APRIL* - THE EVOLUTION OF A LONG TERM CARE SYSTEM

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Abstract

This paper describes a computerized medical information system for long term care, which is relatively unexplored in automated medical record-keeping. APRIL* includes accounting, billing, census, payroll and elderly housing (HUD) systems as well, to enable a facility to use a single computer for all areas. The medical applications include physicians' orders, medication, treatment, restorative nursing care plans, utilization review summaries, and scheduling for certification of need for care, U.R. meetings, care planning, immunizations, doctor visits, clinic and consult visits, and laboratory, x-ray, EKG, and other tests and monitors. Current plans include production of R.N., L.P.N. and aide task lists, calculating of hours of care required based on problems and documented orders, procedures, and plans.

The programs run on Digital's PDP 11's, including the Micro/J-1, and use the RSTS/E operating system, and the BASIC PLUS language. There are facilities in five (5) states using APRIL*, both batch and online, and several scheduled for in house installation before the end of 1983.

Introduction

APRIL*, an acronym for Automated Patient Records In Long Term Care, is an evolutionary system, being written specifically for nursing homes, and, as such, is still changing. Most of the current systems in place are either financial or payroll, in house or batch, or physicians' orders and charting forms produced in batch by pharmacies as an incentive for nursing homes to buy their medications from that particular pharmacy. As a by-product of a billing system these programs initially left much to be desired. Why were nursing homes so eager to have these print-outs? This is a result of a Federal regulation which requires periodic re-writing, or review, of orders generated over a long period of time. This regulation was the result of a real problem. When a patient is institutionalized over a long period of time, and there are orders written on many pages, eventually, it is difficult and time consuming to find out exactly what orders are actually in effect. Therefore, many states started enforcing reviewed or re-written orders every 30 or 60 days, in an effort to get the physician to look at his medical care plan and ascertain that all medications and treatments are still needed.

In 1977 a group of Maryland physicians, nurses and administrators and Health and Energy staff members talked about the needs in the nursing home which were the most time-consuming and lent themselves most easily to automation. The consensus was that any system development should be facility oriented and that all data should be retrievable by report generator. The following goals were developed:

- Physicians' orders must be tied to a drug interaction program, and specific regulations must be met.
- Orders for care must be correlated to diagnoses
- Duplication of effort must be avoided.
- Maintenance orders must have automatic schedules
- Internal departmental reports, such as Dietary, must be produced.
- Information for medical care evaluations must be retrieved.
- Guidelines for ancillary services, based on the orders and procedures must be developed.
- The programs must include interdisciplinary documentation, and allow interactive nursing unit use if desired.
- The same computer must be used for a total information system, including financial, payroll, census, and administrative information, allowing manipulation of data from all these systems to obtain information to influence regulatory changes.
- And, by implementing all of the above, improve documentation, thereby improving the care provided, and develop a base of hard clinical data for research.

The RSTS/E operating system was chosen since, at that time, it appeared most facilities would prefer to be on line to a time sharing service. As hardware costs have plummeted in the fast 5 years, it has become apparent that facilities now prefer to operate in house systems. Fortunately, the virtual arrays used by RSTS/E allow some of the advantages of a database system.

Table driven programs have been used so changes can be made without a programmer. Additionally, report generators have been included in most programs, or will be added shortly.

Initialization

The handwritten physicians' orders were reviewed for content and certain divisions were made in order to make both reading and retrieval of the information easier. Coding conventions were set up for each division within the orders, and the
programs written. Certain unexpected reactions occurred. One medical director was unhappy with the system because it so clearly documented the care the patients were receiving and because he felt he now had to look more closely at his medical care plans to assure that they were adequate. Fairly consistently, when a facility has been through one or two cycles, unused drugs ordered are dropped from the physicians' orders.

Basic to the retrieval system was the development of several "master" files: drug, diagnosis, doctor, functional administrative data may be retained in meters and treatments. Some of the file content was developed by the H&E staff, and some of the coding was conventional. For example, the ICD-9-CM diagnosis codes were used, the ASHP drug codes were used, as well as NDC numbers.

