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Computer assisted strabismus/amblyopia diagnosis

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Abstract

Computer assisted strabismus/amblyopia diagnosis

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COMPUTER ASSISTED STRABISMUS/AMBLYOPIA DIAGNOSIS

by

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COMPUTER ASSISTED STRABISMUS/AMBLYOPIA DIAGNOSIS

INTRODUCTION

The use of computers in medical diagnosis has been a controversial topic. Schartz[1] identified some common physician complaints of computer diagnosis: patient dehumanization, time consuming, removing the art from clinical diagnosis, and that the numbers obtained are meaningless guesses. Proponents of computer diagnosis counter these arguments by claiming decreased diagnosis time, more doctor-patient communication due to the emphasis on case history, and the use of the computer as a diagnostic tool which "assists" the physician in a final diagnosis.[2,3] With these latter goals in mind, this thesis will attempt to aide in the diagnosis of strabismus and amblyopia using a computer data base linked to a signs and symptoms retrieval program. The program will have two functions: (1) Description of types of strabismus/amblyopia diagnosis via input of diagnosis number, and (2) Signs and symptom input resulting in the search and retrieval of tentative diagnosis. This is a data retrieval system and assigns no weighting to the tentative diagnosis. We intend that the program be used as an aide to clinical diagnosis and an educational device in the study of strabismus/ amblyopia. The final diagnosis should result from the physician's experience, knowledge, intuition, and assessment of clinical findings.

LITERATURE REVIEW

In 1959 Ledley and Lusted[4] laid the foundations for computer diagnosis with their discussion of reasoning processes and how these could be automated. They stressed the idea that probabilistic concepts are inherent in diagnosis and that assigning a numerical likelihood to each disease was very beneficial in a differential diagnosis.

Bayes' theorem, a statistical formula, was incorporated for the first time in computer diagnosis in 1961 by Warner, et al,[5] and is currently being used extensively in computer diagnosis. A recently published article by Wagner, et al[6] lists approximately 600 references on computer diagnosis with 219 of them using Bayes' theorem. Bayesian models are currently being used in cardiology,[7] endocrinology,[8] nephrology,[9] and many more in general medicine. Ophthalmology is included in this list with their first system designed by Fritz, et al.[10] In 1978 one of the most extensive systems for computer diagnosis was developed by Weiss, et al[11] in the field of glaucoma consultation.

Programs utilizing the Bayes model rely on large data bases which include a large number of reliably diagnosed case histories and are performed with a very standardized set of findings and observations. Once the findings have been put into the computer the Bayes theorem provides the means of determining how likely each disease is, given the inputted signs, symptoms, and lab results. Computer assisted programs using the Bayesian model have proven successful in limited fields such as acute abdominal pain. The computer team is claiming 92% accuracy in diagnosis compared to the 80% accuracy found in senior clinicians.[3] However, when computer diagnosis is applied to a broader range of ailments the clinical

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staff obtains a higher accuracy. This was shown in the Internist-1 program used to diagnose general internal medical problems.[12] Limitations to this system are most frequently caused by omission, incomplete knowledge of the subject matter and the constant use of value judgement by the clinician. The Bayesian model also does not conveniently allow for the possibility of multiple diseases in the same patient or the representation of non-independence of symptoms with a disease.

The National Library of Medicine in Bethesda, Md. has developed a prototype of a hepatitis knowledge base which consists of huge bodies of text over a wide range of medical problems. This data base type of system is designed to provide the clinician with more information and at a faster rate than reference material. The information available includes signs and symptoms, etiology, synonyms, and laboratory and pathology data for a named disease. In the field of pharmacology the following would be given: contra-indications, pharmacokinetics, and drug interactions.

The convenience and increased ability to provide a faster and more complete diagnosis with the aid of a computer is rapidly coming into day-to-day use. At the present time the A.M.A. and G.T.E. are inaugurating the first nationwide electronic medical-health information system which will be available to the physician with a computer terminal.[13] Most researchers are in favor of this type of system on the premise that if the physician does not think of the correct diagnosis, he cannot make it. A useful computer system can provide a list of possible diagnoses or symptoms once the proper correlate has been introduced.

The ultimate goal of diagnosis computer advocates is artificial intelligence systems. The computer would be fed pertinent data (signs, symptoms, case history, etc.), analyze the data, decide the best course of management, and be able to explain how it arrived at its decision. These decisions are made by either algorithmic or heuristic methods of reasoning. At the present time this level of program is in the proto-type phase, and a viable artificial intelligence program has yet to be written. This type of program is more likely to be accepted by physicians since it goes beyond "black box" computing by explaining its reasoning, and like the physician, it increases its knowledge base by the outcome of previous cases. A drawback to this type of system is the expense of the hardware needed for artificial intelligence programs. This can be cir-cumvented by linking to a large computer via an office terminal.

Relative to other areas of medicine, little use of computer assisted diagnosis has occurred in ophthalmology, even though ophthalmol-ogical diagnosis lends itself to such techniques.[10] Many eye diseases can be subdivided into mutually exclusive categories simply by anatomical location, and ophthalmological measurements are often more precise than other clinical scales. Ophthalmological pathology programs have been designed for glaucoma consultation,[11] the differential diagnosis of leukocoria,[2] retinoblastoma diagnosis,[14] and differential diagnosis of ocular disease.[10] Programs applying to strabismus/amblyopia have been limited to ocular motility analysis,[15] and strabismus surgery selection.[16] Neither of these programs have application to optometric practice due to the nature of diagnosis and treatment of strabismus/amblyopia by ophthal-mology.

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The authors were unable to find reference to computerized diagnosis of strabismus/amblyopia in the optometric literature. Furthermore, the only optometric computer assisted diagnostic program known to the authors was created by Harry Wiessner and Jim Mayer as an aid in pathology diagnosis.

METHODOLOGY

The program is an adaptation of an existing pathology search program created by Harry Wiessner and Jim Mayer as a fourth year thesis project at Pacific University College of Optometry. The following characteristics will be found in the program:

1. The tentative diagnoses will differ by at least one sign or symptom.

2. The tentative diagnosis will be listed with no reference to probability (as in a Bayesian type program).

3. When entering data there will be no need to enter a symbol more than once.

4. Symptoms and signs will have codes, but to minimize errors the program will display the entire alphanumeric value.

5. Illegal sign and symptom codes will be detected and screened out.

6. A dictionary of signs and symptoms and their proper code numbers will be included in the program.

7. Each diagnosis will contain a description of occurance, signs/ symptoms, differentiation, treatment, prognosis, and references.

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PROGRAM DESCRIPTION

The computer program which follows is a modification of the
Computer Assisted Ocular Pathology Search program written by Harry Wiessner
and Jim Mayer. Minimal changes were necessary to adapt their program for
strabismus/amblyopia diagnosis. The program is written in BASIC computer
language for an 80 character screen, and requires 16128 bytes of internal
memory. The data files can be stored using about 100,000 bytes of disc
space. Fifty-six dysfunction descriptions and 159 signs/symptoms are stored
on disc space.

The program consists of two sections. The first section (lines
10 to 5940) involves loading, listing, and editing of the three data files.
The second section (lines 6100 to 12860) involves the data search,
retrieval, and output. A more detailed description of these sections
follows.

Section one is separated from section two at the beginning of
the program by choosing a 1 or 2. Within section one, three data files
are utilized to store signs/symptoms, dysfunction data and descriptions.
The sign/symptom file contains abbreviated s/s names (up to 16 characters
long) and the corresponding s/s number. This file is used as a check of
inputted s/s data by printing the abbreviated s/s name opposite to each
s/s number that a program user inputs. The s/s number is also the file
number where the abbreviated s/s name is located. The string variable E$
is used to input s/s terms of 16 characters or less. These characters are
followed by a negative sentinal which makes the total number of bytes per
record equal to 17.

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The second file is the data file. It contains information about each dysfunction and about the entire program. Dysfunction data is listed starting with record number five. The first two records contain variables describing the size, and dimension values of the stored data. The third and fourth records are empty, in case a future need for storage space arises.

Variables in the first two records have the following functions:

M5-- File number of the highest numbered dysfunction listed in the dysfunction description file. Used to keep file access within the proper range of file numbers.

F2-- Greatest number of signs/symptoms that a program user can input in one search sequence (program adds one more character for the negative sentinal value, which indicates the end of a string). Fifteen is the value used, but the user can choose any number wished. The greater the number chosen, the more storage space and running time is required.

F3-- Greatest number of s/s that can be contained in a data file for a dysfunction. This includes the negative sentinal value and the heating values. Thirty would be large enough to store the presently listed data.

F, F1, F4, F5-- These variables all have the same value and are used to dimension arrays in the search section of the program. The dimension for these is presently set at F2/3*M5 or 300. This value should be large enough, but can easily be changed if more than 5 matches per dysfunction are frequently encountered.

A4-- Data file number where first dysfunction number is found. Since the

    first four data file numbers are reserved, the first dysfunction (#1)

    is found on data file number 5.

A5-- Greatest data file number (highest dysfunction number +4).

A6-- Lowest s/s file number.

A7-- Greatest s/s file number.

A8-- Lowest description file number.

A9-- Greatest description file number.

        Variables from the fifth record on contain information about each dysfunction. The first line contains numeric values corresponding to specific variables. These variables have the following functions:

D-- Dysfunction number.

M1-- Lowest s/s number in this dysfunction.

M2-- Highest s/s number in this dysfunction.

M3-- Total number of s/s listed for this dysfunction, including the negative sentinal value.

D1-- Record number which contains the first line of this dysfunction in the dysfunction description file.

D2-- Record number which contains the last line of this dysfunction in the dysfunction description file.

        The next lines contain numbers decoded into a string (Y$) which represent heading positions and s/s numbers. Heading positions are indicated by the first six numbers decoded into Y$. These headings are cause, onset, signs/symptoms, differentiation, treatment, and prognosis. Numbers following these six are s/s numbers in numerical order followed by the negative sentinal. All numbers in these lines can be up to four digits in length. Headings can be removed from the description printout by

assigning a zero value instead of the usual heading number. The headings name, and references cannot be removed, and appear always at the first and last line of the dysfunction description respectively. The data file from the fifth record on has the following format:

Dysfunction number ---- D, M1, M2, M3, D1, D2

Y$ (sectioned to fit the page). First six numbers are heading locations.

The description file is the third disc file. It presently is storing 56 descriptions and is accessed by the user for a short review of these dysfunctions. Input to this file is limited to 49 characters per line. References must fit on the last line, therefore one or two capital abbreviations are used to indicate the reference.

Section two of the program (lines 6100 to 12860) is the search portion, which the typical user will be more involved with. After the user chooses a 2, indicating he/she wishes to enter the search section, another choice will be made between running a symptom search or listing a specific dysfunction.

The symptom search begins by inputting the patient's name and age. The user then inputs s/s numbers chosen from the s/s list, and follows the last number by a zero to indicate the last s/s. Up to 15 s/s numbers may be entered. The computer checks to see if any numbers are identical, then prints abbreviated s/s names (from the s/s file) opposite the entered s/s number. This allows the user to check for proper input. The computer then internally orders the s/s numbers from least to greatest.

Next the user is asked to choose the minimum number of s/s to identify within each disease data file. For example, if three is chosen then at least three of the above entered s/s numbers must be contained in

a dysfunction before it will be listed. The larger the number, the more specific the search will be.

Now the computer checks each data file to see if the range of s/s input numbers overlaps the data file range. If an overlap occurs the data for that dysfunction is searched.

The search routine uses two arrays which have been ordered from least to greatest. Array "P" is the input numbers and array "L" is data file numbers. Each s/s number matched between arrays is stored in array "C" and the number of the dysfunction being searched is placed in array "B". The number of matches is recorded in array "G", and the number of the dysfunction matched in array "H".

Next, array "G" is ordered from greatest to least to enable the dysfunction with the greatest number of matches to be listed first. The program then finds all s/s matches which were tagged in only one dysfunction.

The user now receives a printout of the search. The signs tagged are listed from greatest to least. Dysfunction numbers and names within a group of equally tagged dysfunctions are listed from least to greatest. S/s matched to only one dysfunction are listed below the disease name.

Now the user can change the minimum number of signs to identify and rerun the search, obtain a description of any dysfunction listed, obtain another search printout, or end the program. Descriptions are obtained by inputting the appropriate dysfunction number.

