CAP:

COMPUTER
AIDED
PSYCHIATRY

What I'd like to do in my talk today is to present a proposal to you. It's a proposal about computerising patient records in a psychiatric setting, a proposal which I hope eventually to present to the hospital administration. What I would like is your comments, your feedback, to help me refine it, to make sure it will ultimately meet your needs.

Before I get to the details of my proposal, I would like to put it into context. So I will begin with some generalities about computers; I will then present a picture, a fantasy, of what the near future might be like for psychiatrists using computers. After that comes my proposal, which we can follow with a discussion.

How can computers help in our specialty? We deal with people and relationships between people. Computers often seem to be the antithesis of this.

Most of us have been exposed to computers through our bank statements, bills in the mail, our paycheques, the machine which predicts the outcome on election night.

If you have had some exposure to the home variety of computer, your appreciation of its mysteriousness and intractable behaviour may have increased, if anything.

Can computers think? No. Are they smart? Sometimes - if they've been programmed intelligently, and they're used in a way which maximizes their strengths. Let me explain this further.

Computers are very good at doing repetitive tasks - they never get bored or tired, and they can be incredibly accurate even when working with finely detailed data. However, they will appear to be infuriatingly obsessive - picky about niggling details, splitting hairs, unable to see the forest for the trees. In contrast, humans are disconcertingly fallible when dealing with similar data over and over. On the other hand, we humans can be proud of our knack for coming up with creative and unique solutions to highly individualized problems.

It seems reasonable, then, to design computer systems which would capitalize on the respective strengths of the humans and the computer, while respecting their weaknesses. This isn't always the case, unfortunately - some systems to process clinical data demand an excessive attention to detail on the part of the clinician who provides the data; for example, a four-page form to record a patient's mental status. Furthermore, it wasn't until the computer came along, with its insatiable appetite for data, that we were able to create as mindless, dull, and boring a job as that of keypunch operator.

How can we use computers effectively? A common denominator for many successful computer applications is embodied in the concept "page-turner". When you need a telephone number, a "page-turner" can help you get quickly to the right entry in the telephone directory. The same applies to a diction-

ary, a medical reference text, or an online computer version of Index Medicus. The computer doesn't interpret the data, it doesn't offer opinions, it doesn't make decisions - the person using it does these things - the computer simply helps him get to the right information quickly, as a "page-turner" would. Whether it is a nurse looking up the latest medication orders written on your patients, or the medical records technician verifying that a chart is complete, or a researcher looking for correlations in volumes of clinical data, or a psychiatrist seeking information about a patient's previous treatment, an automatic, tireless, and friendly "page-turner" can save time and energy - leaving the human with more of that precious time to do what he or she is good at and enjoys doing. Most of us resent the time we spend doing purely clerical tasks; and it doesn't make economic sense to pay us as doctors, nurses, psychologists, and so on, for doing a clerk's job.

OK, now that we've dealt with the "why", let's talk about the "how" and the "what". I'm now going to present to you a fantasy, set perhaps ten years (maybe less) in the future. I'm asking that all of you, individually, using your imaginations, place yourselves inside this fantasy. With your mind's eye, look around, experience it; I'd like very much to hear your reactions at the end of my presentation.

Imagine yourself as a psychiatrist, working as service chief of an admitting inpatient unit at a large mental hospital. You've been on staff for a number of years, and your eclectic approach to mental illness reflects the hospital's philosophy.

Over the years, your working habits have been considerably modified by the increasing utilization of computers in the hospital. Now they have become a part of everyday life, and the initial anxieties you may have had about the new technology are only remote memories.

You do recall vividly, however, all the drudgery that the computer has eliminated from your life: clerical work, like looking for patient charts; trying to decipher hopelessly incomprehensible handwritten progress notes; endless poring through charts to get a picture of a patient's medication history. Now, with the time the computer saves, you have more time to spend with your patients; seeing them individually and in groups, meeting their families, helping them get better.

Let's look at a typical working day. You have just arrived at your hospital office, and the first thing you do is to turn on your computer terminal so it can warm up while you hang up your coat. The terminal displays a cheery "Good Morning" and presents your activities for the day. Most of the items are just routine for this particular day of the week, and you're comfortable with the knowledge that your terminal will "beep" shortly before the important commitments that you've made.

If you like, you can direct the computer to transmit this "beep" to your pocket pager, so you can receive a reminder wherever you happen to be, if you so choose.

The computer lets you know that a meeting conflicts with a psychotherapy session you have scheduled with one of your private patients. Two or three simple commands are enough to set your computer into action to call up the patient, using the telephone numbers it has in its memory. The computer tirelessly calls the number until no longer busy - at that point, it notifies you that the connection has been made, so that you can talk to your patient. In this case, however, the computer reports that there is no reply at both of the telephone numbers it dialled. You dictate into your computer a voice message to your patient, to cancel the appointment, and to suggest an alternate time. The computer will continue to dial the numbers every half hour, and when successful, will play back the message you've just recorded. It will also record the patient's reply, just like any telephone answering machine.

Your day's schedule arranged, you next check your mail. Of course, most of the in-hospital memos are now "electronic mail", which has meant a great saving on costs for paper, copying, and mail distribution. It only requires a couple of commands for you to review on your screen all the memos waiting for you. You can obtain a printout of any of them: for example, an agenda for an upcoming meeting, which you might like to have in front of you during the meeting. An-

other memo might be a notice regarding a conference on "Staff Burnout". Realizing that this topic is of interest to some of your team members, you can direct the computer to retransmit the memo to their computers. You can also have conference data, such as time and location, transferred from the memo into your personal schedule.

Finally, you note that the staff library has provided you with abstracts of the articles published in your field of research in the past month. If you don't have time now to scan them, just get the computer to transfer the abstracts into your file labelled "research 'in' basket".

Suppose that you're a member of the Canadian Psychiatric Association's task force on "Psychiatric Treatment of Minorities", which is preparing a position paper. The task force members, scattered all over the country, have chosen to communicate with each other via an electronic "bulletin board". As the name implies, any member can "post" interesting data, such as personal observations, journal references or even complete articles, names and addresses, etcetera, on the board, to be scanned by any other members, at his or her leisure. In the few minutes remaining before you are due on your unit for Rounds, you request your terminal to dial up automatically, the "bulletin board".

Shortly, the terminal beeps a tone to warn you that you've scheduled yourself to be on the ward for Rounds. You set your terminal to load and store the interesting article from the "bulletin board" that you were reading, so you can continue to read it later, and perhaps, have it printed out. You go to your unit, and meet with the head nurse in the nursing station. Together, you review the patients on the ward, using a computer terminal which makes the medical chart of each patient quickly accessible.

Both you and the head nurse are pleased at how the computerisation of some nursing functions has made the staff better able to look after patients. For example, although the nursing notes entered for each patient, each shift, continue to retain all the usual, routine information required for legal purposes, the computer can be set to pick up only those things which have changed significantly; for example, a patient who had difficulty sleeping last night, when he usually sleeps well, a patient who stayed on the ward rather than following his custom of leaving early to attend Industrial Therapy; any significant changes in weight or in blood pressure or in routine laboratory values; a patient who refused to take his medications, and so on. In this way, you can be alerted to those changes and events which may lead to changes in management, and you do not have to wade through reams of routine data to find the exceptions.

You, together with the nurse, are able quickly to identify problems, discuss them, and come up with solutions. Some patients need a change in their medication: you can obtain almost instantaneously, displayed on the terminal, a list of all medications any given patient is on; changing a medication order can be done as rapidly as writing it out by hand, and there is no need to flag the order. The prescription is

automatically transmitted to the pharmacy, and the change is also automatically reflected on the nursing "Kardex" and the patient's "medication sheet". I'm using "Kardex" and "medication sheet" with quotation marks around them, because of course the card or the sheet as such, is no longer used - the information is stored on the computer, and is readily available to the nursing staff via the terminals located in the nursing station, the head nurse's office, the treatment room, or the medication room.

For other aspects of management, the head nurse can enter on the computer changes to the nursing care plan or more specific orders. For example, a patient who has developed a fever, possibly due to a drug reaction, is put on Q 15 minute observation and vital signs to be taken every four hours for 24 hours. Every four hours the computer will automatically provide a gentle reminder to the nurse looking after that patient.

Finally, all the patients have been reviewed, except for one - a new patient, admitted to the ward yesterday evening from the emergency room. You learn that the patient has not been hospitalized at your hospital previously, but you do have access to an important body of information: while you were in rounds, the new patient was seated in front of a terminal in the interviewing room, responding to a questionnaire presented by the computer.

Now, you can call up on your screen a summary of the information provided by the patient. Studies have shown that this information is probably more complete than you might have been able to elicit in an hour-long interview. For example, the computer-administered questionnaire covers all areas - it obtains, for example, a complete family psychiatric and medical history. Furthermore, patients are not at all reticent about telling the computer intimate information, for example, about relationships with family or problems of a sexual nature, information that they might be embarassed to discuss with a strange doctor in a face-to-face interview. For this particular patient, however, whose first language is not the same as yours, the computer administered the questionnaire in the language of the patient. The summary information can be provided in the same language, or in any of the other languages provided.

Had the patient been illiterate, the computer could have provided a questionnaire in audio form, again in any of the languages available.

To continue with my story: now that you're armed with a summary of the patient's history in your hand, you interview the patient, to explore in more detail the events leading up to the hospitalization, to establish a therapeutic atmosphere, and to do a formal mental status examination. After the interview, you can use your terminal to enter an admission note, a treatment plan, and your orders.

Next, you choose to focus on another patient who has a manic psychosis which does not appear to be responding in spite of adequate lithium levels. You order a review of the patient's medication, which the computer obligingly presents

in graphic format. The information is precise, because the times for giving medication and for taking blood samples are accurate to the minute. The medication nurse and the laboratory technician have notified the computer, using portable, battery-operated terminals, each time blood was drawn or medication was taken. This precision of data allows the computer to calculate half-lives individually for each patient; poor compliance with medication or changes in elimination caused by diuretics or variations in salt intake, can be easily detected.

Another patient is being discharged today. It's a simple matter to review the progress notes and nursing notes, select out of them phrases and sentences, and compose these into a discharge summary, using the powerful word processing features built in to your computer.

Imagine that you're on call for the emergency room today. Beeped to see a patient who has just arrived by ambulance, you put the partially completed discharge summary on "hold", and hurry off to the emergency room. A transient patient has arrived who has never been hospitalized in this city before. Fortunately, he carries a hospital card from a Toronto hospital. A quick telephone call, a consent to release information transmitted to Toronto by facsimile, and within minutes, a discharge summary is available on your computer, transmitted from Toronto via the telephone system. Because it is sent as data, not as voice, it costs only pennies in telephone charges.

