

AN AUTOMATIC CASE-HISTORY TAKER FOR EYE EXAMINATION*

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ABSTRACT

The paper describes an automatic system for conducting the case history interview, a necessary part of an eye examination. Questions are asked of the patient over a loudspeaker from a pre-recorded audio magnetic tape, played on a random-access tape deck controlled by a small, general-purpose digital computer. The patient responds to these questions through one of three pushbuttons labeled YES, DOUBTFUL, and NO. Hardware and software design is presented in detail, together with results of clinical trials employing a total of 80 patients. Results show reliable identification of primary and secondary complaints, the latter being found more reliably than in normal interviews of the same patients.

As described in recent papers^{1, 2, 3} we are engaged in developing a computer-based automatic system for performing ophthalmic refraction under normal clinical conditions. To obviate the need for an initial interview and to lead into the refraction proper, without manual assistance, we felt it desirable to obtain a minimal case-history automatically. For general purposes we could not assume any initial visual capability in the patient. While several workers in the medical field have demonstrated automatic case-history takers using visual presentation^{4, 5, 6}, none appeared adaptable to the optometry situation, and we have therefore undertaken the development of a novel automatic system using auditory presentation. The present paper describes the prototype system and presents results of initial quasi clinical trials. While initiated with fully automatic operation in mind, the questionnaire and findings may also be found useful in the general clinical context.

AUTOMATIC MEDICAL CASE HISTORY TAKERS

Many attempts have been made to automate the medical case-history interview. At the simplest level are check-lists given to patients to mark, either alone or with the aid of a nurse or receptionist, which later may be computer-processed; or other questionnaires are based on sorting punched cards into YES and NO piles for batch processing. Our own interest lies in truly interactive testing accomplished by branch-programmed questions, generally controlled by an on-line digital computer, and this has been pioneered by Slack and his co-workers^{4, 5, 6, 7} using questions in computer-generated test form, presented on a cathode-ray-tube. His studies include allergy, gynecology and general medical interviewing. The case histories generated were more complete than comparable ones obtained in the usual way by a physician. While the computer took more

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time, the authors estimated that a comparably complete interview by a doctor would take equally long. The method was well accepted by patients and actually preferred when they were asked sensitive personal questions about gynecology, though this acceptance may have partly been due to novelty and the so-called Hawthorne effect.

Another automated medical history system was devised by Mayne, Weksel and Sholtz⁸ who found it was highly successful in clinical use from the point of view of both the patients and the physicians. Where comparisons were made, the computer's data collection was significantly better than that of the physician's.

A number of automated medical interviewing systems are now commercially available. Most, such as Searle-Medidata⁹, are relatively large-scale systems often associated with computer-aided multiphasic health examinations at a health center or hospital. Small, private-office branching-systems with a general purpose computer are also available, for example, that of Predictive Systems¹⁰.



Fig. 1. (Left) Before the automated case-history interview, the patient's name, sex, age, occupation and address is entered through the teletypewriter.
Fig. 2. (Right) Patient at the response keyboard listening to interview questions from the loudspeaker.

SYSTEM DESIGN AND PROCEDURE

In devising our own case-history interview system for ophthalmic refraction we assumed that the patient would have neither adequate vision nor literacy to read questions nor the ability to use effectively a teletypewriter keyboard. On receiving the patient, therefore, the experimenter teletyped name, date, age and sex, into computer memory. In clinical use further data such as address, telephone, occupation, and credit reference number for billing information could also be entered (Fig. 1). If this visit were not the patient's first, it could be arranged for his name or patient number to call his previous records and there would then be no need to type in any more data unless there had been changes. In the present case the information entered a small, general purpose, digital computer where it was stored in the core memory for later transfer to disk, punched paper tape or magnetic tape.

The patient was then ushered into a cubicle where he sat at a small table with a loudspeaker and a response keyboard (Fig. 2). The keyboard had four pushbuttons and a small signal light (Fig. 3a). The buttons were labeled

YES (or sometimes), NO (or not applicable), DOUBTFUL (don't know or understand, or repeat), and ENTER. Questions were posed from the loudspeaker and the patient chose one of the three replies in answering each one. After a choice was made, pressing the ENTER button registered the answer in the computer and extinguished the response request light, indicating acceptance by the computer. The next question was asked and reillumination of the response request light indicated that the computer was again receptive. When the interview was completed, the computer verbally thanked the patient for his cooperation; it could also direct him to the next station.

The present procedure differs from those used in previous automated case history studies principally in presenting questions audibly rather than visually. Thus visual disability even amounting to near blindness would be no barrier to its use once the meaning of each of the four pushbuttons had been made clear. This could be done automatically by tactile coding of the buttons supplemented by automatic verbal explanation.