DYSFUNCTION LIST

Esotropia

Exotropia

Non-Paralytic Overtones

SIGNS/SYMPTOMS
Numerical Listing

1. Sudden diplopia
2. Deviation at near = far
3. Deviation increases with age
4. Deviation greater than 40 pd
5. Forced duction test negative
6. Alternating deviation
7. Fusional amplitude low
8. Accommodative amplitude low
9. Orthophoria at near
10. Deviation at near greater than far
11. Deviation between 20-40 pd
12. AC/A low
13. Suppression
14. Deviation at near less than far
15. Fusional divergence low
16. Myopia, 1-5 diopters
17. Myopia, .5-10 diopters
18. Low abduction
19. Diplopia
20. Myopia, greater than 10 diopters
21. Adduction excessive
22. Limited ocular mobility in all gazes
23. Emmetropia
24. Hyperopia, 0-2 diopters
25. Hyperopia, 2-5 diopters
26. Amblyopia
27. Eccentric fixation
28. Vertical tropia
29. Retinoblastoma
30. Cross fixation during lateral gaze
31. Anomalous retinal correspondence
32. Latent nystagmus
33. AC/A high

34. "A" pattern

35. "V" pattern

36. Unilateral deviation

37. Constant deviation

38. Variable deviation

39. Intermittent diplopia

40. Bifocal correction has no effect

41. Miotics have no effect

42. Concomitant deviation

43. History of EOM surgery

44. Relative foveal scotoma

45. Esotropia

46. Pendular vertical movements of occluded eye

47. Excycloduction of non-fixating eye

48. Dissociation with red lens

49. Bilateral deviation

50. Deviation = during lateral gazes

51. Upturn of eye during adduction

52. Hypertropia OS during dextroversion

53. Hypertropia OD during levoversion

54. Increased field of fixation in nasal quadrant

55. Diplopia during horizontal gaze

56. Compensatory head turn

57. Cyclotropia

58. Excyclotropia

59. Compensatory head tilt

60. Downturn of eye during adduction

61. Increased rotation of eye in field of action of SO

62. Subjective incyclotropia

63. Exotropia

64. Hyperopia, greater than 5 diopters

65. Anisometropia

66. Microtropia

67. Hyperopia

68. History of occlusion

69. Astigmatism, high, uncorrected

70. Decreased duction in field of IR

71. Decreased duction in field of SO

72. Decreased duction in field of SR

73. Decreased duction in field of IO

74. Fixation with unaffected eye

75. Pseudo Graefe sign (lid elevation during downgaze)

76. Widening of palpebral fissure during adduction

77. Narrowing of palpebral fissure during abduction

78. Pupil fixed and dilated

79. Globe retraction during adduction

80. Ptosis

81. Objective cyclotropic deviation

82. Past pointing

83. Widening of palpebral fissure during abduction

84. Dolls head phenomena absent

85. Narrowing of palpebral fissure during adduction

86. Upturn of eye limited during adduction

87. Compensatory chin tilt

88. Limited lateral ocular mobility

89. Tongue palsy

90. History of mental retardation

91. Deafness

92. Ectropion

93. History of hydrocephalus and increased intracranial pressure

94. Discordant nystagmus

95. Pupil constriction as strabismus increases and nystagmus decreases

96. Pseudoparalysis of lateral recti

97. Downturned fixation bilaterally

98. History of familial occurence

99. Eyes straighten during anesthesia

100. Refractive error factor insignificant

101. Cyclic bouts of esotropia (24,48,76,92 hours)

102. Intermittent deviation

103. Inferior oblique overaction

104. Blind spot syndrome

105. Hypertropia of non-fixating eye

106. Cyclotropia of non-fixating eye

107. Deviation uncorrected by near spectacle Rx

108. Deviation corrected by distance spectacle Rx

109. Rotation of foveola

110. Esotropia at far

111. Esophoria at near

112. Mixed accommodative and non-accommodative signs

113. Deviation corrected by near spectacle Rx

114. Incomitant deviation

115. Stereoacuity decreased

116. Deviation between 0-5 pd

117. Deviation increases during fatigue

118. Hypertropia in non-fixating eye

119. Vertical tropia rare during primary gaze

120. Deviation maximum during abduction

121. Bielschowsky's head tilt test positive

122. Increased vertical tropia during vertical gaze

123. Asymmetric deviation

124. Low adduction

125. Overaction of all 4 obliques

126. Media opacities

127. Myopia of amblyopic eye

128. Nystagmus

129. No detectable pathology

130. Paretic cyclovertical tropia

131. Cyclotropia unchanged during monocular/binocular transition

132. Asthenopia

133. Deviation OD = OS

134. Diplopia uncrossed at 2-3 meters

135. Fusion at 50-60 cm

136. Retraction and adduction of globe during upgaze

137. Pupil reacts to convergence and adduction

138. No subjective cyclotropia

139. IO overaction during fixation with non-paretic eye

140. Ametropia greater in affected eye
141. History of congenital ocular anomaly
142. Diplopia during adduction
143. Forced duction test positive
144. Increased vertical tropia during adduction
145. Increased visual acuity during adduction
146. Increased nystagmus during abduction
147. Fixation with adducting eye
148. Fibrosis of all EOMs
149. Disrupted convergence during superior and lateral gaze
150. Fixed deviation at all distances
151. History of emotional anomalies
152. Diverging anatomical characteristics
153. Unilateral blindness
154. Occlusion and +3.00 diopter sphere tests positive
155. Abduction excessive
156. NPC receded
157. Convergence excess
158. Divergence insufficiency
159. History of physical trauma

SIGN/SYMPTOM LIST

CATEGORICAL

Case History

Ocular History of:

General Health History of:

External/Internal Exam

Refractive Status

Deviation

Type:

Motility Anomalies

Fixation Anomalies

Diplopia

Test Results

1. SUDDEN DIPLOPIA	34. A PATTERN
2. DEV @ N=F	35. V PATTERN
3. DEV INC W AGE	36. UNILAT DEV
4. DEV >=40 PD	37. CONSTANT DEV
5. F DUCT TEST -	38. VARIABLE DEV
6. ALT DEV	39. INT DIPLOPIA
7. FUS AMP LOW	40. BIF CORR NO EFF
8. ACC AMP LOW	41. MIOTIC NO EFF
9. ORTHOPHORIA @ N	42. CONCOM DEV
10. DEV @ N>F	43. HX EOM SURG
11. DEV 20-40 PD	44. REL FOVEAL SCOT
12. AC/A LOW	45. ESOTROPIA
13. SUPPRESSION	46. PEND VERT MOV
14. DEV @ N<F	47. EXCYCLO NON FIX
15. FUS DIV LOW	48. DISS W RED LENS
16. MYOPIA 1-5 D	49. BILAT DEV
17. MYOPIA 5-10 D	50. DEV = LAT GAZ
18. LOW ABDUCTION	51. UPTURN DUR ADD
19. DIPLOPIA	52. HYPT L DEXTROV
20. MYOPIA >10 D	53. HYPT R LEVOV
21. ADD EXCESS	54. INC FIELD FIX
22. LIM MOB ALL GAZ	55. DIP HOR GAZ
23. EMMETROPIA	56. COMP HEAD TURN
24. HYPEROPIA 0-2 D	57. CYCLOT
25. HYPEROPIA 2-5 D	58. EXCYCLOT
26. AMBLYOPIA	59. COMP HEAD TILT
27. ECC FIX	60. DOWNTURN W ADD
28. VERT TROPIA	61. INC ROT FIELD SO
29. RETINOBLASTOMA	62. SUBJ INCYCLOT
30. CR FIX LAT GAZ	63. EXOTROPIA
31. ARC	64. HYPEROPIA >5 D
32. LAT NYSTAG	65. ANISOMETROPIA
33. AC/A HIGH	66. MICROTROPIA

67. HYPEROPIA

68. HX OCCLUSION

69. ASTIG HIGH UNCOR

70. DEC DUCT IR

71. DEC DUCT SO

72. DEC DUCT SR

73. DEC DUCT IO

74. FIX W UNAFF EYE

75. PSEUDO GRAEFE

76. WID PALP FIS ADD

77. NAR PALP FIS ABD

78. PUPIL FIX DIAL

79. GLOBE RET ADD

80. PTOSIS

81. OBJ CYCLOT DEV

82. PAST POINT

83. WID PALP FIS ABD

84. DOL HEAD PHEN -

85. NAR PALP FIS ADD

86. UPTURN LIM ADD

87. COMP CHIN TILT

88. LIM LAT MOB

89. TONGUE PALSY

90. HX MENT RETARD

91. DEAFNESS

92. ECTROPION

93. HX HYDRO @ INC ICP

94. DISCORD NYSTAG

95. P CON STRAB INC

96. PSEUDO LR

97. DOWNTURN FIX BIL

98. HX FAM OCC

99. STRAIGHT W ANEST

100. REF ERR INSIG

101. CYCLIC ESOT

102. INT DEV

103. INF OBL OVER

104. BLIND SPOT SYN

105. HYPERT NON FIX

106. CYCLOT NON FIX

107. DEV UNCOR N SRX

108. DEV COR DX SRX

109. ROT OF FOVEOLA

110 ESOT @ F

111. ESOPHORIA @ N

112. MIX ACC & NONACC

113. DEV COR N SRX

114. INCOMITANT

115. DEC STEREO

116. DEV 0-5 PD

117. DEV INC FAT

118. HYPERT W NON FIX

119. VERT TROP RARE

120. DEV MAX ABD

121. BIELSCHOWSKY +

122. INC VERT VERT

123. ASYM DEV

124. LOW ADD

125. OVERACT 4 OBL

126. MEDIA OPAC

127. MYOPIA AMBLYO

128. NYSTAGMUS

129. - PATH

130. PARETIC CYCLOV T

131. CYCLOT UNCHANG

132. ASTHENOPIA

133. DEV OD =OS

134. DIP UNCROS 2-3 M

135. FUSION 50-60 CM

136. RETRACT & ADD GLOB

137. PUP RXN CONV & ADD
138. -SUBJ CYCLOT
139. IO OVERACT FIX
140. INC AMETROPIA
141. HX CONG OC ANOM
142. DIPLOPIA W ADD
143. FORCE DUCT T+
144. INC VERT T ADD
145. INC VA ADD
146. INC NYSTAG ABD
147. FIX ADD EYE
148. FIBROSIS ALL EOM
149. DISRUPT CONV S&L
150. FIX DEV@ALL DIST
151. HY EMOTION ANOM
152. DIV ANAT CHAR
153. UNILAT BLIND
154. OCC&3D TEST+
155. ABD EXCESS
156. NPC RECEDED
157. CONV EXCESS
158. DIVER INSUFF
159. HX PHYS TRAUMA

DYSFUNCTION
DATA FILE

FORMAT:

DYSFUNCTION NO:----D,M1,M2,M3,D1,D2

Y$, (SECTIONED TO FIT THE PAGE)


```
1 ---- 1   10   157   14   1    21
3     6    7     0    14   18   10   25   26   26   33   34   35   42   45
107   108  144   157  -1


2 ---- 2   42   158   6    25   32
0     0    27    0    30   0    42   45   110  111  158  -1


3 ---- 3   8    141   12   36   50
0     38   39    0    45   49   8    26   31   36   37   40   41   42   45
112   141  -1


4 ---- 4   6    113   18   54   75
57    59   60    0    68   73   6    10   13   15   19   25   28   31   34
35    36   38    39   42   45   108  113  -1


5 ---- 5   1    45    4    79   90
81    83   85    0    86   88   1    42   45   -1


6 ---- 6   7    159   9    94   106
96    98   99    0    0    104  7    8    11   42   45   100  156  159  -1


7 ---- 7   2    100   11   110  123
113   114  116   0    122  0    2    3    4    5    6    8    42   45   99
100   -1


8 ---- 8   9    157   11   127  137
129   130  131   0    136  0    9    10   11   12   24   40   41   42   45
157   -1


9 --- 9    4    101   6    141  150
0     145  146   0    0    149  4    13   42   45   101  -1


10 ---- 10  14   158   9    154  162
156   157  158   0    0    0    14   15   37   39   42   45   102  158  -1
```

