

Multiple I.T. Paths to Address Medical Errors

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A hospitalist at a prominent teaching hospital was bold enough to publicly share the details of an actual medical error incident. An infant was brought to the emergency room accompanied by his mother, and treated by a senior medical resident. The patient was given a dose of medication 10 times the generally recommended dose for a patient of that age and weight. There no serious complications, but the doctor immediately recognized they had dodged a bullet. Though he was not on duty at the time, the physician was the attending MD of record, and the resident was operating under his supervision. Noticeably shaken by the incident, he took it upon himself to objectively investigate the root cause of the incident. What he discovered was a series of errors and a breakdown in the system of manual checks and balances that is used at many hospitals today. Specific errors he uncovered are:

1. The **registration system** had the wrong birth year, computing the patient's age as 12 months too old. This made the higher medication dose look more reasonable to anyone not knowing the true age of the patient.
2. The patient's **mother** informed the medical staff that the patient was currently being treated with a drug on an outpatient basis, which she had with her. She emphatically stated the dose. It was later discovered she was wrong. The **outpatient/retail pharmacy** did not have dosing instructions affixed to the home medication. They were handed out separately and not brought with the patient to the ER
3. The **resident** did not **check safe-dosing** guidelines. He ordered the home medication, at the dose specified by the mother, to be administered on the floor.
4. **No route** of administration was specified
5. The **ordering nurse** did not check safe dosing
6. **An inpatient pharmacist** questioned the dose, but it was at shift end and no one followed-up
7. **The administering nurse** did not check safe dosing guidelines

Bottom line – at least 7 people could have intervened to avert the error, but did not!

Obviously concerned about the breakdown in the manual system, the doctor began looking for solutions to the problem.

Different Solutions and Approaches Abound

If you were faced with this situation, you would have a number of alternative paths to consider. Here are a few

The hospital described above had success following a low tech short-term solution with plans to move into a more information systems intensive solution as money becomes available within the next 2-3 years. Using common sense and the leverage that comes from working with residents in a teaching hospital, they decided a reasonable solution was to mandate (and enforce) more complete manual orders. With little cost, they designed new order sheets, and required the following data to be completely and accurately filled in for each order:

- Patient Name
- Dose per KG weight
- Route
- Interval
- Indication for ordering the drug

This simple solution has had very positive results in the first few months of implementation in a pilot unit. Incomplete orders were reduced by almost 50%. By assuring all the appropriate information was readily available for the ordering physician and any other health care professional reviewing the order (attending MD, pharmacist, and nursing) the manual checks and balances already in place were working much more effectively. While they hope to get more automated assistance, eventually leading to a Computerized Physician (or Provider) Order Entry system (CPOE), they are happy with their first steps, and learned valuable lessons they can apply to future CPOE implementation.

CPOE

With the current attention being given to patient safety, especially medication errors, many providers investigate CPOE as a high priority option. While there is no generally agreed upon definition of such systems, they can be characterized as sophisticated information systems aimed at having the direct care provider personally enter key clinical orders (pharmacy, lab, radiology etc.) directly into the computer. Ideally, the order will include clinical edits and alerts to assure the order is appropriate based on patient diagnosis, clinical information and prior orders/medications for the patient. Some providers even include financial edits, such as disclosing an option for a less expensive medication, test or procedure that has been demonstrated to be clinically equivalent. These are often part of a larger, integrated set of clinical systems, and may have many other features such as charting, clinical notes, bar coding, medication administration etc. embedded in them. Such systems have tremendous promise of reducing errors and improving the quality and cost effectiveness of care. There are many such products on the market today, but less than 5% of hospitals and physician offices have deployed them. Major constraints to growth are high cost, difficulty getting physician

acceptance, and the lack of clinical standards, though these barriers are gradually being diminished.

Order Entry/Results Reporting Clinical Information Systems

For providers still relying primarily on manual orders, an intermediate step between manual systems and CPOE is to implement an order entry/results reporting clinical system. These systems are characterized by the ability to electronically enter clinical information and orders, as well as perform a host of additional information storage, communications and analysis. Such systems have been available and productively used, especially in hospitals, since the late 1970's. According to the Dorenfest Market Share Report over 85% of US hospitals over 100 beds already have order entry/results reporting systems in place. The biggest drawback to such systems in the medication error scenario is that they are typically geared more towards use by nursing and office staff than by physicians. Even so, they can be very effective in securing accurate orders, checking for incompatibilities between drugs (as well as with diet, lab etc), and having key clinical information available when needed. When tied to decision support tools, they can also be used to determine appropriateness of care, cost effectiveness of ordered medications and tests, and outcomes analysis. While difficult to document and prove, many experts believe prudent implementation can lead to significant cost and length of stay reductions.

Electronic Medical Records

Electronic medical records (EMR); also frequently called Electronic Health Records (EHR), Computer-based Patient Records (CPR), Automated Patient Records (AMR) and more, have been the holy grail of medical informaticists since the 1970's. The concept is simple – have virtually all patient information that may be needed for caregivers available in electronic form. This has the potential to virtually eliminate many of the inherent problems of manual paper records; such as illegibility of orders/notes, lost or missing records, the ability for the chart to be in only one place at a time, and the high costs of chart storage and duplication. EMR's are typically considered a more advanced and sophisticated application of the order entry/ clinical information systems described above. In fact, it is not uncommon for vendors to have a migration path to upgrade older systems to an EMR. Further blurring the lines of distinction between the continuum of products, many believe that CPOE systems are most effective when bundled or embedded into an EMR.

Niche Solutions

The solutions described above are generally most effective when highly integrated with other clinical systems and deployed throughout the health care provider organization. Depending on the specific problem you need to address, there are a variety of niche solutions available. Here are a few

- Bar Coding is frequently used within the medication cycle to enforce the mantra of right patient (bar code the patient wrist band), right drug and right dose (bar code the drug label) and right time. As a by product of use during the medication administration, it also helps create an accurate and complete automated medication administration record. The same technology can also be very effectively deployed in many other clinical and non clinical areas of the organization
- Pharmacy only physician order entry solutions are available, many of them using portable units such as PDA's. They can be effective in dealing with certain medication errors and often have instantaneous prompts and alerts for the ordering physician.
- Document Imaging can be an effective tool to eliminate some of the inherent problems of paper records, such as storage and accessibility. Several hospitals have won the prestigious Davies award from the Computer-based Patient Records Institute (CPRI – now part of HIMSS) for achieving excellence in health care quality, cost, and accessibility through the use of an EMR, by basing their EMR on this technology. When combined with the work flow management tools that are available with many of the higher end products, they can also be very effective in simplifying the number of steps, and cost in routing information throughout the organization.
- Robotics can be very effective in handling many of the labor intensive production tasks in large, high volume pharmacies, reducing labor costs and pharmacist errors in filling and dispensing medication.
- Highly specialized products are available for use in specific clinical processes. For example, there are products specifically designed for maximum value in cardiology, to decrease potential medical errors with infusion pumps, or for use exclusively within ICU/CCU.

In many ways, health care information technology is still a cottage industry. For example, there are over 450 companies claiming to an EMR. You need to clearly define and understand the problems you are trying to address. Depending on your needs you can implement a comprehensive integrated systems solution, a more limited solution, or a highly specialized niche product. In some cases this can come from an upgrade to your current systems. Depending on your needs and your budget, a manual solution focused on modifying work flow and documentation requirements, may also solve your problem. Let's not minimize the importance of process changes. Regardless which solution you embrace, the implementation and ultimate success in going to be highly dependent on tailoring the system, revising work flow/processes and managing the change process.