of the cautions regarding the importance of accurate data collection and precedence of corpsman judgment apply to this program as well.

Inserting the tape and pressing 'AUTOLOAD' will load the introductory page (FIGURE 2-1). This page will remain on the CRT screen while the diagnostic program is loaded into the computer memory.

FIGURE 2-1

SUBMARINE CORPSMAN
COMPUTER-ASSISTED DIAGNOSIS PROGRAM
FOR
CHEST PAIN

Developed by:
NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY
Box 900, SUBASE, NLAN
GROTON, CONNECTICUT 06349
Phone: (203) 449-3660, 4894
Autovon 241-3660, 4094
After the diagnostic program is loaded, the initial choice page will be displayed (FIGURE 2-2).

FIGURE 2-2

OPTIONS... 1. To get DEFINITIONS of datasheet items
2. To access a TREATMENT PROGRAM
3. To access the TRAINING PROGRAM
4. To go directly to making a DIAGNOSIS

Selection of either the TREATMENT PROGRAM or the TRAINING PROGRAM will yield an explanation that these programs have not yet been developed and return the user to the initial choice page.

Selection option 1, the DEFINITIONS choice, will yield a list of the symptom categories included in the diagnostic program. The user selects a definition, enters the corresponding number and then presses 'RETURN' to have the definition displayed. See Section 2.2 for the definitions.

FIGURE 2-3

1. DURATION OF PAIN
2. ONSET OF PAIN
3. TIME COURSE
4. SITE OF PAIN
5. RADIATION
6. HUMHNESS
7. SEVERITY
8. PROGRESS
9. AGGRAV. FACTORS
10. RELIEV. FACTORS
11. DYSPNEA
12. COUGH
13. NAUSEA
14. VOMITING
15. APPETITE
16. BOWELS
17. PREV. CHEST PAIN
18. PREV. ILLNESS
19. PREV. SURGERY
20. TEMPERATURE
21. PULSE
22. BLOOD PRESSURE
23. MOOD
24. COLOR
25. SWEATING
26. SHAKING
27. J.U.P.
28. RESP. MOVEMENT
29. HEART SOUNDS
30. PERCUSSION
31. CHEST SOUNDS
32. BODY BUILD

WHICH DEFINITION WOULD YOU LIKE:
When the user proceeds to the diagnostic program (Option 4, FIGURE 2-2), two display pages will give brief explanations regarding data entry (FIGURE 2-4) and interpretation of diagnostic probabilities (FIGURE 2-5).

FIGURE 2-4

PROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN

REMEMBER...
1. Use DATASHEETS when entering data.
2. Enter information by CODE NUMBER.
3. Follow each code number with RETURN.
4. RE-ENTER codes to erase.
5. INPUT CHANGES can be made at the END.
6. Press RETURN to go on to next page.

Press RETURN to continue.

The computer-assisted diagnosis program can aid the Corpsman in differentiating illnesses which represent both the most common and most serious causes of acute chest pain.

The 5 illnesses which are considered by the computer are MYOCARDIAL INFARCTION, ANGINA, NON-SPECIFIC CHEST PAIN, PNEUMONIA AND PNEUMOTHORAX.

Non-specific chest pain is intended to include those cases which are non-surgical, not life-threatening, and, therefore, not reasons for evacuation.

In addition to diagnosis, the chest pain computer program provides probabilities for the occurrence of 3 classes of post MI complications. These are: NO PROBLEMS, ARRHYTHMIA, and PUMP FAILURE. It also predicts the likelihood of LIFE/DEATH post MI.

IMPORTANT: Supplemental programs for the prediction of complications and the prediction of life/death are used only with cases of MI.

THE CORPSMAN’S JUDGMENT MUST TAKE PRECEDENCE when any doubt exists.

The computer does not have the capability to think or make the subjective evaluations which are so important in medical diagnosis.

Press RETURN to continue.

The user will then be given the option of reviewing the last case. This option is provided as an aid to memory when the course of disease in a patient is being followed over time. The simulation option is a self-instruction program (FIGURE 2-6).
The program then requests some preliminary information (FIGURE 2-7).

SOCIAL SECURITY NUMBER: the entry must be 11 characters including spaces or dashes between numbers as shown below.

TIME AND DATE: the time and date must be entered in the spaces marked on the display. For example: ___/______ should look like 1400/03 Nov 83 after data entry.

AGE: enter the patient's age. Only ages in the range 10 - 99 are accepted by the program. The data base for submarine use applies only to the ages 17 - 60.

FIGURE 2-7
Once the preliminary data have been entered, the computer program sequentially displays each of the 7 data pages. FIGURES 2-8 through 2-14 present the pages with sample entries. To complete the pages, those numbers of the data sheet items recorded during the patient examination are entered on each page as re-presented on the computer display. After a number is entered and 'RETURN' pressed, the symptom is shown as an "input data code" and circled on the screen. If a symptom number is entered in error, re-enter the number and it will be 'X-ed' out, as in FIGURE 2-8, symptom 10, and deleted from memory. When all desired entries have been made on a page, pressing 'RETURN' one more time will erase the screen and display the next page.

FIGURE 2-8

PAIN

DURATION OF PAIN:
<1HR_____ (5)  2-4HR_____ (7)  4-12HR_____ (9)
1-2HR_____ (6)  >12HR_____ (8)

ONSET OF PAIN:
SUDDEN_____ (10)  GRADUAL_____ (11)

TIME COURSE OF PAIN:
CONTINUOUS_____ (12)  INTERMITTENT_____ (13)

RADIATION:
YES_____ (14)  NO_____ (15)

INPUT DATA CODES:
(re-enter codes to delete)

8  10  10 -X  11  12  14

If the display contains diagrams, as in FIGURE 2-9, the appropriate areas are filled-in after the numbers are entered.

FIGURE 2-9

SITE OF PAIN:
CENTRAL_____ (16)  RT. SIDE_____ (19)
ACROSS_____ (17)  EPIGASTRIC_____ (20)
LT. SIDE_____ (18)  OTHER_____ (21)

RADIATES TO:
LT. ARM_____ (22)  SHOULDER_____ (26)
RT. ARM_____ (23)  NECK_____ (27)
BOTH ARMS_____ (24)  JAW_____ (28)
BACK_____ (25)  OTHER_____ (29)

INPUT DATA CODES:
(re-enter codes to delete)

19  25  26
CAUTION: striking the 'RETURN' key two or more times in succession at any time will cause the computer program to step through a corresponding number of displays. The program must be restarted to recover from that error.

FIGURE 2-10

- **NUMBNESS**: Yes______ No_____
- **SEVERITY OF PAIN**: Moderate______ Severe_____
- **PROGRESS**: Better______ Worse_____
- **AGGRAVATING FACTORS**: Movement______ Cough______ Breathing______
- **SITTING**______ Other______ None_____
- **RELIEVING FACTORS**: Nitro______ Rest______ Walking______
- **OTHER FACTORS**: None_____

**INPUT DATA CODES:**

| 31 | 32 | 35 | 36 | 37 | 38 | 40 | 46 |

FIGURE 2-11

- **OTHER SYMPTOMS**
  - **DYSPEA**: No______ This illness______ Habitual______
  - **COUGH**: No______ This illness______ Habitual______
  - **NAUSEA**: Yes______ No______
  - **VOMITING**: Yes______ No______
  - **APPETITE**: Normal______ Decreased______
  - **BOWELS**: Normal______ Constipated______ Diarrhea______

**INPUT DATA CODES:**

| 48 | 51 | 54 | 56 | 57 | 59 |

The program has been designed to minimize the effects of keyboard errors by requiring the input to conform to the anticipated format and content of the information requested. When the input is requested in the form of a 'Y' or 'N' reply, typing any other character or number, or more than one character, will elicit another request for the appropriate input. The erroneous entries are discarded by the program.
FIGURE 2-12

PAST HISTORY

PREVIOUS CHEST PAIN: YES____________ [62] NO____________ [63]

PREVIOUS CARDIO-RESPIRATORY ILLNESS: YES____________ [64] NO____________ [65]

PREVIOUS MAJOR SURGERY: YES____________ [66] NO____________ [67]

VITAL SIGNS

TEMPERATURE PULSE BLOOD PRESSURE

98.6–106.2

68–60

100–120

<100

121–140

>100

141–160

<100

160–182

>100

183–200

<100

200–220

>100


INPUT DATA CODES: (re-enter codes to delete)

63 65 67 69 73 77 92

Each number entered must be one of those displayed on the portion of the data sheet represented on the computer screen. Typing any other number will produce a request for one from the set on the screen. For example, the entry 889 shown in FIGURE 2-13 resulted in the error message shown at the bottom of the figure.

FIGURE 2-13

MOOD:

NORMAL____(86) ANXIOUS____(87) DISTRESSED____(88)

COLOR:

NORMAL____(89) PALE____(90) FLUSHED____(91) CYANOTIC____(92)

GENERAL EXAMINATION

SWEATING:

YES____(93) NO____(94)

SHIVERING:

YES____(95) NO____(96)

JUGULAR VENOUS PULSE:

NORMAL____(97) RAISED____(98)

RESPIRATORY MOVEMENT:

NORMAL____(99) ABNORMAL____(100)

INPUT DATA CODES: (re-enter codes to delete)

87 899 89 94 96 97 99

ERROR: THE DATA CODE ENTERED IS NOT ON THIS PAGE! PLEASE RE-ENTER!

NOTE: The kinds of input errors detected by the program do not affect its computations in any way; those numbers are discarded by the computer before it requests re-entry of a data item. WARNING - Errors in the original record or those made in transcribing that record through the keyboard are not detected by the program. The program accepts any number on the screen.
When the 'RETURN' is pressed after completion of the 7th page of data input, the program will ask the user to enter his preliminary diagnosis (FIGURE 2-15).

FIGURE 2-15

1. MYOCARDIAL INFARCTION
2. ANGINA
3. NON-SPECIFIC CHEST PAIN
4. PNEUMONIA
5. PNEUMOTHORAX
6. OTHER

ENTER THE NUMBER OF YOUR PRELIMINARY DIAGNOSIS : 3

At this time, the computer-generated probabilities DO NOT AGREE with your preliminary diagnosis. However, as of yet, there are no specific categories which would differentiate your preliminary diagnosis from the current program-generated diagnosis.

WOULD YOU LIKE TO MAKE ANY CHANGES? (Y or N) :

After the user's preliminary diagnosis has been entered, the program compares it with the diagnosis found most probable by the system. The program then tells the user whether the diagnoses agree or not. If the diagnoses are the same, keying 'RETURN' directs the program to construct and display the Case Summary Page. If they are not the same, the user may go on as though the diagnoses agreed, or he may return to any earlier
point in the diagnostic process. In the abdominal pain program, indicants that may differentiate between the Corpsman's diagnosis and the computer's are named. That aid will be built into future versions of the chest pain program. The alternatives include revision of previous entries by responding Y to the prompt, "WOULD YOU LIKE TO MAKE ANY CHANGES." If the user selects 'OTHER' as his preliminary diagnosis, the program merely states that it does not consider any diagnosis other than those listed (in FIGURE 2-15).