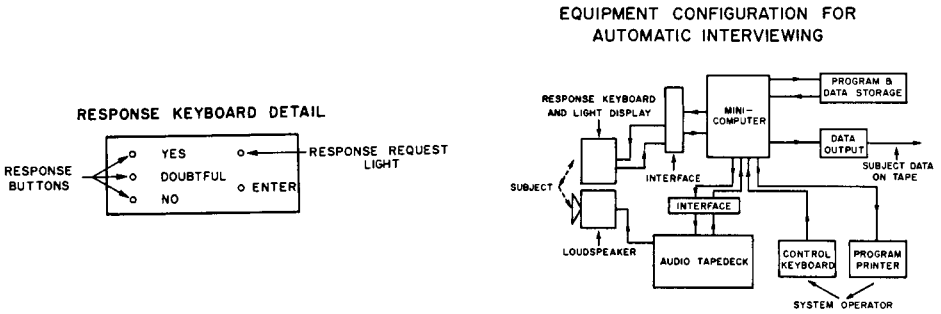


Fig. 3. (Left) Response keyboard detail.

Fig. 4. (Right) Equipment configuration for automatic interviewing.

HARDWARE

The equipment included a small digital computer^a with teletypewriter, high speed paper tape reader and punch, analog to digital converter, and static input and output buffers. A medium speed printer was of help but not essential. Peripheral equipment included a two-track stereo tape-recorder^b which was solenoid operated and a response keyboard with pushbuttons and a signal light as described above. The response keyboard was interfaced to the computer through the static input buffer. The necessary programs were stored on a magnetic disk; this would also be used for multiprocessing or time sharing more than one interviewing station at a time. The computer had a core capacity of 4,000, 12 bit words and a 1.5 μ sec memory access time. Three of the 12 bits available were used in each, the static input buffer and the static output buffer. Fig. 3b shows the configuration of the equipment and Fig. 4 the general flow of information and control during system operation.

Two parallel tracks were available on the audio tape recorder; one contained the vocally recorded questions and the other carried pre-recorded pulse

^aDigital Equipment Corporation PDP-8.

^bSony #777.

sequences constituting sequential binary-coded absolute addresses at about 1/2 sec intervals on the tape. These addresses were converted to digital form and used to implement a control procedure^c permitting repositioning of the tape to any desired address. The operation of the tape unit was initiated through the static output buffer which could select four states; viz., play (slow forward), reverse, fast forward, and stop. The verbal messages were recorded in a sequence so that random access was generally accomplished within a few seconds following the last answer.

ON-LINE COMPUTER PROGRAM^d

The branched question-posing program used to select sequence, present questions and record responses (Fig. 5) produced as its final output a list of positive and negative responses describing the patient's visual status (Fig. 6). The inputs were the question list, the algorithm for choosing the questions and the on-line responses of the patient as the interview proceeded. The recorded list of answers is intended for later use in coded form as input to an automatic subjective refraction procedure and also expanded text form as a narrative or summary case history for the refractionist as an aid in considering the final prescription.

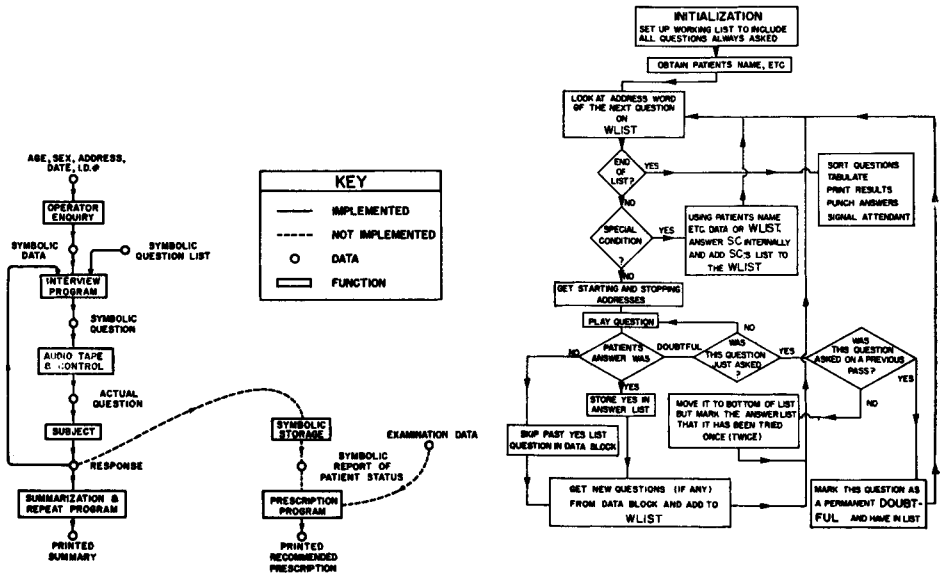


Fig. 5. (Left) Over-all program and data flow in automatic interviewing.
 Fig. 6. (Right) Computer program for automatic interviewing.