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```
11 ---- 11  16   45   7   166   173
0     168  170  0    0     0     16    17    18    19    42    45   -1

12 ---- 12  19   45   7   177   184
179   180  181  0    0     0     19    20    21    22    42    45   -1

13 ---- 13  3    45   9   188   198
0     193  194  0    0     0     3     6     11    18    19    23    42    45   -1

14 ---- 14  2    141  22  202   225
204   205  206  216  219   222   2     4     6     18    21    24    25    26    27
28    29   30   31   32    42    45    103   104   105   106   141  -1

15 ---- 15  26   116  8   229   242
236   0    237  0    240   0     26    31    42    44    45    115   116  -1

16 ---- 16  26   159  7   246   256
248   251  252  0    255   0     26    28    42    45    141   159  -1

17 ---- 17  43   114  4   260   266
262   263  264  0    0     0     43    45    114  -1

18 ---- 18  8    45   6   270   275
0     0    271  0    274   0     8     10    23    42    45   -1

19 ---- 19  1    63   4   279   287
280   281  283  284  285   286   1     42    63   -1

29 ---- 20  2    63   4   291   300
292   293  295  0    297   298   2     42    63   -1

21 ---- 21  10   156  9   304   315
305   306  308  0    311   314   10    12    13    19    42    63    132   156  -1

22 ---- 22  14   155  9   319   332
320   321  323  326  329   331   14    26    31    33    42    63    132   155  -1

23 ---- 23  3    153  7   336   346
337   339  340  0    344   345   3     42    63    117   152   152  -1
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24 ---- 24  42  151   4  350  359
351  352  353  355  357  358  42  63  151 -1


25 ---- 25  42  63   4  363  372
364  366  367  369  370  371  42  43  63  -1


26 ---- 26  14  154   6  376  390
0    378  381  384  388  389  14  33  42  63  154 -1


27 ---- 27  6  118  16  394  412
398  400  401  409  411  0    6   13  19  28  32  45  46  47  48
49  50  102  114  117  118 -1


28 ---- 28  28  119  16  416  432
419  420  421  430  431  0    28  35  36  39  45  49  51  52  53
54  55  56  63  114  119 -1


29 ---- 29  28  122  11  436  450
437  439  442  448  449  0    28  35  36  57  58  59  114  120  121
122 -1


30 ---- 30  28  123  11  454  463
456  0    457  0    462  0    28  34  36  45  49  60  61  63  114
123 -1


31 ---- 31  28  114  8  467  475
468  0    469  0    474  0    28  36  59  60  61  62  114 -1


32 ---- 32  28  125  7  479  487
480  0    481  484  486  0    28  63  109  114  124  125 -1


33 ---- 33  28  50  4  491  496
0    0    492  0    494  0    28  42  50  -1


34 ---- 34  20  64  4  500  506
502  501  504  0    0    0    20  26  64  -1


35 ---- 35  26  116  6  510  515
511  0    513  0    0    0    26  65  66  67  116 -1


36 ---- 36  26  127  10  519  526
521  0    522  0    0    0    26  36  45  49  63  65  68  126  127
-1
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37 ---- 37  26  69  3  530  532
0    0    531  0    0    0    26   69  -1


38 ---- 38  26  128  3  536  538
0    0    537  0    0    0    26  128  -1


39 ---- 39  26  129  4  542  545
0    0    543  0    0    0    26   27  129 -1


40 ---- 40  13  63  6  549  556
551  0    554  0    0    0    13   26   36   45   63  -1


41 ---- 41  34  138  8  560  570
561  0    564  0    569  0    34   39   57   81  130  131  138 -1


42 ---- 42  26  141  11  574  584
576  578  579  0    583  0    26   31   39   45   59   63   87  114  132
141 -1


43 ---- 43  42  135  6  588  597
0    0    589  592  594  595  42   45  133  134  135 -1


44 ---- 44  70  141  5  601  607
602  603  604  0    0    0    20   71  114  141 -1


45 ---- 45  19  141  10  611  620
612  613  614  0    619  0    19   26   36   59   72   73   74  114  141
-1


46 ---- 46  26  137  9  624  635
626  627  628  0    634  0    26   75   76   77   78   80  136  137 -1


47 ---- 47  19  139  9  639  650
641  642  643  648  649  0    19   28   36   49   59  138  139 -1


48 ---- 48  14  141  10  654  662
656  657  658  0    0    0    14   18   19   36   45   49   82  124  141
-1


49 ---- 49  1  159  8  666  676
667  668  669  0    0    672  1    45   56   59   82  114  159 -1
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50 ----50  13  141   17  680  694
681  682  683   0     692  693  13   18   26   45   49   56   59   63   65
79   83   84    85    124  140  141  -1


51 ----  51  28  144  13  698  711
700  701  702  0    710  0    28   35   36   56   59   76   86   87   132
142  143  144 -1


52 ----  52  34  92  11  715  722
716  0    718  0    0    0    34   35   45   56   80   88   89   90   91
92  -1


53 ----  53  38  147  11  726  738
727  0    728  0    737  0    38   45   56   93   94   95   96   145  146
147 -1


54 ----  54  18  114  3  742  746
743  0    745  0    0    0    18   114 -1 -


55 ----  55  45  149  10  750  760
751  752  753  0    759  0    45   80   87   97   98   114  141  148  149
-1


56 ----  56  13  150  7  764  773
765  766  767  0    770  771  13   22   45   63   114  150 -1
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NAME: 1--ACCOMMODATIVE ESOTROPIA
                     CONVERGENCE EXCESS (NON-REFRACTIVE)
CAUSE: ABNORMAL LINK BETWEEN ACCOMMODATION AND
                 CONVERGENCE; EFFORT TO ACCOMMODATE CAUSES LARGE
                 ACCOMMODATIVE CONVERGENCE
ONSET: 8 MONTHS TO 7 YEARS (30 MONTHS AVE.)
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION;
                 CONVERGENCE EXCESS; DEVIATION AT NEAR > FAR;
                 HYPEROPIA, 2-5 DIOPTERS; DEVIATION UNCORRECTED BY
                 NEAR SPECTACLE RX; AC/A HIGH; DEVIATION CORRECTED
                 BY DISTANCE SPECTACLE RX; INCREASED VERTICAL
                 TROPIA DURING ADDUCTION; "A" PATTERN; "V"
                 PATTERN; VERTICAL TROPIA; AMBLYOPIA
TREATMENT: BIFOCALS; MIOTICS; VISUAL TRAINING TO ELIMINATE
                 SUPPRESSION AND DEVELOP FUSIONAL DIVERGENCE
                 AMPLITUDE WHILE CLEARING TARGET AND RELAXATION OF
                 ACCOMMODATION
PROGNOSIS: ANGLE STARTS AS INTERMITTENT W/DIPLOPIA AND
                 PROGRESSES TO FIXED W/SUPPRESSION; SUCCESS OF
                 TREATMENT FAVORABLE
REFERENCES: V-292; LB-325; LJ-307; D-194

NAME: 2--ACCOMMODATIVE ESOTROPIA
                     DIVERGENCE INSUFFICIENCY
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION; DIVERGENCE
                 INSUFFICIENCY; ESOTROPIA AT FAR; ESOPHORIA AT
                 NEAR
TREATMENT: BO PRISM; VISUAL TRAINING TO INCREASE DIVERGENCE;
                 SURGERY
REFERENCES: LJ-307

NAME: 3--ACCOMMODATIVE ESOTROPIA
                     PARTIAL
ONSET: 2-3 YEARS (USUALLY)
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION; HX OF
                 CONGENITAL OCULAR ANOMALY; MIXED ACCOMMODATIVE
                 AND NON-ACCOMMODATIVE SIGNS; MIOTICS HAVE NO
                 EFFECT; BIFOCAL CORRECTION HAS NO EFFECT;
                 UNILATERAL DEVIATION; AMBLYOPIA; ARC;
                 ACCOMMODATIVE AMPLITUDE LOW; CONSTANT DEVIATION
TREATMENT: CORRECT FULL REFRACTIVE ERROR; BIFOCALS AFTER
                 DEVIATION IS ELIMINATED; VISUAL TRAINING TO
                 ELIMINATE AMBLYOPIA; SURGERY FOR ANY NON-
                 ACCOMMODATIVE DEVIATION REMAINING
PROGNOSIS: SUCCESS OF TREATMENT FAVORABLE
REFERENCES: V-293; LB-325; LJ-307; D-199

NAME:	4--ACCOMMODATIVE ESOTROPIA
	    REFRACTIVE (ACCOMMODATIONAL CONVERGENT
	    STRABISMUS)

CAUSE:	ANOMALY DUE TO ACCOMMODATION-CONVERGENCE RELATIONSHIP
ONSET:	2-3 YEARS
SIGN/SYMPT:	ESOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT NEAR<FAR; VARIABLE DEVIATION; INTERMITTENT DIPLOPIA; HYPEROPIA, 2-5 DIOPTERS; FUSIONAL DIVERGENCE LOW; UNILATERAL DEVIATION; ALTERNATING DEVIATION; DEVIATION CORRECTED BY DISTANCE SPECTACLE RX; DEVIATION CORRECTED BY NEAR SPECTACLE RX; DIPLOPIA; SUPPRESSION; ARC; "A" PATTERN; "V" PATTERN; VERTICAL TROPIA
TREATMENT:	CORRECT REFRACTIVE ERROR (GRADUAL TO FULL); CYCLOPLEGIC REFRACTION; VISUAL TRAINING TO ELIMINATE SUPPRESSION, BUILD FUSIONAL DIVERGENCE, RELAX ACCOMMODATION AND CONVERGENCE, AND INCREASE BINOCULAR VISUAL ACUITY
PROGNOSIS:	GRADUAL PROGRESSION FROM INTERMITTENT TO CONSTANT DEVIATION; SUCCESS OF TREATMENT FAVORABLE
REFERENCES:	V-291; HB-324; LJ-306; D-190

NAME:	5--NON-ACCOMMODATIVE ESOTROPIA ACQUIRED ACUTE
CAUSE:	ARTIFICIAL INTERUPTION OF BINOCULAR VISION (OCCLUSION); OR NO APPARENT CAUSE
ONSET:	EARLY INFANCY TO CHILDHOOD; OLDER CHILDREN TO ADULTS
SIGN/SYMPT:	ESOTROPIA; CONCOMITANT DEVIATION; SUDDEN DIPLOPIA
TREATMENT:	CORRECT REFRACTIVE ERROR; VISUAL TRAINING; SURGERY
PROGNOSIS:	SUCCESS OF TREATMENT FAVORABLE; MAY SPONTANEOUSLY RECOVER
REFERENCES:	V-395

NAME:	6--NON-ACCOMMODATIVE ESOTROPIA ACQUIRED ACUTE TYPE 3 (FRANCESHETTI)
CAUSE:	DEBILITATING ILLNESS; EMOTIONAL OR PHYSICAL STRESS
ONSET:	RAPID AT ANY AGE (CHILDHOOD TO ADULT)
SIGN/SYMPT:	ESOTROPIA; CONCOMITANT DEVIATION; HX OF PHYSICAL TRAUMA; HX OF EMOTIONAL ANOMALIES; DEVIATION BETWEEN 20-40 PD; REFRACTIVE ERROR FACTOR INSIGNIFICANT; FUSIONAL AMPLITUDE LOW; ACCOMMODATIVE AMPLITUDE LOW
PROGNOSIS:	WHEN ANGLE IS CORRECTED, GOOD BINOCULAR COOPERATION IS POSSIBLE
REFERENCES:	V-397

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NAME:           7--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED BASIC (ESSENTIAL ESOTROPIA OF LATE
                    ONSET, ACQUIRED TONIC ESOTROPIA)
CAUSE:          INNERVATIONAL ANOMALY, OR FROM PREVIOUS DISEASE
ONSET:          AFTER 6 MONTHS, DURING CHILDHOOD (ASSOCIATED WITH
                    ILLNESS, INJURY, OR EMOTIONAL UPSET)
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT
                    NEAR=FAR; DEVIATION INCREASES WITH AGE; DEVIATION
                    >40 PD; REFRACTIVE ERROR FACTOR INSIGNIFICANT:
                    ACCOMMODATIVE AMPLITUDE LOW; FORCED DUCTION TEST
                    NEGATIVE; EYES STRAIGHTEN DURING ANESTHESIA;
                    ALTERNATING DEVIATION
TREATMENT:      VISUAL TRAINING TO REDUCE AMBLYOPIA; SURGERY
REFERENCES:     V-301; M-16, D-213


