Constructing Rural Health Information Systems for Critical Access Hospitals:
Imposing Interoperability on Disparate Legacy Information Systems, Developing Electronic Health Records, and Connecting Rural Healthcare Providers

The Case for Information Technology
- Cost Savings
- Improving Efficiency in Healthcare Delivery
- Improving Quality of Care
- Improved Patient Safety
- Accountability - Facilitating Improved Reporting of Outcomes
Means to the Ends:

- Electronic Patient Records
  - Provider notes/consultations
- Laboratory data
- Ancillary reports (Radiology, Pathology, Therapies)
- Computerized Provider Order Entry
- Clinical Decision Support
- Electronic communication between patients and providers
- On-line information sources for patients

Bottom line:

- Electronic medical/health records are here to stay.
- The pressure to adopt EMRs is only going to intensify.
Computer Systems and the Rural Hospital

First introduction to computerized systems was likely in the form of financial management software

- Billing programs
- Computerized accounting programs
- Financial decision support

Growth:

As institutional processes and tasks were identified that would be improved or enhanced by computerization, programs/databases/applications were added on the basis of “Best of Breed” and as often, “Best for the Money.”
Result:
- Collection of Legacy Databases and Applications
- Stand-alone silos-
  - Different platforms
  - Proprietary architecture
- Unable to transfer or share data among themselves without a lot of contortions, and even then.....

Dilemma:
- Some units of the hospital may have converted to electronic records
- Some units may still be using paper charts.
Dilemma Continued

The Billing and Financial Management sections of Clinics and/or Hospitals are likely firmly attached to their financial management software making it extremely difficult to replace.

Computers and Clinical Work...

Many clinical record systems were outgrowths of financial management applications.

Assumptions were made in development:
- Healthcare work is logical, step-wise, linear, rationalized, solitary and single minded*
- Data entry by encoding is more efficient and "complete" than other methods
- The solution to "efficiency and completeness" is automation.

Berg and Wear, JAMA 293, 1262
The Reality:

- Clinical work is NOT routine- “it is fundamentally interpretive, interruptive, multitasking, collaborative, distributive, opportunistic and reactive.”* All difficult characteristics to program.
- Free text is the most efficient method of documentation in a clinical encounter- “documentation at the speed of thought”**

* Berg and Wear, JAMA:293:1262
** Ash, Berg, et al. JAMIA11:107

Yes? So…..?

- In implementing an “electronic medical record” in a clinical entity:
  - Simply trying to automate the system will not work.
  - Considering the clinicians’ and institutions' workflow is critically important
  - Recognize that some elements of the workflow may need to change to accommodate the proposed system may be necessary.
  - Also, some elements of the proposed system may need to be customized to the institution.
Important:

- Implementing an EMR is not solely an exercise in technology management.
- It is more an exercise in people and culture management

Wears and Berg: JAMA 293:1262

“Lack of attention to how the technological artifact will affect (and be affected by) the organization in which it becomes imbedded lies at the core of many technological failures...the introduction of computerized tools into healthcare should not be viewed as a problem of technology, but rather a problem in organizational change and, particularly, one of guiding organizational change by a process of experimentation and mutual learning, rather than one of planning, command and control.”
That means:

- An EMR application cannot just be presented to the clinical and support staff with the instruction, "Use it!"- they won't (for long, at least).

Goal:

- The Goal is to construct an “electronic health record”

Three ways to get there:

1) Purchase the clinical modules from the vendor of the financial management/billing software.
   - Not every vendor has all the applications an institution needs, or
   - that will suit the needs of all the users.
   - If it doesn't fit the users' needs, they won't use it.
   - What about the applications that can't be replaced?
Reaching the Goal:

2) Throw out the legacy systems and replace them with a single system from one vendor

- Same devil, different details
- Added problem: the financial and human cost of replacing the systems.

Hospital staff reacting to the proposal that the information system be upgraded by replacing the present computer applications...
Reaching the Goal:

Third alternative:
- Leverage existing applications
- Select most appropriate applications for the purposes required
- Realize that now one has entered the dreaded realm of “INTEGRATION”

The problems of integration
- Proprietary, closed architecture systems
- Require Vendor cooperation and custom interfaces
- Messaging “standards”- although there are standards (HL-7, XML), there seems to be many different “versions.”
Mt. Ascutney Consortium

- Incomplete penetration of electronic records
  - Hospital Billing/Financial management, Lab/X-ray reports, pharmacy, doctors’ outpatient clinics all have electronic record keeping
  - Rehab unit has its own in-house-developed care plan database. Rest of the chart is still paper.
  - Acute/Skilled Level I unit, nursing home still paper

Mt. Ascutney Consortium

- X-ray films are still hard copy, as are reports
- Radiologists want PACS system that is remotely accessible to help with manpower/coverage issues.
Problem

How does an entity:
- Integrate the applications currently possessed
- Integrate the applications needed to acquire to complete the EHR
- Facilitate access to providers that is user-friendly, does not require incessant searches and screen changes, and is accessible remotely

Integration

Consortium discussed needs with several different “integration” firms...
The take-away:
- Expensive
- Impractical, or, in some cases...
- Impossible
Clinical Portal

- Dartmouth Hitchcock Medical Center utilizes a system developed and maintained by their Computer Services.
- Makes available information from many applications
  - To in-house providers in a single screen and
  - In a limited fashion to outside providers through web-based access.

Clinical Portal

- Accesses applications and databases in organization.
- Uses messaging standards to extract information and present it on a front end screen organized per providers.
- Allows providers to work in applications by clicking icons
- Uses context management to synchronize patient data between applications
Clinical Portal

Using context management technology, the portal allows for access to clinical information from multiple systems in a seamless fashion on the front end, the data remaining in the application in which it normally resides.

Integration

- The transfer of data from one application to another for synchronization, reporting...
- Necessary in certain applications
- Potentially burdensome over the entire system.
Integration Engine

- When Data does need to be transferred (synchronized) an Integration Engine can be used to transfer data from one system to the other.

The Case of George

- Seen in Hospital A this morning with chest pain.
- Seen in Hospital B two days ago while at his daughter’s house, where an EKG was done
- Saw his cardiologist three weeks ago and had lab tests and an echocardiogram
Regional Connectivity

- How do several institutions/providers in a region allow access to information between enterprises in order to:
  - Improve Efficiency in Healthcare Delivery
  - Improve Quality of Care
  - Improve Patient Safety
  - Accountability- Facilitating Improved Reporting of Outcomes

Enterprise Diagram Using the Portal
Regional Information Sharing Using the Portal Solution:

Implications of this solution:

- Does not require custom interfaces: this is as close to a “plug and play” solution that could be found.
- Cost effective: Implementing the portal solution as proposed is less expensive by an order of magnitude.
- The GUI (graphical user interface) can be customized to meet the needs of the clinician end users.
- Scalable.
- Already deployed in a heterogeneous system involving urban and rural parts of a health system (Edmonton, Alberta) and now VT.
Case Study: Testimonial

"The challenge is to effectively share patient information with caregivers across our facilities and in the community, providing secure access when and where required. With the help of Orion technology, we will be able to offer our 2,000 physicians and over 6,500 other authorized health care staff access to an unparalleled range of patient lab results, medication information, clinical notes and demographic information."

Donna Strating,
CIO of Capital Health, Edmonton, Alberta.