The branching program was initially set up with two lists. One comprised all the questions along with pertinent information about each question such as its location on audio tape and sublists of questions to follow conditioned

^cDevised by the second author.

^dThis program was developed by T. R. Sarbin, G. Fell and N. Buratovitch under the direction of the second author.

on the patient's response. The other list consisted of basic questions which were always asked. It formed the basis for departure in operating the program.

The control program updated the original list of questions forming a working list. Associated with each question was a "yes list" and a "no list" composed of the question numbers to be added to the working list in the event of a YES or NO answer. The working list grew during the run, starting as the initial list of questions, later becoming the list of questions still to be asked and finally a record of those asked. The yes and/or no lists would be empty for non-branching questions. These simply served to obtain the required data and did not alter the question flow.

Before the questions started, the patient was automatically instructed by the voice over the loudspeaker how to answer them. When the button was pushed to indicate DOUBTFUL, the question was repeated. After three such responses, the program stored the appropriate number and moved on to the next question. After the dynamically updated working list of questions had been completely processed, the program presented any missed questions once more. If they were then answered, the working list would again be updated depending on the content of their yes and no lists.

THE INTERVIEW PROGRAM^e

The questions were modeled after those used in interviews as ideally performed in our clinic. There appears to have been no previous published research on ophthalmic case histories on what is important and substantive in case-history questions so we simply used our clinical experience as our guide.

The flowchart in the left-hand column of the appendix shows the questions and in what sequence they are conditionally presented to the patient depending on his responses. It can be seen that some of the questions are generic ones; if answered affirmatively, these elicit a series of clarifying and qualifying questions on subtopics in the same area. If the basic question is answered negatively, all the satellite questions are skipped. Blurred vision, headaches, eye strain or fatigue, double vision (diplopia), and pathology are examples of the topics of some of the basic questions. Questions are also asked about general health conditions that may have some relevance to vision. This list should be considered a basic one to which more questions will be supplemented as our experience grows with time and with different populations.

RESULTS OF CLINICAL TRIALS

A preliminary version of the questionnaire was typed on file cards and administered manually to 53 clinical patients, the appropriate questions being asked in sequence as if the interviewer were the computer. The need for many changes became obvious. Connotations of words were sometimes critically important. For example, it soon became clear that we should avoid the word "drugs" when referring to medications (rather than narcotics or hallucinogens). Some sections had to be reprogrammed to accomplish automatically certain things that an interviewer does subconsciously, for instance, ensuring that only adult females are asked if they are pregnant.

^eDeveloped by Doctors D. Dilley and W. Baron under the direction of the senior author. Flowchart available on request.

The finalized questionnaire was recorded on tape for computer use and was administered to 27 patients. These were also interviewed conventionally by clinicians who did not know that their case histories were being compared with those taken by computer. Results from the two methods were then compared, bringing out the strengths and weaknesses of both methods, on the following points:

1. Completion time.
2. Determination of chief complaint.
3. Determination of secondary complaints.
4. Strength of reported distress, need or desire.
5. Patient understanding and education.

1. *Time Required*

The computer-used procedure required an average 25 minutes with a range of 15 to 42, while the conventional case history was estimated to take about 6 minutes with a range of 3 to 15 minutes. A computerized interview thus requires about 19 minutes more of the patient's time, while saving 6 minutes of interviewer's time.

The computer system used was relatively slow and in a few instances question-search time was as long as 50 seconds, a period which can be much reduced. The average question had 12.8 syllables, took 4 seconds to ask and was answered in 1.8 seconds. It was noted that when the patient had difficulty answering a given question, the response time came to about 11 seconds with a range of 4 to 25 seconds. The over-all average response time was 5.8 seconds which is close to the 7 second response time reported by Slack, et al.⁴ It would be possible to program the system to respond to longer times by introducing additional questions to bring out finer shades of meaning.

Only one general purpose questionnaire was used: it might be possible to reduce administration time by raising the intellectual level of the questions using more than one questionnaire; however, a prejudgment of patient intelligence would then be required. It also might be possible to shorten the interview by using other patient response modes in addition to the pushbuttons; these might include reaction time and heart rate¹⁰ as well as respiration and galvanic skin reflex. Multiple choice questions could also shorten time but such questions would probably have to be presented visually to avoid confusion.