NAME:           8--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED CONVERGENCE EXCESS
CAUSE:          TONIC INNERVATION
ONSET:          2-3 YEARS
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; CONVERGENCE
                    EXCESS; ORTHOPHORIA AT NEAR;-HYPEROPIA, 0-2
                    DIOPTERS: DEVIATION AT NEAR>FAR; DEVIATION
                    BETWEEN 20-40 PD; BIFOCAL CORRECTION HAS NO
                    EFFECT; MIOTICS HAVE NO EFFECT/ AC/A LOW
TREATMENT:      SURGERY
REFERENCES:     V-302; D-214


NAME:           9--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED CYCLIC (CYCLIC HETEROTROPIA,
                    CIRCADIAN, ALTERNATE DAY, CLOCK MECHANISM
                    ESOTROPIA)
ONSET:          EARLY INFANCY
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; CYCLIC BOUTS OF
                    ESOTROPIA (24,48,76,92 HOURS); DEVIATION >40 PD;
                    SUPPRESSION
PROGNOSIS:      USUALLY PROGRESSES TO CONSTANT ESOTROPIA
REFERENCES:     V-392; H-56; D-215


NAME:           10--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED DIVERGENCE INSUFFICIENCY
CAUSE:          NO NEUROLOGIC, DISEASE, OR PHYSICAL TRAUMA
ONSET:          SUDDEN ESOTROPIA AT DISTANCE
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; DIVERGENCE
                    INSUFFICIENCY; INTERMITTENT DEVIATION; CONSTANT
                    DEVIATION; INTERMITTENT DIPLOPIA; DEVIATION AT
                    NEAR<FAR; FUSIONAL DIVERGENCE LOW
REFERENCES:     V-409
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NAME:           11--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED MYOPIC TYPE 1
ONSET:          YOUNG ADULTS; GRADUAL PROGRESSION FROM TROPIA AT
                DISTANCE TO NEAR
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; MYOPIA,1-5
                DIOPTERS; MYOPIA, 5-10 DIOPTERS; LOW ABDUCTION;
                DIPLOPIA
REFERENCES:     V-302



NAME:           12--NON-ACCOMMODATIVE ESOTROPIA
                    ACQUIRED MYOPIC TYPE 2
CAUSE:          MYOSITIS; ENDOCRINE MYOPATHY
ONSET:          YOUNG ADULTS; GRADUAL PROGRESSION
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; MYOPIA, >10
                DIOPTERS; DIPLOPIA; ADDUCTION EXCESSIVE; LIMITED
                OCULAR MOBILITY IN ALL GAZES
REFERENCES:     V-302



NAME:           13--NON-ACCOMMODATIVE ESOTROPIA
                    ALTERNATING (ALTERNATING CONVERGENT
                    STRABISMUS, ESSENTIAL ALTERNATING
                    CONVERGENT SQUINT, PARETIC ALTERNATING
                    CONVERGENT SQUINT)
ONSET:          VERY EARLY, TO BIRTH
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; DEVIATION
                INCREASES WITH AGE; DEVIATION BETWEEN 20-40 PD;
                EMMETROPIA; ALTERNATING DEVIATION; LOW ABDUCTION;
                DIPLOPIA
REFERENCES:     LB-327



