

COLLOQUIUM #8

Routine vs. Priority
Procedures:
Challenging the
Medical Checkup



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ABSTRACT:

Automated multiphasic test laboratories have many applications, ranging from periodic health examinations to diagnostic survey. Such facilities save time for the patient and the doctor, both in the administration of the examination and, perhaps, in detecting and treating abnormalities earlier than has been the case in the past.

Kaiser-permanente experience to date indicates that patient acceptance of the program is high. It takes two to three hours for complete testing, and then the healthy patient spends about 15 minutes with a physician for review and analysis. If the patient is not healthy, examination may be much longer. The examination includes a questionnaire which contains about 600 medical questions. This has been shown to be quite reliable and reproducible; it also provides the opportunity to perform research to increase the reliability of the testing procedures. There is also the potential of administering psychological inventory-type examinations to accomplish the kind of subjective judgments a physician often makes during patient interviews. The cost of the examination using the multitest laboratory is approximately \$22, compared to a cost of over \$100 if the same tests were to be done in the traditional manner. In the Salt Lake area, a similar type examination is performed on patients being admitted to the hospital; automated equipment is utilized, and computerized analysis is performed. However, the objectives of the Salt Lake program are different than those of the Kaiser-Permanente program in that the former is dealing with a sick population, while the latter is dealing primarily with a well population. One of the greatest problems in instituting such a program is to convince the physicians to accept the value of automating procedures which have traditionally been quite personal in nature. It requires orientation, education, and demonstration to the physicians that multiphasic screening will save them time, will improve the quality of the exams and will decrease the cost of examinations. Although there is incomplete scientific evidence that periodic health examinations are significantly beneficial to the total population, there are indications that if adequate research were to be conducted it could indicate individual benefits and would probably show an overall value, particularly in terms of long-range prediction and prevention. Automated testing and examinations will make it easier to gather data from which such long-term information might be analyzed. The technology is now available to perform automated examinations, to maintain quality control upon such examinations, and to collect and analyze greater quantities of data from the examinations of greater numbers of the population. A side benefit of the automation of examinations is that the training level of technical personnel need not be as high as it has in the past; a person holding an M.D. or Ph.D. is not required at all levels of the testing process. This may help alleviate the critical problem of a doctor shortage in the nation. The requirements for a successful multitest laboratory operation include high volume (approximately 2,000 patients per month), support of local physicians, high-quality service, and reasonable price rates. The minimum level in terms of population is probably about 200,000. A community considering multitest facilities should be at least that large. It is probably better to have patients from outlying areas come

to the testing laboratory, rather than to attempt transportation of the laboratory to small population areas. The key to continued success is quality control, and this is difficult to maintain with mobile-type laboratories. In the future, multitest laboratories will be located in every community of 200,000 or more. The entire population will undergo periodic screening on a regular basis, probably based on age. These multitest laboratories will be tied together through some kind of computer network so that data gathering and information exchange will be facilitated. With the availability of vast quantities of information covering the entire population, it will likely be possible to diagnose disorders prior to the appearance of what are today called "symptoms" through careful analysis of such subtle variables as body chemistry, physiological disturbances, stress response and so on.

THE DISCUSSION:

CASTLE: If multiphasic screening and periodic health examinations can detect earlier those persons who have significant disease, can we alter the national course of disease and thereby decrease costs of care? Also, if we're going to provide many more periodic health examinations, how many doctors will we need? How can we improve the efficiency of physicians' multiphasic screening within the concept of the periodic health examination? Does it significantly save physician time, permitting doctors to provide more periodic health examinations in a shorter time at a more reasonable cost?

Even if you don't believe in periodic health exams, it seems to me automating some of the things we do would still be justified.

COLLEN: Automated multitest laboratories have many objectives, of which periodic health examinations are only one. The automated multitest lab can be used for examinations of patients whom the physician may refer to the laboratory for a diagnostic survey. Similarly, patients who are ambulatory and going into a hospital can receive a battery of tests through such a multitest laboratory, which will provide an admission profile of information which saves the patient time, saves the doctor time, saves costs, and may in some instances initiate treatment earlier, thereby decreasing length of hospital stay. Industrial exams, pre-employment exams, executive exams — there are many purposes for which such a multitest laboratory can be used in addition to just the periodic health exams.