In your interview with the patient, you learn that he's been experiencing visual hallucinations. Recalling that there are a number of organic conditions in which visual hallucinations can be a presenting symptom, you request some help to arrive at a diagnosis, after entering the history of present illness and the mental status into the computer. It obligingly displays a list of the disorders compatible with the patient's symptomatology, and suggests some additional signs, symptoms and lab tests that you might check for.

With your work done in the emergency, you return to the ward, and ask the computer to let your know what is due, for example medication prescriptions which need renewal, annual examinations, and periodic renal and thyroid function tests for patients who take lithium. A single command causes these tests to be automatically ordered. Prescription renewals are just as simple; additionally the computer can provide a warning if you accidentally order medications in potentially dangerous combinations.

That afternoon, you have Medication Clinic for outpatients. Here, the computer is very helpful in prescribing slow-release injectable medications: it presents a graph of clinical status as a function of dosage, automatically calculating equivalences between different antipsychotic agents. For patients who have recently been started on neuroleptics, the computer can remind you to warn patients about medication side-effects, particularly tardive dyskinesia. A single command can put a note into the patient's chart that such a warning has been given.

You can use the computer, of course, to print out prescriptions for your patients. This is particularly simple if there is no change; moreover, the hospital pharmacy can be automatically notified through its computer terminal, so the prescription can be made ready before the patient gets to the pharmacy after leaving your office.

After Clinic, you might wish to spend some time on your teaching and research activities. For this, the computer is also very useful: you can do on-line literature searches from your office (and from home, where you likely also have a personal computer), and get a printout of interesting abstracts, or even entire articles; it only takes minutes. Of course, the data collection and statistics software is so simple to use that no special training is required.

With the built-in graphics capability of your computer, you can generate tables and graphs for your journal articles. The hospital's audio-visual department has a colour plotter, so that the eye-catching overhead transparencies you've laid out on your own computer, can be automatically transferred to the A-V department where the colour transparencies themselves can be produced. The hospital mail system can deliver them to you tomorrow morning.

Suppose that you have a private psychotherapy practice. The computer can allow you to function more effectively, without a secretary, if you wish: keeping track of scheduling, automatically printing bills for patients and for the province's medicare system, aging of accounts receivable, preparing income tax returns, and so on.

It can also be useful in doing psychiatric consultations. In addition to administering a historical questionnaire to patients and generating a summary of historical data, the computer can also administer and score psychological tests, such as an MMPI. If the request for consultation suggests that physiological monitoring might be useful, for example with alexithymic individuals or for psychosomatic illnesses, you can plug in instruments to your computer which can monitor the patient's heart rate, muscle tension, temperature, or galvanic skin response, while the patient is replying to the patient questionnaire or to the MMPI. Armed with such data, which can suggest topics of possible psychological conflict, your interview with the patient can be much more focused on problem areas.

Finally your working day ends. As you are imagining driving home, I'd like you to further imagine, inside this fantasy, some musings, memories, of how your involvement with computers in psychiatry might have begun.

The hospital might have started with a pilot project, involving only the emergency room. For months, after the computers had been installed, you may have continued to do things the old way, somehow reluctant to deal with a fear of being made to look dumb by a machine. But one particularly slow evening on duty, you might have asked to look at the manual for the system. Surprised at its thinness, you read the whole thing in a half hour. The next day, on a sudden impulse, you called to ask that the training unit, a computer

identical to the one in the emergency room, be brought to your office. In privacy, you tried out the things that the manual suggested. It was easy! Better yet , it was fun! The computer was forgiving; if you made a mistake it gave a clear message. But it was hard to make a mistake; the computer it-self told you what your choices were. A manual was almost unnecessary! However, it did provide good explanations of the computer system's features in the area of security, confidentiality of patient data, and what to do in case of equipment malfunction.

It wasn't long before you became a supporter of the comp-uter system, always ready to demonstrate to your disbelieving colleagues how easy it was to use, and how much time it saved for you. However, as you became more proficient, you also became aware of things that could be improved. It wasn't long before you were making suggestions, and feeling grati-fied when they were implemented.

The fantasy part stops here. I would like you to keep your imaginations in gear, though, for the last part of my presen-tation today.

I would like to describe for you a system, and a plan for implementing it, which could serve as some of the initial steps on the path towards realizing the fantasy I've just de-scribed.

My proposal is geared towards mental hospitals and the departments of psychiatry of large general hospitals. These are the environments in which the cost-savings of computerization will be most significant, as well as easiest to monitor.

The system is centered around the patient's medical record as its primary data base, and provides for entering, storing, and retrieving medical record information for psychiatric inpatients and outpatients.

My proposal borrows from techniques and technologies al-ready at work or under development in other fields, for exam-ple, in the automated office.

Even though the scenario I have just described is a radi-cal departure from what we have today, the initial steps in my proposal are cautious steps - conservative in initial cost and commitment required, and designed to operate in parallel with, not to replace, existing systems.

Consider the Emergency Room of this hospital. Most of the doctors here know it, or similar emergency rooms, well, from being "on duty". Most patients of the hospital are seen in the emergency room, some of them frequently.

If one were to place a couple of computers in the Emergen-cy Room, which clinicians could use to speed up the recording of patient evaluations, one would have, pretty quickly, data in the computer on quite a few patients; moreover, quite a few doctors would have had an opportunity to try out the com-puter. In fact, the Emergency Room is an excellent test ve-hicle for a new computer system: lots of doctors to try it, and lots of patient assessments to form its data base. In order for a computer system to survive here, by which I mean for it to be accepted by clinicians, it must be able to pro-

vide more useful information, more quickly, and it must save time.

It is impossible to overestimate the importance of this one factor - acceptance by clinicians. If the doctors don't like it, it won't go anywhere. So a system designer had better have a pretty good idea of what psychiatrists want in a computer system.

My proposal, then, has as its primary objective, to make the clinician more efficient and effective, not to collect statistics, not to do research, not to enable better cost accounting; the principal goal is to help the doctor do a better job. That's not to say that he other objectives are not praiseworthy, but they must move to second place. In this respect, my system differs from those systems already available, which were designed either with cost control or with administrative concerns as the most important priority.

Those of you familiar with this topic will be aware that there are many computerized medical records systems on the market, some geared to the general practitioner, others intended for psychiatrists in private practice, still others aimed at statewide networks of mental health facilities. Mental health workers in other professions may also know of systems directed specifically to counselling, psychological testing, or research.

What about a system intended for hospital-based psychiatry? Such a system should be geared specifically to psychiatry and to the psychiatrist's way of doing things. A system geared to general medicine cannot be expected to accommodate a psychiatrist's eclectic approach in combining psychotherapy with drugs; on the other hand, a system developed for clinical psychologists may not encompass the medical or medico-legal aspects of psychiatry.

As a computer systems engineer, I am aware to some degree of the capabilities and limitations of the computer hardware and software on the market today. In particular, the personal computer revolution has brought the computing power, speed, and memory capacity previously available only on mainframe computers, at a fraction of their cost, to users in their homes, offices, or small businesses. With this power available, we can conceive of a whole variety of possible systems to aid the psychiatrist.

It is as a clinician, however, that I can attempt to determine which features of a system can be useful in practice. The slide shows some of the features which I believe will be helpful to us in a hospital environment, features which are not included in other systems which might be used in this application, at least not to my knowledge. Later on you will see examples of these features.

First, in our bilingual milieu, it is important to be able to enter patient assessments and other information into the system in either official language.

Second, this system will be decentralized. Instead of a large, central computer with a number of terminals connected to it, each location has, instead, its own micro-computer. These computers can communicate with each other, so that for

example, a computer in the medical records department could transmit the contents of a patient's dossier to the computer located in the Emergency Room. There are a number of advantages to this: if there is a computer breakdown, instead of the entire system crashing, a user can simply walk to another nearby computer and carry on, or simply replace the whole computer with a spare. After all, it weighs less than thirty pounds! Because there is no need to communicate with a central processor, response time on an individual computer can be much faster. It goes without saying that the decentralized system provides "on-line" and interactive access; no filling in forms which have to be keypunched; no waiting for reports to be printed out in the computer centre - each computer can have its own printer.

A third feature is the "touch-screen" as an alternative to the keyboard for communicating with the computer. Not everyone can type well, but we all know how to point. There are inexpensive mass-produced "personal" computers available today which can detect the touch of a finger on the screen. The slide shows a picture of a computer screen; each rectangle has a legend written inside it. To tell the computer to do whatever the legend says, simply touch the rectangle with your finger. As the slide shows, touching one of the rectangles causes the rectangle to become brighter. Removing your finger from the selected choice will then cause the computer to carry out the desired action.

A fourth aspect is the capability of personal computers to present high-resolution graphic displays. Consider, for example, how useful it would be to have a graph which displays a patient's Brief Psychiatric Rating Scale scores, together with antipsychotic drug dosage expressed in chlorpromazine equivalents, on a week-by-week basis. The types of displays potentially available are limited only by your imagination.

Personal computers have also popularized a type of display called "windowing". Here, different segments of the same screen can be used to display, simultaneously, data from different programs.

The last unique feature of my proposed system involves some custom hardware, to provide a computerized dictating machine. For those of us who can't type as fast as we can talk, it will be possible to dictate into the computer, using a built-in microphone and the usual dictating machine functions provided on the screen for you to control by touching. It would be nice if computer technology had advanced to the point where the computer could understand your words and have them appear on the screen; we'll have to settle for a system where a dicta-typist can transcribe the recorded segments into the computer, using the keyboard.

Now, how can we put all of this together? Remember, I said earlier on that the primary objective of my proposed system was to make the clinician more effective and efficient. Imagine that you're in the emergency room. Would it save time when assessing a patient if you had, at your fingertips, a legible, concise history of the patient's previous hospitalizations? Again, imagine that you're sitting at the

computer, and the screen in front of you displays what's on the slide. You touch the screen lightly with your index finger, anywhere in the rectangle marked "inpatient data". Immediately, a different menu is displayed, asking you to select which hospitalization you're interested in. If you need more information to make your choice, for example, you'd like the three-month hospitalization in 1983, simply touch the "duration?" heading, and a column showing durations of hospitalizations will appear. You choose hospitalization number nine by touching the rectangle, and the next menu appears. Of the twelve possibilities, the "discharge summary" interests you; when you touch this rectangle, the selected discharge summary appears. You can see any portion of it by "scrolling" up or down, using the two rectangles near the bottom right.

Suppose you want to skip directly to the "medications on discharge" part of the discharge summary. Touch the "select by heading" rectangle at the upper left, and a "window" will momentarily appear, overlying the previously written information. Touch it again, and the window disappears, leaving the information underneath as before. You can use the menu in the window to select any of the headings in the discharge summary to be displayed.

If you want a discharge summary for a different hospitalization, you can use the "select hospitalization" heading, with its corresponding window and menu. A dot marks the hospitalization which is currently selected.