NAME:           14--NON-ACCOMMODATIVE ESOTROPIA
                    CONGENITAL (INFANTILE, CONNATAL)
CAUSE:          INNERVATIONAL ANOMALY
ONSET:          BIRTH TO 6 MONTHS
SIGN/SYMPT:     ESOTROPIA; CONCOMITANT DEVIATION; HX OF
                CONGENITAL OCULAR ANOMALY; DEVIATION >40 PD;
                DEVIATION AT NEAR=FAR; HYPEROPIA,0-2 DIOPTERS;
                HYPEROPIA, 2-5 DIOPTERS; LOW ABDUCTION; ADDUCTION
                EXCESSIVE; AMBLYOPIA; ECCENTRIC FIXATION;
                VERTICAL TROPIA; INFERIOR OBLIQUE OVERACTION;
                RETINOBLASTOMA; ALTERNATING DEVIATION; CROSS
                FIXATION DURING LATERAL GAZE; BLIND SPOT
                SYNDROME; ARC; HYPERTROPIA OF NON-FIXATING EYE;
                CYCLOTROPIA OF NON-FIXATING EYE; LATENT NYSTAGMUS
DIFFEREN:       FROM GENUINE ABDUCENS PARESIS, AND CROSS FIXATOR
                PARESIS WITH PSEUDOPARESIS (BILATERAL 6TH NERVE
                PARESIS) VIA THE DOLLS HEAD PHENOMENA
TREATMENT:      CORRECT REFRACTIVE ERROR (CYCLOPLEGIC REFRACTION)
                MIOTICS; VISUAL TRAINING TO ELIMINATE AMBLYOPIA;
                SURGERY; ALTERNATING PATCHING
```

PROGNOSIS: SURGICAL OUTCOME: COSMETIC ALIGNMENT ONLY, LOW
               STEREOPSIS, PERIPHERAL FUSION, ARC, MONOFIXATION
               SYNDROME
REFERENCES: V-295; M-151; P-99; H-54; LJ-323; D-200

NAME: 15--NON-ACCOMMODATIVE ESOTROPIA
                    MICROTROPIA (PARKS SYNDROME, RETINAL SLIP,
                    FIXATION DISPARITY, FUSION DISPARITY,
                    RETINAL FLICKER, MONOFIXATIONAL ESOPHORIA,
                    MONOFIXATIONAL SYNDROME, STRABISMUS
                    SPURIUS, MICROTROPIA UNILATERALIS ANOMALO_
                    FUSIONALIS, MINISQUINT, MICROSTRABISMUS)
CAUSE: IATROGENIC; IOIOPATHIC; STRABISMUS
SIGN/SYMPT: CONCOMITANT DEVIATION; AMBLYOPIA; ARC; RELATIVE
               FOVEAL SCOTOMA; STEREOACUITY DECREASED; DEVIATION
               BETWEEN 0-5 PD; ESOTROPIA
TREATMENT: VISUAL TRAINING FOR AMBLYOPIA; PRESCRIBE FULL
               REFRACTIVE CORRECTION; OCCLUSION THERAPY
REFERENCES: V-304; D-207

NAME: 16--NON-ACCOMMODATIVE ESOTROPIA
                    SECONDARY (SENSORY ESOTROPIA)
CAUSE: ANISOMETROPIA; CONGENITAL OR TRAUMATIC UNILATERAL
               CATARACTS; INJURIES; MACULAR LESIONS; OPTIC
               ATROPHY; CORNEAL OPACITIES; ORGANIC AMBLYOPIA
ONSET: VARIABLE, ANY AGE
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION; HX OF
               CONGENITAL OCULAR ANOMALY; HX OF PHYSICAL TRAUMA;
               VERTICAL TROPIA; AMBLYOPIA
TREATMENT: VISUAL TRAINING; SURGERY
REFERENCES: V-307; M-18; D-216

NAME: 17--NON-ACCOMMODATIVE ESOTROPIA
                    CONSECUTIVE
CAUSE: SURGERY FOR EXOTROPIA
ONSET: ANY TIME FOLLOWING SURGERY
SIGN/SYMPT: ESOTROPIA; INCOMITANT DEVIATION; HX OF EOM
               SURGERY
REFERENCES: V-308; D-216

NAME: 18--HYPO-ACCOMMODATIVE ESOTROPIA
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION; EMMETROPIA;
               ACCOMMODATIVE AMPLITUDE LOW; DEVIATION AT
               NEAR>FAR
TREATMENT: NEAR POINT LENSES
REFERENCES: V-292; CH-207

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NAME:          19--ACUTE EXOTROPIA
CAUSE:         UNKNOWN
ONSET:         ABRUPT, AFTER EARLY CHILDHOOD, SOMETIMES IN
               ADULTS
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; SUDDEN DIPLOPIA
DIFFEREN:      SUDDEN DIPLOPIA WITHOUT A CAUSE
TREATMENT:     ORTHOPTICS; SURGERY
PROGNOSIS:     VARIABLE
REFERENCES:    DE-626


NAME:          20--BASIC EXOTROPIA
CAUSE:         UNKNOWN
ONSET:         MOST BEFORE AGE 5 (34.5% TO 70% REPORTED TO BEGIN
               BEFORE AGE 2)
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT
               NEAR=FAR
TREATMENT:     ORTHOPTICS; SURGERY, RECESSION-RESECTION
PROGNOSIS:     SURGERY HAS POTENTIAL TO CORRECT NEAR AND FAR
               DEVIATIONS EQUALLY; REOCCURRENCE IS COMMON
REFERENCES:    P-113; DE-620; V-314; M-137


NAME:          21--CONVERGENCE INSUFFICIENCY EXOTROPIA
CAUSE:         HYPOKINETIC INNERVATIONAL ANOMALY
ONSET:         MOST BEFORE AGE 5 (35.5% TO 70% REPORTED TO BEGIN
               BEFORE AGE 2)
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT
               NEAR>FAR; AC/A LOW; NPC RECEDED; ASTHENOPIA;
               DIPLOPIA; SUPPRESSION
TREATMENT:     ORTHOPTICS FOR CONVERGENCE TRAINING; BI PRISM FOR
               NEAR; POOR SURGICAL RESULTS (POSTOPERATIVE
               ESOTROPIA AT DISTANCE IS COMMON)
PROGNOSIS:     ORTHOPTICS MOST SUCCESSFUL; REOCCURRENCE COMMON
REFERENCES:    P-113; DE-620; V-314; M-138; LJ-164; CH-217


NAME:          22--DIVERGENCE EXCESS EXOTROPIA
CAUSE:         HYPERKINETIC INNERVATIONAL ANOMALY
ONSET:         MOST BEFORE AGE 5(REPORTS OF 34.5% TO 70% BEGIN
               BEFORE AGE 2)
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT
               NEAR<FAR; AC/A HIGH; ASTHENOPIA; AMBLYOPIA; ARC;
               ABDUCTION EXCESSIVE
DIFFEREN:      OCCLUSION OR CONVEX SPHERE TESTS DO NOT
               SIGNIFICANTLY INCREASE NEAR DEVIATION, AS FOUND
               IN SIMULATED DIVERGENCE EXCESS EXOTROPIA
TREATMENT:     ORTHOPTICS; SURGERY, RECESSION OF BOTH LATERAL
               RECTI
PROGNOSIS:     ORTHOPTICS LESS SUCCESSFUL; REOCCURRENCE COMMON
REFERENCES:    DE-618; P-115; V-314; M-135
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NAME:          23--ESSENTIAL EXOTROPIA
CAUSE:         USUALLY AN ANATOMICAL OR INNERVATIONAL ANOMALY OF
               UNCERTAIN ORIGIN
ONSET:         AFTER PUBERTY OR IN ADULT LIFE
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; DEVIATION
               INCREASES DURING FATIGUE; DEVIATION INCREASES
               WITH AGE; UNILATERAL BLINDNESS; DIVERGING
               ANATOMICAL CHARACTERISTICS
TREATMENT:     ORTHOPTICS; SURGERY IF ORTHOPTICS FAIL
PROGNOSIS:     REOCCURRENCE COMMON
REFERENCES:    DE-623


NAME:          24--PSYCHOPATHIC EXOTROPIA
CAUSE:         INDUCED BY PSYCHO-NEUROSIS
ONSET:         OFTEN AFTER HIGH PSYCHOLOGICAL STRESS SITUATIONS
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; HX OF EMOTIONAL
               ANOMALIES
DIFFEREN:      HX OF MENTAL ILLNESS ASSOCIATED WITH ONSET OF
               SQUINT
TREATMENT:     PSYCHOLOGICAL COUNSELING
PROGNOSIS:     VARIABLE
REFERENCES:    DE-626; LJ-217


NAME:          25--SECONDARY EXOTROPIA
CAUSE:         SURGICAL OVERCORRECTION OF ESOTROPIA OR UNDER-
               CORRECTION OF EXOTROPIA
ONSET:         GRADUAL INCREASE POST-SURGICALLY
SIGN/SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; HX OF EOM
               SURGERY
DIFFEREN:      HX OF OCULAR MUSCLE SURGERY
TREATMENT:     SURGERY; ORTHOPTICS
PROGNOSIS:     REOCCURRENCE IS COMMON
REFERENCES:    DE-626


NAME:          26--SIMULATED DIVERGENCE EXCESS EXOTROPIA
                     (PSEUDODIVERGENCE EXCESS EXOTROPIA)
ONSET:         MOST BEFORE AGE 5 (34.5% TO 70% REPORTED TO BEGIN
               BEFORE AGE 2)   OCCURS MORE FREQUENTLY THAN
               DIVERGENCE EXCESS EXOTROPIA
SIGN'SYMPT:    EXOTROPIA; CONCOMITANT DEVIATION; DEVIATION AT
               NEAR<FAR; AC/A HIGH; OCCLUSION AND +3.00 DIOPTER
               SPHERE TESTS POSITIVE
DIFFEREN:      OCCLUSION OR CONVEX SPHERE TEST REVEALS AN
               INCREASED NEAR DEVIATION, AS LARGE AS OR LARGER
               THAN FAR DEVIATION; AC/A IS NORMAL IF OCCLUSION
               TEST IS POSITIVE
TREATMENT:     ORTHOPTICS; SURGERY, RECESSION-RESECTION
PROGNOSIS:     ORTHOPTICS LESS SUCCESSFUL; REOCCURRENCE COMMON
REFERENCES:    DE-619; P-117; V-314; M-137
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NAME:          27--DISSOCIATED VERTICAL DEVIATIONS
                    (ALTERNATING SURSUMDUCTION, ANATOPIA,
                    ALTERNATING HYPERTROPIA, DOUBLE HYPERTROPIA
                    OCCLUSION HYPERTROPIA)
CAUSE:         ABNORMAL INTERMITTENT EXCITATION FROM SUBCORTICAL
               CENTERS
ONSET:         8 MONTHS TO 2 YEARS
SIGN/SYMPT:    VERTICAL TROPIA; INCOMITANT DEVIATION; DEVIATION
               INCREASES DURING FATIGUE; PENDULAR VERTICAL
               MOVEMENTS OF OCCLUDED EYE; EXCYCLODUCTION OF
               NON-FIXATING EYE; LATENT NYSTAGMUS; ALTERNATING
               DEVIATION; HYPERTROPIA IN NON-FIXATING EYE;
               ESOTROPIA; DIPLOPIA; SUPPRESSION; DISSOCIATION
               WITH RED LENS; DEVIATION = DURING LATERAL GAZES;
               BILATERAL DEVIATION; INTERMITTENT DEVIATION
DIFFEREN:      PRIMARY OVERACTION OF THE INFERIOR OBLIQUE
               MUSCLE
TREATMENT:     VISUAL TRAINING TO STRENGTHEN VERTICAL FUSION
REFERENCES:    V-330; P-149; D-239



NAME:          28--INFERIOR OBLIQUE OVERACTION, PRIMARY
                    (IDIOPATHIC, STRABISMUS SURSOADDUCTORIUS,
                    STRABISMUS DEORSOADDUCTORIUS)
CAUSE:         ISOLATED MOTILITY DISORDER (NEUROPHYSIOLOGIC)
ONSET:         AFTER 1 YEAR OLD (2-3 YEARS)
SIGN/SYMPT:    VERTICAL TROPIA; INCOMITANT DEVIATION; UPTURN OF
               EYE DURING ADDUCTION; UNILATERAL DEVIATION;
               BILATERAL DEVIATION; HYPERTROPIA OS DURING
               DEXTROVERSION; HYPERTROPIA OD DURING LEVOVERSION;
               VERTICAL TROPIA RARE DURING PRIMARY GAZE;
               INCREASED FIELD OF FIXATION IN NASAL QUADRANT:
               ESOTROPIA; EXOTROPIA; INTERMITTENT DIPLOPIA:
               DIPLOPIA DURING HORIZONTAL GAZE; COMPENSATORY
               HEAD TURN; "V" PATTERN
DIFFEREN:      DISSOCIATED VERTICAL DEVIATION, MUSCLE PALSY
TREATMENT:     SURGERY, WEAKENING OF EOMS
REFERENCES:    V-333; P-143; D-245



NAME:          29--INFERIOR OBLIQUE OVERACTION, SECONDARY
CAUSE:         PALSY OF SUPERIOR RECTUS IN OPPOSITE EYE, OR
               SUPERIOR OBLIQUE IN SAME EYE; HYPERTROPHY OF IO
