Systems Thinking: Tapping into Staff Creativity to Unleash Innovation

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Six years ago, a letter to the editor was published in *The New England Journal of Medicine*1 from a physician who suggested using metal detectors to prevent the risk of injuries from metal objects during magnetic resonance imaging (MRI). Unfortunately, his suggestion was spurred by the tragic death of a six-year-old child in New York who suffered a skull fracture and intracranial hemorrhage when the magnet pulled an oxygen tank into the machine at high speed.

As the physician noted in the letter, the occurrence of injuries from undetected or misplaced metal objects that are brought into MRI examining rooms are not that uncommon. Examples include objects such as intravenous drug poles, sandbags containing metal filings, defibrillators, and wheelchairs. Yet staff training and patient questionnaires, which have been designed to detect metal implants, remain the most common methods used to prevent such incidents.

In fact, education has been health care’s bread and butter for preventing errors and injuries. And although education can prevent some errors, its success is limited, because it relies heavily upon human memory and vigilance. Education alone is not enough to change the system in a way that would eradicate human error.

More effective solutions require “systems thinking.” Systems thinking is a holistic approach that focuses on how systems work over time and within the context of a larger system; a traditional way of thinking would study systems by breaking them down into their separate elements.2 Systems thinking can be used in any area of research, and it has been applied to the study of medical systems, among many others.2

An excellent example of systems thinking is the aforementioned suggestion to use highly sensitive walk-through metal detectors to prevent the accidental introduction of a metal object into a MRI examination room. These metal detectors are available commercially for about $2,000 to $5,500, and minimal maintenance is necessary. Coupled with staff education and patient screening, the addition of these metal detectors would have a high likelihood of preventing injuries.

How did the physician come up with such a powerful idea? In retrospect, it seems obvious. Yet systems thinking is not as easy as it seems.

Our history of errors with potassium chloride (KCl) concentrate for injection in patient-care units demonstrates the need for systems thinking very well. Until systems thinking prevailed, many organizations relied upon staff education and manufacturer label warnings to prevent the administration of KCl concentrate without proper dilution. Although the number of errors was lessened over time, mistakes persisted until three changes were made: (1) the pharmaceutical industry manufactured premixed solutions, (2) physicians standardized potassium replacement therapy to maximize the use of commercially available solutions, and (3) vials of KCl were removed from patient-care units.

Unfortunately, it took years for the health care industry to implement such an effective system-based solution that now seems very simple and intuitive.

To become more proficient at systems thinking, multidisciplinary teams must openly discuss medication errors and should refuse to settle for old familiar or ineffective ways of solving problems. Education might be identified as an error-reduction strategy, but we can’t stop there. Instead of just building inspections into processes to detect errors before they reach patients, we need to find ways to actually prevent errors.

We must always ask, "Are there ways to make it impossible, not just unlikely, for people to make such a mistake?" Systems thinking is the key to bridging the gap between understanding the causes of errors and choosing a strategy that will that have the best chance of success in reducing errors. With practice and a little creativity, we can become more skillful and innovative in identifying system-wide strategies that work continuously and automatically to prevent errors and injuries.

REFERENCES