FIGURE 2-16 presents the Case Summary Page for the symptoms entered in FIGURES 2-8 through 2-14. The Case Summary Page lists the HISTORY and PHYSICAL EXAM items in separate columns so that the user may review his entries for accuracy one more time. The probabilities of the 5 diagnoses relative to each other are shown below the indicants calculated as percentages. In addition, a bar graph displays the percentages for easy visualization of the program's findings. The time, date and location (unit name) of the examination, the patient's SSN and age are shown at the top of the page. This form can be used as an entry in the patient's health record with addition of the patient's name, the practitioner's name and signature, and the designation 'SF-600'. However, it must be reproduced on a medium more stable than the product of the Tektronix hard copy unit. The latter darkens over time, particularly if exposed to light.

FIGURE 2-16

The Case Summary Page presents 5 or 6 options for the next interaction to the user. The options are to change some of the input for the present case and request another calculation, to enter a new case, to access the treatment program, to access the item definitions, to enter the cardiac prognosis program, or to end the computer interaction. In its present form, the cardiac prognosis program can be consulted only if the computer ranks Myocardial Infarction as the most probable diagnosis.
If the user chooses to alter some of the data entries for the present case, FIGURE 2-17 is presented. This option allows deletion of entries by entry of their numbers, as in the main program, and entry of additional numbers to replace those deleted or to add to the information previously supplied to the program. Items added should, of course, be consistent with those already available to the program. As before, keying 'RETURN' after the last item has been entered into the computer results in the construction and display of the new Case Summary Page. FIGURE 2-17 illustrates the input change routine with some sample entries.

FIGURE 2-17

NEW INPUT:
15 RADIATION NO
33 PAIN SEVERE

DELETIONS:
14 RADIATION YES
25 RADIATION TO BACK
26 RADIATION TO SHOULDER
32 PAIN MODERATE

LIMIT: 25 ENTERIES!

INPUT DATA CODES:
15 14 -X 25 -X 26 -X 32 -X 33 (re-enter codes to delete)
If the PROGNOSIS program option is chosen, the computer calculates probabilities for three kinds of cardiac problems. The prognostic program uses a new database to calculate probabilities for cardiac problems based on the set of symptoms already entered for the patient. Once the probabilities have been computed, the display will present the symptom set and probabilities for: NO PROBLEMS, ARRHYTMIA, and PUMP FAILURE (FIGURE 2-18).

FIGURE 2-18

<table>
<thead>
<tr>
<th>PROGNOSIS PROBABILITIES-COMPLICATIONS (MI only)</th>
<th>PHYSICAL EXAM:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATIENT SSN: 123-45-6789</td>
<td></td>
</tr>
<tr>
<td>AGE 38-39</td>
<td></td>
</tr>
<tr>
<td>DURATION 1-2HR</td>
<td></td>
</tr>
<tr>
<td>CONTINUOUS PAIN</td>
<td></td>
</tr>
<tr>
<td>RADIATION NO</td>
<td></td>
</tr>
<tr>
<td>SITE CENTRAL</td>
<td></td>
</tr>
<tr>
<td>NO NUMBNESS</td>
<td></td>
</tr>
<tr>
<td>PAIN SEVERE</td>
<td></td>
</tr>
<tr>
<td>PROGRESS NOW WORSE</td>
<td></td>
</tr>
<tr>
<td>SITTING ACRAGAVES</td>
<td></td>
</tr>
<tr>
<td>WALKING RELIEVES</td>
<td></td>
</tr>
<tr>
<td>NO DYSNPER</td>
<td></td>
</tr>
<tr>
<td>NO COUGH</td>
<td></td>
</tr>
<tr>
<td>HUNGER PRESENT</td>
<td></td>
</tr>
<tr>
<td>NO VOMITING</td>
<td></td>
</tr>
<tr>
<td>APPETITE DECREASED</td>
<td></td>
</tr>
<tr>
<td>CONSTITRATION PRESENT</td>
<td></td>
</tr>
<tr>
<td>NO PREVIOUS CHEST PAIN</td>
<td></td>
</tr>
<tr>
<td>NO PREVIOUS ILLNESS</td>
<td></td>
</tr>
<tr>
<td>NO PREVIOUS SURGERY</td>
<td></td>
</tr>
<tr>
<td>PHYSICAL EXAM:</td>
<td></td>
</tr>
<tr>
<td>TEMP 98.6-100.2</td>
<td></td>
</tr>
<tr>
<td>PULSE 81-106</td>
<td></td>
</tr>
<tr>
<td>SYSTOLIC BP 121-140</td>
<td></td>
</tr>
<tr>
<td>DIASTOLIC BP 81-98</td>
<td></td>
</tr>
<tr>
<td>MOOD DISTRESSED</td>
<td></td>
</tr>
<tr>
<td>COLOR PALE</td>
<td></td>
</tr>
<tr>
<td>SWEATING PRESENT</td>
<td></td>
</tr>
<tr>
<td>NO SHIVERING</td>
<td></td>
</tr>
<tr>
<td>JUP. NORMAL</td>
<td></td>
</tr>
<tr>
<td>resp. MOV. NORMAL</td>
<td></td>
</tr>
<tr>
<td>HEART SOUNDS NORMAL</td>
<td></td>
</tr>
<tr>
<td>PERCUSSION NORMAL</td>
<td></td>
</tr>
<tr>
<td>CHEST SOUNDS NORMAL</td>
<td></td>
</tr>
<tr>
<td>98.3% NO PROBLEMS</td>
<td></td>
</tr>
<tr>
<td>0.8% ARRHYTMIA</td>
<td></td>
</tr>
<tr>
<td>1.0% PUMP FAILURE</td>
<td></td>
</tr>
</tbody>
</table>

Also included as part of the PROGNOSIS program are probabilities for the likelihood that the patient will either live or die, even if in a hospital setting. For this section of the prognosis program, the computer will ask for additional data input (FIGURE 2-19).

FIGURE 2-19

<table>
<thead>
<tr>
<th>LIFE/DEATH Probabilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BODY BUILD:</td>
</tr>
<tr>
<td>NORMAL...(1) OBESE...(2)</td>
</tr>
<tr>
<td>CORRESPOND OPINION OF PATIENT'S CONDITION:</td>
</tr>
<tr>
<td>GOOD... (3) DUBIOUS... (4) POOR... (5)</td>
</tr>
<tr>
<td>DURATION OF PAIN (refined):</td>
</tr>
<tr>
<td>&lt;6HR (6) 6-24HR (7) &gt;24HR (8)</td>
</tr>
</tbody>
</table>

INPUT DATA CODES: 2 4 6 4 5
The program calculates 'LIFE/DEATH' probabilities using a subset of symptoms entered for the patient. Figure 2-20 illustrates the Case Summary Page for the 'LIFE/DEATH' section of the prognosis program. Starred symptoms are ones which contribute to the calculation of the probabilities.

**FIGURE 2-20**

<table>
<thead>
<tr>
<th>1000 30 OCT 93</th>
<th>PATIENT SSN: 123-45-6789</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE/DEATH PROBABILITIES (1) only</td>
<td>PAGE: 17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HISTORY:</th>
<th>PHYSICAL EXAM:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE 38-39</td>
<td>TEMP 98.6-100.2</td>
</tr>
<tr>
<td>DURATION 1-2HR</td>
<td>PULSE 81-100</td>
</tr>
<tr>
<td>ONSET SUDDEN</td>
<td>SYSTOLIC BP 121-140</td>
</tr>
<tr>
<td>CONTINUOUS PAIN</td>
<td>DIASTOLIC BP 81-90</td>
</tr>
<tr>
<td>RADIATION NO</td>
<td>NOODLED DISTRESSED</td>
</tr>
<tr>
<td>SITE CENTRAL</td>
<td>COLOR PALE</td>
</tr>
<tr>
<td>NO NUMBNESS</td>
<td>SWEATING PRESENT</td>
</tr>
<tr>
<td>PAIN SEVERE</td>
<td>NO SHIVERING</td>
</tr>
<tr>
<td>PROGRESS NOT WORSE</td>
<td>CHEST PAIN NORMAL</td>
</tr>
<tr>
<td>SITTING AGGRAVATES</td>
<td>BREATHING NORMAL</td>
</tr>
<tr>
<td>WALKING RELIEVES</td>
<td>HEART SOUNDS NORMAL</td>
</tr>
<tr>
<td>AND DYSPEA</td>
<td>PERCUSSION NORMAL</td>
</tr>
<tr>
<td>NO COUGH</td>
<td>(NO COUGH</td>
</tr>
<tr>
<td>NAUSEA PRESENT</td>
<td>CHEST SOUNDS NORMAL</td>
</tr>
<tr>
<td>NO VOMITING</td>
<td>NO PREVIOUS CHEST PAIN</td>
</tr>
<tr>
<td>APPETITE DECREASED</td>
<td>NO PREVIOUS ILLNESS</td>
</tr>
<tr>
<td>CONSTIPATION PRESENT</td>
<td>NO PREVIOUS SURGERY</td>
</tr>
<tr>
<td>AND PREVIOUS CHEST PAIN</td>
<td>OBESE BUILD</td>
</tr>
<tr>
<td>NO PREVIOUS ILLNESS</td>
<td>POOR CONDITION</td>
</tr>
<tr>
<td>NO PREVIOUS SURGERY</td>
<td>DURATION-refined &lt;6HR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>28.6%</th>
<th>71.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIE EVEN IN HOSPITAL</td>
<td>LIVE IN HOSPITAL</td>
</tr>
</tbody>
</table>

Following the presentation of the 'LIFE/DEATH' probabilities, the user is given four options. They are to obtain a symptom definition, display treatment information, run a new case, or end the interaction with the computer.
2.2 DATA SHEET DEFINITIONS

The following are definitions of chest pain signs and symptoms. The definitions are accessed through the chest pain DIAGNOSIS program.

DURATION OF PAIN definition:

<1HR (5) 1-2HR (6) 2-4HR (7) 4-12HR (8) >12HR (9)

Here we're interested in how long since the pain began for this episode of illness. Record in hours and minutes.

ONSET OF PAIN definition:

SUDDEN (10) GRADUAL (11)

Determine how long it took the pain to develop fully. If it took less than 2 minutes, write SUDDEN; if greater than 2 minutes, write GRADUAL.

TIME COURSE OF PAIN definition:

CONTINUOUS (12) INTERMITTENT (13)

If your patient has had times when he has been free of pain since it started, circle INTERMITTENT. Otherwise circle CONTINUOUS.