ONSET:         USUALLY 6 MONTHS AFTER PALSY (CAN BE ANY AGE);
               USUALLY FOLLOWS A CONTRALATERAL SR PALSY, OR AN
               IPSILATERAL SO PALSY
SIGN/SYMPT:    VERTICAL TROPIA; INCOMITANT DEVIATION; DEVIATION
               MAXIMUM DURING ABDUCTION; CYCLOTROPIA;
               EXCYCLOTROPIA; BIELSCHOWSKY'S HEAD TILT TEST
               POSITIVE; INCREASED VERTICAL TROPIA DURING
               VERTICAL GAZE; "V" PATTERN; COMPENSATORY HEAD
               TILT: UNILATERAL DEVIATION
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DIFFEREN:       OVERACTION OF IO (PRIMARY)
TREATMENT:      SURGERY
REFERENCES:     P-146; D-245



NAME:           30--SUPERIOR OBLIQUE OVERACTION, PRIMARY
                    (IDIOPATHIC, STRABISMUS DEORSOADDUCTORIUS)
CAUSE:          NEUROPHYSIOLOGIC
SIGN/SYMPT:     VERTICAL TROPIA; INCOMITANT DEVIATION; DOWNTURN
                OF EYE DURING ADDUCTION; INCREASED ROTATION OF
                EYE IN FIELD OF ACTION OF SO; ESOTROPIA;
                EXOTROPIA; BILATERAL DEVIATION; UNILATERAL
                DEVIATION; ASYMMETRIC DEVIATION; "A" PATTERN
TREATMENT:      SURGERY
REFERENCES:     D-252



NAME:           31--SUPERIOR OBLIQUE OVERACTION, SECONDARY
CAUSE:          WEAKNESS OF CONTRALATERAL IR, OR IPSILATERAL IO
SIGN/SYMPT:     VERTICAL TROPIA; INCOMITANT DEVIATION; DOWNTURN
                OF EYE DURING ADDUCTION; INCREASED ROTATION OF
                EYE IN FIELD OF ACTION OF SO; UNILATERAL
                DEVIATION; SUBJECTIVE INCYCLOTROPIA; CONPENSATORY
                HEAD TILT
TREATMENT:      SURGERY
REFERENCES:     D-252



NAME:           32--TIGHT LATERAL RECTUS SYNDROME
CAUSE:          MECHANICAL
SIGN/SYMPT:     VERTICAL TROPIA; INCOMITANT DEVIATION; LOW
                ADDUCTION; OVERACTION OF ALL 4 OBLIQUES;
                ROTATION OF FOVEOLA; EXOTROPIA
DIFFEREN:       USE FORCED DUCTION TEST TO DIFFERENTIATE FROM
                OBLIQUE OVERACTION
TREATMENT:      SURGERY
REFERENCES:     D-267



NAME:           33--PURELY CONCOMITANT HYPERDEVIATIONS
SIGN/SYMPT:     VERTICAL TROPIA; CONCOMITANT DEVIATION:
                DEVIATION = DURING LATERAL GAZES
TREATMENT:      PRISM APPLICATION EQUALLY DISTRIBUTED BETWEEN
                EYES
REFERENCES:     V-329
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NAME:          34--AMETROPIC AMBLYOPIA
ONSET:         EARLY CHILDHOOD
CAUSE:         UNCORRECTED HIGH HYPEROPIA OR EXTREMELY HIGH
               MYOPIA
SIGN/SYMPT:    AMBLYOPIA; HYPEROPIA; >5 DIOPTERS; MYOPIA,
               >10 DIOPTERS
REFERENCES:    V-223; CH-157


NAME:          35--ANISOMETROPIC AMBLYOPIA
CAUSE:         FORM VISION DEPRIVATION; ABNORMAL BINOCULAR
               INTERACTION CAUSED BY UNEQUAL FOVEAL IMAGES
SIGN/SYMPT:    AMBLYOPIA; ANISOMETROPIA; MICROTROPIA; HYPEROPIA;
               DEVIATION BETWEEN 0-5 PD
REFERENCES:    V-222; CH-157


NAME:          36--AMBLYOPIA EXANOPSIA
                    (VISUAL DEPRIVATION AMBLYOPIA)
CAUSE:         DISUSE OR UNDER-STIMULATION OF THE RETINA
SIGN/SYMPT:    AMBLYOPIA; MEDIA OPACITIES; HX OF OCCLUSION;
               UNILATERAL DEVIATION; BILATERAL DEVIATION;
               ESOTROPIA; EXOTROPIA; ANISOMETROPIA; MYOPIA OF
               AMBLYOPIC EYE
REFERENCES:    V-223


NAME:          37--MERIDIONAL AMBLYOPIA
SIGN/SYMPT:    AMBLYOPIA; ASTIGMATISM, HIGH, UNCORRECTED
REFERENCES:    V-223


NAME:          38--NYSTAGMOID AMBLYOPIA
SIGN/SYMPT:    AMBLYOPIA; NYSTAGMUS
REFERENCES:    V-224


NAME:          39--ORGANIC AMBLYOPIA
SIGN/SYMPT:    AMBLYOPIA; ECCENTRIC FIXATION; NO DETECTABLE
               PATHOLOGY
REFERENCES:    V-223


NAME:          40--STRABISMIC AMBLYOPIA
                    (SUPPRESSION AMBLYOPIA)
CAUSE:         ACTIVE INHINITION WITHIN THE RETINOCORTICAL
               PATHWAYS OF VISUAL INPUT, ORIGINATING AT THE
               FOVEA OF DEVIATING EYE
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SIGN/SYMPT: AMBLYOPIA; SUPPRESSION; UNILATERAL DEVIATION;
                ESOTROPIA; EXOTROPIA
REFERENCES: V-221

NAME: 41--CYCLODEVIATIONS
CAUSE: IMBALANCE BETWEEN MUSCLE PAIRS (SO&SR = INTORTION
                IO&IR = EXTORTION); UNCORRECTED OR IMPROPER
                CORRECTION OF OBLIQUE ASTIGMATISM
SIGN/SYMPT: CYCLOTROPIA; PARETIC CYCLOVERTICAL TROPIA; "A"
                PATTERN; INTERMITTENT DIPLOPIA; CYCLOTROPIA
                UNCHANGED DURING MONOCULAR/BINOCULAR TRANSITION;
                NO SUBJECTIVE CYCLOTROPIA; OBJECTIVE CYCLOTROPIC
                DEVIATION
TREATMENT: SURGERY; LENSES
REFERENCES: V-334; D-256

NAME: 42--A,V,X,Y,λ SYNDROME
                    (NON-PARETIC)
CAUSE: CONGENITAL AND ACQUIRED CYCLO AND VERTICAL
                MUSCLE PARESIS
ONSET: BIRTH
SIGN/SYMPT: ESOTROPIA; EXOTROPIA; INCOMITANT DEVIATION; HX OF
                CONGENITAL OCULAR ANOMALY; ASTHENOPIA;
                INTERMITTENT DIPLOPIA; ARC; COMPENSATORY CHIN
                TILT; COMPENSATORY HEAD TILT; AMBLYOPIA
TREATMENT: FULL SPECTACLE CORRECTION; SURGERY
REFERENCES: V-338; D-264

NAME: 43--DIVERGENCE PARALYSIS
SIGN/SYMPT: ESOTROPIA; CONCOMITANT DEVIATION; DEVIATION
                OD = OS; DIPLOPIA UNCROSSED AT 2-3 METERS;
                FUSION AT 50-60 CM
DIFFEREN: FROM 6TH NERVE PALSY VIA EQUAL DEVIATION OD
                AND OS
TREATMENT: BI PRISM THERAPY
PROGNOSIS: USUALLY SELF LIMITING AND DISAPPEARS IN 5-6
                MONTHS
REFERENCES: D-215

NAME: 44--DOUBLE DEPRESSOR PALSY
CAUSE: CONGENITAL
ONSET: BIRTH
SIGN/SYMPT: INCOMITANT DEVIATION; HX OF CONGENITAL OCULAR
                ANOMALY; DECREASED DUCTION IN FIELD OF IR;
                DECREASED DUCTION IN FIELD OF SO
REFERENCES: D-315

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NAME:          45--DOUBLE ELEVATOR PALSY
CAUSE:         CONGENITAL OR ACQUIRED
ONSET:         BIRTH OR LATER
SIGN/SYMPT:    INCOMITANT DEVIATION; HX OF CONGENITAL OCULAR
               ANOMALY; DECREASED DUCTION IN FIELD OF SR;
               DECREASED DUCTION IN FIELD OF IO; UNILATERAL
               DEVIATION; DIPLOPIA; COMPENSATORY HEAD TILT;
               FIXATION WITH UNAFFECTED EYE; AMBLYOPIA
TREATMENT:     SURGERY
REFERENCES:    D-313


NAME:          46--THIRD NERVE PALSY
                    (CONGENITAL OR ACQUIRED)
CAUSE:         AXONAL GROWTH ANOMALY; MECHANICAL DAMAGE TO NERVE
ONSET:         BIRTH OR LATER
SIGN/SYMPT:    PSEUDO GRAEFE SIGN; WIDENING OF PALPEBRAL FISSURE
               DURING ADDUCTION/ NARROWING OF PALPEBRAL FISSURE
               DURING ABDUCTION; PIPIL FIXED AND DILATED; PUPIL
               REACTS TO CONVERGENCE AND ADDUCTION; RETRACTION
               AND ADDUCTION OF GLOBE DURING UP GAZE; PTOSIS;
               AMBLYOPIA
TREATMENT:     PATCHING; SURGERY
REFERENCES:    D-292


NAME:          47--FOURTH NERVE PALSY
                    (CONGENITAL OR ACQUIRED)
CAUSE:         AXONAL GROWTH ANOMALY; MECHANICAL DAMAGE TO NERVE
ONSET:         BIRTH OR LATER
SIGN/SYMPT:    UNILATERAL DEVIATION; BILATERAL DEVIATION;
               VERTICAL TROPIA; COMPENSATORY HEAD TILT:
               DIPLOPIA; IO OVERACTION DURING FIXATION WITH
               NON-PARETIC EYE; OBJECTIVE CYCLOTROPIC DEVIATION;
               NO SUBJECTIVE CYCLOTROPIA
DIFFEREN:      RESEMBLES DOUBLE ELEVATOR PALSY
TREATMENT:     PATCHING; SURGERY
REFERENCES:    D-307


NAME:          48--SIXTH NERVE PALSY
                    (CONGENITAL OR ACQUIRED)
CAUSE:         AXONAL GROWTH ANOMALY; MECHANICAL DAMAGE TO NERVE
ONSET:         BIRTH OR LATER
SIGN/SYMPT:    ESOTROPIA; HX OF CONGENITAL OCULAR ANOMALY:
               BILATERAL DEVIATION; UNILATERAL DEVIATION;
               DEVIATION AT NEAR>FAR; DIPLOPIA; LOW ADDUCTION;
               LOW ABDUCTION; PAST POINTING
REFERENCES:    H-55; D-310
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NAME:           49--PARALYTIC ESOTROPIA
CAUSE:          HEAD TRAUMA OR SYSTEMIC DISORDER
ONSET:          SUDDEN AT ANY AGE
SIGN/SYMPT:     ESOTROPIA; INCOMITANT DEVIATION; HX OF PHYSICAL
                TRAUMA; SUDDEN DIPLOPIA; COMPENSATORY HEAD TURN;
                COMPENSATORY HEAD TILT; PAST POINTING
PROGNOSIS:      DEVIATION MORE PRONOUNCED IN FIELD OF ACTION OF
                PARETIC MUSCLE IN BEGINNING STAGES, THEN
                DEVIATION EQUALIZES IN ALL FIELDS OF GAZE AND
                BECOMES MORE CONCOMITANT IN LATER STAGES
REFERENCES:     V-364



NAME:           50--DUANE'S RETRACTION SYNDROME
CAUSE:          PARADOXIC INNERVATION
ONSET:          3-4 MONTHS OF AGE
SIGN/SYMPT:     WIDENING OF PALPEBRAL FISSURE DURING ABDUCTION;
                DOLLS HEAD PHENOMENA ABSENT; ANISOMETROPIA;
                BILATERAL DEVIATION; LOW ABDUCTION; LOW
                ADDUCTION; GLOBE RETRACTION DURING ADDUCTION;
                NARROWING OF PALPEBRAL FISSURE DURING ADDUCTION;
                ESOTROPIA; EXOTROPIA; SUPPRESSION; AMBLYOPIA;
                COMPENSATORY HEAD TILT; AMETROPIA GREATER IN
                AFFECTED EYE; HX OF CONGENITAL OCULAR ANOMALY;
                PENDULAR VERTICAL MOVEMENTS OF OCCLUDED EYE
TREATMENT:      VISUAL TRAINING FOR AMBLYOPIA; SURGERY
PROGNOSIS:      POOR RESULTS FROM SURGERY
REFERENCES:     M-13; V-379; P-165; H-55; D-326



NAME:           51--INTERMITTENT SUPERIOR-OBLIQUE TENDON-
                    SHEATH SYNDROME (BROWN'S SYNDROME)
CAUSE:          HEREDITARY (DOMINANT TRAIT)
ONSET:          USUALLY CHILDHOOD
SIGN/SYMPT:     UPTURN OF EYE LIMITED DURING ADDUCTION;
                INCREASED VERTICAL TROPIA DURING ADDUCTION;
                WIDENING OF PALPEBRAL FISSURE DURING ADDUCTION;
                FORCED DUCTION TEST POSITIVE; VERTICAL TROPIA;
                COMPENSATORY HEAD TURN; COMPENSATORY HEAD TILT;
                COMPENSATORY CHIN TILT; ASTHENOPIA; DIPLOPIA