It won't take long to become familiar with the menus, to the point where you will be able to select what you want, in seconds. This is sure to save time in the Emergency Room.

However, it's difficult to imagine that entering an assessment into a computer could be any faster than just writing it out by hand. I believe that it can be - not if you have to use a keyboard, but if you use a combination of the touchscreen and the computerized dictating feature, it becomes possible.

How? A lot of the information contained in a typical patient assessment can be organized into "menus". Some of the menu items, when selected, will simply cause the computer to insert the corresponding text into the final assessment. Other menu items, if selected, will result in another menu being displayed.

Of course, if the menus were to contain every possibility that might conceivably appear in a patient assessment, they would take forever to go through. It is necessary to strike a balance between completeness and conciseness. However, it is possible to put a large part of a typical assessment into menus. This is true particularly for the "identification", "mental status", "diagnosis", "differential diagnosis", and "treatment plan" sections of the assessment. Even in the "history of present illness" section, symptom complexes for illnesses such as depression, mania or anxiety disorder can be easily organized into menus. There will always be portions which cannot fit into menus: much of the "history of present illness" is bound to be unique to the individual;

such things as delusions, the content of hallucinations, or manifestations of disordered thinking, are idiosyncratic to the patient, and could never be incorporated into a menu. This is where the dictating feature comes in handy. The menu permits you to select "dictate"; you then say what you would like to appear in the assessment report, and the computer keeps track of where it should go in the report.

Let's look at an example. We've seen a patient in the Emergency, and we're writing up the assessment. We've gotten through the "identification", the "history of present illness", and so on, and we're now entering the "mental status". We can go through the various categories, touching those rectangles we want, ignoring others, and as we do this, a separate window near the bottom displays the text as it will appear. When we get to the end of a menu, the next menu automatically appears. Alternatively, we can skip ahead to it with the "next menu" rectangle at the bottom left.

You can see how the text builds up as we go through the menus. On this one, for the "substance abuse" subheading, there is a place marked "other", which can be filled in. If we touch this "other" rectangle, we can then simply type in what we wish, using the keyboard. As we type, it will appear on the line beside the word "other". Alternatively, we could touch the "dictate" rectangle, which would cause the "dictate" window to appear, all set to go in its "record" mode. No need to worry about pauses when dictating; they're automatically removed. The dictated material can be transferred to another computer for dicta-typing.

But what happens if it's a weekend, and no dictatypist is available? How can you read an assessment report that's been dictated but not typed? Simple - you can read the material that was entered through menus. At those places in the report where dictated material was recorded, you can touch the screen to hear a playback of the recorded material.

Of course, the final result of all of this must still be an assessment report printed on a piece of paper, which can be signed and inserted into the existing medical record. This is an important aspect of the proposal: the existing manual system must continue to exist and function, side by side with the new computer system. This means that the clinician has a choice: he can use the new equipment, or continue to produce handwritten reports which would simply be typed into the computer, now used as a word processor. Once entered into the computer, however, it becomes available for quick reference by other clinicians.

How about using the computerized assessment reports? Is the important information buried in a mass of redundant data, somewhere in a five-page computer printout? Compare the six lines of text which this system would produce, to the fourteen lines of table, with its redundant headings, typical of the output of many existing systems. The table may look neater, but I feel that it makes it more difficult to sort out the important information quickly.

In my proposed system, the computerized assessment report will be as brief and to-the-point as possible; if information

has not been provided to the computer, there will be no reference to it in the report. However, the menus will provide for significant negatives to be reported, for example, if the patient is asked about olfactory hallucinations and states he has none, the menu would permit the clinician to select "olfactory hallucinations - denied" on the menu, and that phrase would appear in the report. If the question had not come up in the interview, then the entire topic of olfactory hallucinations would be skipped over when entering the data, and the topic would not appear at all in the report.

What about confidentiality and security of patient information? The computer system should ensure that access to sensitive psychiatric information is limited to those who need to know, that the confidentiality of the doctor-patient relationship is upheld, and that data is protected from mindless vandalism, purposeful tampering, or accidental loss. The proposed system will provide a number of different categories of access. Each person who is authorized to use the system is assigned a category. This limits that person's access only to the data which is necessary to do his or her job. The physician and the nurse, of course, need to be able to read all available information. However, an admission clerk who must enter basic identifying information, does not need to read patient assessments, and thus will have no access to them. The dicta-typist has access only to that portion of the record which is being typed in or corrected. Researchers who do not need identifying information can be restricted from seeing names, addresses, and so on.

In preventing data from being tampered with or accidentally destroyed, it's limiting access that again plays the most important role. Only authorized personnel can use the system; they are permitted access only at certain terminals, and only after properly identifying themselves, including a password. Once logged on, your category determines not only what data you can look at, but also what files you may copy into other files, what data you may enter or modify, and what reports you can get printed out. For example, physicians should not be able to modify nursing notes or care plans; in general researchers will not be able to modify any part of a patient's dossier.

Any successful log-on, as well as unsuccessful attempts, can be automatically logged so that on-going security can be monitored.

An important concern is the legality of documents stored on computer, and this also has to do with tampering. An undeniable advantage of progress or nursing notes written or typed on paper, is that tampering and changes are easier to detect than for data stored in a computer. For this reason, the paper chart will not disappear, at least for a long while. Therefore, the computerised system must function side by side with the existing medical records system, and the paper copy printed out by the computer and signed by the clinician, will be the legal chart document.

One can envision a future in which the legal archive will consist of computer-generated "laser" discs or microfiche,

both of which are essentially tamperproof.

I have to admit that what I've been presenting is a pretty grandiose scheme, and anybody should approach such an idea with a great deal of scepticism. After all, how can I prove that it will work, or that it will be accepted by its users, or that it won't cost much more than estimated?

There aren't any money-back guarantees in the computer business, but there are other ways to reduce risks. One way would be to introduce computerization one step at a time, using relatively small investments in computer hardware and software at each step. This way, no long-term, high-risk commitments are necessary.

The scheme I propose has a number of phases. The preliminary phase, of course, is a development phase, during which the software required for the next phase is designed, written, and tested. Two microcomputer systems, capable of being connected together, are needed for development.

Once the software is available, an additional microcomputer would be placed in, most likely, the admissions office. It would be used by clerical or nursing data to enter basic identifying information for any patients being admitted or being seen in the emergency room. For each such patient, the computer would print-out a form with this identifying data printed at the top, so that the patient evaluation can be added, by hand, later on by the clinician.

The next phase, Phase II, requires another computer, located in the emergency room interviewing office. It will be used by physicians to access previously entered patient assessments, and to input new evaluations. The computer in the admissions office can now be used by a dictatypist to transcribe the information dictated by clinicians.

At this point, the project has four computers. Two of them used as I've just described, while the first two continue to be used for software development. They can also be used to train people, and to replace malfunctioning units while they're being repaired.

Phase III involves yet another computer, which will be used by nurses for entering nursing admission data and nursing notes. As the software is developed, this unit will also be used for recording vital signs and medications given.

Up until this point, the three computers in clinical use have not been hooked together. Instead, data is transferred by physically carrying a floppy disk from one unit to another.

Phase IV doesn't involve more computers; however, the existing units are now linked together for data transfer. This will permit computerization of the system for communicating doctor's orders to the nursing staff.

Phase V requires another computer in medical records, to be used for dictatyping, archival storage, and training purposes.

I won't describe any more phases, but one can see how additional computers could be located in the pharmacy, and in physicians' offices.

Once the system is accepted and has proved its worth,

other hospital wards can be added, as funds become available to purchase more computers.

How much will all this cost? I won't go into details, except to point out that microcomputers of this type are available at prices ranging from five to ten thousand dollars each. Software is another matter: what I've described just isn't available right now, and would have to be developed from scratch. Two or three good programmer-analysts, in a year-and-a-half could get Phase I started, with subsequent phases coming along at six- or eight-month intervals.
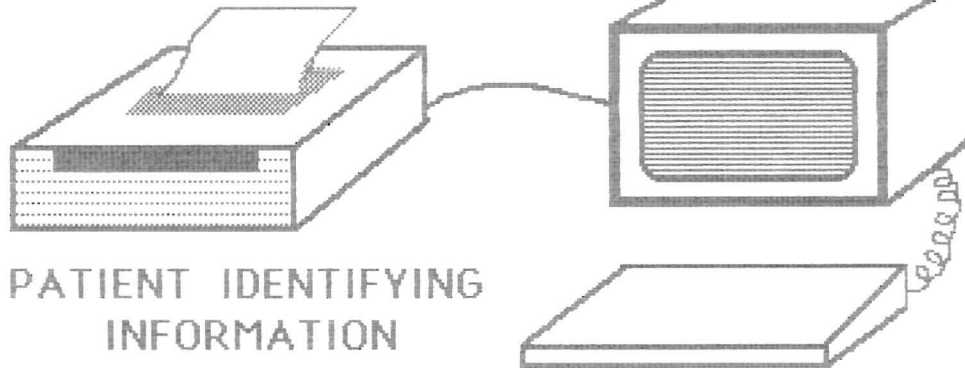
I've come to the end of my presentation today. I would like to thank all of you for participating with me in exercising your imaginations. I am very interested in hearing your comments or suggestions, or answering your questions.

