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Feature

Filling Holes or Moving Cheese?

Applying patient safety principles to communication of critical laboratory values

Timely and reliable communication of critical laboratory values is a required laboratory practice.[i] Our group has been trying to improve our communication of critical laboratory values by applying patient safety principles.

There are two potential approaches to improving safety. The *person-centred approach* focuses on the individual performance and individual human error. When things go wrong, the focus is on education, training, or possibly discipline if the error was serious. The *person-centred approach* is doomed to fail, however, because errors are an inherent property of the humans doing the work and the complexity of the work itself. By contrast, the *system-centred approach* is based on three principles[ii]: 1) error is unavoidable, 2) processes can be designed to reduce the possibility of error, and 3) processes can be designed so that errors are detected and corrected before patients are harmed.

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The system-centred approach is often called the 'Swiss cheese' approach to safety. Each layer of safety, such as a person, a protocol, or a piece of equipment, is conceived as a slice of Swiss cheese. Holes in each slice of cheese represent weaknesses, such as inadequate staffing, or human error, such as incorrect sample labeling. Individual holes rarely cause patient harm, but harm may occur when a series of holes 'line up'. Fortunately, the holes rarely line up. For example, only one out of every 100 medication errors leads to harm.[iii] By analogy, there are many weaknesses and errors in the critical value notification process, but these rarely lead to actual patient harm.

There are several methods to improve safety. *Forcing functions* are safety design features that eliminate the possibility of a specific error. For example, the size and shape of a reagent bottle forces the correct placement of the bottle in an analyzer. *Simplification* is another valuable safety improvement method. The fewer steps in a process, the less likely a process is to fail. Standardization can also reduce the potential for error. The standard list of critical laboratory values that require notification enhances safety by eliminating guesswork about what requires notification. *Automation* can improve safety, often by improving the speed of a process. Automated alerting of critical laboratory values through pagers and computer alerts reduced median response time from 96 to 60 minutes in one randomized trial.[iv]

A final patient safety principle is the law of unintended consequences. Any effort to improve safety can have unintended negative effects on patient safety.[v] Using the Swiss cheese model, unintended consequences are the result of 'moving cheese'. If we move cheese from one slice to fill holes elsewhere, we have not necessarily improved safety, but rather we have created new potential for error and harm. Although automated paging of critical laboratory values can speed up the process, automated paging can also have unintended downsides. The pages may go to the wrong person on the team, disrupting usual lines of communication, or the pages may provide excessive unhelpful information that distract clinicians.[vi]

We set out to apply these safety principles to improve communication of critical laboratory values. We felt that simplification and automation could improve the speed and reliability of the communication process. We focussed our initial efforts on our inpatient service. The existing process involved telephone notification by the technologist to the patient's hospital ward. This phone call might be received by the ward clerk, or a nurse. The result would be written on a standard memo for critical lab values. The patient's nurse would then contact the physician responsible for the patient.

We wondered if the result could be routed directly to the pager of the responsible physician, thereby simplifying and speeding the process. We created a dedicated lab value pager for one medical team. We were pleased to find that the results were reliably received by the pager within minutes of the result being accepted by the laboratory technologist. We felt we were truly 'filling holes'.

We then expanded the project to involve all four of our medical teams. Each team had a dedicated pager to receive critical laboratory values. The law of unintended consequences began to take effect. First, the physicians told us that some of the pages were not helpful. For example, they did not really need to receive a page about a critical troponin I value of 0.12 ug/L, because they usually already knew that patient's troponin was elevated from a previous test. We pointed out that they would be phoned about that result anyway, based on existing hospital protocols. This is an example of automating a system that the users (physicians) did not consider valuable. To address this problem, we created a more sophisticated algorithm for choosing which critical values

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Shari Batson, MLT, District 4 Director

New Board Member

My name is Shari Batson and I am pleased to serve on the OSMT Board of Directors in the position of District 4 Director.

I have enjoyed a personally rewarding career in the 22 years since graduating from the Medical Laboratory Science program at St. Lawrence College in 1986. My first job was in chemistry with the great people at LifeLabs in Belleville (they were MDS then). From there I moved to the Grey Bruce Health Services in Owen Sound where the laboratory staff treated me like one of their family. They patiently allowed me to indulge in getting my feet wet in several clinical areas of laboratory service. Meeting the man who would become my husband sparked a move back home to Kingston where the knowledgeable and experienced technologists in the microbiology laboratory at the Hotel Dieu Hospital shared so much learning with me. Since 1997, I have been teaching bright, enthusiastic future MLTs as the microbiology Professor at my alma mater.

The constant throughout my career has been the caliber of the people I had the good fortune to work with – inquisitive, dedicated, and generous with their time and expertise.

Teaching allows me to pass these things on to the future. Representing technologists and technicians with the OSMT allows me to give back to those in the lab who are busy doing for others. I look forward to this opportunity to learn and grow and move with us all in new directions! ❖

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would go to the pager. Of course, the lab continues to phone the wards about these critical troponin values, because of the existing protocol. While filling one hole, we had uncovered another!

Second, on call physicians told us that they were now carrying up to four additional critical laboratory pagers, one for each medical team, at night. This was in addition to their usual pager, and another on call pager for emergencies. This excess of pagers caused two practical problems. The physicians found that their on call uniforms ('scrubs') were often being pulled down by the relentless weight of 6 pagers. Worse, it was unclear which pager was actually ringing, so the physician had to check each one until the message could be retrieved. In this case, we had simply moved cheese and created at least two new holes.

The problem of multiple pagers forced us to confront another 'hole in the cheese': unreliable physician scheduling. If we knew which physician was responsible for receiving a critical laboratory value at any time, then we would not need a dedicated critical lab value pager. Instead, we could send the critical value directly to the correct physicians' pagers. Therefore, although this project began as a 'critical value alerting' project, it has changed to a 'physician scheduling' project. By trying to fill one hole in the cheese, we have become aware of a much more important hole, in a different slice, that must be addressed first.

Such events must be expected whenever safety improvements are attempted. As we focus on a specific hole, we will occasionally create new holes, and we will become more aware of closely related holes that must also be filled. We have made adjustments to the paging algorithm so that physicians do not receive unimportant pages. We are improving the reliability of the physician scheduling system so that critical values can be routed directly to the correct physician's pager. Safety will be improved by disciplined application of patient safety principles.

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