2. *Determination of Chief Complaint*

The computer system failed to determine the chief complaints (reasons for coming) in three cases out of the 27 patients. The first was a student who said he wanted the experience of an eye examination. The second came because in a previous examination in the clinic he was told to return at a later date to have his fundus re-examined. The third patient appeared because he had experienced transient amaurosis.

The first of these might be considered to have an extraordinary "complaint" but the other two should have been identified; future versions will include appropriate questions. No doubt further unforeseen complaints will arise and appropriate questions will be needed. It should be emphasized that such omissions do not invalidate the automatic method since the number of programmable questions is limited only by time and money. Improved coverage

will require experience with particular groups of patients to be served in their normal environment. For these reasons easy editing is an important facility.

3. *Determination of Secondary Complaints*

The computer system was superior to our clinicians in this regard, finding 131 complaints or an average of 4.3 per patient that the human interviewers ignored. Fifty-eight per cent of these had to do with asthenopia. Some such responses may have been elicited because the question reminded the patient of his problem or because it suggested the complaint, but this would be equally true for a thorough human interviewer asking the same questions. There seemed to be no way of evaluating the importance of suggestion except by further investigation and lacking this we simply note the occurrence of this phenomenon. Nine per cent of additional secondary "complaints" referred to desires for new ophthalmic materials such as lenses, frames and contact lenses. These responses may have been misleading because most patients when questioned verbally did not want to purchase such materials.

The computer system failed to identify 20 secondary complaints discovered by the clinicians. Of these, 11 were missed because relevant questions were lacking. They could, of course, be added. Three involved the names of drugs and an illness which could be typed in but not easily fitted into a branched program.

Inadequate coverage was found in the following areas: 1) light sensitivity (this appeared only in the headache series and was bypassed by those who did not report having headaches), 2) scratched lenses, 3) occupational problems such as visual difficulties in typing, 4) headaches twice a week (as well as once or thrice a week), 5) seeing lights double, 6) reading problems including induced sleepiness, 7) the question dealing with broken frames should be followed by inquiring if a repair or a replacement is wanted. The more questions that are available, the less is the possibility of patient frustration because he feels he is not getting his message through.

4. *Strength of Reported Distress, Need or Desire*

Probably the major problem in computer interviewing was assessing the subjective importance of the complaint, desire or wish reported in response to a question. For example, does the patient who wants contact lenses want them enough to warrant the expense, nuisance and transient discomfort of fitting? Does the patient whose eyes are irritated from reading have sufficient irritation for it to be considered a chief or an important secondary complaint? The human interviewer looks for signs of strength or severity of the complaint. He may find them in verbal as well as non-verbal behavior during the response, which he may, however, misinterpret unless he knows the patient well. Such cues are denied to the computer, though heart rate and reaction time have been used elsewhere in a computer-based mental status examination¹⁰ and could be added in our case. The human interviewer also draws out the patient. He points out the cost and trouble of contact lenses. He asks if the eye irritation is severe enough to make the patient stop reading or sewing, etc. These questions can be asked equally well by the computer and they should be used in future programs.

5. Patient Understanding and Education

Some questions involved words or concepts unfamiliar to some patients. For example a number of them did not know the meaning of *glaucoma* and alternative terms such as *ocular hypertension* were little if any better. An explanation of *glaucoma* should probably be programmed to follow a DOUBTFUL response. A further and more detailed explanation could be available in a subsequent response if the first explanation was not understood before reverting to the original question. In this way the computer would tutor the patient to the extent needed to question him, just as the human interviewer does when he has the time, patience and inclination.

An expert human case-history taker often uses various stratagems to increase the apparent validity of the responses. He may ask the same question in various ways to satisfy himself that the response is correct. The present program has not emphasized this approach but we expect to investigate it and perhaps to employ it to a larger extent in the future.

CONCLUSIONS

Our prototype automatic case history taker has proven successful in quasi-clinical trials, and its output agrees well with the data obtained by human interviewers. However, the present version requires more patient time. Patient acceptance of automated interviewing appears to be favorable. These conclusions agree with those drawn from clinical testing of a general medical computer-based interview program¹².