CASTLE: If a patient comes in with symptoms, do you think the multitest laboratory facilitates the physician making the diagnosis, or do you think the physician does a better job in seeing the patient, taking the symptom, and then identifying the specific test he needs and just getting that one?

COLLEN: These are the two alternatives, of course. Since the great majority of people have some symptoms, we assume that every

patient has some abnormality and the objective is to identify important clinical conditions which cause those symptoms. It has been our experience that the great majority of patients save time by being able to obtain a whole battery of tests within two to three hours which ordinarily would take a whole day. It is also our experience that 70 to 90 percent of patients can be taken care of by one single visit to the doctor. Those who have important clinical abnormalities can then be followed up in a more traditional manner, but those who are generally healthy can be fully taken care of in one 20-minute visit with the physician.

CASTLE: It seems sort of cold and inhuman to have the patient go to a laboratory first. His first encounter with the health system is through a laboratory.

NOEHREN: Yes, and if they're essentially healthy, why do they have to see a doctor at all? Why not just leave the blood sample, and we'll let you know whether we need to see you any further?

COLLEN: Our experience is that patient acceptability of the program is generally very high. I think the majority of patients clearly separate in their minds a laboratory from a doctor's office, so that going to the laboratory, whether it is first or after, is not material to the patient, but going through a complete, modern, highly-technical laboratory is very impressive to them. As far as being willing to see the physician if they're healthy, there are many hundreds of conditions which we don't attempt to identify because they are very rare or because they are very costly, and so if a patient goes through the multitest laboratory and has no test abnormalities, it merely means that he does not have these specific conditions. He may have any of several hundred other conditions which the physician will have to attempt to identify in his followup.

NOEHREN: So if it takes the physician 15 minutes to read the card and find out who the patient is, how much else can he do in that short period of time? You're talking about just diagnosis; you're not talking about treatment. Is that right?

COLLEN: It only takes a few minutes for the physician to review the summary report which he obtains. The summary report is so structured that it's easy to follow. Abnormalities are identified with asterisks so that it brings to his attention those test results which are important. If all the tests are normal on the report, he can determine this within a few minutes. Then he will need only to follow through with the patient the special problems or complaints not included. Then he completes his physical examination. He doesn't have to ask all the routine questions; they have already been done before. All of these routine questions and procedures have been pushed forward in time into the laboratory so he can start right in with the definitive decision-making process and try to come to a

diagnosis. If he confirms that there are no other significant complaints and no other abnormalities found on examination, he can then discharge the patient. If, however, he finds an abnormality, then he arranges additional exams.

NOEHREN: That's not figured in this 15 minutes.

COLLEN: No. The 15 minutes is just for those who have no important abnormalities.

NOEHREN: By the time you've taken enough histories, it becomes rather apparent that you learn a great deal about the patient just in the way he answers his questions. It seems to me you're transferring this very subjective and very personal feeling for the patient to the character of his handwriting. This is rather an abbreviated form of typecasting a personality. This is hard to buy.

COLLEN: When one deals with automated history taking and self-administered questionnaires, the subjective character is, of course, eliminated. This is why it is still necessary for the physician to see the patient after the exam. That component of data acquisition which is objective and can be quantitative we can build into the machine.

NOEHREN: How many questions do you ask?

COLLEN: Well, we ask some 600 medical questions. We have essentially three questionnaire phases. One is the past history that the patient answers at home, the second is the interval history that the patient answers while he is there; and, the third is the inventory by systems, which is 200 of the usual questions every doctor asks.

NOEHREN: I doubt if we ask 600 questions in the period of an examination.

COLLEN: Of course not. No patient can afford to pay a doctor to take the time to ask that many questions. That's why we moved it into the multitest laboratory. We have been able to conduct considerable studies evaluating the reliability of such a questionnaire, and we've published those. Very few physicians have any idea as to the reliability of their questions.

