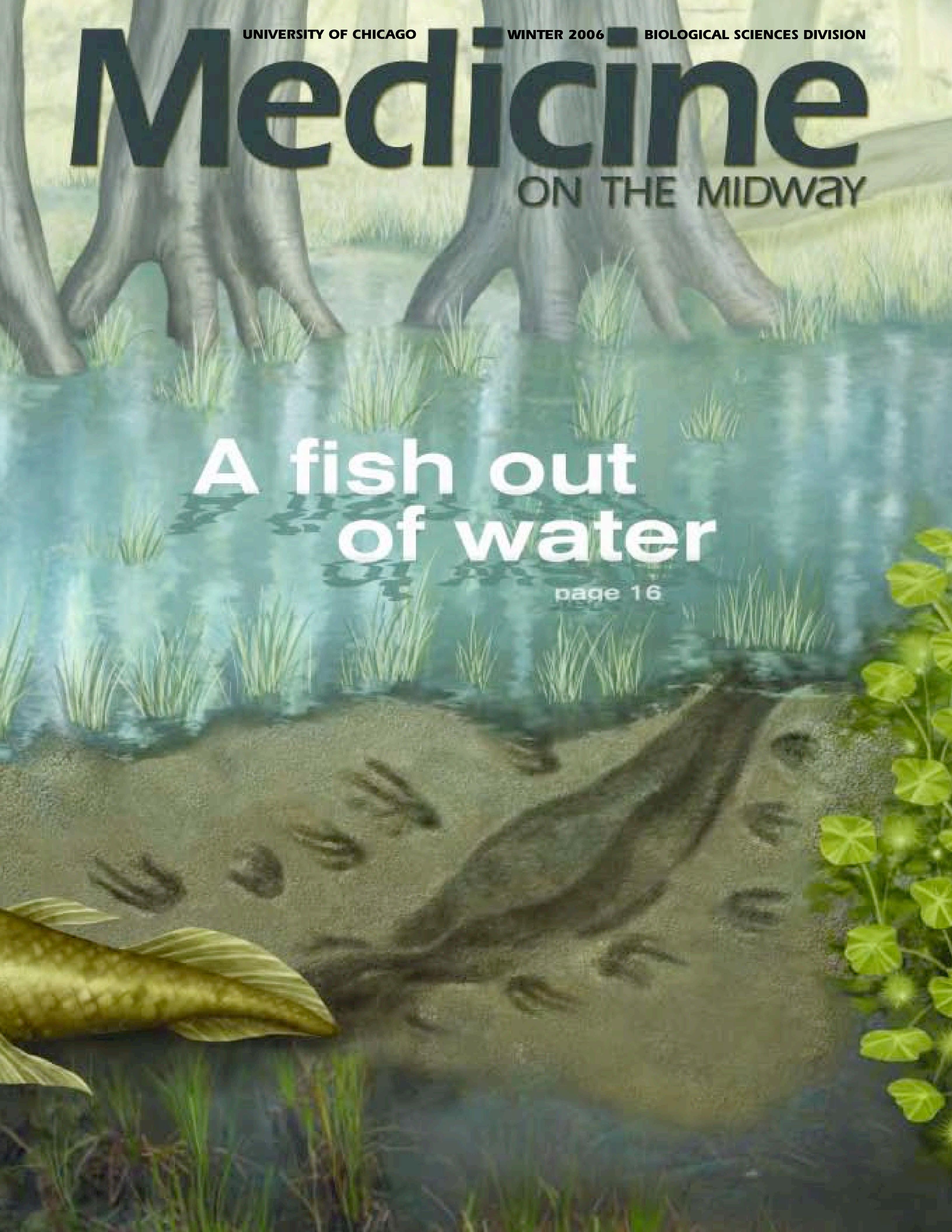
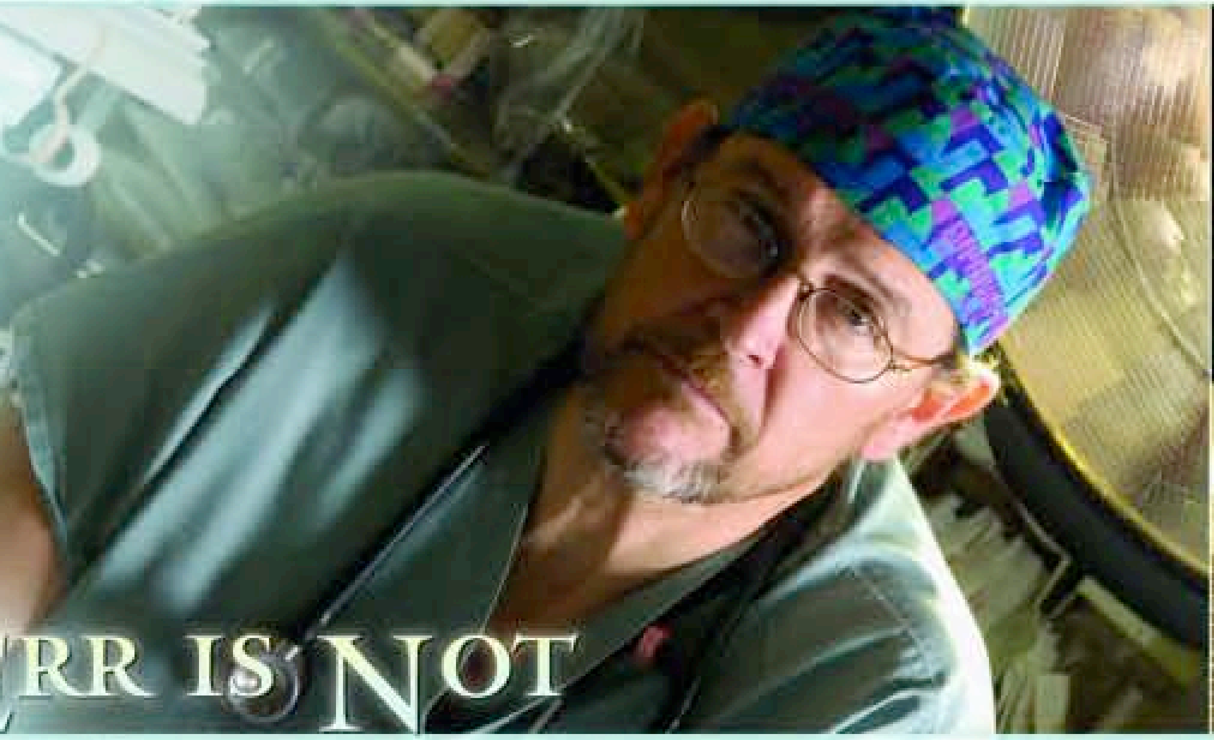
UNIVERSITY OF CHICAGO WINTER 2006 BIOLOGICAL SCIENCES DIVISION