                DURING ADDUCTION; "V" PATTERN; UNILATERAL
                DEVIATION
TREATMENT:      SURGICAL STRIPPING OF TENDON SHEATH
REFERENCES:     N-219; V-384; P-167; M-13; D-315
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NAME:         52--MOBIUS' SYNDROME
CAUSE:        APLASIA OF ABDUCENS, FACIAL AND GLOSSOPHARYNGEAL
              NUCLEI
SIGN/SYMPT:   LIMITED LATERAL OCULAR MOBILITY; ESOTROPIA; "A"
              PATTERN; "V" PATTERN; COMPENSATORY HEAD TURN;
              PTOSIS; TONGUE PALSY; HX OF MENTAL RETARDATION;
              DEAFNESS; ECTROPION
REFERENCES:   P-169; D-330



NAME:         53--NYSTAGMUS BLOCKAGE SYNDROME
CAUSE:        INNERVATIONAL ORIGIN
SIGN/SYMPT:   ESOTROPIA; CONCOMITTANT DEVIATION; HX OF
              HYDROCEPHALUS AND INCREASED INTRACRANIAL
              PRESSURE; DISCORDANT NYSTAGMUS; INCREASED VISUAL
              ACUITY DURING ADDUCTION; PUPIL CONSTRICTION AS
              STRABISMUS INCREASES AND NYSTAGMUS DECREASES;
              VARIABLE DEVIATION; PSEUDOPARALYSIS OF LATERAL
              RECTI; INCREASED NYSTAGMUS DURING ABDUCTION;
              FIXATION WITH ADDUCTING EYE; COMPENSATORY HEAD
              TURN
TREATMENT:    SURGERY
REFERENCES:   V-415; D-214



NAME:         54--JOHNSON'S ADHERENCE SYNDROME
CAUSE:        PSEUDOPARALYSIS OF LATERAL RECTUS OR SUPERIOR
              RECTUS
SIGN/SYMPT:   INCOMITANT DEVIATION; LOW ABDUCTION
REFERENCES:   V-387; D-319



NAME:         55--NON-PARALYTIC FIBROSIS
CAUSE:        CONGENITAL
ONSET:        BIRTH
SIGN/SYMPT:   ESOTROPIA; INCOMITANT DEVIATION; HX OF
              CONGENITAL OCULAR ANOMALY; FIBROSIS OF ALL EOMS;
              DOWNTURNED FIXATION BILATERALLY; PTOSIS;
              COMPENSATORY CHIN TILT; DISRUPTED CONVERGENCE
              DURING SUPERIOR AND LATERAL GAZE; HX OF FAMILIAL
              OCCURENCE
TREATMENT:    SURGERY
REFERENCES:   V-388; D-322
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NAME:          56--STRABISMUS FIXUS
CAUSE:         FIBROUS SUBSTITUTION OF OCULAR MUSCLE; CONGENITAL
ONSET:         BIRTH
SIGN/SYMPT:    EXOTROPIA; ESOTROPIA; INCOMITANT DEVIATION;
               LIMITED OCULAR MOBILITY IN ALL GAZES:
               SUPPRESSION; FIXED DEVIATION AT ALL DISTANCES
TREATMENT:     SURGERY
PROGNOSIS:     BINOCULAR VISION IMPOSSIBLE; OCULAR MOTILITY
               REMAINS NIL; HEAD TURNING REQUIRED
REFERENCES:    DE-748; V-388; P-172; D-323
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LIST
20 PRINT "STRABISMUS/AMBLYOPIA SEARCH"
40 PRINT "INPUT A (1) FOR LOADING/LISTING OR A (2) FOR SEARCH";
60 INPUT X
80 IF X=2 GOTO 6000
100 IF X<1 OR X>2 GOTO 40
120 DIM D3[300]
140 DIM Y$[335]
160 DIM E$[16],D$[49]
180 DIM X3$[10],X5$[10],X6$[10]
200 LET X3=1,X5=2,X6=3
220 LET X3$="D5:FILE1"
240 LET X5$="D5:FILE1"
260 LET X6$="D5:FILE1"
280 OPEN FILE[X3,360],X3$
300 OPEN FILE[X5,17],X5$
320 OPEN FILE[X6,50],X6$
340 PRINT
360 PRINT
380 PRINT "MENU:"
400 PRINT "1] LOAD SIGN/SYMPTOM LIST        2] LOAD DATA"
420 PRINT "3] LOAD ARRAY DIMS/HOUSEKEEPING  4] LOAD DYSFUNCTION DESCRIPTIONS"
440 PRINT "5] PRINT OUT S/S LIST            6] PRINT OUT DATA"
460 PRINT "7] PRINT OUT HOUSEKEEPING        8] PRINT OUT DESCRIPTIONS"
480 PRINT
500 PRINT "    PICK A NUMBER:";
520 INPUT X
540 IF X=1 GOTO 3000
560 IF X=2 GOTO 1620
580 IF X=3 GOTO 740
600 IF X=4 GOTO 3200
620 IF X=5 GOTO 3400
640 IF X=6 GOTO 4760
660 IF X=7 GOTO 5740
680 IF X=8 GOTO 3720
700 PRINT "  PLEASE PICK ONE OF THE NUMBERS LISTED ABOVE"
720 GOTO 500
740 PRINT "WHAT IS THE NUMBER OF THE HIGHEST DYSFUNCTION?";
760 INPUT M5
780 PRINT "WHAT IS THE TOTAL NUMBER OF SIGNS & SYMPTOMS?";
800 INPUT X
820 IF X>=2000 GOTO 880
840 LET F=X,F1=X
860 GOTO 920
880 LET F=2000,F1=2000
900 PRINT
920 PRINT "TOTAL NO. OF SIGNS/SYMPTOMS THAT CAN BE INPUTTED BY THE USER"
940 PRINT "IS [DO NOT INCLUDE THE SENTINAL VALUE]?";
960 INPUT F2
980 LET F2=F2+1
1000 LET F=INT(F2/3*M5)
1020 LET F1=F,F4=F,F5=F
1040 PRINT
1060 PRINT "WHAT IS THE MAXIMUM NUMBER OF S/S DATA VALUES THAT CAN BE READ"
1080 PRINT "FROM THE DATA FILE [INCLUDES HEADING VALUES AND SENTINAL"
1100 PRINT "VALUE]?";
1120 INPUT F3
1140 LET A4=5
1160 LET A5=M5
1180 PRINT "THE DATA FOR DYSFUNCTION NO.";A5;"WILL BE FOUND AT RECORD"
1200 PRINT "NO.";A5+4
1220 LET A5=A5+4
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1260 PRINT "WHAT IS THE 1ST RECORD NO. FOR THE S/S FILE?";
1280 INPUT A6
1300 PRINT "LAST RECORD NO. OF S/S FILE?";
1320 INPUT A7
1340 PRINT "1ST RECORD NO. OF DYSFUNCTION DESCRIPTION FILE?";
1360 INPUT A8
1380 PRINT "LAST RECORD NO. OF DYSFUNCTION DESCRIPTION FILE?";
1400 INPUT A9
1420 PRINT
1440 PRINT
1460 PRINT "NEED TO MAKE ANY CHANGES?"
1480 PRINT " 1] EVERYTHINGS OK"
1500 PRINT " 2] HAVE TO START OVER"
1520 INPUT X
1540 IF X<>1 GOTO 740
1560 WRITE FILE[X3,1],M5,F,F1,F2,F3,F4,F5
1580 WRITE FILE[X3,2],A4,A5,A6,A7,A8,A9
1600 GOTO 340
1620 PRINT
1640 PRINT "NOW WE WILL LOAD FILE[";X3;",360]"
1660 PRINT "DYSFUNCTION#?";
1680 INPUT D
1700 LET X=D+4
1720 GOTO 1880
1740 PRINT "LOWEST SIGN/SYMPT#?";
1760 INPUT M1
1780 PRINT "HIGHEST SIGN/SYMPT#?";
1800 INPUT M2
1820 PRINT "TOTAL NO. OF SIGN/SYMPT NUMBERS IN DATA LINE"
1840 PRINT "INCLUDING THE SENTINAL VALUE IS?";
1860 INPUT M3
1880 PRINT "DESCRIPTION FOR DYSFUNCTION NO.";D;"STARTS WITH RECORD NO.";
1900 INPUT D1
1920 GOTO 2000
1940 PRINT "NOW INPUT THE LINE/RECORD NUMBERS THAT CORRESPOND TO THESE"
1960 PRINT "DESCRIPTION HEADINGS.  IF YOU DO NOT WANT A HEADING TO"
1980 PRINT "APPEAR, INPUT A '0'"
2000 PRINT "CAUSE#";
2020 INPUT D3[1]
2040 PRINT "ONSET#";
2060 INPUT D3[2]
2080 PRINT "SIGN/SYMPT#";
2100 INPUT D3[3]
2120 PRINT "DIFFEREN#";
2140 INPUT D3[4]
2160 PRINT "TREATMENT#";
2180 INPUT D3[5]
2200 PRINT "PROGNOSIS#";
2220 INPUT D3[6]
2240 PRINT "REFERENCE# [LAST LINE#]";
2260 INPUT D2
2280 LET J=-4
2300 PRINT
2320 PRINT "S/S DATA"
2340 PRINT
2360 FOR I=7 TO F3
2380    PRINT I-6;
2400    INPUT D3[I]
2420    IF D3[I]<0 GOTO 2520
2440 NEXT I
2460 PRINT "***YOU HAVE REACHED THE LAST INPUT WITHOUT ENTERING A"
2480 PRINT "MINUS NUMBER.  PLEASE START OVER, AND REMEMBER THIS TIME."
2500 GOTO 2360
2520 FOR L2=1 TO I-1
2540    FOR N2=7 TO I-1-L2
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2580     LET T2=D3[N2]
2600     LET D3[N2]=D3[N2+1]
2620     LET D3[N2+1]=T2
2640    NEXT N2
2660 NEXT L2
2680 FOR L2=1 TO 6
2700   PRINT D3[L2];
2720 NEXT L2
2740 PRINT
2760 FOR L2=7 TO I
2780   PRINT D3[L2];
2800 NEXT L2
2820 LET M3=I-6,M1=D3[7],M2=D3[I-1]
2840 FOR L2=1 TO I
2860   LET J=J+5
2880   DECODE Y$[J,J+4],D3[L2],USING "#####"
2900 NEXT L2
2920 WRITE FILE[X3,X],D,M1,M2,M3,D1,D2,Y$
2940 PRINT
2960 PRINT
2980 GOTO 1660
3000 DIM E$[16]
3020 PRINT "BE SURE TO TYPE 'CLOSE' WHEN FINISHED."
3040 PRINT "RECORD NO.";
3060 INPUT X
3080 PRINT "   ----------------"
3100 INPUT E$
3120 WRITE FILE[X5,X],E$
3140 PRINT
3160 PRINT
3180 GOTO 3040
3200 DIM D$[49]
3220 PRINT "RECORD NO.";
3240 INPUT X
3260 PRINT "   -------------------------------------------------"
3280 INPUT D$;
3300 WRITE FILE[X6,X],D$
3320 PRINT
3340 PRINT
3360 GOTO 3220
3380 STOP
3400 READ FILE[X3,2],A4,A5,A6,A7,A8,A9
3420 PRINT "FIRST RECORD STARTS AT";A6;", LAST RECORD ENDS WITH NO.";A7
3440 PRINT "YOU WISH TO PRINT OUT FILE STARTING WITH RECORD NO.";
3460 INPUT J1
3480 PRINT "AND ENDING WITH RECORD NO.";
3500 INPUT J2
3520 IF J1<1 GOTO 3420
3540 IF J2>A7 GOTO 3420
3560 PRINT "NO."
3580 FOR I=J1 TO J2
3600   READ FILE[X5,I],E$
3620   PRINT I,E$
3640 NEXT I
3660 PRINT
3680 PRINT
3700 GOTO 380
3720 READ FILE[X3,2],A4,A5,A6,A7,A8,A9
3740 PRINT
3760 PRINT "THE NUMBER OF THE LAST [THE HIGHEST] DYSFUNCTION NO. IS";A5-4
3780 PRINT "YOU WISH TO PRINT THE FILE STARTING WITH DYSFUNCTION NO.";
3800 INPUT J1
3820 PRINT "AND ENDING WITH DYSFUNCTION NO.";
3840 INPUT J2
3860 IF J2<1 GOTO 3740
```

```
3900 FOR I=J1 TO J2
3920   READ FILE[X3,I+4],D,M1,M2,M3,D1,D2,Y$
3940   LET B2=-4
3960   FOR I2=1 TO 6
3980     LET B2=B2+5
4000     ENCODE Y$[B2,B2+4],D3[I2]
4020   NEXT I2
4040   PRINT
4060   PRINT
4080   FOR H=D1 TO D2
4100     READ FILE[X6,H],D$
4120     IF H=D1 GOTO 4300
4140     IF H=D3[1] GOTO 4340
4160     IF H=D3[2] GOTO 4420
4180     IF H=D3[3] GOTO 4380
4200     IF H=D3[4] GOTO 4460
4220     IF H=D3[5] GOTO 4500
4240     IF H=D3[6] GOTO 4540
4260     IF H=D2 GOTO 4580
4280     GOTO 4600
4300     PRINT "NAME:";
4320     GOTO 4600
4340     PRINT "CAUSE:";
4360     GOTO 4600
4380     PRINT "SIGN/SYMPT:";
4400     GOTO 4600
4420     PRINT "ONSET:";
4440     GOTO 4600
4460     PRINT "DIFFEREN:";
4480     GOTO 4600
4500     PRINT "TREATMENT:";
4520     GOTO 4600
4540     PRINT "PROGNOSIS:";
4560     GOTO 4600
4580     PRINT "REFERENCES:";
4600     PRINT TAB(15);D$
4620   NEXT H
4640   PRINT
4660   PRINT
4680 NEXT I
4700 PRINT
4720 PRINT
4740 GOTO 380
4760 READ FILE[X3,2],A4,A5,A6,A7,A8,A9
4780 PRINT "THE LAST DYSFUNCTION NO. ON FILE IS NO.";A5-4
4800 PRINT "YOU WISH TO PRINT OUT THE DATA FOR THE DYSFUNCTION NUMBERS STARTING"
4820 PRINT "WITH DYSFUNCTION NO.";
4840 INPUT J1
4860 PRINT "AND ENDING WITH DYSFUNCTION NO.";
4880 INPUT J2
4900 PRINT
4920 PRINT
4940 IF J1<1 GOTO 4800
4960 IF J2>A5-4 GOTO 4780
4980 PRINT "THE PRINT OUT FORMAT WILL BE:"
5000 PRINT "DYSFUNCTION NO. ---- D,M1,M2,M3,D1,D2"
5020 PRINT "   Y$,[SECTIONED TO FIT THE PAGE]"
5040 PRINT
5060 FOR I=J1 TO J2
5080   PRINT
5100   PRINT
5120   READ FILE[X3,I+4],D,M1,M2,M3,D1,D2,Y$
5140   LET B=(M3+6)*5
5160   PRINT I;"----";D;M1;M2;M3;D1;D2
5180   IF B<=75 GOTO 5280
```

```
5220    IF B<=225 GOTO 5380
5240    IF B<=300 GOTO 5460
5260    IF B<=375 GOTO 5560
5280    PRINT Y$
5300    GOTO 5660
5320    PRINT Y$[1,75]
5340    PRINT Y$[76,B]
5360    GOTO 5660
5380    PRINT Y$[1,75]
5400    PRINT Y$[76,150]
5420    PRINT Y$[151,B]
5440    GOTO 5660
5460    PRINT Y$[1,75]
5480    PRINT Y$[76,150]
5500    PRINT Y$[151,225]