SITE OF PAIN definition:

SUBSTERNAL (16) ACROSS (17) LEFT SIDE (18)
RIGHT SIDE (19) EPIGASTRIC (20) OTHER (21)

This is sometimes hard to express. Look at the choices on your data sheet, then get your patient to bare his chest and show you with one finger where his pain is. Choose the data sheet category which fits best.

RADIATION OF PAIN definition:

YES (14) NO (15)
LEFT ARM (22) RIGHT ARM (23) BOTH ARMS (24) BACK (25)
SHOULDER (26) NECK (27) JAW (28) OTHER (29)

Radiation is pain spreading from a primary site (here, the chest) to other areas. Patients often describe this pain as 'moving' or 'shooting' to the area in question. Ask about each of the possible choices on your data sheet.
NUMBNESS definition:

YES (30) NO (31)

This refers to the present illness only. Your patient may describe this as not having sensation or as a 'tingling' in some area.

SEVERITY definition:

MODERATE (32) SEVERE (33)

This is a judgment you make: don't ask your patient. If the pain is obviously intense, causing obvious distress, sweating, or shivering, circle SEVERE. Otherwise circle MODERATE.

PROGRESS definition:

BETTER (34) WORSE (35)

In general, since it began, is the pain getting BETTER or WORSE? If in doubt, leave blank and skip this entry. There is no SAME category.

AGGRAVATING FACTORS definition:

MOVEMENT (36) COUGH (37) RESPIRATION (38)
SITTING (39) OTHER (40) NONE (41)

This means patient activities which make the pain worse. Ask about each of the data sheet items mentioned in a neutral manner, e.g. 'Does X affect your pain?'

RELIEVING FACTORS definition:

NITRO (42) REST (43) WALKING (44)
OTHER (45) NOTHING (46)

This refers to patient activities which ease the pain. Ask about each of the data sheet items in a neutral fashion, e.g. 'Does X affect your pain?'

NITRO is nitroglycerin, a tablet put under the tongue for angina chest pain. Ask about this even though you feel sure your patient has never used any.

DYSPNEA definition:

NO (47) THIS ILLNESS (48) HABITUAL (49)

This is shortness of breath while not engaged in strenuous activity. Ask your patient if he's felt unusually short of breath, especially while resting. Here it is important to distinguish between chronic dyspnea (circle HABITUAL) and dyspnea that has started recently (circle THIS ILLNESS).
COUGH definition:

NO (50) THIS ILLNESS (51) HABITUAL (52)

Here it is important to distinguish between chronic cough (circle HABITUAL) and cough that has started recently (circle THIS ILLNESS).

NAUSEA definition:

YES (53) NO (54)

This means your patient is feeling sick to his stomach. This may be accompanied by weakness, sweating, and profuse salivation.

VOMITING definition:

YES (55) NO (56)

Here the patient is being sick to his stomach with an appreciable amount of stomach contents expelled. This should be distinguished from 'burping' up small amounts of acid material, which is not vomiting.

APPETITE definition:

NORMAL (57) DECREASED (58)

Here we're interested in RECENT change. Your patient may still feel he can eat, but you wish to know if his DESIRE to eat is decreased. If his desire to eat is the same, write NORMAL, otherwise write DECREASED.

BOWELS definition:

NORMAL (59) CONSTIPATED (60) DIARRHEA (61)

Here we're interested in a recent change. If there has been a marked DECREASE in the number of stools, circle CONSTIPATED, if a marked INCREASE circle DIARRHEA (especially if watery). Otherwise circle NORMAL.

PREVIOUS SIMILAR PAIN definition:

YES (62) NO (63)

Check carefully for times in the past when your patient has experienced chest pain. Sometimes incidents are forgotten. Sometimes they have been concealed to avoid a MEDICAL BOARD.
PREVIOUS CARDIO-RESPIRATORY ILLNESS definition:

YES (64) NO (65)

This refers only to a significant illness involving the cardiovascular or respiratory systems. Ask about, and check his health record for, major illnesses in the past such as high blood pressure, angina, pericarditis, pneumonia, pneumothorax, pulmonary embolism, asthma.

PREVIOUS MAJOR SURGERY definition:

YES (66) NO (67)

This refers to major surgery of any kind. Ask about, and check health records for, major surgery in the past.

TEMPERATURE definition:

<98.6 (68) 98.6-100.2 (69) 100.3-102 (70) >102 (71)

This is self-explanatory. Use oral temperature. Ensure that your patient has not drunk hot or cold liquids during the 15 minutes prior to your measurement.

PULSE definition:

<60 (72) 61-80 (73) 81-100 (74) >100 (75)

Enter the pulse rate in beats per minute. Feel the radial or carotid pulse for one full minute. If you detect irregularities such as extra beats, count the number of times this happens in a minute. (The computer only uses the pulse rate, but you want to be aware if your patient has arrhythmia.)

BP (Blood Pressure) definition:

SYSTOLIC BP:
<100 (76) 101-120 (77) 121-140 (78) 141-160 (79) >160 (80)

DIASTOLIC BP:
<70 (81) 71-80 (82) 81-90 (83) 91-100 (84) >100 (85)

Self-explanatory. Write down the Systolic and Diastolic pressures.

MOOD definition:

NORMAL (86) ANXIOUS (87) DISTRESSED (88)

Don't attempt deep psychoanalysis here. If your patient is obviously reacting to great pain or other severe symptoms, circle DISTRESSED. If he's mainly agitated and worried, circle ANXIOUS. Otherwise circle NORMAL.
COLOR definition:

NORMAL (89)  PALE (90)  FLUSHED (91)  CYANOTIC (92)

Check especially for pallor (unusual absence of color), flushing (unusual ruddiness), or cyanosis (blueness). In whites, check the face and ears. In blacks and whites, check also the extremities and mucus membranes, e.g. nailbeds, nose, lips, conjunctivae.

SWEATING definition:

YES (93)  NO (94)

Self-explanatory. We assume that the sweating is not due to an obvious cause such as hot compartment or heavy exercise.

SHIVERING definition:

YES (95)  NO (96)

Self-explanatory. We assume that the shivering is not due to a cold compartment.

J.V.P. (Jugular Venous Pulsation) definition:

NORMAL (97)  RAISED (98)

Standing on your patient's right, have your patient reclining at a 45° angle, his chin turned about 30 degrees to the left, with a light shining at an angle across his neck so that his right neck vein casts a shadow. It is important to distinguish the pulsation of the external jugular vein from the carotid artery pulse. This can be accomplished by pressing lightly but firmly against the vein at the base of the neck; the vein pulsation will be stopped by this maneuver while the arterial pulsation will not be (since artery pressure is higher).

With the patient in this position and the JVP identified, check in the following way: if the meniscus is seen more than one half of the distance from the clavicle to the chin, circle ELEVATED. Otherwise circle NORMAL. If you're not sure, omit this entry.

An elevated JVP often indicates heart failure.
RESPIRATORY MOVEMENT definition:

NORMAL (99)     ABNORMAL (100)

Here we check the amount and pattern of chest expansion. Check for two things.

A) At the level of the nipples measure the amount of chest expansion with a tape measure or string. If the difference between full inspiration and full expiration is less than 2 inches, circle ABNORMAL (don’t draw the tape tightly enough to push in on the skin).

B) Inspect and palpate with both hands whether expansion is equal on both sides. If obviously different, circle ABNORMAL.

HEART SOUNDS definition:

NORMAL (101)     ABNORMAL (102)

With the diaphragm of your stethoscope listen carefully to the first and second heart sounds (LUB-DUB, LUB-DUB). If you can hear anything else or if the heart is irregular, circle ABNORMAL. Otherwise circle NORMAL.

Sometimes changing your patient’s position makes auscultation easier: have him sit up, lean forward, lie back, etc., as needed.

Also, in young, healthy men the heart can slow and speed with respiration. This is called sinus arrhythmia, and is NORMAL.

PERCUSSION definition:

NORMAL (103)     DULL (104)     HYPER-RESONANT (105)

Be sure to carefully percuss both the front and back of the chest. The best method is to compare sides as you go, left with right. If the sides don’t sound the same, there is probably an abnormality. The lungs should normally sound somewhat resonant. If an area sounds markedly less resonant than normal, circle DULL; if an area is markedly more resonant than normal, circle HYPER-RESONANT, otherwise circle NORMAL.

With regard to comparing sides, note than when percussing anteriorly right and left are normally different in two areas: 1) dullness should be present to the left of the lower sternum over the heart and 2) when percussing below the level of the xiphoid (tip of the sternum) there is usually dullness to the patient's right (liver) and tympany to the patient's left (over the stomach). So compare only those areas above the level of the sternum and not over the level of the heart.
CHEST SOUNDS definition:

NORMAL (106)  RHONCHI (107)  RALES (108)  DECREASED (109)

Listen with the diaphragm of your stethoscope to your patient's back. Have him breathe deeply through his mouth and compare right and left sides. If one side is markedly decreased, write DECREASED.

Rales are discrete, non-continuous (crackling) sounds produced by moisture in airways of the lung. Fine rales sound like the rubbing of a lock of hair between your fingers near your ear. Rales are usually heard late in inspiration. If you suspect heart failure, fine rales should be checked for by listening to the lung bases (about 2 finger widths below each scapula) and having your patient cough, then breathe deeply. Coarser rales can be heard elsewhere in the lung in conditions such as pneumonia.

Rhonchi are continuous, musical sounds that range from high-pitched wheezes to lower-pitched moaning. Rhonchi can be both inspiratory and expiratory although they are often more prominent in expiration. They can be heard anywhere over the lungs. Rhonchi are usually heard with infections such as bronchitis or pneumonia, or with airway spasm (asthma).

If breath sounds are not markedly decreased, and if there are no added sounds, write NORMAL.

SGOT definition:

<50 (110)  50-100 (111)  101-200 (112)  >200 (113)

Serum Glutamic Oxaloacetic Transaminase was the first enzyme to be widely used as a laboratory diagnostic aid. It begins to rise 12 hours post injury, peaks at 2-4 times normal at 24 hours, and returns to normal in 4-7 days. It is also released from an injured liver and other cells and is thus a sensitive but non-specific indicator. The current terminology is "AST" or aspartate transferase. Facilities for measurement may not be available at sea.
2.3 CHEST PAIN DATASHEET

The chest pain data sheet (FIGURE 2-21) provides the practitioner with a guide to use in performing the history and physical examination and in collecting data from the patient. It consists of 21 history items, including age, and 13 physical exam categories. The findings on these categories are used by the computer program to arrive at a diagnosis. The datasheet pages displayed by the diagnostic program correspond to the format of the paper and pencil datasheet.