ACKNOWLEDGMENTS

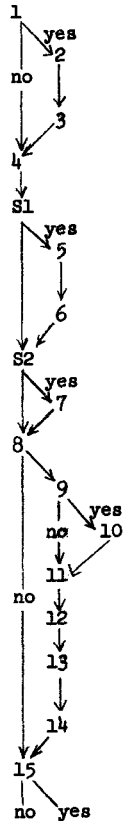
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APPENDIX A

BRANCH STRUCTURE



BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
1	1. Do you have sight in one eye only?	Y	Blind in one eye
2	2. Is it your left eye which is blind?	Y	- left
3		N	- right
4	3. Do you have an artificial eye?	Y	- has prosthesis
S1	4. Did a physician or other professional person refer you to us? (Patient age less than 9 years)	Y	Professional referral (less than 9 years)
5	5. Did you bring your child in to be examined because you feel he/she holds things too close?	Y	- works too closely
6	6. Does your child squint? (Patient age between 5 and 18 years)	Y	- squints (5 - 18 years)
7	7. Did a school nurse or teacher refer you to us?	Y	- school referral
8	8. Are you troubled in any way with blurred vision?	Y	Has blurred vision
9	9. Is your distance vision blurred?	Y	- distance
10	10. Do you experience blurred distance vision only at night?	Y	- at night only
11	11. Is your near vision blurred?	Y	- near
12	12. Did your blurred vision develop suddenly?	Y	- developed suddenly
13	13. While you are looking at something, does the blurriness come and go?	Y	- spasmodic
14	14. Do you have trouble keeping words in focus while reading?	Y	- words blur while reading
15	15. Do you have headaches, eye pain, or eye strain or fatigue?		

BRANCH STRUCTURE

VERBAL QUESTION

RESPONSE

PRINTED OUTPUT

BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no			
yes			
16	16. Do you have headaches?	Y	Has headaches
yes			
17	17. Do you feel headaches on top of your head?	Y	- parietal
18	18. Do you feel the headaches in your forehead?	Y	- frontal
19	19. Are the headaches located in the back of your head?	Y	- occipital
20	20. Are the headaches located at the temples or sides of your head?	Y	- temporal
21	21. When your head aches, does it hurt in the eye sockets?	Y	- orbital
22	22. When your head aches, does it hurt on only one side?		
yes			
23	23. Are the headaches felt on just the right side?	Y	- right unilateral
no		N	- left unilateral
25	25. Do you generally have headaches three or more times a week?	Y	- occur 3 or more times per week
no			
26	26. Do the headaches occur at least once in a week?	Y	- occur 1 to 3 times per week
yes			
27	27. Do you have headaches in the morning?	Y	- morning
yes			
28	28. Do the headaches occur upon waking?	Y	- on waking
no			
29	29. Do your headaches occur in the afternoon?	Y	- afternoon
30	30. Do you have headaches in the early evening?	Y	- early evening
31	31. Do your headaches occur in the late evening?	Y	- late evening
32	32. Are the headaches related to the use of your eyes?	Y	- related to use of eyes
yes			
33	33. Do the headaches occur when you are doing close work, such as reading or sewing?	Y	- near
34	34. Do you have headaches when you are driving, at the movies, or watching television?	Y	- distance
no			
no			
no			
34			

BRANCH STRUCTURE

VERBAL QUESTION

RESPONSE

PRINTED OUTPUT

BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no	51. Are you an albino?	Y	- albino
no	52. Do your eyes feel strained or fatigued?	Y	Has eye strain or fatigue
yes	53. Do your eyes feel tired when reading?	Y	- near
no	54. Can you read for more than two hours before your eyes start to bother you?	Y	- after two hours reading
yes	55. Do you feel eye strain or fatigue upon waking up in the morning?	N	- before two hours reading
no	56. Are your eyes fatigued or strained after you have been driving for a while?	Y	- upon waking
yes	(Patient age greater than 15 years ?)	Y	- while driving
no	57. Do your eyes bother you when driving at night?	Y	- at night
yes	58. Do your eyes bother you when driving during the day?	Y	- daytime
no	59. Do your eyes become strained or fatigued when watching a play or movie?	Y	- at theatre
yes	60. Do your eyes bother you when you watch television?	Y	- while watching television
no	61. Do your eyes bother you more than about four days per week?	Y	- more than 4 times per week
yes	62. When your eyes bother you, do you find relief from the strain or fatigue by stopping whatever activity you are doing?	N	- less than 4 times per week
no	63. When your eyes are fatigued or strained, do you cover or close one eye in order to obtain relief?	Y	- stops activity for relief
yes	64. Do you cover or close the right eye when your eyes are tired?	Y	- closes one eye for relief
no	65. When you feel eye fatigue, do you cover or close the left eye?	Y	- right eye
yes		Y	- left eye
no	66.		