As we are all aware, the diagnosis has become more important for reimbursement in the past five years. As this has occurred, the content of the patient diagnosis file has changed. As a result of the DRG concept and some of the HCFA policy decisions, the diagnosis file contains codes, dates of onset, surgery, resolution, and, because this is a long term patient, a date of re-activation. The resultant Disease Index is more comprehensive and contains more information than the traditional one. The primary and secondary diagnoses are identified by admission, and upon discharge the final diagnoses are flagged. Since a patient may be in and out many times to the hospital, a patient may appear more than once under a single diagnosis, but this is tracked by the Adm-Disc dates. When a patient is transferred to a history file such as this, if the facility expects him back, the original administrative data may be retained in the active file as well. It is also possible to maintain inactive diagnoses in a complete problem list, but print out only active diagnoses on an order sheet, or patient care plan.

The drug file contains a matrix for drug inter-actions, and allows automatic prompting on the medication or treatment cardex and on the lab/test schedule of the items contained in either the Federal Indicators for Drug monitoring, or the facility's own monitoring standards, or the state requirements. For example, the Federal Drug Mon-tor requirement is for a periodic blood pressure for patients with diuretics ordered, while the PMR team in Massachusetts requires a periodic weight. A table of these monitors and checks is provided each facility, as well as a print-out of a compar-ision of diagnoses to drugs and lab/tests for physical review. Provision is made for medication administration times, unique to each facility, and, perhaps to different floors in a single facility. Start and stop dates, brand and generic equivalent names are listed for drugs where this applicable.

The doctor file contains name, address, phone, DEA number; other files, such as dentist or funeral home list the same type of data.

Reports
The physician's orders include the usual informa-tion, but it is more structured, and includes a section for his Medical Care Plan for the patient, including his determination of the level of care, based on the patient's needs, his visit schedule, his prognosis, discharge plan, estimation of the rehabilitation potential, and long and short term goals. It is from the information in this section that recertification schedules and recent and physician visit reminder letters are produced, and the utilization review scheduling is done.

The next section is the General Order section, which is undergoing revision as we get into staff restorative measures, interdisciplinary care plan-ing, and preventive measures. For the present, this section contains diet, leave of absence, dental, optical and podiatry care, clinic and mon-itoring of vital signs, as well as physical therapy occupational therapy and speech therapy.

The laboratory and other periodic testing orders follow, and include the next date on which the test is to be performed. This can be provided by a cycle method, or by actual date, and can include the specific laboratory to be used. Shortly, this section will be used to generate test requests automatically so that the staff will not have to complete request forms. A listing for the current month is provided for each nursing unit, and includes the patient, test, date to be done, a check-off section for done, received back, and reported to the M.D. if abnormal. This provides the staff with reminders of what is to be done, shows the point at which each test is, and is documentation that policies regarding physician notification are carried out, a requirement in some states.

The treatment section includes such items as the application of topical dressings, Foley catheter care, decubitus care, preventive methods and de-vices, and monitors such as urine sugar and acetone tests and intake and output. To obtain adequate data for analysis of the content of this section, several facilities' treatment sections, which were initially un-structured, were dumped for review. It was possible to group 95% of the items listed. Several major categories were established, plus many minor categories. For example, a major cate-gory is Respiratory Therapy. Under this are sub-categories of oxygen, IPPB/Bennett, Chest P.T., vaporizer, inhalation and others. Regardless of the date of the order, all respiratory therapy or-ders are printed out together on the physician's order form, and on the treatment charting form.

The charting form includes space for documentation of the reason for administering a "PRN" treatment, and for not administering a routine drug.

The program has been written so that the facility can choose the categories itself if desired, and allows the facility to add others. It includes the capability to document the number of assistants required for a task, and the average time required to perform that task so that projected staff requirements based on patient needs and orders can be generated. This will then be compared to the actual time logged by staff in the Payroll segment of APRIL. An attempt is also being made to tie in-ventory of medical/surgical supplies to projection of need based on actual orders.

Medications appear next, and are divided into two sections: first, the routine medications and then the "PRN", or as needed medications. There is a built in mechanism on the order form for ordering.
either by brand name or generic name.

