From Computerized Patient Records
to
National Resource

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Abstract

To help curb constantly rising costs of medical services, healthcare providers in Israel have been busy incorporating computerized patient record systems (CPR) into their organizations since the early 1990s. Our CPR based integrated system solutions (named Clicks®) now serve over 90% of primary and secondary medical care professionals throughout the country, covering over 90% of the population across medical fields with all healthcare providers.

Online verification of member rights, embedded business rules and medical protocols as well as Preventive Medical Assistance (PMA) rules are incorporated into the system. These, coupled by bi-directional communication to facilitate implementation and enforcement at all points of service and to transmit administrative and focal medical information, have created a firm foundation for carrying out the organization's cost control and expense management strategies.

The CPR systems based on these underlying concepts and on token driven data entry methodology have transformed traditional medical work areas into virtually paperless environments.

The enterprise wide solutions use dedicated viewports to address the needs and requirements of any medical field, user population and a wide range of medical facilities. Extensive data collection and detailed documentation are maintained universally at all points of service, for the entire patient population. Current applications, based on a distributed approach and local databases with communication to central systems for bi-directional transfer of information, gradually give way to unified databases located on central systems. Two concepts are being implemented: (a) MDC (Medical Data Core), which contains patients' focal medical data as transmitted from the local database at the physician's workstation, and (b) a complete centrally located database, where continuous communication is required from the physician's workstation to the central system, through dumb terminals. This concept entails massive investment in communication capacity and hardware and requires high reliability of all communication transactions at all times.

MDC information by contrast does not require open communication lines around the clock, is communicated bi-directionally at predefined points in time or in the workflow, alleviating load and congestion on communication lines. In addition, access, retrieval and display of MDC information is done using standard browsing techniques under known protocols and requires no extra investment for these capabilities.

Introduction

As a result of the constantly rising costs of medical services and the coming of age of computer technology, all Health Care providers in Israel since the early 1990s have been busy creating computerized patient record systems (CPR).

Now serving over 90% of primary and secondary medical care professionals in Israel and covering over 90% of the population across all healthcare providers, CPR systems based on *Clicks*® concepts and methodology have transformed traditional medical work areas into virtually paperless environments.

1. The Driving forces

Relying on physicians' commitment to detailed documentation of their work, numerous additional driving forces came into play for incorporating CPR systems into the fabric of Healthcare Providers' daily operation:

Membership/Eligibility control
Proper control mechanisms (accompanied by easy-to-use magnetic cards) incorporated into the CPR systems provide online, reliable control over eligibility and members' rights to service, at each point of entry.

Enforcement of business rules
The main benefit to healthcare providers however of a CPR system based on the concepts and methodology as described here, is the system's ability to seamlessly incorporate the organization's business rules into the daily workflow. This feature is crucial and its importance cannot be exaggerated. It can be analogous to computerizing the entire medical production floor so to speak, where key concepts and regulations are put into effect. Moreover, their implementation is enforced throughout the organization at all levels and points of entry, exactly when and where each operation takes place.

High quality, comprehensive, synchronized data collection
By building internationally accepted medical standards into the workflow, our CPR systems ensure high quality collection of all medical data across all physician and para-medical users, for the entire patient population at all points of service. This also means standardized work methods throughout the organization and the same high-standard documentation for all member patients throughout the healthcare provider's facilities.

Enforcement of documentation rules
Physicians are professionally committed to thorough, detailed data collection and documentation. However, the paper-based techniques available to them proved inadequate, resulting in lacking, sometimes confused, often-unreadable documentation, and occasionally misplaced patient files.

CPR systems by contrast, which have accepted medical standards built into them, use mostly non-writing, token-driven data collection techniques to facilitate detailed documentation of the entire medical encounter. Wherever strict documentation rules apply, in case for instance when a clear connection between a medication and diagnosis has to be established and documented, the appropriate regulation can easily be incorporated and enforced within the workflow.