NOEHREN: Their questions or their answers?

COLLEN: Both. You never ask the same question the same way; you ask them differently, and so the responses are different. In our questionnaire we have found that the reproducibility of these questions can be measured. We know that some questions are very reproducible and "hard" questions, so to speak. Others are quite unreliable questions, and so we continually improve and revise questions to increase the reliability. For example, we can assure a physician that if the patient response to a question is "no," that if he asks that question a second time, better than 98 percent of the second re-

sponses will be "no" again. The reproducibility of a "no" response is very good. The reproducibility of a "yes" response, however, is not so good. They might change their minds because they may not be sure or they may want the doctor to ask more about it.

NOEHREN: That may be obliging the doctor. I think we all suffer from that, don't we?

WARNER: I wouldn't be quite so quick to discard the self-administered history as not being an important source of information about the patient's psychological makeup. At the Mayo Clinic for at least four or five years now they have been routinely administering a Minnesota multiphasic modified kind of psychological questionnaire which is designed to present to the doctor at the time he first sees the patient a statement regarding the psychological makeup of that patient. This has proven to be a very helpful thing in determining which patients need a rather detailed psychiatric workup, so these self-administered questionnaires can be a very significant help to the doctor in sizing up the psychological makeup of that patient.

CASTLE: Can I ask you another question? We're talking about multi-test laboratory and multiphasic screening as though it's one thing, and I get the impression that when Homer says multiphasic screening he may mean one thing, and when someone else talks about multiphasic screening he may mean an entirely different battery of tests. When we talk about costs, what is the battery of tests that you use?

COLLEN: I'll describe briefly the tests that we include. Many of them are under evaluation. One must tailor the laboratory and screening program to the population being examined, and so every laboratory may have different test phases. Our laboratory has a registration station first, then electrocardiogram, blood pressure, body measurements, and a series of X-rays. We now do a flat film of the abdomen, which is under evaluation. We wouldn't recommend it yet, not until we evaluate how useful it is to detect disease. We do a mammography in women over 47. We've found that one in every 500 women going through our program has cancer of the breast and so we feel that's important. Then we do a visual acuity, tonometry for glaucoma, hearing tests, and respirometry. We have a questionnaire, as I described. Then the blood samples are drawn, and we do at least eight serum chemistries, serum glucose one hour after 75 gram challenge dose, cholesterol, uric acid, calcium transaminase, albumin and total protein.

NOEHREN: Wait a minute. The patient's getting weak from loss of blood. How much blood do you need?

COLLEN: We draw four vacutainer tubes, about 12 to 15 cc. We do hematology with the Coulter counter, (hemoglobin, white count, red count and indices); VDRL test for syphilis; blood typing; and also rheumatoid factor by the latex fixation test.

NOEHREN: About \$125 worth, I believe.

COLLEN: We estimate that in the usual manner it would be about \$100 or more. Our cost, by packaging it in the multitest laboratory and by examining a group of 100 to 120 per day, providing the summary report, all interpretation, amortization of equipment and facilities is about \$22.

NOEHREN: Does that include the doctors?

COLLEN: This does not include the physicians' followup, but it does include the physicians' costs to read the EKG's and X-rays in our programs.

CASTLE: Does it include the physician's initial contact with the patient where he has the data?

COLLEN: No, it does not. Any patient who goes through the multi-test laboratory can see any physician in the community, and therefore, these costs are not included. Most of them see our doctors within our health plan program.

NOEHREN: Does this include the amortizing of the equipment, too?

COLLEN: Yes. Amortizing of equipment, rental of space, plant maintenance, indirect costs, overhead — everything.

NOEHREN: Has Medicare heard about this yet?