PRELIMINARY PHASE
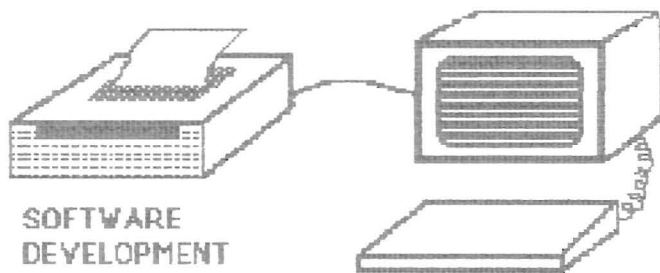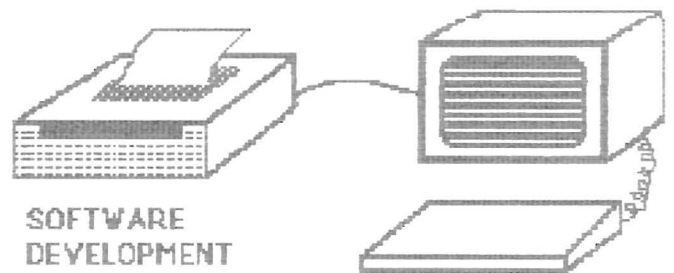
SOFTWARE
DEVELOPMENT

SOFTWARE
DEVELOPMENT
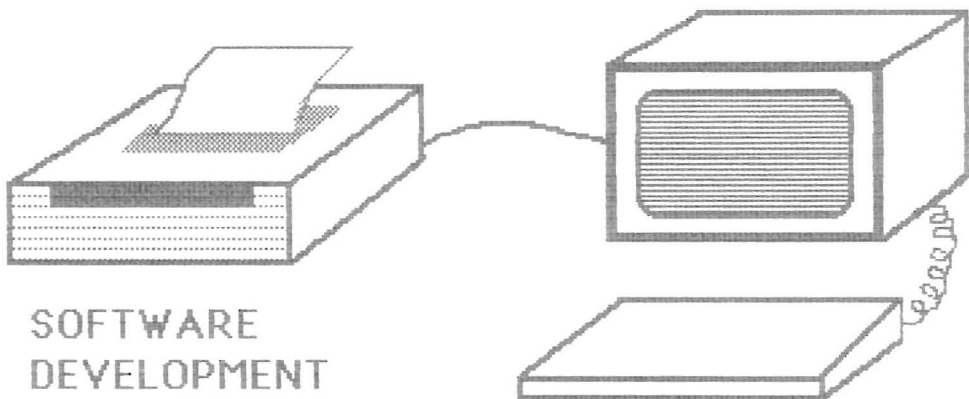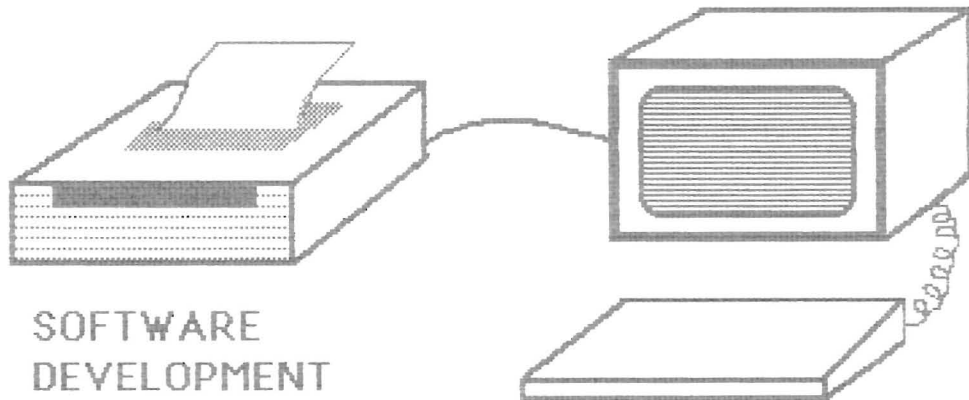
PHASE ONE

IN ADMISSIONS OFFICE

PATIENT IDENTIFYING
INFORMATION

SOFTWARE
DEVELOPMENT

SOFTWARE
DEVELOPMENT

PHASE TWO

IN ADMISSIONS OFFICE

PATIENT IDENTIFYING
INFORMATION
DICTA-TYPING

IN EMERGENCY ROOM
INTERVIEWING OFFICE
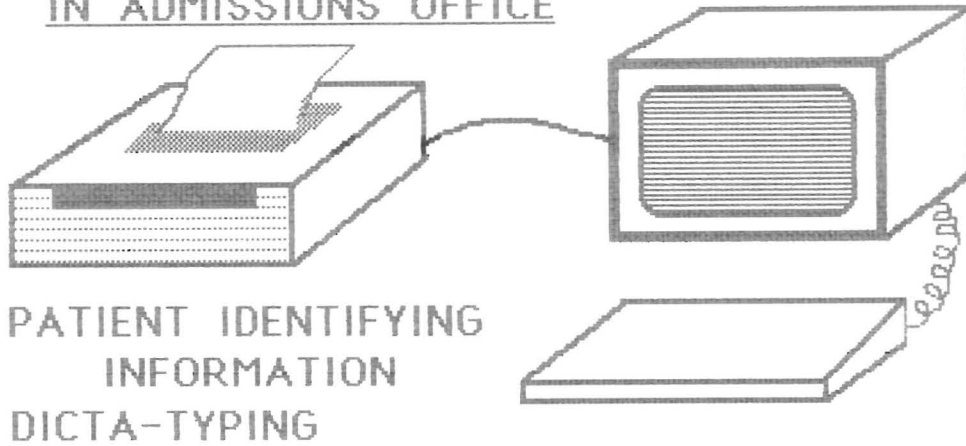
ACCESS PATIENT INFO
ENTER PT ASSESSMENTS

SOFTWARE
DEVELOPMENT

SOFTWARE
DEVELOPMENT
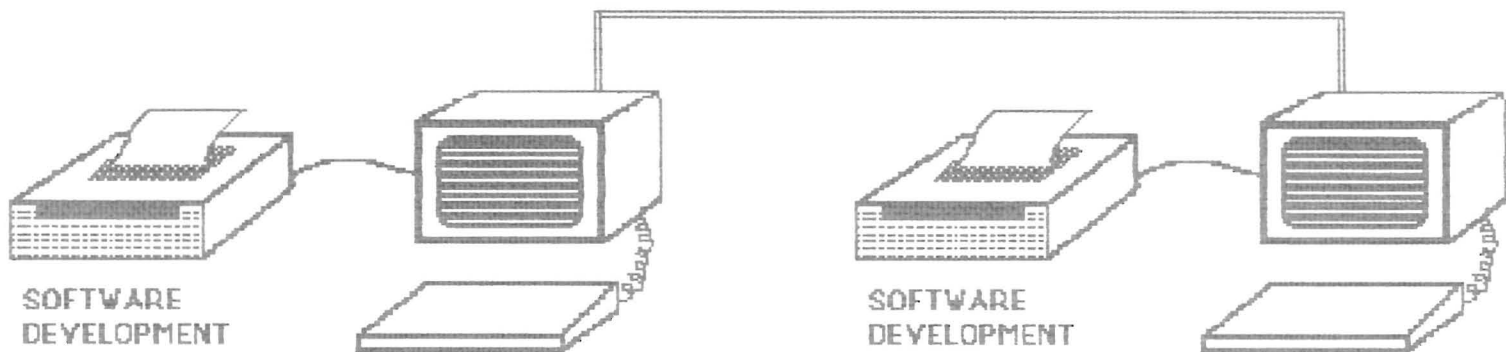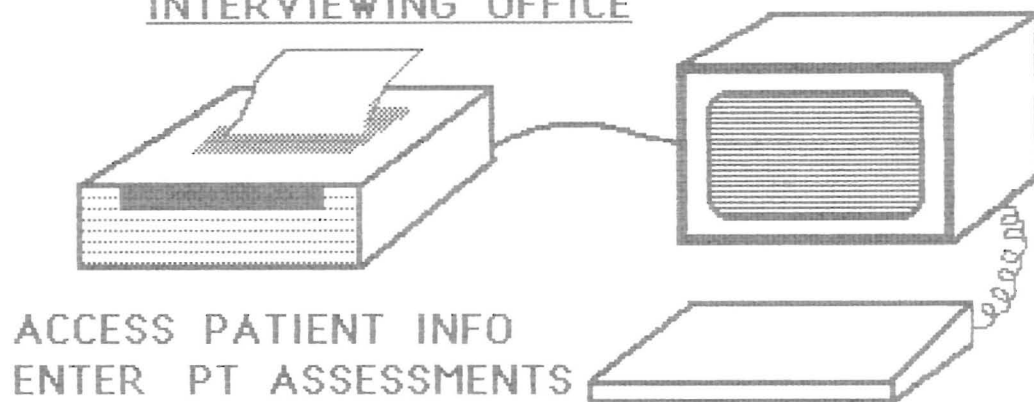
PHASE THREE

IN ADMISSIONS OFFICE
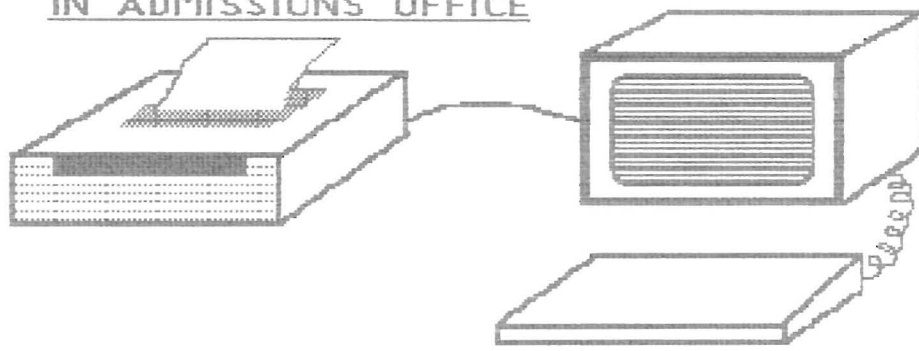
PATIENT IDENTIFICATION
DICTA-TYPING
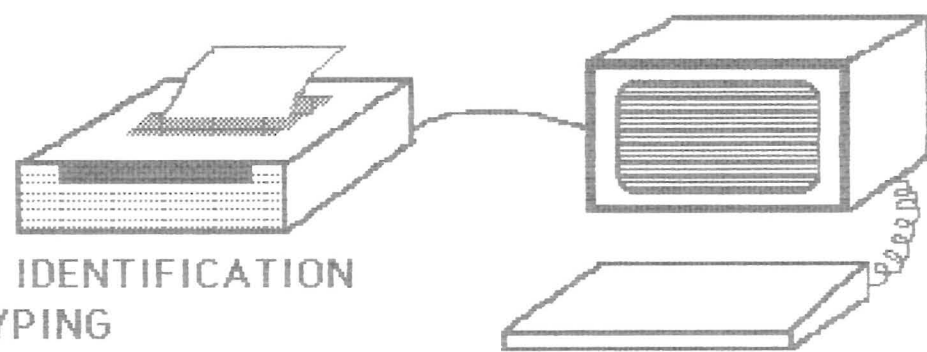
NURSING ADMISSION
NURSING NOTES
VITAL SIGNS
MEDICATIONS GIVEN
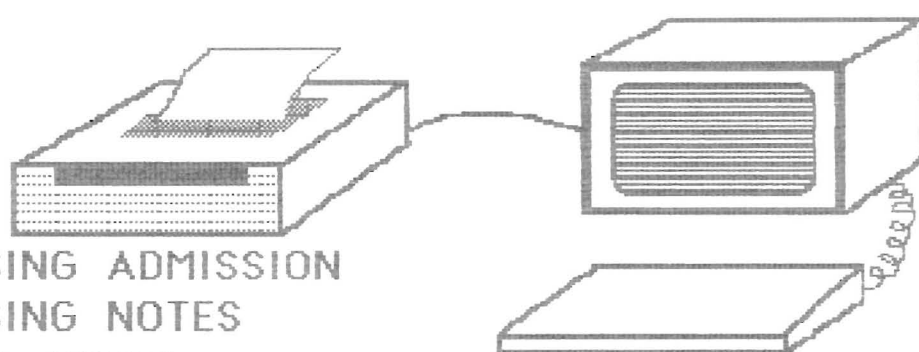
IN EMERGENCY
ROOM NURSING
STATION
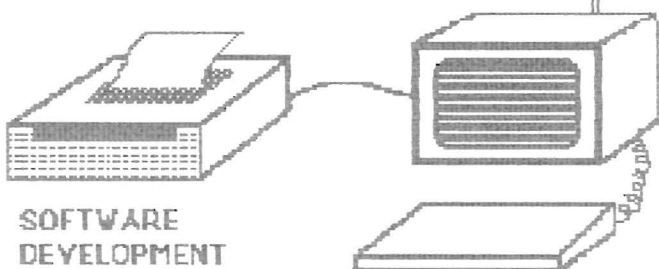
SOFTWARE
DEVELOPMENT
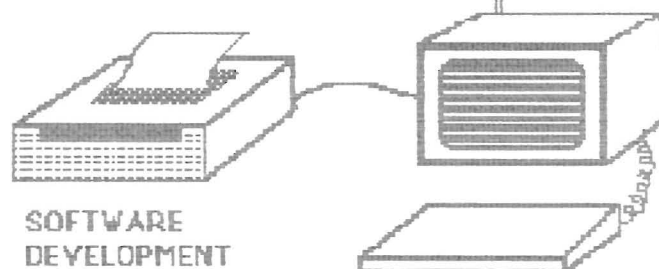
SOFTWARE
DEVELOPMENT