HMO Expenses control
By closely monitoring and documenting online all operations that take place, our systems enable close monitoring of expense-incurring processes. Combined with reporting capabilities and export features to main computer systems, our system solutions deliver a high quality decision support tool to enhance the organization's expense control strategies.

Fraud detection/prevention
Complete eligibility control, detailed documentation of the medical process, enforcing business rules, pre-coding and computerizing expense incurring processes (such as laboratory test orders and referrals), bi-directional online communication with central systems and peripheral facilities, and implementation of medico-legal standards – all of these features are combined and built into a single integrated solution. Built directly into the medical information system, these control measures are a greater barrier to loopholes, leakage of organization resources and downright fraud than had they been part of a separate management system.

Preliminary disease management
Our integrated solutions enable the embedding of preventive medicine guidelines based on internationally accepted standards. Once activated, this module can help detect disease and guide through proper management and follow up procedures.

2. The solution

All-inclusive CPR
The Computerized Patient Record is the basic building block of all our systems and is fundamental to our concept of integrated medical information system solutions. As such it includes all the tools necessary to collect, display, retrieve, document and maintain the medical information and to carry out all the procedures relevant to the physician's work at the point of care.

Emulation of paper records
To facilitate as smooth a transition as possible, our CPR-based systems fully emulate traditional paper records while at the same time offering front edge computer technology advantages.

Task driven application
The authoring environment for all CPR based system solutions has all the tools to create any dedicated end system, specially designed to answer the needs and requirements of the host organization, the medical facility, the scope of activities

or geographical range of the organization network. The unique tasks and workflow are integrated into the system so that they best reflect these requirements and answer those needs.

<u>Customized to the physician's specialty</u>
While the full medical file encompasses the entire medical information concerning the patient, our systems contain specialty-dedicated viewports that enable each physician to work within his or her own specially designed section. Invariably, each viewport is designed to reflect that field's workflow and tasks. This way, general procedures are maintained throughout, each viewport is specially designed to suit the expertise of its users and the complete medical file reflects the medical situation according to the highest professional standards.

3. Achievements…Enterprise solution…

With widening use, all participating departments realized that the CPR-based system has become their insight device on the desktop of the physician's workstation, an extension of their own body enterprise.

Online monitoring of customers enabled the health organization to verify membership plans at each point of entry.

Communication with the physician's desktop enabled distributing lab test results and X-ray answers quickly and accurately, directly into the patient's medical file.

Drug alerts, drug interaction and risk factor alerts are displayed online at the right stage of the workflow.

Drug list and HMO preferences are integrated into the system, such as online suggestions for alternative, equally effective drugs.

Disease management using specific progressive and detailed guidelines.

Patient education became personalized as preparations for tests and medication related instructions could be printed in context for individual patients.

Continuous, topic-dedicated physician education has become possible through online communication, in addition to embedded data sheets, which are available throughout the workflow.

Online communication of administrative updates for immediate implementation is a measure used on a routine basis.

4. Problems

Distributed database
The current approach underlying the configuration of our CPR-based solutions is a distributed database, which, for all the communication modules embedded in it, has limited data-sharing capabilities.

- **Cost**
  Various components must be taken into account when working out the cost of the solution presented here:
- Software development: Suitable applications must be designed and developed for both target destinations - end user work stations and the healthcare provider's central system.
- Development of communication infrastructure for the entire project.
- Hardware

Installation, assimilation and instruction: In a project of this nature, the importance of assimilation and continuous instruction cannot be exaggerated. Assimilation of the concept, universal work habits and workflow by knowledgeable personnel must be taken into account especially at the beginning stages of implementation. Appropriate instruction design and courses must be integrated into the overall implementation phase for maximum efficiency and effect. Additional instruction and courses following further developments through the system's life cycle must also be considered.

Help desk and support center: With a solution designed to function in a variety of facilities and emergency units, a help desk must be established with duly trained and knowledgeable personnel to answer calls around the clock.

Continuous development: The nature of an organization-encompassing medical system solution Following the initial implementation, further development of various system components must be taken into account.