Included in the program for physicians' orders is the capability to indicate that no order has been written for a specific order. For example, if no diet has been given, "Not Specified" may, at the facility's choice, appear after the heading as a reminder that this order must be written. With few exceptions the name of an order type will appear only when an order is in effect for that category. The parameters are unique to a facility and are established at the time the files are set up. These may be changed later, if desired. In one instance this was done because a surveyor had seen the facility's "Not Specified" reminder and cited this as a deficiency.

In every case where possible, the order is preceded by the original order date. (Obviously, when a facility starts computerization original dates of orders long in effect may not easily be available.) It is then possible to see at a glance how long a patient has been on a given medication or other form of therapy. For example, if an order for penicillin for 10 days, initiated seven days before re-writing, were to be re-copied verbatim, the patient would receive an extra seven days of penicillin. (Actually, the medication cardex has been: this approach to record-keeping in long term care facilities is a novelty; in a new situation, the health care providers look at the orders more closely and critically, which ultimately results in easier identification of all information about a single problem without having to look through all the orders to find it. Especially in long term care the problem list becomes more than a diagnosis listing. It includes other problems with which the staff has to deal, and which affect patient care. A given patient may have diagnoses of ASCVD and chronic brain syndrome, but also have entries of "feeding problem" and "wandering" on the problem list. The same APRIL* system we have been describing allows cross-referencing of drugs to problems with a single additional entry. It also allows use of the problems on the patient care plan which the doctor has established, or inclusion of problems identified by the staff. This type of entry assures improved specificity of medication orders (the nurses know exactly what the medication is for) simplifies concurrent audit of patient care; facilitates compliance with accreditation agencies' requirements; and, most importantly, makes the physician think why he is ordering a particular item. Certain standing orders do not readily fall-into problem headings. These are printed under "Other". An example would be turning and positioning as a consistent finding. The facility cited above was one of the first to use the system. Another facility of 250 beds just started eliminated a full time equivalent also.)

At the first facility above, after the APRIL* system had been installed for two months, the error rate was re-checked. It was down overall to 2%. A check after six months showed an error rate of 1/2%. Verifying of information on print outs was eight hours, down from a full time equivalent.

During a telephone survey of sixty facilities in the metropolitan New York City area, each facility was asked how much time was needed to re-copy reports each month. Only four had any idea how much, an average of 41 minutes per patient.

There is an interesting cycle of acceptance of the computerization of medical records. There is some apprehension, which is to be expected. Then when the first print outs are placed on the records and they are clear, and there is a reminder that there is an euphoric attitude. Since the internal systems on the units are different, and there are new places to document care, everyone becomes unhappy. This lasts for approximately two months. Then there is acceptance and familiarity, and the staff is pleased once again. (This is not because of lack of in service; all shifts are trained in the use of the forms, and there is an initial presentation by the medical record administrator on the H&E staff. There are documented internal procedure manuals which H&E has developed for the staff to use as guidelines for their own procedures.)

Problem Orientation

One facility chose to use not a source oriented type of order form, but a format requiring the physician to document the reason for prescribing certain medications or treatments. The diagnosis system maintenance was described earlier, and this is used as the index for the orders. Each problem is numbered, and whenever a reference is made to that problem in the orders, the treatments and medications for that condition are listed just underneath. This makes for easier identification of all information about a single problem without having to look through all the orders to find it. Especially in long term care the problem list becomes more than a diagnosis listing. It includes other problems with which the staff has to deal, and which affect patient care. A given patient may have diagnoses of ASCVD and chronic brain syndrome, but also have entries of "feeding problem" and "wandering" on the problem list. The same APRIL* system we have been describing allows cross-referencing of drugs to problems with a single additional entry. It also allows use of the problems on the patient care plan which the doctor has established, or inclusion of problems identified by the staff. This type of entry assures improved specificity of medication orders (the nurses know exactly what the medication is for) simplifies concurrent audit of patient care; facilitates compliance with accreditation agencies' requirements; and, most importantly, makes the physician think why he is ordering a particular item. Certain standing orders do not readily fall-into problem headings. These are printed under "Other". An example would be turning and positioning as a
preventive measure. Occasionally a physician forgets to cross-reference a medication to the appropriate problem. These are simply listed under "Other Meds" and the proper problem number inserted later.