WARNER: This is quite a different battery of tests than we perform — a much more comprehensive battery in some senses. Our screening activities here in the Salt Lake area have been limited to screening patients who are already being admitted to the hospital for some known abnormality. Many of these are surgical patients coming in to have an operation. We screen them on admission, primarily to assess the status of their body independent of the condition for which they're being treated. For instance, a patient might be coming in for a hernia operation who also has a respiratory problem we'd like to know about before he's given a general anesthetic, and so our battery of tests is somewhat different. First, the patients have an electrocardiogram, which is read directly by the computer. The electrocardiogram is classified into either normal or one of several families of abnormal patterns, so this isn't a diagnosis but an EKG classification. Second, the patient breathes into a spirometer, and this is automatically read by the computer. The values then are presented back at the bedside as a percent of the expected value for that patient's height, weight, age, and sex. They are recorded this way into the computer record. Third, a blood sample is drawn and the 12-channel standard battery is done on this, as well as the routine hematology and urine. The blood pressure and temperature are taken by the nurse at the station, so that this is out of the way by the time the patient gets to his room. While he's waiting to be

admitted to one of the examining rooms, he starts taking a history questionnaire which is presented to him in the form of a little book which has one IBM card in it and a series of pages with questions on them. He then simply punches out the hole if his answer to that question is "yes." We end up with one card with a series of holes in it, which then can be fed through the computer to record his answers.

NOEHREN: Is this a "yes" or "no" questionnaire? He can't pursue a "yes" answer.

WARNER: No. It's just a screening device, and we cover much of the same territory Dr. Collen does.

NOEHREN: How many questions on it?

WARNER: There are 280 at present. These are questions that have been designed by specialists serving on a committee at the hospital. Specialists in each of the areas have designed questions for their particular area, and we hope in time to do research on the questions as to reproducibility, effectiveness, and reliability with regard to actually separating patients with a particular disease from other patients. We have a study going now, for instance, in which the patient will take the test by answering the questions directly on the punch card, and then when he gets to the ward the resident will interview him and ask the same questions. We'll then compare the answers this way. This answers one of the questions we'd like to know: Do the patients understand the questions? Is it different if they're presented by a doctor who can perhaps do some explaining if they have difficulties with them?

NOEHREN: Do you have any answers yet?

WARNER: We don't. We're just starting that study.

COLLEN: We have compared interview questions on forms with questions on cards, but not using physician interviews.

CASTLE: I sense from what you said earlier that the package Dr. Warner is talking about can provide for a patient who has illness, who has symptoms, but that this would not be as large a package as you would recommend.

COLLEN: It's a different package, and as I emphasized, you tailor your own laboratory to your own needs. Dr. Warner is much more sophisticated than we are in that we don't have computer analysis of the electrocardiogram and spirogram, but he's dealing primarily with patients going into a hospital, and we're dealing primarily with office patients. As our objectives become more similar to Dr. Warner's, then we will probably want to do many of the things he's doing.

NOEHREN: You're dealing with a well population, and he's dealing with a sick population.

COLLEN: That's a fair description.

CASTLE: How do the physicians respond to this? It seems to me this is a tremendous change from what they've been taught in medical school and in their training. My guess would be that physicians wouldn't take very well to having the laboratory do these things in an automated way.

COLLEN: Physicians are properly skeptical of all innovations until they are proven to either improve quality or economy. One must demonstrate that these innovations do have high utility, and until these are demonstrated, the physicians often will not accept the programs. We have been using multiphasic screening techniques in periodic health examinations since 1949, and so the majority of our physicians do accept them. However, there are still some who believe periodic health examinations have not yet been proven to be of value. They are not very enthusiastic about periodic health examinations and, therefore, are not very enthusiastic about any method of doing them, including those which use multiphasic screening techniques. It requires orientation, education, and demonstration to the physicians that it will save them time, improve the quality of the exams, decrease the cost of the exams, and so forth.

NOEHREN: What's your answer to the doctor who doesn't believe these routine examinations pay off? Do you have an answer?

COLLEN: No. There's no scientific evidence that if one has a periodic health exam every year or two that he's going to live any longer or that he's going to have fewer hospital days in the future or less disability. This has not yet been demonstrated, and there are those who question the long-term value of periodic health exams. Our health plan made the decision that it was going to provide periodic health examinations to those who joined the program.