MENTAL STATUS: The patient looks older than her stated age, in poor
     physical health, mildly cachectic, short, in a wheelchair. She is
     neatly dressed in pyjamas. Posture is mildly stooped. Facial
     expression is very often impassive and occasionally suspicious.
     There is mild psychomotor retardation and a mild tremor. She is
     moderately withdrawn and somewhat uncooperative.

MENTAL STATUS

Appearance	looks older than stated age
Apparent physical health	poor
Weight	cachectic
Height	short
Ambulation	in wheelchair
Dress	neat
Grooming	unspecified
Posture	stooped
Facial expression	impassive - very often
Eyes	unspecified
Motor behavior	psychomotor retardation - mild
	tremor - mild
General attitude and behavior	uncooperative - somewhat
	withdrawn - moderate

PRINCIPAL GOAL:

TO HELP THE CLINICIAN

BE MORE EFFICIENT

AND EFFECTIVE

SECONDARY OBJECTIVES:

- Statistics
- Research
- Cost accounting
- Quality assurance

UNIQUE FEATURES:

- Bilingual

- Decentralized

- Touch - screen

- Graphic displays

- Windowing

- Dictating functions

CONFIDENTIALITY AND SECURITY FEATURES:

- Limited access via identification and password;

- Different categories for different individuals:
  An individual's category determines what data
  may be looked at / entered or modified / copied /
  printed out / transferred to other computers;

- Individuals may use only certain terminals;

- All attempts to use the system are logged.

COMPUTERIZATION OF MEDICAL RECORDS:

- Gradual, phased acquisition of computer hardware;

- Continuous software design, development, and testing;

- Phased introduction of new software.

C A P - FOR PROFESSIONAL ACTIVITIES:

- Communication with peers via "bulletin boards"

- Scheduling of meetings, appointments, etc.

- time reminders

- record of time spent

- electronic mail

- automated telephone

C A P - ON AN INPATIENT UNIT:

- Accessing patient data, eg medications given, clinical status, problem behaviours

- Communication of doctors's orders: to nursing staff, to the pharmacy

- recording by ward staff of: nursing admission, vital signs, medication given, nursing notes

- recording by psychiatrist of: admission and progress notes, discharge summaries

- administering a patient questionnaire

C A P - IN THE EMERGENCY ROOM:

- Reviewing patient charts

- entering assessment reports

- assistance with diagnosis
  and management decisionmaking

- retrieving patient records from
  other hospitals

C A P - IN MEDICATION CLINIC:

- Graphic presentations of clinical status

- keeping track of informed consents

- Keeping track of laboratory tests

- Printing prescriptions

- Dictation of notes

C A P - IN TEACHING AND RESEARCH:

- On - line literature searches

- Retrieval of articles

- Data collection

- Statistical analysis

- Preparation of tables and graphs

- Automatic reformatting of articles
  and citations for different journals

- text processing of articles

- preparation of slides and
  overhead transparencies

C A P — IN A PSYCHOTHERAPY PRACTICE:

- Patient scheduling

- Accounts receivable and billing

- Medicare slips

- Writing up case reports and
  notes

C A P - IN PSYCHIATRIC CONSULTATION:

- Administering a patient questionnaire

- Administering and scoring
  psychological tests (eg MMPI)

- Monitoring physiological variables
  (eg GSR, heart rate, temperature)

- text processing of reports

MENTAL STATUS 23

PERCEPTION: HALLUCINATIONS: denied

      Auditory   (Voice   /   voices   /   noise   )   absent

           located:-   inside   /   outside   of head   unknown

      Gustatory   Tactile   Visceral   suspected

      Visual   (formed   /   unformed   )   slight   mild

                                                moderate   marked

MENTAL STATUS 6

GENERAL ATTITUDE AND BEHAVIOUR (CONT'D):

			Self mutilating	none
Antisocial	Impulsive	Passive	Dependent	somewhat
Domineering	Guarded	Complaining	Obsequious	mild
Apathetic	Fearful	Dramatic	Seductive	moderate

SUBSTANCE ABUSE:

Alcohol	Hallucinogen	Barbiturate	marked
Stimulant	Narcotic	Cocaine	Phencyclidine	suspected
Marihuana	Hashish	Other: _____	slight

neatly dressed in pyjamas. Posture is mildly stooped. Facial expression is very often impassive and occasionally suspicious. There is mild psychomotor retardation and a mild tremor. She is moderately withdrawn and somewhat uncooperative.

NEXT MENU	PREVIOUS MENU	TOPLEVEL MENU	HELP	PRINT SCREEN	DICTATE	ENTER TEXT

MENTAL STATUS 5

GENERAL ATTITUDE AND BEHAVIOUR: Helpful   Cooperative

Cheerful   Responsible   Pleasant   Likeable   not at all

Good sense of humour   somewhat

Uncooperative   Withdrawn   Inappropriate   Angry   mild

Suspicious   Sullen   Sarcastic   Irritable   moderate

Critical   Assaultive   Argumentative   Threatening   marked

Physically destructive   Provokes anger

neatly dressed in pyjamas. Posture is mildly stooped. Facial
expression is very often impassive and occasionally suspicious.
There is mild psychomotor retardation and a mild tremor. She is
moderately withdrawn and somewhat uncooperative.

SELECT HOSPITALIZATION

12	1983
11	1983
10	1981
• 9	1980
8	1977
7	1976
6	1971
EARLIER?	

MOTOR: Psychomotor:-   Retardation / Excitement   none

          Catatonic stupor   Catatonic rigidity   slight

          Waxy flexibility   Catatonic excitement   mild

          Tremor   Tics   Posturing   Pacing   Fidgeting   moderate

GAIT: Unsteady   Rigid   Slow   Festinating   marked

physical health, mildly cachectic, short, in a wheelchair. She is
neatly dressed in pyjamas. Posture is mildly stooped. Facial
expression is very often impassive and occasionally suspicious.
There is mild psychomotor retardation and a mild tremor.

MENTAL STATUS 3

FACIAL EXPRESSION: Unremarkable   Impassive   Tense   occasional

                    Perplexed   Suspcious   Angry   Sullen   Bored   often

                    Worried   Sad   Tearful   Elated   Silly   very often

                    Grimacing   Hypervigilant   most of time

EYES: Eye contact:-   Good / Poor   Stares into space

         Glances furtively   Looks around suspiciously

MENTAL STATUS: The patient looks older than her stated age, in poor
    physical health, mildly cachectic, short, in a wheelchair. She is
    neatly dressed in pyjamas. Posture is mildly stooped. Facial
    expression is very often impassive and occasionally suspicious.

| NEXT MENU | PREVIOUS MENU | TOPLEVEL MENU | HELP | PRINT SCREEN | DICTATE | ENTER TEXT |

MENTAL STATUS 2

DRESS: Wearing street clothes   In johnny-shirt   In pyjamas

          Neat   Appropriate   Inappropriate   Unkempt   Seductive

GROOMING: Wearing makeup:-   Appropriate   /   Inappropriate

          Neat   Poor   Very poor

POSTURE: Upright   Stooped   Stiff   Bizarre   slight   mild

                                                          moderate   marked

MENTAL STATUS: The patient looks older than her stated age, in poor
     physical health, mildly cachectic, short, in a wheelchair. She is
     neatly dressed in pyjamas. Posture is mildly stooped.

MENTAL STATUS 1

APPEARANCE: Patient looks: Stated age   Older   Younger

APPARENT PHYSICAL HEALTH: Very good   Good   Fair   Poor

WEIGHT: Average   Slim   Obese:-   Mildly / Grossly   Cachectic

HEIGHT: Very short   Short   Average   Tall   Very tall

AMBULATION: Walking   with:-   Cane / Crutches   Unknown

In wheelchair   In geriatric chair   In bed

MENTAL STATUS: The patient looks older than her stated age, in poor
physical health, mildly cachectic, short, in a wheelchair.

| NEXT MENU | PREVIOUS MENU | TOPLEVEL MENU | HELP | PRINT SCREEN | DICTATE | ENTER TEXT |

• IDENTIFICATION   SCHARGE SUMMARY

IDENTIFICATI| HIST PRES ILLNESS   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| xxxxxxxxxxxxxxx. Xxxxxxxxxxxxxxxxxx
    xxxxxxx| PHYSICAL EXAM
HISTORY OF P| xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| LAB TESTS   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| MENTAL STATUS ADM   x.
    Xxxxxxx| xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| COURSE IN HOSP   xxxxxxxxxxxxxxxxxx.
PHYSICAL EXA| xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxx| DIAGNOSIS   xxxxx.
LABORATORY T| xxxxxxxxxxxxx.
MENTAL STATU| MEDS ON DISCHARGE   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

                 FOLLOWUP PLANS

                                                              SCROLL   SCROLL
                 PROGNOSIS   UP   DOWN

DISCHARGE SUMMARY

IDENTIFICATION: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx. Xxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxx.
HISTORY OF PRESENT ILLNESS: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
    Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
PHYSICAL EXAMINATION: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
LABORATORY TESTS: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
MENTAL STATUS ON ADMISSION: Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

						SCROLL UP	SCROLL DOWN
NEXT MENU	PREVIOUS MENU	TOPLEVEL MENU	HELP	PRINT SCREEN	NEXT PATIENT	PREVIOUS PATIENT	SELECT PATIENT

CHART REVIEW: 6 - INPATIENT DATA

1 - ADMITTING NOTE	7 - NURSING CARE PLAN
2 - ANAMNESIS	8 - NURSING OBSERVATIONS
3 - PROGRESS NOTES	9 - MEDICATIONS GIVEN
4 - MEDICATION ORDERS	10- VITAL SIGNS
5 - PHYSICIANS' ORDERS	11- CONSULTATIONS
6 - DISCHARGE SUMMARY	12- CORRESPONDENCE

CHART REVIEW

1 - DISCHARGE SUMMARIES

2 - EMERGENCY ROOM VISITS

3 - OUTPATIENT DEPARTMENT VISITS

4 - ANAMNESES

5 - MEDICATION ORDERS

6 - INPATIENT DATA

7 - OBSERVATION ROOM DATA

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CAP: COMPUTER AIDED PSYCHIATRY

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I would like to begin with some generalizations about computers; I will
then present a picture, a fantasy, of what the near future might be like
for psychiatrists using computers. Following that I want to demonstrate
a computer program that I've written, a program which will illustrate
how today's personal computers can help us to be more productive.