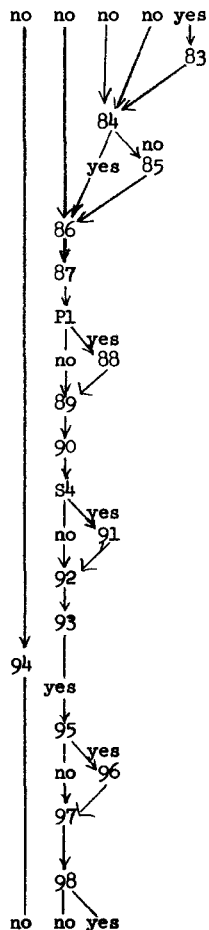
BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no			
no			
66	66. When your eyes are strained or fatigued do you try closing both of them in order to obtain relief?	Y	- closes both eyes for relief
66			
67	67. When your eyes are fatigued or strained, do you take aspirin or any medication for relief from the discomfort?	Y	- takes medication for relief
68	68. Is there any nausea or dizziness associated with the use of your eyes?	Y	- reports nausea/dizziness
69	69. Do you feel a drawing or pulling sensation in your eyes?	Y	- has drawing/pulling sensation
70	70. Are there any intense or acute pains in your eyes?	Y	Has acute pain in eyes
yes	71. Do you feel pain in both eyes?	Y	- bilateral
71			
no	72. Does pain occur in just your right eye?	Y	- left unilateral
yes		N	- right unilateral
72			
74	74. Have you noticed any excessive mucus or pussy discharge from your eyes?	Y	Reports discharge from eye
75	75. Does one or both of your eyelids twitch uncontrollably?	Y	Has lid fibrillation
76	76. Have you ever had crossed eyes or an eye that turned out?	Y	Has existing squint
yes	77. Does your eye still turn?	Y	Has existing squint
77			
yes	78. Does the eye turn occur in the evening?	Y	- in evening
78			
79	79. Does the eye turn occur in the early part of the day?	Y	- in morning
80	80. Does the eye turn when you are tired?	Y	- when tired
81	81. Is the eye turned more than one fourth of the time?	N	- less than 25% time
yes	82. Does the eye turn more than half of the time?	N	- 25-50% time
no			
no			
no			
no			
yes			

BRANCH STRUCTURE

VERBAL QUESTION

RESPONSE

PRINTED OUTPUT



- 83. Is the eye turned more than three fourths of the time?
- 84. Is it just the right eye that turns?
- 85. Does only the left eye turn?
- 86. Is or was your eye turn inward, toward your nose?
- 87. Is or was there an appearance of one eye pointing or drifting outward?
(Response to Q. 77)
- 88. Do you have uncontrollable double vision?
- 89. Have you had eye exercises to correct the eye turn?
- 90. Have you had surgery to correct the eye turn?
(Patient age greater than 12 years?)
- 91. Did you have the eye turn in your childhood?
- 92. Does any other member of your family have an eye turn?
- 93. Would you like to have your eye turn corrected?
- 94. Are there any abnormal growths or coloration in or about your eyes or eyelids?
- 95. Is there any inflammation in or about your eyes?
- 96. Do you associate this inflammation with the use of your eyes?
- 97. Do you have any abnormal growths on or in your eyeball?
- 98. Do you have any abnormal growths on your eyelids?

- Y - more than 75% time
- N - 50-75% time
- Y - right eye
- Y - left eye
- N - bilateral
- Y - squint eso
- Y - squint exo
- Y - diplopia
- Y - has had orthoptic exercises
- Y - has had squint surgery
- Y - had squint in childhood
- Y - family history of squint
- Y - desires correction
- Y Reports eye inflammation
- Y - with eye use
- Y Has abnormal growth(s) on eyeballs
- Y Has abnormal growth(s) on eyelids

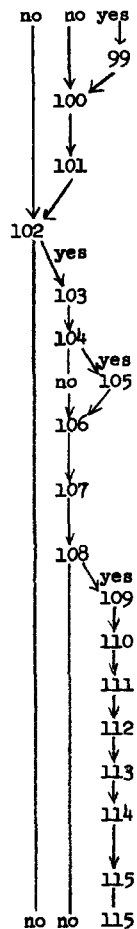
CASE-HISTORY TAKER—MARG, GROSSMAN, GOODEVE & WAKAMATSU

BRANCH STRUCTURE

VERBAL QUESTION

RESPONSE

PRINTED OUTPUT



- 99. Does this growth affect your vision?
- 100. Have you noticed any abnormal colored spots on your eyeball?
- 101. Have you noticed any abnormal colored spots on your eyelids?
- 102. Are there any other abnormal things about your vision that bother you?
- 103. Do you have a noticeable blind spot in your field of view?
- 104. Do you see spots floating around before your eyes?
- 105. Are you unable to ignore these floating spots?
- 106. Have you noticed any flashing or streaking of lights in your vision? .
- 107. Do you have poor vision for which glasses seem to help only a little?
- 108. Do you have uncontrolled double vision?
- 109. When you see double, are the two images along side of each other?
- 110. When you see two images, is one above the other?
- 111. Do you see double at least every other day?
- 112. Do you see double in the morning?
- 113. Do you see double in the evening?
- 114. Do you close or cover one eye to stop from seeing double?
- 115. When you see double do you shut one eye off?