NOEHREN: You are working on faith, then. Is that right?

COLLEN: Yes.

WARNER: I don't quite agree with you on this. It seems to me that certain groups, such as the Framingham group and others, have pinpointed certain risk factors for heart disease; for instance, they have made it very clear that patients who are obese, or patients who have smoking habits, or patients who have high cholesterol have additional risk of illness. We know from other studies that if those factors are detected early — those are just a couple of very simple things — and if the doctor gives his advice, and if the patient follows that advice, the risks change. I don't think we need to wait another 20 years to see that those particular patients survive who happen to be detected through a multiphasic screening unit. I think the evidence is pretty clear already in certain diseases that these risk factors exist and that certain early conditions which represent risk factors are reversible.

CASTLE: Hypertension is a perfectly good example. We know the risks increase with elevated blood pressure. We also know that if you change that blood pressure level and bring it back down to normal, you can very definitely alter the course of the patient. There are several similar examples. If you put them together, it becomes rather convincing that if you detect the disease early and treat it effectively, you can do something to alter the course. I think you leave the impression that we haven't answered the question in the affirmative, when we really haven't looked at the problem long enough to get an answer.

NOEHREN: Isn't some of the skepticism concerned with whether or not it's worth the cost? Hasn't this been one of the major stumbling blocks in this area? We went through this with routine chest X-rays with the public health service, and they found that it cost \$25,000 to pick up a new case of tuberculosis. There was no question about picking up the case of tuberculosis, but was it worth \$25,000 to find that case?

COLLEN: Correct. Economists are beginning to ask if cost benefit studies have been completed, but it is difficult to do these because it does take 10 to 20 years to complete such a cost benefit study. If we look at individual conditions, we do believe that decreasing weight, decreasing or normalizing blood pressure, decreasing blood sugar, and so forth, will help individually. What we're trying to do is measure the overall effect on a group of people if we monitor the state of health and disease over a period of time.

NOEHREN: You're interested in the population group, then, aren't you?

COLLEN: We're trying to measure the effect on a population group. This is more difficult, and essentially, this is what the government and large groups are interested in. If they invest resources in health monitoring or health surveillance of a population, 20 years from now will the results be worth it?

NOEHREN: Don't the insurance companies have some answers on this?

COLLEN: Many years ago Metropolitan Life Insurance began to do a study, but they never finished it, or at least never published any results. They began a study to try to measure the effect of health examination on longevity. They published the statement of their study, but they never followed through. Whether or not they completed it, I don't know.

CASTLE: How is it that you had so much foresight to begin something 20 years ago which only now seems to be in the mind of everyone else?

COLLEN: Well, we started 20 years ago because it was necessary from the viewpoint of economics. Dr. Garfield, the founder at our organization made the decision that we should include periodic health exams as one of the benefits available to our subscribers. So we had to provide it in an economical and efficient manner, and that's why we started. In a way, I see the same question arising nationwide. Prominent people are beginning to feel that the people ought to have more care, more examinations, and so forth. Therefore, if our country is going to make a decision — by Preventicare or other legislation — that periodic health exams should be provided to the people, then what's the most economical way of doing it? A resurgence of interest in multiphasic screening and multitest laboratories is now developing to respond to that need which is apparently developing.

WARNER: There's another important factor here that accounts for at least part of the resurgence of interest in this screening process, and that's the technology itself. Doctors don't particularly like to do examinations on healthy people; it's uninteresting. As we learn ways of doing this that don't involve doctors and that take some of the drudgery out of it, not only is it economically more feasible, but from the point of view of the people who have to do it, it's a lot more exciting. I think this plays a very important role. People are fascinated by automation. We're exploring what this can do for medicine, and this has been important in getting people enthused about it. The idea of hiring people to do something for you is one thing, but the idea of getting a machine that can relieve you of the task and provide you with some information that might have to be collected manually otherwise is another kind of thing. Another impact of automation or the technology is the business of quality control — improving the accuracy of the tests. As you polish a tool and make it so that it can measure something more accurately as well as more easily, it takes on a different dimension. I'll give you a simple example, and that's spirometry. When we started doing spirometry, the cost to the patient, based on man hours, was up around \$25. We can easily do that test now for \$2. All of the interpretation can be done, and you can classify the patient as to the probability that he is normal or abnormal. We've reduced by a factor of at least ten not only the cost procedure but the time it takes to do it.