(-2-) How can computers help in our specialty? We deal with people and
the relationships between people. Computers often seem to be very far
away from this.

Most of us have been exposed to computers through our bank statements,
bills in the mail, our paycheques, the machine which predicts the
outcome on election night. If you have had some exposure to the home
variety of computer, your appreciation of its mysteriousness and
intractable behaviour may have increased, if anything.

Can computers think? No. Are they smart? Sometimes - if they've been
programmed intelligently, and they're used in a way which maximizes
their strengths. Let me explain this further.

Computers are very good at doing repetitive tasks - they never get bored
or tired, and they can be incredibly accurate even when working with
finely detailed data. However, they will appear to be infuriatingly
obsessive - picky about niggling details, splitting hairs, unable to see
the forest for the trees. In contrast, humans are disconcertingly
fallible when dealing with similar data over and over. On the other
hand, we humans can be proud of our knack for coming up with creative
and unique solutions to highly individualized problems.

It seems reasonable, then, to design computer systems which would
capitalize on the respective strengths of the humans and the computer,
while respecting their weaknesses. This isn't always the case,
unfortunately - some systems to process clinical data demand an
excessive attention to detail on the part of the clinician who provides
the data; I have an example here of a four-page form to record a
patient's mental status. Furthermore, it wasn't until the computer came
along, with its insatiable appetite for data, that we were able to
create as mindless, dull, and boring a job as that of keypunch operator.

How can we use computers effectively? A common denominator for many
successful computer applications is embodied in the comcept "page-
turner". When you need a telephone number, a "page-turner" cam help you
get quickly to the right entry in the telephone directory. The same
applies to a dictionary, a medical reference text, or an online computer
version of Index Medicus. The computer doesn't interpret the data, it
doesn't offer opinions, it doesn't make decisions - the person using it
does these things - the computer simply helps him get at the right
information quickly, as a "page-turner". Whether it is a nurse looking
up the latest medication orders written on his patients, or a medical

records technician verifying that a chart is complete, or a researcher looking for correlations in volumes of clinical data, or a psychiatrist seeking information about a patient's previous treatment, an automatic, tireless, and friendly "page-turner" can save time and energy - leaving the human with more of those precious commodities to use in doing what he or she is good at and enjoys. Most of us resent the time we spend doing purely clerical tasks; and it doesn't make economic sense to pay us as doctors, nurses, psychologists, and so on, for doing a clerk's job.

OK, now that we've dealt with the "why", let's talk about the "how" and the "what". I'm now going to present to you a fantasy, set perhaps ten years in the future. I'm asking that all of you, individually, using your imaginations, place yourselves inside this fantasy. With your mind's eye, look around, experience it; I'd like very much to hear your reactions at the end of my presentation.

Imagine yourself as a psychiatrist, working as service chief of an adult inpatient unit in a general hospital. You've been on staff for a number of years, and have experienced your working habits change as computers have become more and more a part of your everyday life. The anxieties you had felt at first about these new technologies are now only remote memories.

You do recall vividly, however, all the drudgery that the computer has eliminated from your life: clerical work, like looking for missing charts; trying to decipher hopelessly incomprehensible handwritten progress notes; endless poring through charts to get a medication history. Now, with the time the computer saves, you have more time to spend with your patients.

Let's look at a typical working day. You have just arrived at your hospital office, and the third thing you do (after hanging up your coat and getting a coffee - some things never change!) is to turn on your computer terminal. It displays a cheery "good morning" and presents you with a list of your appointments and "things to do" for the day. Most of the items are just routine, and you're comfortable with the knowledge that your terminal will "beep" shortly before the important commitments that you've made.

(-3-) If you like, you can even direct the computer to automatically dial you on your pocket telephone. When you answer, it can give you a voice message. Handy when you are out of the hospital!

The computer lets you know that a staff meeting called by your boss the day before (her computer simply called your computer) conflicts with a consultation that you had previously scheduled. It's easy to get the computer to dial the patient's home and work numbers, dialing as often as necessary until the number is no longer busy, and notifying you when a connection has been made, so you can talk to your

patient. If there's no answer, you dictate a brief but personalized message into the computer, and it will continue to dial the number

periodically until it gets an answer and can deliver your message, as well as recording your patient's response.

Now that your day's schedule has been settled, you turn to your mail. For several years now, most of the in-hospital correspondence has been "electronic mail", which has saved lots of paper and photocopying. Delivery is also instantaneous, which means that you have fewer excuses that you could use. You can get a printout of anything, if you want; but it's really unnecessary. You can simply direct the computer to put the important stuff into your personal data base; you can easily find it again by doing a rapid "on-line search" using subject, author, date, or anything else you wish, to retrieve it.

One item, a notice of a conference on "Staff Burnout" you feel would be of interest to the ward staff. It's easy to get your computer to redirect that notice to each of them; when they log in on the terminals in the nursing station or the medication room, they will be sure to see it.

As a member of a CPA task force, let's say on the "Psychiatric Treatment of Minorities", you are contributing to the preparation of a position paper. Task Force members, scattered all over the country, communicate with each other via an electronic "bulletin board". Any member can "post" interesting material for other members to read. You access it through your computer, which automatically dials up the bulletin board computer located in another city. Because you are not using a telephone line dedicated to voice communications, your long-distance charges are never more than a couple of dollars per hour, no matter what city you call.

(-4-) Finally, your computer lets you know that it has done this month's automatic literature search for anything recently published in your field of research. The abstracts are in your personal data base, where you can browse at your leisure. If you want the entire article, you can easily get it on your terminal and print it out as well; however, the library computer can arrange for you to receive a copy of the original article - diagrams and figures are much easier to understand on a photocopy than on a screen. All this without leaving your desk - no wonder lower back pain is so endemic!

You are gently beeped to remind you that you are due to meet with nursing staff for morning rounds. In the staff lounge, fortified by another cup of coffee, you and the members of your team review each patient, using a computer terminal to go over the nursing notes for the last few shifts. You use this opportunity to focus on the psychodynamic aspects of treating these patients, because you have become comfortable with the expectation that the computer will warn you of significant events or changes in a patient's clinical condition: a patient who had difficulty sleeping last night, as reported by the night shift, would be flagged if the patient customarily slept well; any significant changes in weight, vital signs, patient behaviours such as aggression, noncompliance with treatment, and so on would similarly be picked up by the computer.

(-5-) After discussing strategies for the management of each patient, you can enter orders immediately into the terminal. They will immediately go to the nursing station; the computer in the pharmacy is also automatically updated, so that medications can be delivered without delay. Changes in treatment plan will automatically be reflected on the nursing "Kardex" and the "Medication Sheet" — I use these terms in quotation marks, because of course there is no longer a physical card or sheet.

Nursing care plans are also easily entered; the computer also simplifies the carrying out of such care plans, by providing timely reminders of nursing interventions called for in the nursing care plan.

After reviewing all the patients except for one, a young man who presented at the emergency room the previous evening, diagnosed as acutely psychotic by the resident on call. He has not been treated at your hospital previously, so there is no chart available. However, you do have some important data already: for the past hour, the patient has been seated in front of a computer terminal in an interviewing room, responding to a questionnaire. The information he has provided is available to you on your terminal, and it is likely that the patient, who is suspicious and paranoid, has revealed more to the computer than he would have in a face-to-face interview. Moreover, the computer has been typically thorough in its questioning, eliciting a complete family history and a medical history. Studies have shown that patients are not at all reticent about telling the computer intimate information such as about family relationships or sexual problems, information that they might be embarrassed to discuss with a strange doctor in a face-to-face interview.

The computer can also administer such a questionnaire in any language, or even as speech, for illiterate patients.

Armed with background data from the questionnaire, you can interview the patient with a view to clarifying areas that are still unclear, as well as establishing a therapeutic atmosphere, and to complete a mental status examination. Afterwards, you use the computer terminal to enter an admission note, a treatment plan, and your orders. Later on in my talk, I will demonstrate how you could use the computer to enter such data.

Another patient has a manic psychosis unresponsive to lithium, even though blood lithium levels appear to be adequate. You order a review of the patient's medication history, which the computer obligingly presents as a graph. The data used to generate the graph is quite precise — each time a nurse administers medication, she confirms this on a portable computer terminal, which records the exact time of administration. Similarly, the lab technician drawing blood samples notifies his portable terminal so that exact times are available for lithium levels. With such data, the computer can use this information to calculate lithium elimination half-lives individually for each patient; poor compliance, or changes in elimination caused by diuretics or variations in salt intake, can be easily detected.

Back on the ward, you ask the computer to tell you what is due; for example, medication orders to be renewed, or periodic liver and thyroid function tests for patients on lithium. When you indicate your agreement with ordering these things, the computer does the work for you. If you accidentally order medications in potentially dangerous combinations, the computer will warn you.

A patient is being discharged today. It's a simple matter to review the progress notes and nursing notes, select out of them phrases and sentences, and compose these into a discharge summary, using the powerful word processing features built into your computer.

Imagine that you're on call for the Emergency Room today. Beeped to see a patient who has been brought in by ambulance as a "transient", your interview elicits little information other than that the patient was previously living in Toronto. You request the computer to call up all the hospitals in Toronto and poll their computers to find out whether your patient has ever been seen in any of them.

The poll is successful, and also inexpensive, because long-distance charges for data transmission are very low. Fortunately, your patient is willing to sign a consent to release information, and you transmit this to the Toronto hospital. They obligingly send back a discharge summary.

In your interview with the patient, you learn that he's been experiencing visual hallucinations. Recalling that there are a number of organic conditions in which visual hallucinations can be a presenting symptom, you request some diagnostic help from the "Expert System" programmed into the computer. Using the history of present illness, the functional inquiry, and the physical and mental status exam results already entered by you and by the emergency room intern, the computer displays a differential diagnosis, and suggests some additional signs, symptoms, and lab tests that you might check for.