In addition to the symptom categories used by the diagnostic program, the chest pain datasheet also includes 3 symptom categories (Body build, Duration of pain (refined, Examiner's Opinion of the patient's condition), which are used by the computer program to arrive at a prognosis for patients whose initial computer diagnosis is MYOCARDIAL INFARCTION. These terms are defined on the datasheet; they are not included in the items defined by the section of the program described on pages 14-20.
FIGURE 2-21

CHEST PAIN DATA SHEET

PATIENT NAME: J. R. SYK

SSN: 123-45-6789

HISTORY

AGE: 37
DATE/TIME: 30 OCT 83 1400

PAIN

DURATION OF PAIN: (duration of this episode of pain)
- Initial (18) - Epigastic (7°)
- Mid (27) - Substernal < -16U (28)
- Late (29)

ONSET OF PAIN: (onset of this episode of pain)
- Sudden (13)
- Gradual (11)

TIME COURSE OF PAIN: (onset & duration of pain)
- Continuous (20)
- Intermittent (17)

RADIATION: (pain other than in chest)
- Yes (14)
- No (55)

SITE OF PAIN:
- Substernal (15)
- Retrosternal (12)
- Other (55)

NUMBERS:
- None (33)
- One (34)
- Two (35)

SEVERITY OF PAIN:
- Mild (36)
- Moderate (52)
- Severe (15)

PROGRESS OF PAIN:
- Gradual (16)
- Sudden (17)
- Other (18)

AGGRAVATING FACTORS:
- Emotional stress
- Exercise
- Other (57)

REIEVING FACTORS:
- Activities which ease the pain
- Rest
- Walking (27)
- Other (53)

OTHER SYMPTOMS

CUGH:
- Yes (27)
- No (56)

VOMITING:
- Yes (28)
- No (57)

APPETITE:
- Decreased (54)

BOWELS:
- Constipated (50)

PAST HISTORY

PREVIOUS CHEST PAIN:
- Yes (29)
- No (50)

PREVIOUS CARDIO-RESPIRATORY ILLNESS:
- Yes (29)
- No (50)

PREVIOUS MAJOR SURGERY:
- Yes (29)
- No (50)

PHYSICAL EXAM

VITAL SIGNS

TEMPERATURE
- Normal (88)

PULSE
- Normal (116)

BLOOD PRESSURE
- Normal (118)

MOUTH:
- Normal (120)

COLOR:
- Normal (122)

EXAMINATION

SNEEZING:
- Yes (31)

SNEEZING:
- Yes (31)

SHIVERING:
- Yes (32)

SHIVERING:
- Yes (32)

JUGULAR VENOUS PULSE:
- Normal (132)

RESPIRATORY MOVEMENT:
- Normal (134)

HEART SOUNDS:
- Normal (136)

PERCUSSION:
- Normal (138)

CHEST SOUNDS:
- Normal (140)

SGOT:
- Normal (142)

BODY BUILD:
- Normal (144)

OCCURRENCE OF PAIN (DEFINITE):
- Initial (145)

EXAMINEE’S OPINION OF THE PATIENT’S CONDITION:
- Good (146)

CORPSMAN’S DIAGNOSIS:
- N.G.’S DIAGNOSIS:
2.4 DIAGNOSTIC CATEGORIES:

The diagnostic program is intended to specifically diagnose four of the most common and the most serious causes of chest pain in the submarine population. These categories are: acute myocardial infarction (M.I.), angina (ANGINA), pneumonia (PNEUMO), and pneumothorax (THORAX).

In addition, a fifth category termed nonspecific chest pain (NONSCP) is intended to include those conditions which are vague and general in nature and which are amenable to symptomatic treatment. Occasionally, the practitioner will pinpoint a "specific" diagnosis (i.e., esophagitis) in this category, but in all cases NONSCP is intended to encompass those conditions which are non-life-threatening and not a reason for medical evacuation.

There are several causes of acute chest pain (pulmonary embolism, pericarditis, aortic dissection) which are not included in the above categories, yet are of a serious nature. The program will yield the diagnosis of the category which most closely reflects the sign/symptom complex of a serious illness for which there is no specific category. Thus, the practitioner must utilize his clinical judgment both when gathering and entering the data and when interpreting the results of his computer interaction. A discussion of each diagnostic category is presented below.

SPECIFIC DIAGNOSES -

A. MYOCARDIAL INFARCTION: Myocardial infarction (M.I.) is a leading cause of mortality and morbidity in the population of the western, affluent civilization. In the United States, the annual incidence is approximately 1,000,000 cases weighted towards a middle age or older age group. Pre-hospital mortality approaches 50%. M.I. is acute necrosis of myocardium secondary to a sudden interruption or decrease of blood supply. Major risk factors are hypertension, hyperlipidemia, and smoking. Diabetes and angina are related risk factors unlikely to be present in the submarine population.

A history of acute onset of crushing substernal chest discomfort radiating to the left arm and accompanied by diaphoresis, nausea, and a sense of impending doom is classic. The pain lasts longer than 20 minutes and is unrelieved by rest and nitroglycerin. Physical exam ranges from near-normal to obvious shock. An electrocardiogram (ECG) taken early in the course is abnormal less than 50% of the time, but may show ST elevation, T wave inversion, or left ventricular hypertrophy. Q waves appear later. Cardiac enzyme determinations may be helpful but are unavailable at sea. Variations in the presentation are legion and well-documented. Diagnosis must be made on clinical grounds incorporating risk factors, the history and physical exam, the ECG (if available), and the practitioner's impression of the patient's overall condition.
B. ANGINA: Relative myocardial ischemia from an imbalance in myocardial oxygen supply versus demand is believed to be the basis for angina pectoris. Risk factors are the same as for M.I. Angina (ANGINA) is commonly described as substernal chest pain, pressure, tightness, or burning sensation that may radiate to the left arm (or elsewhere). The discomfort is relieved within 1-5 minutes of resting and/or by nitroglycerin.

The physical exam is usually normal. Cardiac examination, during an episode of pain, may reveal an S₃, a mitral regurgitant murmur, or a systolic bulge that disappears as the pain subsides. The ECG is usually normal but may show ST depression which later resolves. Cardiac enzymes are normal, although such testing is unavailable at sea.

Diagnosis is made on the assessment of risk factors, the history and physical exam, the ECG (if available), and the response to rest and nitroglycerin.

Variant or "rest" angina, also known as Prinzmetal's angina, is due to coronary artery spasm. There is a good response to nitroglycerin but not to rest. The ECG may show transient ST elevation.

Recurrent and frequent episodes of angina may be a harbinger of impending M.I. The episodes may occur given less cardiopulmonary stress and be less responsive to rest and nitroglycerin than typical episodes.

C. PNEUMONIA: Pneumonia (PNEUMO) is an alveolar infection caused by a bacterium, virus, or other non-bacterial pathogen. Pneumococcal (bacterial) pneumonia is most likely in the isolated case. Mycoplasma (non-bacterial) or viral pneumonia is more common when groups of people are ill. Chest pain as a component of pneumonia is due to pleuritic or bronchial irritation. The pain may be felt anywhere in the thorax and is exacerbated by coughing or deep breathing. The "pleuritic component" to the pain distinguishes it from M.I. or ANGINA. Additionally, pneumonia is characterized by coexisting or recent upper respiratory tract symptoms, malaise, fever, chills, and sputum production. Dyspnea, tachypnea, and tachycardia may be present.

Physical exam reveals varying degrees of vocal fremitus, egophony, dullness to percussion, rhonchi, and rales. These signs are worse with bacterial pneumonia.

A lung infiltrate is usually visible on chest roentgenogram, but this study is unavailable aboard ship. The white blood cell count is elevated in bacterial pneumonia, but near-normal or depressed otherwise. Mycoplasma pneumonia is common in young adults and varies from the milder illness of a viral pneumonia to the more serious bacterial pneumonia. A right lower lobe pneumonia will occasionally present as abdominal discomfort in a younger person. A compatible history and rales in the lung field, that do not clear with cough, are the best indicators of the presence or absence of pneumonia.
D. PNEUMOTHORAX: Pneumothorax (THORAX) involves a degree of collapse of a lung secondary to entrance of air into the potential space between visceral and parietal pleura. Spontaneous pneumothorax develops de novo from rupture of an existing pulmonary bleb or occurs during respiratory infection. Cough or another mechanism whereby intra-alveolar pressure is elevated may be a precipitating factor. Penetrating chest trauma and rib fracture are other causes.

There is an acute onset of chest discomfort on the side of the pneumothorax, with a pleuritic quality to the discomfort. Dyspnea, tachypnea and cyanosis may be present with a large pneumothorax.

Physical exam reveals absent breath sounds and hyper-resonance overlying the pneumothorax. The trachea may be deviated away from the affected side. There is no fever or accompanying respiratory infection, unless pre-existent. Subcutaneous emphysema may be present in the chest wall or neck area if the parietal pleura is torn.

The pneumothorax is visible on chest roentgenogram, although this study is unavailable on a submarine. White blood cell count is normal unless there is acute distress, whereupon it might be elevated moderately. Occasionally, a "one-way valve" effect exists leading to the life-threatening tension pneumothorax. Usually, the non-tension pneumothorax stabilizes within a few minutes.

NON-SPECIFIC CHEST PAIN

Non-specific chest pain (NONSCP) is intended to encompass those disorders which are not serious and not a cause for medical evacuation. Pain in this category is often more annoying than worrisome to patients. This aspect is helpful in diagnosis.

The likelihood of chest pain being due to non-specific causes varies with the age of the patient and clinical circumstances of the case. In a young adult without previous or recent medical illness, a serious cause for chest pain is unlikely.

Non-specific causes for chest pain include: a) musculoskeletal pain; b) costochondritis (Tietze's syndrome); c) esophagitis; d) esophageal spasm ("esophageal angina"); e) hyperventilation syndrome; f) psychoneurotic disorder; g) epigastric lesions (cholelithiasis, peptic ulcer, etc.).

Musculoskeletal pain and costochondritis denote muscle, rib, or cartilage pain due to inflammation or trauma. The pain is often sharp, of moderate intensity, localized to the chest wall, and reproduced by direct manipulation of the affected area.

Esophagitis and esophageal spasm are felt substernally in the mid-chest and/or epigastrium. Esophagitis is caused by direct irritation from food or drink, by reflux of gastric contents, or by infection (the latter is uncommon in healthy people). There is a good response to liquid antacids, a fact which assists in diagnosis. Esophageal spasm may follow a meal and is accompanied by dysphagia. The pain is relieved by nitroglycerin, making differentiation from classic angina difficult. The concomitant dysphagia and lack of relationship to exercise may be helpful in diagnosis.
Hyperventilation syndrome is a relatively common cause of chest discomfort in an (already) anxious person. The accompanying breathlessness, palpitations, weakness, and response to re-breathing techniques are diagnostic.

In psychoneurotic disorders no physical etiology for chest pain is found. This diagnosis is best made by those skilled in psychiatric evaluation. It should be assumed that crewmembers with chest pain have a physical etiology for chest pain.