NOEHREN: There's another side to this coin, you know. We constantly compare the machines with the human interpreter, but as we learned from Garland's studies on the reading of X-rays, the human interpreters can vary considerably. We assume that the doctor is, by definition, correct in his reading of the spirogram and the EKG, but if you ask two doctors to read the same EKG, you have a duplicate reading error. Have you studied this?

COLLEN: Yes. There may be an observed variability of 30 to 40 percent, sometimes.

NOEHREN: We need his intuition, but at the same time, he's not infallible.

CASTLE: There's a considerable variation in the same observer reading an electrocardiogram today as compared to two days from now or two years ago. Can you program more reliability into a machine?

WARNER: That's what we're trying to do — all of us.

CASTLE: One thing struck me when you said these automated tests are being done by people other than physicians. You're taking the physician out, but it seems to me it would take highly skilled people. Maybe you don't call them doctors, but it would take highly trained, advanced people to do the tests you're talking about.

COLLEN: That depends, of course, on the test. You do have to match the person to the requirements. However, opportunities do develop to upgrade people. In taking body measurements, our first technician was a graduate who had majored in anthropology. She did very well, but after a couple of years she got married and left. We couldn't find an adequately trained person to take her place, but we had LVN's — nursing aids — and we found they do very well because they know the body locations to take measurements. In some of the tests, you can train high school graduates to do a routine repetitive task over and over, where the task is clearly defined and you can teach them how to do it in a precise manner. In other areas, such as the automated chemical analyzers, we have a Ph.D. biochemist to supervise that. We have 30 people in the laboratory, and that's the range of training — high school to Ph.D.

CASTLE: Well, what about doing the ocular tension?

COLLEN: When we first started, we had physicians doing ocular tension for glaucoma detection, but in 1964 and 1965 they began to train nurses.

NOEHREN: Who did?

COLLEN: The ophthalmologists trained the nurses to do ocular tension, and since that time they have delegated that routine procedure to nurses. We now have nurses who have performed tens of thousands of these examinations, more than many ophthalmologists have done, and we have no record of any corneal injury or infection. Our ophthalmologists are now satisfied that trained nurses under supervision can do ocular tension with the tonometer.

CASTLE: Do you think if you work at this long enough and get the people well trained that you can get the physician out of it entirely?

COLLEN: No. You can get the physician out of individual tasks. We can train nurses or corpsmen to detect murmurs and do that parti-

cular task. We can train nurses to do pelvics. Everyone knows we have very good OB nurses on the OB floors who do the pelvics and tell the obstetrician when the baby's ready to come.

NOEHREN: Have you mentioned this to your obstetricians lately?

COLLEN: We have, but they haven't accepted it yet. We can train physicians' assistants to perhaps do sigmoidoscopies. I think we can train people to do these individual tasks, but the overall decision-making process that took us 8 to 12 years to learn cannot be delegated because to train someone to have sufficient experience to do that would take 8 to 12 years. Therefore, I think the physician will always be the decision-maker. Essentially, he will manage the case. He will put it all in the proper context, and make the diagnosis, and prescribe treatment tailored to that individual patient by that patient's age, sex, education, socio-economic status, occupation, and so forth. The M.D. is necessary to make the decisions and prescribe and manage the case. All the data acquisition — gathering all the information on organs and systems — will be transferred to others who can do this task as well, if not better, than the doctor.

NOEHREN: How much have you been able to sell this idea to other institutions? It seems to me that acceptance by other groups is a critical measure of this whole thing.

COLLEN: I don't like to hear you say, "How much have you sold?" Because we're not selling it. Others have done a much better job in demonstrating the value of, say, pediatric nurse practitioners. There's an excellent example in Colorado.

