Eliminating Medical Errors

A KMCI Research Center Paper By

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The Problem

Karl Popper is recognized around the world as one of the 20th century's greatest philosophers of science. Popper taught that the method of science is conjecture and refutation—or trial and error—and that the goal of scientific inquiry is to kill our errors before they kill us!

This may strike some as an overly dramatic expression of his 'falsificationist' philosophy of science—or as an overly politicized account by a man who associated the totalitarian regimes that dominated Europe for most of the 20th century with the claims of 'scientific' socialism. But in November 1999, the Institute of Medicine (IOM) released a report (Kohn, Corrigan, and Donaldson, 1999) estimating that between 44,000 and 98,000 patients die each year in American hospitals as a result of medical errors. And this suggests that we should begin to take ideas such as Popper's about a philosophy of science focused on solving problems and eliminating errors more seriously.

More people in America die each year from medical errors than from motor vehicle accidents (43,458), breast cancer (42,297), or AIDS (16,516). This means that medical error is now at least the eighth, and very possibly the fifth, leading cause of death in the United States. *Deaths* from adverse drug events alone, total more than 7,000 annually, and exceed the number of yearly workplace *injuries* (6,000). The Medical Error Reduction Act of 2000 (Introduced in the Senate on 8 February 2000 by Senators Specter, Harkin, and Inouye) says that 'One national study estimates that more than 100,000,000 Americans have experience with medical errors, and 1 out 3 cases caused permanent harm, with half of the errors occurring in hospitals.'

The problem is also financially draining. The IOM report estimates that medical errors cost the Nation approximately $37.6 billion each year—and that $17 billion of those costs are due to *preventable* errors. How to reduce medical error is thus one of our society's greatest problems. And the final report of President Clinton's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, released in 1998, specified the reduction of medical errors as one of the four major challenges facing the nation in improving health care quality, and as one of six National Aims for Improvement. It is a social problem and a scientific problem. The IOM report emphasized that it is a 'systems' problem. But it is also

a knowledge management problem, and a problem that has very deep roots in epistemology and the philosophy of science.

IOM Recommendations

The IOM report acknowledges that the problem of medical error is complex and that it has cultural and ethical roots. It emphasizes that:

1. 'No single action represents a complete answer, nor can any single group or sector offer a complete fix to the problem'
2. 'The key to reducing medical errors is to focus on improving the systems of delivering care and not to blame individuals'; and that
3. A 'critical component of a comprehensive strategy to improve patient safety is to create an environment that encourages organizations to identify errors, evaluate causes and take appropriate actions to improve performance in the future'.

And it specifically recommends that:

4. Professional societies establish a permanent committee dedicated to safety improvements, and that this committee 'develop a curriculum on patient safety and encourage its adoption into training and certification requirements'.

We agree with this assessment and with these recommendations. But we also believe that the problem has *epistemological* aspects, and that these relate importantly to the IOM recommendations. In particular, items 2 and 3 above imply individual access to and application of a *theory of knowledge* that can help us decide what kind of improved delivery systems and environments supporting error elimination we need to reduce medical errors. We believe Popper's epistemological theory can provide the foundation for accomplishing 2 and 3. We also believe that his philosophy of science should be an essential part of the curriculum recommended by IOM in 4.

Proposal

The IOM report states that our 'focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system.' We agree, of course, that this is true. But we do not think that 'designing safety into the system' is likely to work unless we simultaneously work to change our societal attitudes and behavior regarding errors themselves. Popper, insofar as this is concerned, thought that even the best designed systems can be misused if the people who work in them have values, attitudes, and goals that are in conflict with the system. We no doubt want and need to improve our systems for detecting and eliminating errors. But the problem of improving them is a problem for *persons,* not systems. Or rather, it is a problem of the re-organization of

systems composed of persons primarily, and only a problem of reconstructing information systems insofar as they support and enhance such a re-organization.

This is what we mean when we say that the problem of medical errors is an epistemological problem. If we are to solve it, then we will need to effect a sea-change in our basic values, beliefs, attitudes, and behavior, regarding scientific knowledge and error. In particular, *if we want to create an environment that encourages people to identify and learn from their mistakes, then we need to stop teaching our aspiring medical professionals that scientific knowledge is justified true belief, and we need to both promote and practice a philosophy of science that identifies it with learning from error instead.*

Karl Popper has articulated just such a philosophy in very simple terms. It now provides the intellectual foundation for the Supreme Court's 1993 Daubert decision (Supreme Court of the United States, 1993) on the admissibility of expert testimony in federal courts. But it is still widely ignored in American universities. We believe that this is part of the problem, and that a greater appreciation of Popper's philosophy is an important part of the solution to the problem of eliminating medical and other errors.