That afternoon, in your medication clinic for outpatients, the computer assists you in prescribing long-acting antipsychotic medications. It can present a graph of clinical status as a function of dosage, calculate equivalences between different medications, prompt you to examine for tardive dyskinesia, and remind you to warn the patient about such side-effects. It will insert a note into the patient's chart about your warning, taken from a selection of standard "boiler-plate" texts, which you can customize as you wish.

The computer will print out a prescription to give to the patient; if it is to be filled in the hospital pharmacy, the computer will transmit the information to the pharmacy, so that the prescription will already be made up when the patient arrives there.

In your private psychotherapy practice, the computer has long been useful in keeping track of your schedule, in printing out statements for your patients, automatically billing the provincial medicare system or other insurance plans, preparing your income tax returns, and so on.

(-9-) It has also enhanced your ability to do thorough consultations and assessments: besides administering questionnaires directly to patients, it can administer and score psychological tests such as the MMPI; you can also plug in instruments to allow monitoring of physiological variables such as galvanic skin response, heart rate, temperature, or muscle tension, which can later be plotted as a function of test question content, for the MMPI or for the patient questionnaire. For alexithymic patients who consent to this type of monitoring, immediate feedback can help them become aware of areas of psychological conflict.

When your working day is over, and you are driving home in heavy traffic (again, some things don't change!) I'd like you to imagine that you, still inside this fantasy, are musing about how your involvement with computers in psychiatry began.

Your hospital probably started with a pilot project, initially involving only the emergency room. In the middle of the 1980's, personal computers had become sufficiently inexpensive and powerful enough to be used for the kinds of things I've described, in place of the cumbersome and costly central computers hospitals were still using for such things as accounting and payroll. But as more and more clinical areas in the hospital began to purchase personal computers and experimented with their use, psychiatry couldn't be far behind.

The choice of the Emergency Psychiatry area as the location for the pilot project was not accidental. Most of the medical staff in the department work in the Emergency from time to time, when on call; many of the patients in the department had made one or more visits to the Emergency, and could be counted on to return there. In a general hospital, issues of confidentiality also meant that a patient's psychiatric chart was often difficult to obtain after regular working hours.

A system which could improve access to patient information for staff working in the Emergency would easily justify expenditures on a computer and some off-the-shelf data base software. With a small investment in time and training, relevant data about prior ER visits, hospitalizations, diagnoses, and medications could be entered into the computer by clerical staff, and then retrieved for display by the psychiatrist using easy-to-learn "menus".

Again in your fantasy, you recall that this first system was fairly successful, although you and your colleagues were soon asking for a more powerful system, with more information stored in it. Your initial misgivings about using computers had been overcome, partly because using this system was entirely optional - the card file which it was intended to replace continued to exist, as a "backup". No one felt under pressure to use the computer. Moreover, you had the opportunity to familiarize yourself with the system in private and at your leisure, reassured by the fact that nothing you might reasonably do could hurt the system irreparably. One evening on call when things were slow, and you felt under no pressure, you decided to read the surprisingly slim manual and try out the tutorial program.

Because of the wide variety and quantity of patients who came to the emergency room, the system had demonstrated its flexibility and ease of use in a wide variety of situations; furthermore, almost every doctor in the department had had an opportunity to try it out, during their "on calls".

Unfortunately for those who wanted a more powerful and flexible system, nothing could be found that met all the requirements: systems specific to psychiatry were either intended for use on large computers, or could not be modified easily to meet the specific needs of the department. Other systems lacked power or speed, or were difficult to learn. Yet other possible systems had shortcomings in areas such as security and confidentiality of patient information.

The approach which ~~was~~ *might have been* eventually taken, was for your hospital to get together with several others, and to jointly sponsor and pay for the development of software. Not only ~~did~~ *would* this reduce the cash outlay for each hospital, it also ensured that the software system being developed could be easily customized to meet the varying needs of different centres. Of course, the hospitals had to standardize on the computer hardware to be used, but this proved to be easy.

The system which I've described thus evolved, if you will permit me to continue the fantasy, in a series of stages. The first stage involved Emergency Psychiatry as a test bed: to survive here, a computer system has to be acceptable to clinicians, which means easy to use, and able to provide more useful information more quickly and with time savings compared to manual ways of doing it.

Once this critical hurdle - acceptance by clinicians - was passed, the computer's influence in other areas expanded as more software was designed, in consultation with the ultimate users, and then written and tested.

Perhaps we can at this point return to reality, to the here and now. As a resident in psychiatry, I can visualize how some of my daily activities could be simplified by a fast, tireless, electronic helper. As a computer engineer, I am aware of the capabilities and limitations of the computer hardware and software on the market today. With this in mind, I suggest we are at the point where we can benefit from computers used as electronic "page-turners"; specifically, computers can help us organize and work with patient information contained in their medical records.

Those of you familiar with computers will be aware that there are many computerized medical records systems on the market; some are geared to the general practitioner, others are intended for psychiatrists in private practice, still others are aimed at statewide networks of mental health facilities. Social workers and psychologists may also know of systems directed specifically to counselling, psychological testing, or research.

(-O-) What are the design features that would be desirable in a system which would be suitable for our situation, that is, hospital-based general psychiatry?

First, in our bilingual milieu, it is important to be able to enter patient assessments and other information into the system in either official language.

Second, such a system should be decentralized. Instead of a large central computer with a number of terminals connected to it, each location would have its own personal computer. These computers can communicate with each other, in what are known as "LAN's", or Local Area Networks. For example, a computer located in the medical records department could transmit the contents of a patient's chart to the computer situated in the Emergency Psychiatry area. This kind of decentralization offers a number of important advantages: system reliability is much higher compared to the central computer system. With a central computer, a single computer breakdown is enough to knock out the whole system. If one of the computers in a decentralized network packs it in, you can simply walk to another nearby computer. Each unit is sufficiently small, lightweight, and inexpensive to be replaced as a unit with a spare computer. Another advantage of a decentralized system is speed of response; because there is no need to communicate with other computers except for the transmission of data, there's no need to wait for the central computer to respond. It goes without saying that a decentralized system has no forms to be filled in which then have to be keypunched; there's also no waiting for "batch jobs" to be run at night, or for computer printouts to be delivered in the mail.

A third design feature is ease of data entry. Traditionally, computers have come equipped with keyboards. But not all clinicians are typists. If at all possible, then, a system for psychiatrists should avoid the necessity to use the keyboard.

In recent years, several alternatives to keyboards have come along. You've all seen the television ads for the Apple Macintosh, with its "Mouse" that you move over a flat surface. Light pens that you simply touch to the screen have been around for many years, although they are plagued with low reliability. Touch-sensitive pads are now available for even the cheapest home computer. But the one instrument which we all have and know how to use is our finger. Hewlett-Packard is presently marketing a personal computer which has a "touch-screen"; the computer screen displays a series of options which you can choose simply by touching the screen in the appropriate location with your finger. I will demonstrate this shortly.

A fourth design feature is the ability to present information graphically. A picture is worth at least one "K" words; I mentioned earlier on how a graph of, say, clinical status plotted along with medication dosage as a function of time, could be very useful to the clinician. Today's personal computers come equipped not only with high-resolution graphics capabilities, but can often display information in

colour. "Windows" are becoming popular as a way of displaying simultaneously data from a number of different sources.

The fifth feature of my system involves computer hardware that is really still quite new and not widely used. You have probably all heard computer generated speech — not so easy to understand, is it! And computer recognition of speech does work, but not very well. What <u>does</u> work well, however, is a system which converts speech into digital signals which can then be stored by the computer — the idea is the same as that used for digital disk audio recordings. This means that a personal computer can be used as a sophisticated dictating machine. Why bother, when dictating machines are so much cheaper? Well, in the computer, a dictating function can be integrated with other ways of entering data, such as a touch-screen. When combined into one machine, you have something which is much more than the sum of its parts.

Lastly, computer technology can provide us with something that is even better than the paper medical record for archival purposes. One objection to computer data has always been that it is so easy to tamper with, something that is unacceptable from a legal point of view for medical records. Again, using technology popularized in the home entertainment field, that of the laser video disk, it is now possible to store large quantities of information on inexpensive disks of metal and plastic. Would you believe 200,000 pages on one disk? Best of all, once the data has been written on the disk, it cannot be changed, erased, or otherwise tampered with except by destroying the disk.

<u>(-Q-)</u> What I would like to do now is to demonstrate to you a computer program that I've written. The domonstration has two parts. The first part demonstrates the use of a computerized psychiatric medical records system, as it might be used to retrieve patient information in a setting such as an emergency room. The second part is intended to demonstrate how such a system could be used to generate reports, such as an assessment report for a patient evaluated in the emergency room.

The screen shows a menu (no, we're not in a restaurant — menu is simply computer jargon for computer screen display which shows the options available to the user), a menu to find the chart you wish to look at, out from all the many charts stored by the computer in such a system.

Before going on, though, I would like to introduce a few disclaimers. First, the computer program that is now running is only a demonstrator; that is, it can't really do what it appears to be doing.

The second caveat has to do with the display that you're seeing on the giant screen. It's a "monochrome" display, and the "mono" part of that word might just as well mean "monotonous". If you will glance down here at this little screen, you will see colours. The use of different colours in a display can really add to the readability, and make a system such as this much easier to use. Unfortunately, renting a large screen colour display is not cheap.

The third disclaimer has to do with the speed of the display. I've written the program in a high-level language which is easy to program

in, but tends to be somewhat slow. A real, working system would be able to zip through pages almost instantaneously.

Finally, I spoke earlier on about the use of a touch-screen. This computer doesn't have such an animal, although it's available. Instead, my assistant and I will attempt to simulate the use of touch-screen. The program will help us do this by blinking a number at us, which not only indicates which rectangle is to be touched, but also tells us what number to enter at the keyboard at that point to make it look real.

OK, let's get started on locating a chart we want to look at. This menu shows how to set up a search through all the files in the computer. We'll assume that there is a different file for each patient chart. You are all aware of some of the difficulties in finding a chart. It helps if you know the chart number; failing that, you try the patient name, hoping that you've got the spelling right, and that you've got the married name and the maiden name sorted out right. If there's more than one chart with the same name, the patient's date of birth is essential.

It's bad enough when looking through a set of index cards in a box; suppose that all the patient charts were placed into one giant box, irregardless of which service they were seen in, whether they're closed or not, child, youth, adult all in the same box - medical charts as well. This is the problem a computerized system must deal with.

On this menu, the rectangles indicate the parameters, or pieces of information, you can specify to the computer to help it locate the right chart. Let's say the patient who has come into the ER is an uncooperative person who gives nothing except name, but won't spell it for you.