- Y - which affect(s) vision
- Y Has abnormal colored spots on eyeball
- Y Has abnormal colored spots on eyelid
- N Reports no other abnormalities
- Y Reports scotoma
- Y Has floaters
- Y - cannot ignore them
- Y Sees flashing lights
- Y Feels vision is subnormal
- Y Has diplopia
- Y - lateral
- Y - vertical
- Y - more than once/day
- Y - in morning
- Y - in evening
- Y - closes one eye
- Y - suppresses one eye

BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no no 115 ↓ 116 ↓ 117 ↓ 118	116. Are you doing close work when you see double?	Y	- at near
↓ 119	117. Do you see distant objects double?	Y	- at far
yes P2 ↓ no yes 120 ↓ 121	118. Is your vision distorted?	Y	Reports distorted vision
↓ 122	119. Is there something else you consider abnormal or odd about your vision? (Q. 9, 15, 76, 94, 102)	Y	Has an unlisted abnormality
↓ 123	120. Have you come simply to have your eyes checked?	Y	Desires visual checkup only
yes no 124 ↓ 125	121. Do you want a routine check for glaucoma?	Y	Desires glaucoma check
↓ S5	122. Do you need an examination to determine if you fulfill the qualifications for a job, driver's license or other type of application?	Y	Desires form filled out
yes no 126 ↓ 127	123. Are you sick?	Y	Patient is sick
yes no 128 ↓ 129	124. Do you have a head cold or sinus infection?	Y	- cold or sinus infection
↓ 130	125. Do you have hayfever or an allergy? (Smog today?)	Y	Patient has hayfever or allergy
yes no 131 ↓ 131	126. Does the smog in the air affect your eyes?	Y	Eyes are sensitive to smog
yes no 132 ↓ 133	127. Have you ever had an eye injury?	Y	Has had eye injury
yes no 134 ↓ 135	128. Was the right eye injured?	Y	- right eye
yes no 136 ↓ 137	129. Was the left eye hurt?	Y	- left eye
yes no 138 ↓ 139	130. Could you see as well after the eye injury as before?	Y	- causing reduced or disturbed vision
yes no 140 ↓ 141	131. Do you have an eye disease?	Y	Has eye disease

BRANCH STRUCTURE

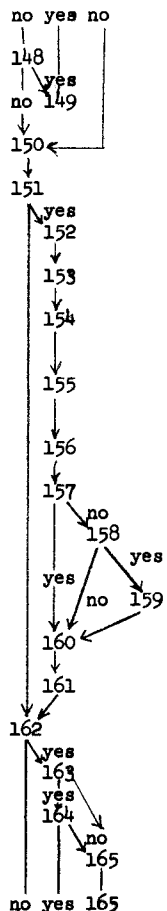
VERBAL QUESTION

RESPONSE

PRINTED OUTPUT

BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no			
yes			
132	132. Do you have cataracts?	Y	- cataract
133	133. Do you have glaucoma?	Y	- glaucoma.
134	134. Does this eye disease affect your vision?	Y	- affecting vision
135	135. Have you in the past ever had an eye disease?	Y	Has had eye disease
yes			
136	136. Did it leave you with reduced or disturbed vision?	Y	- resulting in reduced or disturbed vision
no			
137	137. Are you presently under the care of a physician for anything?	Y	Is under care of a physician
yes			
138	138. Is a physician treating or watching an eye disease you may have?	Y	- for eye disease
139	139. Is a physician treating or watching you for diabetes?	Y	- for diabetes
140	140. Are you presently under the care of a physician for high blood pressure?	Y	- for high blood pressure
S6	(Patient female and older than 14 years?)		
yes			
141	141. Are you pregnant?	Y	- for pregnancy
no			
142	142. Is there a form of blindness or eye disease that seems to run in your family?	Y	Family history of blindness, etc.
yes			
143	143. Does this family eye disease involve cataracts?	Y	- involving cataract
no			
144	144. Does this family eye disease involve glaucoma?	Y	- involving glaucoma
145	145. Not counting yourself, does any member of your immediate family have diabetes?	Y	Family history of diabetes
S6	(Patient female and older than 14 years?)		
yes			
146	146. Are you taking birth control medication?	Y	Is taking birth control medication
147	147. Are you taking any other form of medication?	Y	- and other medication
no			
yes			
no			