Medicine ON THE MIDWAY



A fish out of water

page 16



To Err is Not Always Human

by Richard Cook, MD

Despite efforts to eradicate them, catastrophic medical accidents remain all too common. However, their cause—and cure—isn't as straightforward as some have suggested.

Catastrophic accidents in health care and other domains have been the focus of my attention for almost 20 years, long before a series of well-publicized medical accidents beginning in the late 1980s drew public attention to the issue. After the *Institute of Medicine Report* released its report, "To Err is Human," in 1999, there were spirited presentations claiming as many as "98,000 deaths a year" from "medical error."

By 2000, President Clinton stated a goal of reducing this "error" by 50 percent in five years. A variety of programmatic efforts touched every hospital and clinic in the country.

But by 2004 it was becoming clear that the problem of accidents in health care was resistant to the programmatic approaches that had seemed so promising a few years earlier. In retrospect, that really shouldn't be surprising.

Medicine is not alone in having a "human error" problem. Similar accidents have occurred in other high-tech workplaces, nuclear power and aviation among them. Events like the Three Mile Island meltdown in 1979 helped create a small community of researchers interested in how such accidents happen and how to prevent them.

Beginning in 1987 this community expanded to include a small number of physicians interested in medical accidents. Since then, research on patient safety has provided a good deal of insight.We now understand that accidents do not occur because of single faults but because of the accumulation of multiple faults, each individually insufficient to cause an accident but together just enough to overwhelm the defenses of the system and produce a catastrophe. Modern accidents are not Achilles' heel events where a single flaw creates a disaster; instead, they're more of a "for want of a nail the shoe was lost, for want of a shoe the horse was lost" sort of thing.

Our research group, along with many others, has explored the implications of such accidents, now called complex systems failures, for about 15 years. A startling feature of these accidents was how often they were attributed to human error. About 85 percent of accidents in aviation, nuclear power, shipping, medicine and the military were attributed subsequently to human error.