Patient Assessment forms, including social, behavioral, psychological, and physical limitations, observations and interests, have been developed as an input document for problem orientation for all areas of the medical record, and also serve as a flow sheet showing changes in the patient over a period of time. This input document also is used for the patient care plan.

Patient Care Plan

This program allows extraction of information from a number of APRIL* clinical programs, and is set up as two actual forms. One contains problems, goals, responsibilities, and follow up on goal-setting, and the information from the periodic patient assessment. The other form is an insert form, and contains the medications, treatments, physicians' plans and goals, and the diagnoses. This is because the physicians' orders are updated more frequently than the care plans in the computer system. Ideally, this document, which is not intended to become a permanent part of the record, should be accessed interactively, and changes made via CRT on the nursing unit. We have not reached this point yet, but expect to do so within the next year.

Other Products

Any item on the physician's order can be listed for all patients within the facility. A listing of all drugs, by patient, by room-bed, can be produced, and is frequently used by the consultant pharmacist. A comparison of drugs to diagnoses can be listed by patient. A listing for a single diagnosis, or of diagnoses in combination can be done, as can drugs or treatments. Laboratory schedules have already been discussed. Immunization schedules, annual history and physical schedules, consult visits, therapeutic diet listings; floor monitor sheets, positioning and turning sheets and many other useful reports are used.

Medication cardexes list the patient's Pn orders, and then the routine orders, separating them on the cardex. The times of administration are given if the facility desires this, and the vital sign and weight monitors recommended are listed with each pertinent drug, and highlighted by an asterisk, which refers the staff to the statement that these are Federal Drug Indicator recommendations. There is a start and stop date for each drug; both generic equivalent and brand names are given where pertinent, and the number of slots required for documentation calculated by program. The visible portion of the cardex includes the patient's name, room-bed, allergies, physician and I.D. number and indicates whether or not there is a continuation page. On the back is space for documentation of stat drugs, nurses signatures and initials, and space for notes regarding Pn medications given and routine medications not given.

The Treatment cardexes are basically the same format as the medication cardexes. In this instance, the treatments, whether Pn or not, are listed together for each treatment category. Again, calculations are done on the number of posting blocks required based on the frequency of order.

Audit of Care

With the report generator just added to the clinical system, it is possible to retrieve current information on patients using categories chosen by the facility. The evaluation topic, age, sex, location of the patient, and the parameters to be studied can be entered on the report generator, and print outs of all information obtained so that one does not have to go to the medical record to get much of the information. For example, in a diabetes to therapy correlation, it was decided to include all patients with a diagnosis of diabetes mellitus, and/or on a diabetic diet and/or receiving an anti-diabetic drug. One report listed the medical record number, physician, room, and several types of treatment which could be identified by the patient database; these were diagnosis established, diet, order for diabetic drug, hand & foot care, S&A monitors, and PFS tests ordered. The report very clearly shows which patients are missing necessary or recommended items. Listings of these parameters can be generated by physician, as well, so reports on his own patients can be sent to him, without his being able to compare other physicians' results.

Monitoring Algorithms

Throughout this paper monitors based on certain criteria have been described. Algorithms such as the Federal Drug Indicators, have been programmed and others developed. The facilities starting to use APRIL* usually set up admission order forms which contain orders such as "if diuretic, then electrolyte test q.3 months". This is being expanded to include others, such as the Massachusetts PnR reviewers parameters which say if a physician has not ordered an S & A on a diabetic, then the staff shall do a sugar each day, or if the patient has an indwelling Foley, then the urethral meatus shall be washed twice a day. These specifications are being developed now, and developed in table format so there can be differences for each state. This type of requirement will be included in the Treatment and Restorative Care Form, which has been developed as a multi-user form. Physicians' treatments will be listed first, and, if more specific than the regulation, not repeated in the staff section below his orders.

Summary

There is little doubt that the initial goals of the APRIL system have been achieved -- improved accuracy, legibility and efficiency, simplification and standardization of orders, easier justification of treatment in terms of the patient's medical problems and other needs, and the reduction in unnecessary drugs administered.

Through the utilization of a flexible data storage and retrieval system, orderly data collection, methods, and straightforward decisional networks, the facilities using APRIL* have realized time savings, reduced medical record deficiencies, and improved documentation for reimbursement. An effective clinical system has become a "must" for them.