NOEHREN: I was referring to your basic automated screening program. How many other institutions have taken this on for large study groups? How about HIP in New York, and the Mayo Clinic, and some of those? Have they gone along with this thinking?

COLLEN: HIP in New York has applied for and is planning to institute a program somewhat like ours.

CASTLE: Maybe these other institutions don't have the ingredients. Dr. Collen, what do you need to launch a program somewhat like what you're doing? It seems to me that you need a massive volume and almost a captive audience of patients in order to be certain that you have the cost benefits you're looking for, and to justify the enormous cost of the initial investment.

COLLEN: You've covered the requirements, although I don't like to use the words "captive patients," because they're not; it's all voluntary. Essentially, for a successful multiphasic health-testing program one does first need the support of the physicians who take care of the patients. The program must be integrated into the continuing care of the patient; it cannot function as an island. Secondly, it must provide a quality service, which means, as Homer has pointed

out, improved quality of testing in a manner acceptable and useful to the physicians. Thirdly, it must do it at a cost which is competitive to the usual manner and preferably far below it, and in order to do that and to be able to support automated equipment, one must have volume. One must do 100 exams or so a day to be able to operate with costs such as ours, and this, of course, requires the cooperation of the people and the doctors in the community to see that adequate numbers go through. Therefore, with the support of the physicians and quality service at a reasonable cost, any program should succeed. Not everyone has these ingredients, and our history has shown that if you don't have all three of these, eventually the program will fail.

CASTLE: You know enough about Salt Lake City to respond as to whether or not this community justifies considering such a facility.

COLLEN: What's your population?

CASTLE: Within Salt Lake proper we're talking about 200,000, but in the Salt Lake metropolitan area it's 350,000 to 400,000.

COLLEN: You have the requirements to provide a very successful program. With 200,000 or more, assuming that half of them are adults and assuming that one-fourth of them will go through once a year, that gives you 25,000 a year, or 2,000 a month. That's exactly the volume we have, and that should guarantee you an adequate volume for reasonable care. You have a medical center with all the expertise, and if your medical society and the physicians in the community will support the program, you have all the ingredients for success.

CASTLE: How can we benefit the more distant communities with this facility, though, if we had it in Salt Lake City? How would you benefit a population of 10,000 from a community 150 or 200 miles from here? Could you take the laboratory there, or would it be better to bring the patients here?

COLLEN: My opinion is that it is better for the patients to be transported to the center rather than have the center transported to the people. Now, there are several mobile multiphastic screening units being evaluated in the country, and others may differ from my opinion on this. I think the difficulties of quality standardized tests and quality-controlled monitoring is very difficult, and having such a multitest laboratory associated with a medical center automatically gives you the necessary quality supervision from the cardiologist, from the clinical laboratory, from your radiologist, and from all the specialists necessary to monitor each of the phases.

NOEHREN: This is a continuing process, you're saying?

COLLEN: To me, quality control is the most difficult, most important part of the whole program. Quality control goes on as long as the

program goes, and every day, every week, you must continually monitor. If you do it the first year and then say, "We're fine," and don't do it the second year, it will go downhill. The same quality control monitoring that is in your clinical lab can be built in this, and your electrocardiogram lab, and your X-ray lab and so forth. If you have these mobile units travelling around, who's going to monitor their quality control? That's one thing that concerns me.

WARNER: We have a program now in the Intermountain Area that is achieving just this quality control laboratory work. This is run on a voluntary basis by the Society of Medical Technologists. Each month test sera are sent out to these laboratories, and each day they run the test sera through their system. The results are sent to the central computer facility, where reports are prepared showing them how each laboratory varies from day to day and how their mean differs from the mean of the laboratories. Over a period of several years now, these fellows have been able to focus on their problems if one laboratory systematically differs from another. They then examine whether they are doing the test differently, or whether they have a different technician, or whatever. With this they have maintained a quality control which didn't exist two years ago at all.

CASTLE: That's just with the clinical laboratories. That certainly is good, and should be done, but with the total multitest lab there are many other tests that would require some kind of control.