Disorders that present with epigastric pain such as gastritis, peptic ulcer, pancreatitis, and cholelithiasis may occasionally be confused with chest pain disorders. In most of these disorders, the abdominal exam is revealing — any abdominal tenderness points to a non-chest source of the pain. The key issue is to avoid overlooking an atypical presentation of M.I. The assessment of risk factors, the history and physical exam (chest and abdominal), and the ECG (if available) are helpful in this regard.
SECTION 3 - PROGRAMMING DETAILS

3.1 THE DIAGNOSTIC PROGRAM

The chest pain tape is composed of two related programs: the diagnostic program and the prognostic program. The diagnostic program elements will be discussed in this section, and the prognostic program elements will be discussed in section 3.2.

The diagnostic program contains one main program (Program 10) and two small introductory programs which serve only to automatically lead the user into Program 10 when the tape is loaded.

The first page of program 10 is the initial option page from which the user may proceed to obtain datasheet definitions, treatment displays, the training program, or the diagnostic program.

If the datasheet definition pathway is chosen, once the user specifies the definition desired, the program searches for file 9 and accesses the definition desired by reading each definition as binary data until the appropriate definition is reached. Once read, the definition is displayed and, if a graphic display accompanies the definition, the appropriate display is produced by program 10. The program flow then returns to the original decision point.

The treatment suggestions and training programs do not yet exist. If either of these options are selected, the program will display a statement to this effect and return the user to the initial option page.

If the diagnostic interaction is chosen, program 10 finds the file (11) which contains the data entry reminders and summary page and serially displays them. The program loads the database and all variables are set to their initial values. The program continues on from this point as described in Section 2.

On the following pages each program (both data and programming) is reproduced with some programming notes to aid in understanding the flow of the program. Table 3-1 lists the programs as they are stored on the tape and in the order in which they will be discussed.
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This program is used only to load program 2, the BINARY PROGRAM introductory page. The ASCII introductory page is required by the computer software to enable loading of BINARY programs.

CHEST PAIN PROGRAM 1

ASCII INTRODUCTION

10 FIND 2
20 CALL "BOLD"
30 RUN
40 END
This program, automatically loaded and executed when the tape is inserted and "AUTOLOAD" is keyed, displays the Introductory Page and automatically accesses, loads, and executes the main diagnostic program, program 10.
PROGRAMS 3-6 SPACE ALLOCATED FOR TREATMENT DISPLAYS

Programs 3-6 are currently empty. These files allocate space for the inclusion of chest pain treatment regimes.

PROGRAM 7 - PROGNOSTIC PROGRAM
PROGRAM 8 - PROGNOSTIC PROBABILITIES
DISPLAY PAGES

Programs 7 and 8 pertain to the prognostic program. These program elements will be discussed in Section 3.2.

PROGRAM 9 - DATASHEET DEFINITIONS

Program 9 contains the datasheet definitions stored as BINARY DATA in order of their appearance on the datasheet and definition selection display. The data strings are sequentially read until the desired definition string is accessed and the string is then automatically printed. The graphic display contained in the "CHEST SOUNDS" definition is constructed by the main diagnostic program.

In total, there are 32 definition strings. Age, as usual, is taken to the last birthday. In addition, there are no definitions for symptom categories pertaining only to the prediction of prognosis (Body build, Duration of pain (refined), and Examiner's opinion of the patient's condition).

The reader is asked to refer to Section 2.2 for a complete listing of datasheet definitions.
PROGRAM 10 - DIAGNOSTIC PROGRAM

The following pages list the main diagnostic program and highlight some of the important programming features. The line demarcations below serve to aid in the understanding of program organization.

<table>
<thead>
<tr>
<th>LINES</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 700</td>
<td>Display and choose initial choice, read in all initial displays and databases</td>
</tr>
<tr>
<td>1000 - 1379</td>
<td>Begin diagnostic interaction, 'last case', input patient's personal data</td>
</tr>
<tr>
<td>1400 - 1440</td>
<td>Display datasheet pages including graphics</td>
</tr>
<tr>
<td>3000 - 3640</td>
<td>Data input routine</td>
</tr>
<tr>
<td>4010 - 4590</td>
<td>Preliminary diagnosis comparison routine</td>
</tr>
<tr>
<td>4620 - 4800</td>
<td>Reconstruct 'last case' from memory (J$)</td>
</tr>
<tr>
<td>5000 - 6000</td>
<td>Case summary page construction</td>
</tr>
<tr>
<td>6010 - 6310</td>
<td>Entry of case into 'last case' file and datafile</td>
</tr>
<tr>
<td>6320 - 6340</td>
<td>Treatment files not yet created</td>
</tr>
<tr>
<td>7010 - 7280</td>
<td>Input change routine, GOSUB data input subroutine</td>
</tr>
<tr>
<td>8000 - 8200</td>
<td>Graphics to circle and 'X' data entries</td>
</tr>
<tr>
<td>9000 - 10030</td>
<td>Display definition choices, add graphics to 'Chest Sounds' definition</td>
</tr>
<tr>
<td>12000 - 15540</td>
<td>Draws graphics for page 2 of datasheet</td>
</tr>
<tr>
<td>16000 - 16090</td>
<td>Underlines major headings on datasheet pages</td>
</tr>
</tbody>
</table>
Sets initial dimensions
Reads in database and definition headings
Display page heading
Display initial options
Option choice and validity check
Space to access training programs
Space to access treatment programs
Display entry reminders
Display summary page
Sets dimensions of diagnostic variables
Inputs unit name, case counter and last case memory string
START DIAGNOSTIC PROGRAM
set initial variable values
Last case choice
Validity check
SSN entry and validity check

100 INIT
101 SET KEY
102 DIM B$(5500), A$(1650), D$(1610), Z$(180), F$(104)
103 Y$="0"
104 FIND 11
106 READ @33:B$, A$, D$, Z$, F$
108 GOSUB 120
110 GO TO 170
120 PRINT USING "P,6/10T,4A": "CHDX"
130 PRINT "KIPROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN"
140 PRINT @32,21:19.2,93
152 IF Y$<"4" THEN 155
153 PRINT @32,21:0,70
154 GO TO 160
155 PRINT @32,21:0,60
160 RETURN

170 PRINT "OPTIONS... 1. To get DEFINITIONS of datasheet item;"
180 PRINT "2. To access a TREATMENT PROGRAM; 3. To access the ";
190 PRINT "TRAINING PROGRAM; 4. To go directly to making a DIAGNOSIS;"
200 PRINT "I OPTION: ";
210 INPUT Y$
220 IF LEN(Y$)=1 THEN 200
230 IF ASC(Y$)<49 OR ASC(Y$)>52 THEN 200
240 GO TO VAL(Y$) OF 9000, 270, 245, 380
245 GOSUB 120
250 PRINT "TRAINING PROGRAMS DO NOT EXIST YET."
260 GO TO 10000
270 GOSUB 120
280 PRINT "TREATMENT PROGRAMS DO NOT EXIST YET."
285 GO TO 10000
290 GOSUB 120
300 PRINT "ENTRY REMINDERS;"
310 PRINT "DISPLAY SUMMARY PAGE;"
320 PRINT "SET DIMENSIONS OF diagnostic variables;"
330 PRINT "READ @33:A$;"
340 PRINT A$
350 READ @33:A$
360 INPUT Z$
370 GOSUB 120
380 PRINT A$
390 PRINT A$
400 PRINT " Press RETURN to continue. ";
410 INPUT Y$
420 IF LEN(Y$)<1 THEN 200
430 IF ASC(Y$)<49 OR ASC(Y$)>52 THEN 200
440 GO TO VAL(Y$) OF 9000, 270, 245, 380
445 GOSUB 120
450 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
460 INPUT R$
470 IF R$="N" OR R$="n" THEN 1020
480 IF R$="Y" AND R$="y" THEN 1060
490 GO TO 1070
500 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
510 PRINT "(Y or N): ";
520 INPUT R$
530 IF R$="N" OR R$="n" THEN 1170
540 IF R$="Y" AND R$="y" THEN 1050
550 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
560 PRINT "(Y or N): ";
570 INPUT R$
580 IF R$="N" OR R$="n" THEN 1170
590 IF R$="Y" AND R$="y" THEN 1050
600 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
610 PRINT "(Y or N): ";
620 INPUT R$
630 IF R$="N" OR R$="n" THEN 1170
640 IF R$="Y" AND R$="y" THEN 1050
650 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?
660 PRINT "(Y or N): ";
670 INPUT R$
680 IF R$="N" OR R$="n" THEN 1170
690 IF R$="Y" AND R$="y" THEN 1050
700 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
710 PRINT "(Y or N): ";
720 INPUT R$
730 IF R$="N" OR R$="n" THEN 1170
740 IF R$="Y" AND R$="y" THEN 1050
750 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
760 PRINT "(Y or N): ";
770 INPUT R$
780 IF R$="N" OR R$="n" THEN 1170
790 IF R$="Y" AND R$="y" THEN 1050
800 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
810 PRINT "(Y or N): ";
820 INPUT R$
830 IF R$="N" OR R$="n" THEN 1170
840 IF R$="Y" AND R$="y" THEN 1050
850 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
860 PRINT "(Y or N): ";
870 INPUT R$
880 IF R$="N" OR R$="n" THEN 1170
890 IF R$="Y" AND R$="y" THEN 1050
900 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
910 PRINT "(Y or N): ";
920 INPUT R$
930 IF R$="N" OR R$="n" THEN 1170
940 IF R$="Y" AND R$="y" THEN 1050
950 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
960 PRINT "(Y or N): ";
970 INPUT R$
980 IF R$="N" OR R$="n" THEN 1170
990 IF R$="Y" AND R$="y" THEN 1050
1000 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
1010 PRINT "(Y or N): ";
1020 INPUT R$
1030 P=0
1040 GOSUB 120
1050 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
1060 PRINT "(Y or N): ";
1070 INPUT R$
1080 IF R$="N" OR R$="n" THEN 1170
1090 IF R$="Y" AND R$="y" THEN 1050
1100 PRINT "DO YOU WANT TO REVIEW THE LAST CASE?"
1110 PRINT "(Y or N): ";
1120 INPUT R$
1130 IF LEN(R$)<1 THEN 1110
1140 GO TO 4620
Simulation choice and validity check

SSN entry and validity check

Time/date entry and validity check

Age entry and validity check

(goes to data input subroutine)

Reads and displays datasheet pages

Calls for diagrams for page 2

START DATA ENTRY SUBROUTINE

E & F = coordinates for next input in entry box
C = entry counter

Spaces entries in entry box

SYMPTOM #‘S INPUT

Checks input and displays error message

Validity check

Access conditional probabilities
Flow directors

(to enter graphics)