5. What's next?

Integrating data collection from medical devices
While current CPR systems enable collection of data from the basic 'production floor' that is, from the patient-physician encounter, the next phase can facilitate the collection of data from other medical services as well. This data will be channeled through to an all-inclusive patient file under appropriate transparency methods and will be accessible throughout the domain of system users.

Central data storage: MDC (Medical Data Core) versus Central Database:

These are two approaches for an all-inclusive CPR.

In the central database option, the entire database resides in one central location (a main computer system, server farm etc.). All individual workstations on location in clinics and private offices must communicate with the central database for each and every operation required in the patient file and in the work environment, via dumb terminals. This concept entails massive investment in communication capacity and hardware and requires high reliability of all communication transactions at all times.

In the MDC option, the (medical) database still resides locally but communicates predefined segments of the information to a central medical data core (MDC) residing on a central computer. Typically, MDC information includes focal points of the patient history: active problems, chronic medications, drug allergies and risk factors, history of hospitalizations and surgical intervention, last batch of laboratory test results and an abstract of the last visit to the family physician and to all specialists.

MDC-resident information is accessible and available to authorized users within the organization, such as specialists of all fields, and to other parties as required, such as hospital emergency rooms.

Not requiring open communication lines around the clock, MDC information is communicated bi-directionally at predefined points in time or in the workflow, alleviating load and congestion on communication lines. In addition, access, retrieval and display of MDC information is done using standard browsing techniques under known protocols and requires no extra investment for these capabilities.

Country-wise fast and targeted data collection as infra structure for evidence-based medicine
Widening use of CPR based solutions create a readily available database of medical information. To date, CPR based solutions cover 90% of primary and secondary care population in Israel. Operating under a unified patient file approach such as an MDC database, targeted data collection channeled through to the MDC, combined with proper reporting and analysis can serve as infrastructure for evidence-based medicine.

Hospital connections
Based on the MDC concept, centrally located focal patient information can be made available to hospitals nation wide.

Single Patient CPR for Home-care patients
With increasing home care needs on one hand and the availability of communication functions on the other hand, a single patient CPR for home-care patients can be envisioned. This single-CPR system located at a static point of service will keep track of all home care treatments for the respective patient and will monitor the various personnel rendering those treatments. Relying on communication to access the central system, the unified file remains available and up to date for this growing patient population as well.

Mobile Connector?

With the advent of cellular connection to Internet services, mobile connection to centrally located medical information cannot be excluded, however remote its implementation can seem at this stage.

Smart Card as an access key

Smart cards containing patients' crucial information and functioning as access keys have a certain attraction but present a series of problems: who updates them and where, how they are replaced and what happens to the data stored in them; there is also the question of duplicate data stored in different locations, and so forth.

Standard advanced and updateable disease management

Routine protocols integrated into the workflow can serve medical and organization disease management strategies. Updated regularly and universal across the entire physician population, this feature contributes to the quality of medical care and serves in the organization's expense control efforts.

PMA (Preventive Medicine Assistance)

Residing dormant in the background, a PMA module containing a list of markers and a set of governing rules is updated upon predefined operations in the workflow. Triggered in response to the governing rules, this module alerts the physician upon opening the patient file, informing about aspects of the patient's condition, which would otherwise escape the physician. Possibly, such alerts can suggest a recommended procedure, based on the standards and protocols embedded in the system. Alerting an ophthalmologist of a diabetic patient, along with a display of his/her last glucose level test is a case in point.

Tighter cost control and better expense management

Combining reporting and analysis tools, fast and reliable communication lines and incorporating the above-listed measures into the system create a powerful tool for tighter cost control and better expense management.

Medical audit

The incorporation of coded, easily retrievable data objects such as diagnoses, medications and tests and referrals, the use of PMA as described above, embedded medical protocols and bi-directional online communication for their implementation at all points of service, lay the foundation for in-depth medical audit throughout the organization. Combined with reporting and analysis tools, organizations can gain unprecedented insight into the medical process. Performed over time, across patient populations and upon the vast amounts of

data that accumulate in their systems, what starts as a CPR based medical information system turns into a genuine national health resource.