5520    PRINT Y$[226,B]
5540    GOTO 5660
5560    PRINT Y$[1,75]
5580    PRINT Y$[76,150]
5600    PRINT Y$[151,225]
5620    PRINT Y$[226,300]
5640    PRINT Y$[301,B]
5660 NEXT I
5680 PRINT
5700 PRINT
5720 GOTO 380
5740 PRINT "YOU WISH TO PRINT OUT THE HOUSEKEEPING NUMBERS FILE"
5760 PRINT "THEY WILL BE LISTED AS FOLLOWS:"
5780 PRINT
5800 PRINT "M5,F,F1,F2,F3,F4,F5"
5820 PRINT "A4,A5,A6,A7,A8,A9"
5840 PRINT
5860 READ FILE[X3,1],M5,F,F1,F2,F3,F4,F5
5880 READ FILE[X3,2],A4,A5,A6,A7,A8,A9
5900 PRINT M5;F;F1;F2;F3;F4;F5
5920 PRINT A4;A5;A6;A7;A8;A9
5940 PRINT
5960 PRINT
5980 GOTO 380
6000 DIM X1$[10],X5$[10],X6$[10]
6020 LET X1=1,X5=2,X6=3
6040 LET X1$="D5:FILE1"
6060 LET X5$="D5:FILE1"
6080 LET X6$="D5:FILE1"
6100 OPEN FILE[X1,360],X1$
6120 OPEN FILE[X5,17],X5$
6140 OPEN FILE[X6,50],X6$
6160 READ FILE[X1,1],M5,F,F1,F2,F3,F4,F5
6180 READ FILE[X1,2],A4,A5,A6,A7,A8,A9
6200 DIM B[F],C[F1],P[F2],L[F3],G[F4],H[F5]
6220 DIM D$[49],C$[47],E$[16],A$[30]
6240 DIM A$[30]
6260 DIM D3[10]
6280 DIM Y$[335]
6300 PRINT
6320 PRINT
6340 PRINT "PLEASE INDICATE WHICH PART OF THE PROGRAM"
6360 PRINT "YOU WISH TO START WITH"
6380 PRINT " 1--SYMPTOM SEARCH"
6400 PRINT " 2--LISTING OF A SPECIFIC DYSFUNCTION"
6420 PRINT "(TYPE IN A 1 OR 2)";
6440 INPUT X
6460 IF X=2 GOTO 10420
6480 PRINT
6500 PRINT
```

```
6540 INPUT A$
6560 PRINT "AGE OF PATIENT";
6580 INPUT A
6600 PRINT
6620 PRINT
6640 PRINT "YOU HAVE ROOM TO INPUT UP TO";F2-1;"DIFFERENT SIGNS/SYMPTOMS."
6660 PRINT "TYPE IN ONLY ONE SYMPTOM NUMBER PER REQUEST."
6680 PRINT "   ***AFTER THE LAST SYMPTOM HAS BEEN ENTERED, TYPE IN A '0'"
6700 PRINT "        INSTEAD OF A SYMPTOM NUMBER."
6720 PRINT "   ***TO MAKE A CORRECTION, TYPE -99 INSTEAD OF A SIGN/SYMPTOM NO."
6740 PRINT "--------------------------------------------------------------------"
6760 PRINT "PATIENT:";A$;"       AGE:";A;"    DATE:";
6780 PRINT SYS(1);"-";SYS(2);"-";SYS(3)
6800 LET W=0,M=0,M1=0,M2=0,I=0,X=0,X2=0,X3=0,A=0,A1=0,S=0,Z=0,Q=0
6820 PRINT
6840 PRINT
6860 PRINT "               SIGN OR"
6880 IF K=F2 GOTO 8400
6900 PRINT "NUMBER          NUMBER         DESCRIPTION"
6920 PRINT
6940 FOR K=1 TO F2
6960    LET S=S+1
7000    PRINT S,
7020    INPUT P[K];
7040    IF P[K]<0 GOTO 7580
7060    IF P[K]=0 GOTO 8180
7080    IF P[K]>A7 GOTO 7860
7100    IF S=1 GOTO 7180
7120    FOR B=1 TO S-1
7140       IF P[B]=P[K] GOTO 7900
7160    NEXT B
7180    GOSUB 7260
7200    READ FILE[X5,P[K]],E$
7220    PRINT E$
7240    GOTO 7960
7260    LET I=P[K]
7280    GOTO 7340
7300    LET I=P[X]
7320    GOTO 7780
7340    IF I>999 GOTO 7520
7360    IF I>99 GOTO 7480
7380    IF I>9 GOTO 7440
7400    PRINT "              ";
7420    RETURN
7440    PRINT "          ";
7460    RETURN
7480    PRINT "        ";
7500    RETURN
7520    PRINT "       ";
7540    PRINT "APPEAR, INPUT A '0'"
7560    RETURN
7580    PRINT
7600    PRINT
7620    PRINT "WHICH LINE NUMBER CONTAINS THE ERROR";
7640    INPUT X
7660    PRINT "WHAT IS THE CORRECT SIGN/SYMPTOM NUMBER";
7680    INPUT P[X]
7700    PRINT
7720    PRINT X,P[X];
7740    IF P[X]>F GOTO 7860
7760    GOTO 7300
7780    GOSUB 7340
7800    READ FILE[X5,I],E$
7820    PRINT E$
7840    GOTO 7000
```

```
           PRINT "   NO ROOM NUMBER ON FILE"
7880    GOTO 7000
7900    PRINT "    ***THIS NO. HAS ALREADY BEEN INPUTTED***"
7920    PRINT "           PLEASE CHOOSE ANOTHER"
7940    GOTO 7000
7960 NEXT K
7980 PRINT
8000 PRINT "YOU HAVE NO MORE ROOM LEFT TO INPUT SIGNS.  DO YOU WANT TO:"
8020 PRINT " 1]  CONTINUE   2]  START OVER"
8040 PRINT "[TYPE IN A 1 OR 2]";
8060 INPUT X
8080 PRINT
8100 PRINT
8120 IF X=2 GOTO 6740
8140 LET P[F2]=0
8160 PRINT
8180 FOR L=1 TO S-1
8200   FOR N=1 TO S-L
8220     IF P[N]<P[N+1] GOTO 8300
8240     LET T=P[N]
8260     LET P[N]=P[N+1]
8280     LET P[N+1]=T
8300   NEXT N
8320 NEXT L
8340 LET X2=P[2]
8360 LET X3=P[S]
8380 PRINT
8400 PRINT
8420 PRINT " MIN. NO. OF SIGNS TO IDENTIFY";
8440 INPUT N
8460 PRINT "----------------------"
8480 LET R3=4
8500 LET R=0
8520 LET Z=0
8540 LET W=W+1
8560 LET R3=R3+1
8580 IF R3>(M5+4) GOTO 9220
8600 READ FILE[X1,R3],D,M1,M2,M3,D1,D2,Y$
8620 IF X3<M1 GOTO 8520
8640 IF X2>M2 GOTO 8520
8660 LET B2=26
8680 FOR J=1 TO M3
8700   LET B2=B2+5
8720   ENCODE Y$[B2,B2+4],L[J]
8740 NEXT J
8760 LET J=1
8780 LET K=2
8800 IF P[K]=0 GOTO 9120
8820 IF L[J]<1 GOTO 9120
8840 IF P[K]=L[J] GOTO 8980
8860 IF P[K]<L[J] GOTO 8900
8880 IF P[K]>L[J] GOTO 8940
8900 LET K=K+1
8920 GOTO 8800
8940 LET J=J+1
8960 GOTO 8800
8980 LET K=K+1
9000 LET R=R+1
9020 LET B[R]=D
9040 LET C[R]=L[J]
9060 LET J=J+1
9080 LET Z=Z+1
9100 IF P[K]>0 GOTO 8820
9120 IF Z=0 GOTO 8540
9140 IF Z<N GOTO 8520
9160 LET Q=Q+1
```

```
9180 LET G[Q]=Z,H[Q]=D
9200 GOTO 8520
9220 IF Q=0 GOTO 11700
9240 FOR L=1 TO W-1
9260    FOR Q=1 TO W-L
9280       IF G[Q]>=G[Q+1] GOTO 9360
9300       LET T=G[Q],T1=H[Q]
9320       LET G[Q]=G[Q+1],H[Q]=H[Q+1]
9340       LET G[Q+1]=T,H[Q+1]=T1
9360    NEXT Q
9380 NEXT L
9400 FOR R7=1 TO R
9420    LET T2=0
9440    LET X=C[R7]
9460    IF X=0 GOTO 9620
9480    FOR R2=R7+1 TO R
9500       IF X=C[R2] GOTO 9540
9520       GOTO 9580
9540       LET C[R2]=0
9560       LET T2=T2+1
9580    NEXT R2
9600    IF T2>0 THEN  LET C[R7]=0
9620 NEXT R7
9640 PRINT
9660 PRINT
9680 PRINT "SIGNS"
9700 PRINT "TAGGED            DYSFUNCTION NUMBER & NAME"
9720 PRINT
9740 FOR Q=1 TO W-1
9760    IF G[Q]=0 GOTO 10020
9780    IF G[Q]<N GOTO 10000
9800    IF H[Q]=0 GOTO 10020
9820    READ FILE[X1,H[Q]+4],D,M1,M2,M3,D1
9840    READ FILE[X6,D1],D$
9860    PRINT G[Q],D$
9880    FOR R8=1 TO R
9900       IF D=B[R8] GOTO 9940
9920       GOTO 9980
9940       IF C[R8]=0 GOTO 9980
9960       READ FILE[X5,C[R8]],E$
9980    NEXT R8
10000 NEXT Q
10020 PRINT
10040 PRINT
10060 PRINT "-----***END OF SEARCH***---------------------------"
10080 PRINT
10100 PRINT
10120 PRINT "DO YOU WISH TO:"
10140 PRINT "    1--CONTINUE WITH DYSFUNCTION DESCRIPTIONS"
10160 PRINT "    2--CHANGE THE VALUE OF THE MIN. NO. OF SIGNS TO IDENTIFY"
10180 PRINT "    3--OBTAIN ANOTHER PRINT-OUT OF THE SEARCH"
10200 PRINT "    4--END PROGRAM"
10220 PRINT "[INPUT A 1,2,3, OR 4]"
10240 INPUT X
10260 IF X=4 GOTO 11560
10280 IF X=3 GOTO 9640
10300 IF X=2 GOTO 10380
10320 PRINT
10340 PRINT
10360 GOTO 10420
10380 LET W=0,M=0,I=0,X=0,A1=0,Z=0,Q=0
10400 GOTO 8340
10420 PRINT
10440 PRINT "AT THIS TIME, TYPE IN THE NUMBER OF THE DYSFUNCTION YOU WOULD LIKE"
10460 PRINT "TO SEE A DESCRIPTION OF.  TO END THE LOOP, TYPE IN A '0'"
10480 PRINT "INSTEAD OF A DYSFUNCTION NUMBER."
```

```
10520 PRINT
10540 PRINT " DYSFUNCTION NUMBER";
10560 INPUT X
10580 IF X<1 GOTO 11360
10600 IF X>M5 GOTO 11320
10620 READ FILE[X1,X+4],D,M1,M2,M3,D1,D2,Y$
10640 LET B2=-4
10660 FOR I=1 TO 6
10680    LET B2=B2+5
10700    ENCODE Y$[B2,B2+4],D3[I]
10720 NEXT I
10740 FOR H=D1 TO D2
10760    READ FILE[X6,H],D$
10780    IF H=D1 GOTO 10960
10800    IF H=D3[1] GOTO 11000
10820    IF H=D3[2] GOTO 11080
10840    IF H=D3[3] GOTO 11040
10860    IF H=D3[4] GOTO 11120
10880    IF H=D3[5] GOTO 11160
10900    IF H=D3[6] GOTO 11200
10920    IF H=D2 GOTO 11240
10940    GOTO 11260
10960    PRINT "NAME:";
10980    GOTO 11260
11000    PRINT "CAUSE:";
11020    GOTO 11260
11040    PRINT "SIGN/SYMPT:";
11060    GOTO 11260
11080    PRINT "ONSET:";
11100    GOTO 11260
11120    PRINT "DIFFEREN:";
11140    GOTO 11260
11160    PRINT "TREATMENT:";
11180    GOTO 11260
11200    PRINT "PROGONSIS:";
11220    GOTO 11260
11240    PRINT "REFERENCES:";
11260    PRINT TAB(15);D$
11280 NEXT H
11300 GOTO 10500
11320 PRINT "    ****NO SUCH NUMBER ON FILE****"
11340 GOTO 10540
11360 PRINT
11380 PRINT "OPTIONS:"
11400 PRINT "   1--START OVER"
11420 PRINT "   2--END PROGRAM"
11440 PRINT "[TYPE IN A 1 OR 2]";
11460 INPUT X
11480 IF X=1 GOTO 6200
11500 IF X=2 GOTO 11560
11520 PRINT "  PLEASE TYPE IN THE CORRECT NUMBER"
11540 GOTO 11440
11560 CLOSE
11580 PRINT
11600 PRINT
11620 PRINT
11640 PRINT "****PLEASE SIGN OFF THE COMPUTER BY"
11660 PRINT "TYPING IN THE WORD 'BYE' AT THIS TIME.   THANK YOU."
11680 GOTO 11800
11700 PRINT " THE COMPUTER HAS FOUND NO DYSFUNCTIONS THAT MEET THE SEARCH"
11720 PRINT "CRITERIA AS SPECIFIED ABOVE.   IN ORDER TO OBTAIN A PRINT-"
11740 PRINT "OUT, SET THE 'MIN. NO. OF SIGNS TO IDENTIFY' AT A LOWER"
11760 PRINT "VALUE AND RUN THE PROGRAM AGAIN."
11780 GOTO 10080
11800 STOP
```

CONCLUSION

Due to a lack of disc space at the Optometry department computer center, we were unable to enter the three files onto discs. Therefore, the program has not been run and debugged. Also, it was necessary to use false file names when referring to the files on lines 220, 240, 260, 6040, 6060, and 6080 of the program. This can be changed by substituting the proper file names instead of "D5:FILE1" when disc space becomes available.

Loading the three files can be accomplished by following the loading/listing instructions given in the program description and the program itself. Any changes made in the dysfunction description file must be reflected in the dysfunction data file. New dysfunctions are added at the end of the file, and also need to be included in the index and reference pages. New signs/symptoms must be abbreviated to 16 or less characters before entering the s/s file. Access to the program is accomplished using account number 5293, password JOHN, followed by a LOAD D5:FILE1 command.

With the increased availability of personal computers, it would be useful to adapt the program for this type of computer. Due to the program's large storage requirements, a program language which uses less space and time than BASIC would work the best. If the present computer is utilized, a machine language version of the program would decrease the running time and storage requirements. The decreased time would be a benefit to anyone using the system via a telephone modem.