Calculates running probabilities

Total number of entries counter

REENTRY ROUTINE - resets P(I) to 0 and recalculates probabilities

Flow directors

Calculates final probabilities

Checks for highest probability

Displays choices for clinician's preliminary diagnosis

Verify input

Input and display for "other diagnosis" routine

Does not agree routine

Change option

Diagnoses agree

3320 IF L=5 AND H=113 THEN 7190
3330 IF P(2)=1 THEN 3450
3350 IF Z=5 THEN 3810
3400 GOSUB 8000
3410 P(Z)=1
3412 FOR I=1 TO 5
3414 P(I)=P(1)*B(I)
3415 NEXT I
3418 C3=C3+1
3420 GO TO 3510
3450 GOSUB 8000
3460 MOVE E,F
3465 PRINT " -X"
3470 P(Z)=0
3480 FOR I=1 TO 5
3490 P(I)=P(1)/B(I)
3500 NEXT I
3505 C3=C3-1
3510 IF Z<5 THEN 3410
3520 FOR I=1 TO 5
3530 IF H=113 THEN 3560
3550 NEXT I
3560 FOR I=1 TO 5
3570 P2(I)=P1(I)/SUM(P1)*100
3580 NEXT I
3580 NEXT I
4010 IF H=113 AND L=5 THEN 5000
4020 IF R$="Y" OR R$="y" THEN 5000
4030 PRINT "1. MYOCARDIAL INFARCTION, II. ANGINA, III. NON-SPECIFIC ";
4040 PRINT "CHEST PAIN, IV. PNEUMONIA, V. PNEUMOTHORAX, VI. OTHER"
4050 PRINT "ENTER THE NUMBER OF YOUR PRELIMINARY DIAGNOSIS : ";
4070 INPUT Z$
4080 IF LEN(Z$)<>1 THEN 4060
4090 IF ASC(Z$)<49 OR ASC(Z$)>55 THEN 4060
4100 P(114)=VAL(Z$)
4120 PRINT "ENTER NAME OF OTHER DIAGNOSIS : ";
4130 INPUT Z$
4140 IF "CHEST PAIN program does not consider this disease ";
4150 PRINT "in the differential diagnosis of acute chest pain. ";
4155 PRINT "Press RETURN for " Case Summary Page" ;
4160 PRINT "WILL YOU LIKE TO MAKE ANY CHANGES? (Y or N) : ";
4170 INPUT Z$
4180 GO TO 5000
4190 IF P(114)=P3 THEN 4560
4194 PRINT #32,21:0,64
4200 PRINT "At this time, the computer-generated probabilities D";
4210 PRINT "G NOT AGREE with your preliminary diagnosis. ";
4220 PRINT "However, as of yet, there are no specific categories which";
4250 PRINT "Woud differentiate your preliminary diagnosis from the cu";
4280 PRINT "rent program-generated diagnosis. ";
4290 PRINT "WOULD YOU LIKE TO MAKE ANY CHANGES? (Y or N) : ";
4310 PRINT "Change option"
4320 IF Z$="Y" OR Z$="y" THEN 7010
4350 GO TO 5000
4360 PRI "Press RETURN for 'CASE SUMMARY PAGE'";
4370 INPUT Z$
4380 GO TO 5000
4390 PRINT "Diagnostic agree";
Reconstructs last case

Constructs case summary page

Display history symptoms

Display physical symptoms

Simulated case note (if needed)

Prints out "s for each diagnosis

Draws bargraph

Draws bargraph bars
Display next choice

Display prognosis option if M.I. probability is highest

Verify entry

Flow directors

Update case counter

Construct case memory

Save unit name, case counter, last case and Dx multiples

Access appropriate datafile and writes case memory string onto the end

Flow directors
Subroutine for changes

Graphics to circle data entries

Display 16 definition categories
Input definition choice

9110 INPUT Z$
9120 IF LEN(Z$)<1 OR LEN(Z$)>2 THEN 9100
9130 IF LEN(Z$) THEN 9160
9140 A$=SEG(Z$,2,1)
9150 IF ASC(A$)<48 OR ASC(A$)>57 THEN 9100
9160 A$=SEG(Z$,1,1)
9170 IF ASC(A$)<48 OR ASC(A$)>57 THEN 9100
9180 C=VAL(Z$)
9190 FIND 9
9200 FOR I=1 TO C
9210 READ @33:A$
9220 NEXT I
9230 PRINT A$
9240 IF C<>32 THEN 9100
9250 PRINT @32,21:16,4,32,25
9260 FOR I=4.6 TO 23.6 STEP 0.2
9270 PRINT @32,20:1*$4,(SIN(I)+2.65)*8+19
9280 NEXT I
9290 PRINT 9420
9300 FOR L=1 TO 3
9310 FOR I=1 TO 7
9320 GOSUB 9410
9330 PRINT @32,21:J,K
9340 NEXT I
9350 RESTORE
9360 NEXT L
9370 GO TO 9420
9380 PRINT @32,21:0,46
9390 PRINT USING "8X,FA,35X,FA":"Rales-","-Inspiration"
9400 PRINT USING "4/,54x,fa":"-Expiration"
9410 READ J,K
9420 DATA 25.75,45,28,47,67,47,27.5,46,27,45.5,26.5,46,28.5,47.5
9430 GO TO L OF 9440,9450,9470
9440 RETURN
9450 J=J+49.5
9460 RETURN
9470 J=J+50
9480 RETURN
10000 PRINT @32,21:0,46
10010 PRINT "Press RETURN to continue."*
10020 INPUT Z$
10030 IF Y$="1" OR Y$="2" OR Y$="3" THEN 108
10040 GO TO 9500
10050 END
11000 DELETE 100,10050
11010 FIND 7
11020 CALL "link",100
11030 END
12000 RESTORE
12002 T=0
12004 MOVE 27,90
12005 FOR I=1 TO 36
12006 READ A1,111
12007 NDRAW A1,111
12009 NEXT I
12010 DATA 8,0,0,-7.8,-1.5,9,-13.75,-5,-2.5,-7.10,75,0,-18,-9.6
12020 DATA -9,-6,0,18,-7,-10,75,-5,2,25,9,14,8,1,50.7
12030 DATA 2,-2.5,4,0.2,2.5,0,-7,-4,-2.5,2,-8,-1.5,-3.5
12040 DATA 7.5,-3.75,0,-13.25,0,13.25,4.5,4.75,0,2,0,-2.4,5,-4.75
12050 DATA 0,-13.25,-9,0,9,0,13.25,7.5,3.75,0,3.5
12060 IF T=1 THEN 12110
12070 MOVE 93.5,50
12080 NDRAW 93.5,50
12090 T=1
12100 GO TO 12005
12110 GO TO 3000
Flow directors for graphics to fill in site of pain and radiation

13000 IF Z=21 OR Z=29 THEN 8160
13002 Z=21-15
13005 IF Z=21 THEN 13009
13008 GO TO 21 OF 13015,13070,14010,14090,15050,13060,15155,15100,15100
13009 Z=21-19
13010 GO TO 22 OF 15400,15210,15330,15375
13015 PRINT $32,21:31,79
13020 FOR H=0.25 TO 5 STEP 0.25
13030 PRINT $32,20:35.75-M,74.5-H,35.75-H,60.75-M,31,63.75+H
13050 NEXT H
13060 GO TO 14000
13070 PRINT $32,20:22,64
13072 FOR H=0.25 TO 5.25 STEP 0.25
13073 PRINT $32,20:21.75+H,70.25-H,40.25-H,70.25-H
13074 PRINT $32,20:40.25-H,63.75+H,21.75+H,63.75-H
13075 NEXT H
14000 RETURN

Substernal

14010 PRINT $32,21:35.5,74.25
14020 FOR H=0 TO 3.25 STEP 0.25
14030 PRINT $32,20:40-M,76-M,40,58+M,35.5+M,61+M
14050 PRINT $32,20:40-M,74.25-H
14060 NEXT H
14080 RETURN

Left side

14090 PRINT $32,21:22,58
15000 FOR H=0 TO 3.25 STEP 0.25
15020 PRINT $32,20:21.75+M,63.75-H,78-M,78-H
15030 NEXT H
15040 RETURN

15050 PRINT $32,21:31,64
15060 FOR H=0 TO 3 STEP 0.25
15070 PRINT $32,20:35.5-H,61,26.5-H,61,31,64-H
15080 NEXT H
15090 RETURN

Epigastric

15100 PRINT $32,21:85.5,81.5
15110 FOR H=0 TO 6.75 STEP 0.25
15130 PRINT $32,20:76.5+H,67.5+H,85.5,81.5-N
15140 NEXT H
15150 IF Z=24 THEN 15155
15155 RETURN

Right arm

15160 PRINT $32,21:100.5,81.5
15170 FOR H=0 TO 5.5 STEP 0.25
15170 PRINT $32,20:118.5-H,67.5,113.5+H,65.25+H,106.5+H,76.75-H
15180 PRINT $32,20:109.5+H/12,78-H/12,109.5,81.5-M/5
15185 NEXT H
15200 RETURN

Left arm

15210 PRINT $32,21:85.5,81.5
15220 FOR H=0 TO 6 STEP 0.25
15230 PRINT $32,20:93.5,83-H,97.5-H,81,97.5-H,79,93,74.25+H
15240 PRINT $32,20:85.5-H,78,85.5-H,81.5-H
15250 NEXT H
15270 PRINT $32,21:97.5,81
15275 FOR H=0 TO 6 STEP 0.25
15300 PRINT $32,20:102,74.25+H,97.5+H,79,97.5+H,81
15310 NEXT H
15320 RETURN

Shoulders

40
Graphics to fill in: Neck

\begin{verbatim}
15330 PRINT @32,21:93.5,63
15335 FOR M=0 TO 5 STEP 0.25
15340 PRINT @32,20:93.5-11/5,90-11/5,93.5+M,83+M/7,97.5-11/5,93.5+M,87-5-M,99.5 ,87-5-M, 87-5-M, 93.5+M,83
15350 NEXT M
15360 RETURN
15370 PRINT @32,21:93.5,90
15375 FOR M=0 TO 2.25 STEP 0.25
15380 PRINT @32:20:101.5-M,90,99.5-M,87.5+M,95.5+M,87.5+M,93.5+M,90
15382 NEXT M
15390 RETURN
15400 PRINT @32,21:88.5,63
15405 FOR M=0 TO 2.5 STEP 0.1
15410 PRINT @32,20:88.5-M,63+M
15420 NEXT M
15430 FOR M=0 TO 1.5 STEP 0.1
15440 PRINT @32,20:85.9+M,65.6+M
15445 NEXT M
15450 PRINT @32,20:86,67.5,87.5,67.2,87.5,65.7
15460 PRINT @32,21:106.5,63
15470 FOR M=0 TO 2.5 STEP 0.1
15480 PRINT @32,20:106.5+M,63+M
15490 NEXT M
15500 FOR M=0 TO 1.5 STEP 0.1
15510 PRINT @32,20:109.1-M,65.6+M
15520 NEXT M
15530 PRINT @32,20:109,67.5,107.5,67.2,107.5,65.7
15540 RETURN
16000 GO TO 19 OF 16010,16017,16020,16030,16040,16070
16010 MOVE 0,84
16015 DRAW 6,84
16017 RETURN
16020 MOVE 0,92.2
16025 DRAW 24,92.2
16027 RETURN
16030 MOVE 0,98
16035 DRAW 20,98
16037 MOVE 0,55.5
16038 DRAW 19,55.5
16039 RETURN
16040 MOVE 0,69.5
16050 DRAW 34,69.5
16060 RETURN
16070 MOVE 0,89.5
16080 DRAW 46,89.5
16090 RETURN
\end{verbatim}

Jaw

\begin{verbatim}
Draws arrows to the back

\end{verbatim}

Underlines major headings on
datasheet pages

\begin{verbatim}

41
\end{verbatim}
Program 11 contains three BINARY DATA strings. The first two data strings are the displays for the 'data entry reminders' and the 'summary page', both of which are displayed at the beginning of the diagnostic program. Initial construction of these data strings required input of test 'operators.' String construction was performed by utility programs and entered onto the file as data. They cannot be read out literally since the text operators perform their designated functions when printed. The following two displays are the individual strings as they appear when printed.