This puzzled many researchers: Why should blame so consistently fall on the operator? My psychologist colleague at Ohio State University, David Woods, and I realized in the early 1990s that assigning blame for accidents was biased by hindsight. Cognitive bias leads those involved in after-accident investigation to believe that the pattern of circumstances that existed before the catastrophe should have made the operators alert to the failure.

It is not surprising that reviewers repeatedly blame human error because their knowledge of the event's outcome makes them biased. Hindsight bias makes us believe the outcome more likely than it actually was. This is sometimes called the "I knew it all along" bias, and it is extremely powerful. Like other cognitive biases, we are unaware of its effects on our own judgment. Our knowledge of

Photos by Dan Dry

There are many more opportunities for failure than there are overt failures. The amazing thing is not that there are so many accidents in health care but that there are so few.

the outcome sways our judgments about what the people involved should have foreseen. We conclude that human error is the cause of most accidents because our own processes of understanding lead us to that conclusion. The human error, if there is any, is not in the operators of the systems but in our own understanding of how the accidents came to be.

This is not a popular view because it leads to some very controversial conclusions. For one, it largely invalidates the idea of peer review, in which experts make judgments about the performance of operators (pilots, physicians, power plant operators, military officers) following a bad outcome.

More importantly, it invalidates most of the research on "human error" itself. Most so-called "error" studies are unscientific because they rely on judgments about when an error has occurred. Jen Rasmussen, the Danish engineer and human performance researcher, observed long ago that "human error" is not a stable category of analysis because the judgments needed to assess when it is present are themselves biased.

As a consequence, studies of "error" in medicine, aviation and other fields are not studies of how accidents happen but of how judgments are made. Pursuing error as a way of increasing safety is a fool's errand.

The idea of human error is attractive in part because the alternative is, from a business perspective, so unattractive. Studies of industrial accidents in the 1980s and medical accidents in the 1990s do not lead to human fallibility so much as to the nature of systems and their tolerance for failure. Scientifically grounded study leads to the conclusion that accidents are not the abnormal operation of broken systems but the normal operations of systems under economic, social and political pressure to produce more with less.

Indeed, the research findings are disturbing in another way. When we look closely we discover that these systems are performing far more successfully than we expect: That is to say, the rate of accidents is not very high but actually quite low.

Our studies in industrial settings, transportation and health care lead us to conclude that the reason there are so few accidents is because the operators prevent them from happening. Operators—meaning power plant workers, nurses, pilots and others—are constantly working to detect and forestall accidents. Paradoxically, they do this so well that we can mistakenly attribute the smooth running of these systems to its inherent qualities rather than to active intervention by its operators.

From this perspective, accidents are not human operators erring in ways that cause failure. Instead they are instances where the conflicts and contradictions present in the system overwhelm the operators' abilities to snatch victory from the jaws of defeat. The research turns the usual story about accidents and their causes on its head: Instead of being the Achilles' heel of systems they are the source of its robustness.

So where should we look for progress on patient safety?

One research-based answer is that we should look to enhance the factors that give the systems of care their robust performance. We have recently been calling this "capacity resilience." With my colleagues Christopher Nemeth and David Woods, I have provided several examples of resilience in a chapter of a new book, *Resilience Engineering* (Ashgate Press, 2006).

There are many forms of resilience, but I had the chance to observe one up close while visiting a colleague in Jerusalem and seeing his hospital deal with many casualties shortly after a suicide bombing of a commuter bus. The hospital workers' performance was remarkable in many ways. They handled a large number of critically injured people quickly, efficiently, effectively and humanely. Beyond this, they continued normal work in the hospital, even resuming the regular surgical operations soon after the event. The bomb was detonated shortly after 7 a.m.; by noon the hospital had dealt with the casualties and resumed normal operations.

I tried to capture what made these people so very successful at dealing with a catastrophe of this magnitude.

Our research on accidents has come full circle. We started out trying to discover why systems sometimes fail, thinking that practitioner "error" was somehow the cause. Now, instead of viewing them as threats to safety, we recognize practitioners as part of the resilience that makes it possible for so many people to benefit from the complex, hurried and often conflicted conditions that surround health care.

Instead of being critical of operators when they fail to rescue the system from failure, we are trying to understand how it is that they so often succeed.

Richard Cook is an associate professor of anesthesia and critical care and the director of the Cognitive Technologies Lab at the University of Chicago. For more research on patient safety, human factors and cognitive technology, go to www.ctlab.org.