First of all, let's specify that it's a woman. This reduces the number of possible charts by up to one-half. I do this by touching the rectangle 'female'. Next, to use the patient's name as a search parameter, touch the rectangle labeled 'last name'. The program now allows us to enter, on the keyboard, the patient name. Let's suppose the name is 'Schacter', and you try one common spelling. When we enter the name, the program asks us, down in the clear area, whether we want it to try alternate ways of spelling that name. We indicate 'yes'. Note that the search parameters being used are indicated in the appropriate places on the screen.

An educated guess about the patient's age puts her in her 70's. Let's tell the computer to search by year of birth, like so. The blank area is rapidly filling up with additional rectangles to help specify the birth-year. We could, for example, specify all birthdates after any given year, or before any particular year, or in any interval. The way we'll do it here is to specify the 1910's decade. We select 'equal to', then we select this century, then the second decade (ie the 1910's), and finally, we select the question mark, that is, the wild card character, for the units place. What this means is that any value, from zero through nine, can satisfy the search if it occurs in the units place in the patient's year of birth.

Finally, we can narrow the range of possibilities greatly if we can specify the service that treats the patient at present, or in the past. This would be especially useful for someone working in a particular service, for example the ward, to access only the charts for ward patients.

In the present case, let's suppose that a member of the nursing staff remembers that this particular lady has been treated previously, both on 4 east and in the continuing care clinic. To use this, select the rectangle marked 'has been on service', which causes the computer to display a list of all the services in the department. We then select '4 east' followed by the connector 'OR' and then 'ccc' for the continuing care clinic. The 'OR' means that either 4 east or the ccc in the patient's chart will satisfy the search.

If there's no additional information to be used, we initiate the search by touching the 'search' rectangle down at the bottom. The computer's response is to tell us how many 'hits' it picked up; that is, how many patient charts satisfied the search criteria. In this case, the number 14 is displayed in the bottom right-hand corner.

Let's look at those 14 patients. Press the rectangle labeled 'display', and the computer displays basic information about the 14 patients: last name, first name, then initial; on the second line the 'F' stands for 'female'; this is followed by the date of birth, then the patient's age, and finally the married name, in brackets. Note that there are four different spellings for this particular name that the computer found.

If we want further data on any of the patients to help us identify which of the 14 is the right one, press the rectangle preceding the name of the patient. We'll try number 4, Alma Schacter, age 74. This next screen displays the information that Alma Schacter is not registered in any service currently; however, her address, telephone number, and medicare number, on further questioning, turn out to match what the patient can tell us.

Let's look at what the chart for this patient contains. Touch the rectangle marked 'by service', and a listing of all the 'records' (some more jargon — here we'll use it to indicate the different sections of a patient's chart, that is, one record or section for each service that a patient has received treatment from, for each interval of treatment by that service.

For Alma Schacter, the chart informs us that she has been to the emergency room three times, has been in the pha twice, and was admitted to 4 east twice. If there were additional sections, we could look at them by pressing the up arrow rectangle, or the down arrow, to 'scroll' the listing up or down.

Pressing the rectangle marked 'chronological' allows us to view the same information, but in reverse chronological order.

Let's review some inpatient data. I'm going to pick the 4 east admission which began on the third of December 1983 and ended on the thirtieth of March 1984. When we select this record, the computer displays the subsections of the chart for this particular admission. As you can see, on the left are the subsections generally used by physicians, while evaluations and observations by nursing, social service, and occupational therapy are listed on the right.

To review the admission note written by Dr. X. on the third of December. Touch the rectangle, and on the screen will be displayed the actual admission note (finally!). Again, we can scroll up or down to see the rest of the note, to overcome the limitation of the screen on the amount that can be displayed. We could zoom directly to any given heading, for example 'differential diagnosis' or 'treatment plan' by touching the rectangle labeled 'select heading'. This would display a list of all the headings in this note, and we would then touch the rectangle for the desired heading. *press 2*

That concludes this section of the demonstration. While we wait for the computer to load the next program, I will describe the next section. What I will show you is one way in which a computerized medical records system could be used by a busy clinician to save time in writing such things as progress notes, consultations, discharge summaries, case histories, and so on. In this system, you can select the things that you want to appear in the written document from a series on menus, by touching rectangles on the screen.

I don't have to tell you that such a system would work best for those parts of a writeup which are the most structured and repetitious, such as the diagnosis, mental status, or treatment plan, parts in which the number of different things you could say are limited. In fact, I will use the creation of a mental status to demonstrate the process. However, I will also, a little later on, show you how you could ~~also~~ write highly individualized portions of a writeup using this system.
OK, let's begin. We'll use the mental status for the same patient whose chart we looked up before. Assume that she's very depressed at this point. The first menu allows us to specify the patient's general appearance. I want to say that she looks older than her stated age, so I touch the rectangle marked 'older'. When I do this, observe the blank area in the bottom third of your screen. When I select 'older', a sentence appears here, as it will appear in the final document. Notice that it's been fleshed out to be grammatical, although it sure isn't lyrical! The rectangle 'older' also gets highlighted, to remind me that I've selected it.

Let's continue with the process. Watch what happens to the text when I touch the rectangle marked 'poor' to indicate her physical health. I continue on with the descriptors 'cachectic' for her weight, and for her height, I select the rectangle 'short'. As I continue to select, the text near the bottom gets added on to. The last thing I select on this menu is the phrase 'in a wheelchair' to describe her ambulation.

To go the next menu, I touch the rectangle labeled 'next menu'. Again, I want to say that the program I've written operates quite slowly, whereas a real program would flip to the next menu in the blink of an eye.

On this menu, I indicate that the patient is wearing pajamas, and appears neat in her state of dress. I don't want to say anything about her grooming, so I simply skip over this heading. The system will not force me to enter something; it leaves that choice entirely up to the clinician.

I next touch the rectangle marked 'stooped' to describe her posture. When I do this, a further series of four rectangles appear over on the right of the screen. These rectangles allow me to modify the descriptor I've just chosen with a suitable adjective. In this case, I want to say that she is mildly stooped. Again, the choice is highlighted. There's nothing more I want to add from this menu, so I will go to the next one.

Here there is a section to describe the patient's facial expression. I want to describe her as very often impassive, so I first select 'impassive' and then the modifier phrase 'very often'. However, there is more that I want to say about her facial expression. Will the system allow me to add something, or do I get only one choice per heading? Let's try the rectangle 'suspicious'. Great! the system bought it. Can I modify this descriptor also? I'll try the rectangle marked 'occasional'. The entire sentence appears near the bottom. I could select all the descriptors in this or any other heading, if I wanted. But that wouldn't make a great deal of sense. The system could be programmed to reject any choices which are contradictory.

On the next menu, I select 'mild psychomotor retardation' as well as 'mild tremor' to describe her motor behaviour. There is nothing I can say about her gait, as she's in a wheelchair.

While we wait for the computer to load the next portion of the demonstrator program, I want to remind you that although the process as I'm demonstrating it doesn't appear to be particularly fast, with a real system you could compose a writeup as quickly as your finger could move from one rectangle to the next. With some familiarity with the menus, this would go very fast. Are there any questions?

OK, here we have a menu to describe general attitude. I select 'moderately withdrawn' by first touching 'withdrawn' and then the modifier 'moderate'. I add that she is 'somewhat uncooperative'. Nothing more here, so let's go to the next menu

On this menu, there is nothing that applies to this patient. I will use it to demonstrate how we can go back to a previous menu, for example if we wanted to make changes. I simply touch the rectangle at the bottom labeled 'previous menu' and the menu that was displayed before appears. Note that now, however, the choices which I made previously are still highlighted.

Suppose I want to add some text which is not provided for by the menu choices. I could press the rectangle marked 'enter text' at the bottom of sthe screen, and then enter text using the keyboard. But if I don't like to type, I could choose the 'dictate' rectangle. When I do this, the system displays on the right-hand portion of the screen a scale, and several rectangles marked with the usual dictating machine functions, dictate, review, cue, play, and rewind. The scale indicates the number of minutes of dictation used so far in this document.

At the very bottom of the screen, a prompt appears, asking me to indicate where in the text I want the dictated segment to appear. I can simply touch the text at any location, the computer senses where I,ve touched, and marks the text at that location with a rectangle to remind me that dictated text will appear at that point, once it's been dictatyped. After choosing this point, I can use the rectangles for the dictating machine functions to dictate something right into the computer. This particular computer doesn't have the right hardware, so I can't demonstrate it for you. When I finish dictating this segment, I press the 'dictate' rectangle at the bottom a second time to return to the menu underneath.

If I or somebody else wanted to read the writeup before the dictated portions had been dictatyped, the system could be set so that it would automatically play back the appropriate segment of dictation, when the marker rectangle in the text is touched.

I am going to skip over a number of menus now. This menu allows me to describe psychotic symptoms. I want to specify, for auditory hallucinations, that I suspect she is experiencing them (she appears to be listening to something) but when I ask her, she denies it. I simply touch the rectangles for 'auditory hallucinations', and then for 'suspected' and finally for 'denied'.

We now have more than five lines of mental status in our text, but only five lines are visible. To see the rest, I can touch the up or the down arrow, on the screen, to scroll the text display up or down. I will touch the 'down' arrow once, to scroll the text display down by one line. If I touch it and hold, the display will scroll as many lines as I like.

If I want to display more than five lines at a time, I can touch the rectangle marked 'expand'; this causes the window containing the text to increase in size. Now we can view 14 lines at a time. Unfortunately, it's become very difficult to read the menu behind the enlarged window. We can jump right to the beginning of this writeup by touching the rectangle labeled 'top of document'. I could shrink the window again, to continue working with the menu.

That concludes the demonstration. I'd like to mention some of the features of a good patient records system, which I haven't had time to include in the demonstration. One of the most important, something I feel strongly about, is the protection of confidentiality of patient information. A well designed computer system would enhance security and

confidentiality of information. One way would be by using passwords. For example, to use the system, a person would have to enter one or more passwords which only that person and the computer would know. Another level of security could be provided by arranging it so that a person could look at only those things necessary to do his or her job. For example, a dictatypist would need to look only at the text that she is typing, and doesn't need to see the rest of the document. A dietician wouldn't need to see a patient's case history, although she would need to know about current medications and medical consults. These things are relatively easy to include. Security of information also includes the legal requirement that once a note is written and signed, it cannot be changed. Again, this is something that is easier for a computer system to accomplish than a manual medical records system.

Finally, I want to mention that a computerized medical records system could make it easier to work in a bilingual milieu. I didn't demonstrate how it would be possible to switch from an English to a French menu, by simply touching a rectangle. Something which is also technically possible is the translation, from one language to another, of those portions of a writeup which were generated from menus. This could be extended to just about any language, of course, given time and money to program the menus.

That concludes my presentation. I would like to thank the Department of Psychiatry, for renting the projection monitor, and to the computer store "MicroAge", who kindly donated the use of this computer for this presentation. And thanks to all of you.