BRANCH STRUCTURE



VERBAL QUESTION

RESPONSE

PRINTED OUTPUT

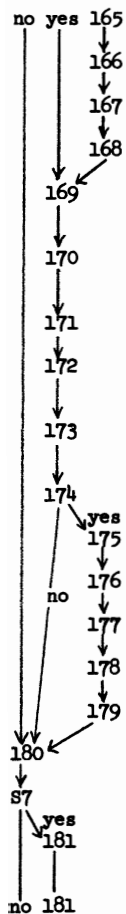
148. Are you taking any form of drugs or medication?	Y	Is taking medication
149. Does the medication you are taking affect your eyes or vision?	Y	- affecting eyes or vision
150. To your knowledge, are you color blind?	Y	Reports color blindness
151. Do you wear contact lenses?	Y	Wears contact lenses
152. Have your contact lenses in the past been satisfactory?	Y	- unsatisfactory in past
153. Are your contact lenses satisfactory now?	Y	- unsatisfactory at present
154. Do you want glasses to wear after taking out your contact lenses in the evening?	Y	- desires glasses to use after removal
155. Do you wear your contact lenses at least eight hours a day?	Y N	- worn at least 8 hrs/day - worn less than 8 hrs/day
156. Do you wear your contact lenses almost every day?	Y	- worn daily
157. Do you have your contact lenses in your eyes at this moment?	Y	- worn at interview
158. Did you take your contact lenses out more than two hours before this examination?	N	- removed within 2 hours before interview
159. Did you take your contact lenses out more than 8 hours ago?	N	- removed more than 8 hours ago
160. Have you damaged or lost one or both of your contact lenses?	Y	- damaged or lost lens
161. Do you want a new pair of contact lenses?	Y	- desires replacement
162. Have you ever worn glasses to correct your vision?	Y	Has worn glasses
163. Did you lose or break your glasses?	Y	- lost or broken
164. Are your frames broken?	Y	- broken frames
165. Do your frames need adjustment?	Y	- frames need adjustment

BRANCH STRUCTURE

VERBAL QUESTION

RESPONSE

PRINTED OUTPUT



166. Are your frames more than two years old?	Y	- frames more than 2 yrs old
167. Do you want new frames?	Y	- desires new frames
168. Is one or both of your lenses broken?	Y	- broken lens
169. Did you stop wearing your glasses for some reason other than because they were lost or broken?	Y	- stopped wearing for no mechanical reason
170. Are your glasses less than a year old?	Y	- prescription less than 1 year old
171. Would you like to start wearing contact lenses?	Y	- desires contact lenses
172. Have you had good, comfortable vision through your glasses in the past?	N	- prescription unsatisfactory in past
173. Are your glasses satisfactory now?	N	- prescription unsatisfactory at present
174. Do you want spare glasses or special purpose glasses?	Y	- desires an additional pair
175. Would you like a second pair of general glasses?	Y	- general prescription
176. Do you want sunglasses?	Y	- sunglasses
177. Do you want reading glasses?	Y	- reading glasses
178. Do you want industrial safety glasses?	Y	- safety glasses
179. Do you have any hobbies or a job which requires special glasses?	Y	- occupational glasses
180. Are you in good health? (Patient age between 23 and 35?)	N	Patient reports he/she is not in good health
181. Was your last examination by an eye doctor less than about one year ago?	Y	(age less than 23 or older than 35) Patient young or old--last examination less than 1 year ago

BRANCH STRUCTURE	VERBAL QUESTION	RESPONSE	PRINTED OUTPUT
no 181		N	Patient young or old--last eye examination more than 1 year ago
↓	182. Was your last eye examination less than about three years ago?	N	Last eye examination was more than 3 years ago
↓	183. Was your last physical examination less than one year ago?	N	Last physical examination was more than 1 year ago
↓	184. Have you ever had a serious accident or illness? (So serious that your life was in danger?)	Y	Has had serious accident or illness
↓	185. Do you get carsick, seasick, or airsick?	Y	Has motion sickness
↓	186. Do you cover or close one eye when you want to look at something closely?	Y	Covers one eye for close vision
↓	187. Have these questions covered the reason you came in?		Complaint not covered in interview*
END			

KEY yes and Y -- Patient pressed "Yes" button.
no and N -- Patient pressed "Doubtful" or "No" button (in the former case the question is stored for repeated presentation).
* -- Should be followed up by professional personnel.

* Requires verbal inquiry