NOEHREN: Would you project, Dr. Collen, where this is going in the future? Could you give us sort of a Buck Rogers concept of where this is all going to end? What is the maximum? What do you dream of?

COLLEN: To follow on my previous statement, I think that every community of 200,000 or more is going to have such an automated multitest or multipurpose laboratory. I think that every large medical center in such a community is going to have such a laboratory for both inpatient and outpatient in order to be able to provide better quality service faster, more accurately, and at less expense. I think that each of these centers, then, will be connected to some computer center within, perhaps, a hundred-mile radius so that communications costs don't get too expensive. This computer center will then provide the data base for all these facilities so that patients can move among them and the doctors can obtain information from them. Furthermore, that computer center will provide the central quality control, providing mean values for each of the centers so they can compare their lab reports, and so forth. Beyond that, I don't know.

NOEHREN: Will we screen the whole population someday?

COLLEN: At certain intervals, although perhaps not yearly. I think high school students ought to have one exam. I think college kids

ought to have an exam. I think people in their 30's ought to be examined at least every three years, those in their 40's every other year, those in their 50's maybe every year, those in their 60's every nine months, and those in their 70's maybe every six months.

NOEHREN: Do you really think we're going to come to this?

COLLEN: I think we are.

CASTLE: Do you think we can afford that?

COLLEN: With technology and automation, I think we can.

WARNER: We have this pretty much now, don't we? I mean the high school kids all have to have an exam, and the college kids have an exam when they go to college. It's being done by the physician instead of through automated test laboratories. I'd just like to make one speculative statement with regard to the long-term effects of this kind of endeavor. I look favorably on the sort of thing Dr. Collen is doing, and we're struggling with a simple means to an end at the moment. It's a means to get a data base, to start getting data in a systematic fashion on patients. Ultimately, we'll be able to do much more. Dr. Collen is now four years downstream with his program, and as he gets five or ten years downstream, he'll be able to look back on his data ten years before and see what patterns exist in the numbers he gathered on patients which might have told him well in advance that these patients ten years later would have developed this, that, or the other condition. I really think this is the more important goal we're all working toward. If periodic examinations are not as valuable in the minds of physicians as they might be at this point in time, it's simply because we don't yet know how to interpret the data. With the help of sophisticated statistical methods and with the proper data base for experience, we can accumulate information in a form that doctors just can't handle intuitively. We already know from certain prototype studies that this is possible, and with time we should be able to do a great deal more with the information we get than we can now. The startling point has to be to get the technology going, to get the data gathered, and we've found from experience that the data gathering process is only effective as long as it provides some service as it goes along. So we're all hoping that the service we're providing today is useful enough to at least justify its existence.

CASTLE: Maybe if the doctor isn't interested in doing this and is not so concerned about predictive medicine, the patients will be.

WARNER: I think the doctor is concerned about it. He's frustrated by it because we don't really have the facts to know how to do it yet. It's only through these systematic data gathering methods that we'll eventually get those techniques developed and have the information available to make predictions.

NOEHREN: It's interesting. He's saying the same thing that Dr. Feinstein said about symptoms when he was here. In evaluating the symptoms over a period of time, we're going to be able to project in the future what this means for disease. Now, these men are telling us the same thing for laboratory data — that by developing curves and being able to look at the beginning of it, we should be able to predict much better.

CASTLE: Then our findings and symptoms are not different; they are just expressed differently.

NOEHREN: One is subjective and the other is objective.

CASTLE: One is subjective and the other is more reproducible or measurable.

WARNER: Let me make one other statement about symptoms. I feel pretty confident that symptoms will be much less important in the future than they are now. Symptoms are a rather late manifestation of disordered body processes. There should be many more subtle things we can detect through body chemistry, disturbed physiology, response to stress, and so on. We know, for instance, that a patient who has a congenital heart disease and is limited in his activity may really think he feels pretty well, but when he's cured and he has that defect repaired, he feels fine. You see, he didn't really know what feeling well meant because it sneaks up so gradually.