**DATA ENTRY REMINDER STRING**

REMEMBER... 1. Use DATASHEETS when entering data.
2. Enter information by CODE NUMBER.
3. Follow each code number with RETURN.
4. RE-ENTER codes to erase.
5. INPUT CHANGES can be made at the END.
6. Press RETURN to go on to next page.

Press RETURN to continue.

**SUMMARY PAGE STRING**

The computer-assisted diagnosis program can aid the Corpsman in differentiating illnesses which represent both the most common and most serious causes of acute chest pain.

The five illnesses which are considered by the computer are MYOCARDIAL INFARCTION, ANGINA, NON-SPECIFIC CHEST PAIN, PNEUMONIA, and PNEUMOTHORAX. Non-specific chest pain is intended to include those cases which are non-surgical, not life-threatening, and, therefore, not reasons for evacuation.

In addition to diagnosis, the chest pain computer program provides probabilities for the occurrence of 3 classes of post M.I. complications. These are: NO PROBLEMS, ARRYTHMIA, and PUMP FAILURE. It also predicts the likelihood of LIFE/DEATH post M.I.
IMPORTANT: Supplemental programs for the prediction of complications and the prediction of life/death are used only with cases of M.I.

THE CORPSMAN'S JUDGMENT MUST TAKE PRECEDENCE when any doubt exists. The computer does not have the capability to think or make the subjective evaluations which are so important in medical diagnosis.

The last character string is the diagnostic database (B$). The diagnostic database has three components; the first (SEG 1 to 3390) contains the datasheet item names and is used to construct the Case Summary Page, the second (SEG 3391 to 4520) contains the conditional probabilities used to compute the diagnostic probabilities as each datasheet item is entered, and the third section contains the datasheet item number display coordinates in ASCII format.

The datasheet item names are contained in 30 character segments. Access to a particular item name merely requires multiplying the item number by 30 and accessing the preceding 30 characters (see lines 5140 & 5200 of the diagnostic program).

The conditional probabilities are in segments of 10 characters; two characters for each diagnostic category. Access to one group of conditional probabilities requires multiplying the item number by 10, adding 3390 (length of datasheet names), and accessing the preceding 10 characters. NOTE: The conditional probabilities cannot be released at this time.

The datasheet item number display coordinates are appended to the end of the conditional probabilities and are in ASCII format and, therefore, not amenable to literal display. Each coordinate is composed of two characters which, when converted to 'real' numbers, are separated by a decimal point to yield the exact location of each datasheet item number on the display screen.
AGE <30
AGE 40-49
AGE 49+
AGE 30-39
DURATION <1HR
DURATION 1-2HR
DURATION 2-4HR
DURATION >4HR
ONSET SUDDEN
ONSET GRADUAL
ONSET SLOW
INTERMITTENT PAIN
CONTINUOUS PAIN
SITE CENTRAL
SITE ACROSS
SITE LT. SIDE
SITE RT. SIDE
RADIATION YES
RADIATION NO
RADIATION TO LEFT
RADIATION TO RIGHT ARM
RADIATION TO SHOULDER
RADIATION TO NECK
RADIATION TO BACK
RADIATION TO JAW
RADIATION TO ARM
RADIATION TO OTHER
NUMBNESS PRESENT
NO NUMBNESS
PAIN MILD
PAIN SEVERE
PROGRESS HOW BETTER
PROGRESS NOW WORSE
MOVEMENT AGGRAVATES
BREATHING AGGRAVATES
SITTING AGGRAVATES
NOTHING AGGRAVATES
NITRO RELIEVES
REST RELIEVES
WALKING RELIEVES
NOTHING RELIEVES
DYSPEA THIS ILLNESS
COUGH THIS ILLNESS
HABITUAL DYSPEA
NO COUGH
HABITUAL COUGH
NAUSEA PRESENT
APPETITE NORMAL
APPETITE DECREASED
BOWELS NORMAL
CONSTIPATION PRESENT
DIARRHEA PRESENT
PREVIOUS CHEST PAIN
CHEST PAIN
PREVIOUS SURGERY
PREVIOUS ILLNESS
TEMP < 98.6
TEMP 98.6-100.2
TEMP >102
PULSE <60
PULSE 60-80
PULSE 81-100
PULSE >100
SYSTOLIC BP <100
SYSTOLIC BP 101-140
SYSTOLIC BP 141-160
SYSTOLIC BP >160
DIASTOLIC BP <70
DIASTOLIC BP 71-90
DIASTOLIC BP 91-100
DIASTOLIC BP >100
MOOD NORMAL
MOOD DISTRESSED
COLOR PALE
COLOR FLUSHED
COLOR CYANOTIC
SWEATING PRESENT
NO SWEATING
SHIVERING PRESENT
NO SHIVERING
JUP NORMAL
JUP ELEVATED
RESP. MOV. NORMAL
RESP. MOV. ABNORMAL
HEART SOUNDS NORMAL
HEART SOUNDS ABNORMAL
PERCUSSION NORMAL
PERCUSSION HYPER-RESONANT
CHEST SOUNDS NORMAL
CHEST SOUNDS RHONCHI
CHEST SOUNDS DECREASED
SGOT <50
SGOT 51-100
SGOT >200
**Program 12 - Datasheet Display Pages Strings**

Program 12 contains the seven datasheet display pages which are presented during data input. These pages are contained in file 12 as binary data and are read and displayed by the diagnostic program. The following displays are the individual character strings as they appear when printed.

### Display Page String #1

**Pain**

<table>
<thead>
<tr>
<th>Duration of Pain:</th>
<th>Onset of Pain:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 hr - (5)</td>
<td>sudden - (10)</td>
</tr>
<tr>
<td>1-2 hr - (6)</td>
<td>gradual - (11)</td>
</tr>
<tr>
<td>&gt;12 hr - (9)</td>
<td></td>
</tr>
</tbody>
</table>

**Time Course of Pain:**

| Continuous - (12)                        |                             |
|                                          |                             |
| Intermittent - (13)                      |                             |

### Display Page String #2

**Site of Pain:**

| Central - (16)                           | LT. Arm - (22)              |
|                                          | Shoulder - (26)             |
| Across - (17)                            | RT. Arm - (23)              |
|                                          | Neck - (27)                 |
| LT. Side - (18)                          | Both Arms - (24)            |
|                                          | Jaw - (28)                  |
|                                          | Back - (25)                 |
|                                          | Other - (29)                |
|                                          | Other - (21)                |

| EpiGastric - (20)                        |                             |
|                                          |                             |
| Other - (21)                             |                             |
NUMBNESS:
YES-----------(30)  NO-------------(31)
SEVERITY OF PAIN:
MODERATE------(32)  SEVERE---------(33)
PROGRESS:
BETTER---------(34)  WORSE----------(35)
AGGRAVATING FACTORS:
MOVEMENT------(36)  COUGH----------(37)  BREATHING------(38)
SITTING-------(39)  OTHER----------(40)  NONE-----------(41)
RELIEVING FACTORS:
NITRO----------(42)  REST----------(43)  WALKING--------(44)
OTHER---------(45)  NONE----------(46)

DYSPNEA:
NO-------------(47)  THIS ILLNESS--(48)  HABITUAL-------(49)
COUGH:
NO-------------(50)  THIS ILLNESS--(51)  HABITUAL-------(52)
NAUSEA:
YES-----------(53)  NO-------------(54)
VOMITING:
YES-----------(55)  NO-------------(56)
APPETITE:
NORMAL-------(57)  DECREASED------(58)
BOWELS:
NORMAL-------(59)  CONSTIPATED--(60)  DIARRHEA---------(61)
MOOD:
NORMAL----(86) ANXIOUS-----(87) DISTRESSED-(88)

COLOR:
NORMAL----(89) PALE----------(90) FLUSHED-----(91) CYANOTIC--(92)

GENERAL EXAMINATION
SWEATING:
YES-------(93) NO-----------(94)

SHIVERING:
YES-------(95) NO-----------(96)

JUGULAR VENOUS PULSE:
NORMAL-----(97) RAISED------(98)

RESPIRATORY MOVEMENT:
NORMAL-----(99) ABNORMAL----(100)

PAST HISTORY
PREVIOUS CHEST PAIN:
YES-------(62) NO-----------(63)

PREVIOUS CARDIO-RESPIRATORY ILLNESS:
YES-------(64) NO-----------(65)

PREVIOUS MAJOR SURGERY:
YES-------(66) NO-----------(67)

VITAL SIGNS

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>PULSE</th>
<th>BLOOD PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;98.6-(68)</td>
<td>&lt;60-(72)</td>
<td>systolic &lt;100-(76)</td>
</tr>
<tr>
<td>98.6-100.2-(69)</td>
<td>60-80-(73)</td>
<td>100-120-(77)</td>
</tr>
<tr>
<td>100.3-102---(70)</td>
<td>81-100-(74)</td>
<td>121-140-(78)</td>
</tr>
<tr>
<td>&gt;102---(71)</td>
<td>&gt;100-(75)</td>
<td>141-160-(79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;160-(80)</td>
</tr>
</tbody>
</table>
DISPLAY PAGE STRING #7

GENERAL EXAMINATION (cont'd)

HEART SOUNDS:
  NORMAL--(101)    ABNORMAL--(102)

PERCUSSION:
  NORMAL--(103)    DULL----- (104)    HYPER-RESONANT--(105)

CHEST SOUNDS:
  NORMAL--(106)    RHONCHI---(107)    RALES----- (108)    DECREASED--(109)

SGOT:
  <50----- (110)    51-100----- (111)    101-200----- (112)    >200------- (113)
PROGRAM 13 - NAME, CASE COUNTER, LAST CASE MEMORY

PROGRAM 13 allows space for the name of the boat to which the tape belongs (N$; at the present time, the name has been set to NAVSUBMEDRSCHLAB), the case counter (Q), and the 'last case' stored as J$. The name is a string 50 characters long and is accessed by 'READ@33:N$'. The case counter is an 8 column array where Q(1) through Q(5) represent the number of cases of each category which have been placed into memory as either simulated or real cases. Q(7) and Q(8) represent the number of real and simulated cases, respectively. The Q array must be dimensioned to 8 before reading. The last case is stored after Q as a 147 character string (refer to lines 6050 - 6189 for segmental listing), J$.

PROGRAMS 14 THROUGH 27 - DATAFILES

PROGRAMS 14 through 27 allow space for all cases which are placed into memory. Each datafile is 'primed' with the name of the research laboratory (NAVSUBMEDRSCHLAB) as a 50 character string and each case run on the diagnostic program is sequentially added to each file to a maximum of 40 cases in each file. After the 40th case, the next case is entered onto the next datafile. If all datafiles become full (containing 560 cases), data will no longer be entered onto datafiles but will still be entered into file 13 as the 'last case'.
3.2 THE PROGNOSTIC PROGRAM (PROGRAM 7)

The prognostic program calculates probabilities that a patient suspected of MYOCARDIAL INFARCTION will develop one of three kinds of problems (No problems, Arrhythmia, and Pump failure) and the likelihood that the same patient will live or die even if placed in a hospital.

The user accesses the prognostic program by way of the chest pain diagnostic program (Program 10). The chest pain diagnostic probability must be highest for MYOCARDIAL INFARCTION before the user is given the option to obtain prognostic probabilities.

On the following pages the program is reproduced with some notes to aid in understanding the flow of the program. The line demarcations below serve to provide additional information regarding program organization.

<table>
<thead>
<tr>
<th>LINES</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 410</td>
<td>Sets variables and calculates probabilities for problems using symptom profile from diagnostic program</td>
</tr>
<tr>
<td>420 - 910</td>
<td>Case summary page construction</td>
</tr>
<tr>
<td>912 - 1040</td>
<td>Resets variables, display additional symptom page</td>
</tr>
<tr>
<td>1045 - 1250</td>
<td>Additional data input subroutine</td>
</tr>
<tr>
<td>1265 - 1790</td>
<td>Calculates probabilities for live/die prognosis, goes to case summary page and draws bar graph</td>
</tr>
<tr>
<td>1792 - 1910</td>
<td>Augments case memory string with additional symptoms, saves it in data file and then offers choices for next interaction</td>
</tr>
<tr>
<td>5000 - 5050</td>
<td>Calculates running probabilities</td>
</tr>
<tr>
<td>8000 - 9020</td>
<td>Draws circle or 'X' for input page</td>
</tr>
</tbody>
</table>
SET INITIAL VALUES

Access data file and read data strings

Calculates conditional probabilities for problems

Calculates final probabilities for problems

Displays headings for display

Graphics for display page

Display history and physical exam symptoms

Prints "simulated case" when required

Prints out % probabilities for problems

Graphics for bargraph
Prints out bargraph and footnote for problems

Resets variables for live/die calculations

Display page for additional symptom input

Additional symptom # input and validity check

Extracts live/die probabilities from L$

Flow directors

Calculates final probabilities for live/die
Prints history symptoms for live/die display

1410 FOR I=1 TO 67
1420 IF P(I)=0 THEN 1510
1430 Z$=SEG(B$,(I-1)*30+1,30)
1450 Q$=SEG(L$,30*(I-1)+1,2)
1470 IF Q$="00" THEN 1490
1480 PRINT "*";Z$
1484 GO TO 1510
1490 PRINT "*";Z$
1510 NEXT I
1511 FOR I=1 TO 8
1512 IF P6(I)=0 THEN 1515
1513 Z$=SEG(B$,(I-1)*30+1,30)
1514 PRINT "*";Z$
1515 NEXT I
1519 PRINT 032,21:0,83
1520 FOR I=68 TO 113
1530 IF P(I)=0 THEN 1620
1540 Z$=SEG(B$,(I-1)*30+1,30)
1560 Q$=SEG(L$,30*(I-1)+1,2)
1580 IF Q$="00" THEN 1600
1590 PRINT USING "$T,FA,FA";"*";Z$
1595 GO TO 1620
1600 PRINT USING "$T,FA";Z$
1620 NEXT I
1623 PRINT
1630 IF Q$="N" OR Q$="n" THEN 1660
1640 PRINT 032,21:32,8,15.7
1650 PRINT "SIMULATED CASE"
1660 PRINT 032,21:2,4,11.5
1670 IMAGE 10D.1D,"$",21D.1D,"$"
1680 PRINT USING 1670:D(1),D(2)
1690 PRINT "DIE EVEN IN HOSPITAL"
1700 GO TO 720
1710 PRINT "DIE LIVE"
1715 J1=0.75
1720 FOR I=1 TO 2
1730 IF D(I)<1 THEN 1785
1740 PRINT 032,21:97.4+J1*8,52
1750 FOR K=0 TO 2.64 STEP 0.33
1760 PRINT 032,20:97.4+J1*6+K,52+D(I)*0.4
1770 PRINT 032,20:97.6+J1*8+K,52+D(I)*0.4,97.6+J1*8+K,52
1780 NEXT K
1785 J1=J1+1.25
1790 NEXT I
1792 FOR I=1 TO 8
1794 T$=CHR(P6(I))
1796 J$=J$&T$
1798 NEXT I
1800 PRINT "J$J$HEX INTERACTION. Obtain definition ITI";
1810 PRINT 1119". Another diagnosis"
1820 PRINT "ITI. End interaction"
1821 FIND 13
1822 WRITE H$,Q,J$,P4
1823 CLOSE
1824 IF Q(7)+Q(8)>560 THEN 1835
1825 FIND 14+INT((Q(7)+Q(8))/40)
1826 ON EOF (0) THEN 1829
1827 READ D33;Z$
1828 GO TO 1827
1829 WRITE JS
1830 CLOSE

Prints physical symptoms for live/die display

Prints "simulated case" when appropriate

Prints live/die probabilities

(Graphics for bargraph)

Draws bargraph

Adds additional symptom input to case memory string

Display next interaction choices

Saves updated case counter and updated case memory string
Interaction choice input and validation check

1835 PRINT "_IIIHRCHOICE: 0";
1840 INPUT Y$;
1850 IF LEN(Y$)<1 THEN 1830
1860 IF ASC(Y$)<49 OR ASC(Y$)>52 THEN 1830
1870 IF Y$="4" THEN 1900
1880 IF Y$="1" OR Y$="2" THEN 9000
1881 Y$="4"
1882 GO TO 9000
1900 PAGE
1910 END

Flow directors

5000 IF P6(Z)=1 THEN 5040
5010 P6(Z)=1
5020 A6=A6/(V1/W1)
5030 RETURN
5040 A6=A6/(V1/W1)
5045 P6(Z)=0
5050 RETURN

Calculates running propabilities for alive/die

8000 Z$=SEG(L$,(Z-1) *4+485,1)
8010 V=ASC(Z$)
8020 Z$=SEG(L$,(Z-1) *4+486,1)
8030 V=V+ASC(Z$)/100
8040 Z$=SEG(L$,(Z-1) *4+487,1)
8050 W=ASC(Z$)
8060 Z$=SEG(L$,(Z-1) *4+488,1)
8070 W=W+ASC(Z$)/100
8080 IF P6(Z)=1 THEN 8170
8100 FOR K=1 TO 3
8110 HsH+0.25
8120 PRINT @32,21:V-3.4,W-0.65
8130 PRINT @32,20:V-3.4,W+1.85,V-0.9,W+3.35,V+2.1,W+3.35,V+4.6,W+1.85
8140 PRINT @32,20:V+4.4,W+5,V+4.6,W+4.8,V-3.2,W-3.1,V-3.4,W-2.9,V+4.4,W-3.1
8150 FOR K=1 TO 3
8160 NEXT K
8170 RETURN

Finds coordinates for drawing hexagrams

6000 IF P6(Z)=1 THEN 6170
6100 FOR K=1 TO 3
6110 W=W+.25
6120 PRINT @32,21:V+0.4,W+1
6130 PRINT @32,20:V+4.4,W+5,V+4.6,W+4.8,W-3.2,W-3.1,W-3.4,W-2.9,W+4.4,W-3.1
6140 PRINT @32,20:V-3.4,W+4.8,W-3.2,W+5,V+4.6,W-2.9,V+4.4,W-3.1,V+0.4,W+1
6150 RETURN

Draw hexagram around symptom numbers

9000 DELETE 100,8999
9005 DELETE C$,P$,L$,P7,P5,P6,D2
9010 FIND 10
9020 CALL "LINK",240

Clears memory and returns to diagnostic program

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Program 8 contains three binary data strings (C$, P$, L$). The first string contains probabilities for the calculation of prognostic problems (No problems, Arrhythmia, and Pump failure). The probabilities are stored in segments of 6 characters; two characters for each problem category. The conditional probabilities cannot be released at this time.

The second string (P$) contains one display page string. This page requests data from the user for three additional symptom categories. The user's responses are employed in the calculation of probabilities that the patient will live or die even if placed in a hospital.

DISPLAY PAGE STRING
LIFE/DEATH Probabilities:

BODY BUILD:
NORMAL----(1)       OBESE-----(2)

CORPSMAN OPINION OF PATIENT'S CONDITION:
GOOD------(3)      DUBIOUS-----(4)       POOR------(5)

DURATION OF PAIN (refined):
<6 HR------(6)       6-24 HR-----(7)       >24 HR-----(8)

The third string (L$) contains conditional probabilities for the calculation of live/die probabilities (conditional probabilities cannot be released at this time), symptom names used by the program, and coordinates that identify the location of item numbers on the display page. Each coordinate is composed of two characters which, when converted to 'real' numbers are separated by a decimal point to yield the exact location of each datasheet item number on the display screen.
SECTION 4 - REFERENCES

## Computer Assisted Diagnosis of Chest Pain - PRELIMINARY MANUAL

### Title (and Subtitle)

Computer Assisted Diagnosis of Chest Pain - PRELIMINARY MANUAL

### Author(s)

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### Abstract

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs, in the style of the computer-assisted diagnosis program for acute abdominal pain, to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. The purpose of the present report is to summarize and document the progress to date on the computer-based (cont'd)
diagnostic program for chest pain. The disorders considered are: myocardial infarction, angina, pneumonia, pneumothorax, and non-specific (non-life-threatening) chest pain. A very preliminary version of outcome of M.I. (myocardial infarction) is also presented.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.