In applying Popper's theory, we need **to discourage the idea that scientific knowledge is necessarily true, or justified true belief** — for that idea inevitably goes hand in hand with a reluctance to admit that it can be mistaken, and with behavior that declines to search for and eliminate errors. And we need to encourage values, beliefs, and attitudes that are compatible with the idea that it is better to discover and eliminate our errors than it is to hide or cover them up.

We propose a program to implement the four IOM recommendations quoted above. The program will have components aimed at creating (a) an educational program containing workshops specially designed to ground attendees in Popper's error elimination model and (b) a new environment for problem-solving supporting that model.

The Educational Component

One of us, Mark A. Notturno, was a friend and associate of Popper's and has spent many years working on his philosophy. Notturno has, for example, edited two books from Popper's archives (Popper, 1994a, 1994b) and has also written three books of his own (Notturno, 1985, 2000, 2002) about Popper's philosophy. From 1994 through 1999, he was director of the 'Popper Project' at the Central European University in Budapest. His work during this time was supported by the Soros and Ianus Foundations. It took him to more than fifteen different countries in Central and Eastern Europe and Middle Asia, where, with the collaboration of his wife, Dr. Kira L. Viktorova, he organized and directed over forty international workshops, seminars, lectures, and summer schools in Budapest and in the countries of the former Soviet Union and socialist bloc.

These programs, and their round-table discussion format, were largely Dr. Notturno's own creation. Their intellectual content revolved around problems pertaining to critical thinking and open society. Their participants included more than one thousand faculty and researchers from these countries' most prestigious universities and research institutes, as well as representatives from their ministries of education. And they received significant media coverage in some of the countries in which they were offered. These workshops have played an important role in introducing Popper's ideas into countries in which his writings were once forbidden. And we believe that a program of 'Popper Workshops', designed as in-house courses for practicing medical professionals, could play an important role in the effort to reduce medical errors.

We propose to develop a program of workshops—modeled on the workshops that Drs. Viktorova and Notturno organized in Europe and Asia, but designed for practicing medical professionals—with the aim of initiating changing our societal values, beliefs, and attitudes about error from a justificationist perspective to a Popperian error elimination model.

The Problem-Solving Environmental Component

In addition to implementing a workshop program to introduce Popper's theory of knowledge production through error elimination, we propose to introduce an enterprise-wide learning and innovation environment that features:

? Enhanced transparency and openness policies and programs in business and knowledge processing, a la the Open Enterprise (McElroy, 2003; Firestone and McElroy, 2003a; Firestone and McElroy, 2003b)
? Communities of Inquiry (COIs) in which health care professionals can freely subject prevailing ideas to testing and evaluation, and also innovate together
? Medical Knowledge Portals (MKPs), a type of Enterprise Knowledge Portal, into hospitals and health care facilities.

Communities of Inquiry,, greater degrees of transparency and openness, and Medical Knowledge Portals can provide an opportunity to apply the educational outcomes of the error elimination workshops. Once educational outcomes are applied, they will be more likely to be reinforced by behavior in the CoIs, and behavior in turn will change attitudes toward inquiry and error elimination, as well as further behavior.

The impact of MKPs will also not be restricted to CoIs. In addition, MKPs support problem-solving in multiple individual and organizational contexts and can reinforce the attitudes toward problem-solving introduced in the workshops in all of them. Therefore, MKPs represent generalized IT support for knowledge production through error elimination.

The dimensions of policy and programs that we propose to introduce will augment, if not replace, policies already in place that govern individual learning and training programs, organizational learning, credit and entitlement schemes for innovation, and the quality and make up of communications within medical institutions and between them and their stakeholder constituents. It is imperative that this overall policy/program environment be addressed as a precursor to implementing CoIs or an MKP, so that the social, technology and management systems in use are mutually reinforcing.

Background

Error Elimination

Sir Karl Popper (1902-94) was the author of *Logik der Forschung* (1934, English translation: *The Logic of Scientific Discovery*, 1959), which is the single most important 20th century work in the philosophy of science, and numerous other books and articles on epistemology, the philosophy of science, and Democratic Theory. Popper (1934, 1959, 1962, 1972, 1994a, 1994b; Popper and Eccles, 1977) characterized scientific inquiry, and learning in general, as a *creative and critical* process, in which we propose a speculative solution to a problem, and then try to test the solution against experience in an effort to eliminate errors.

Popper outlined this process in his so-called 'tetradic schema' P_1 ? TT? EE ? P_2. Here, 'P_1' is a problem from which we start; 'TT' is a theory that we tentatively propose to solve it; 'EE' is error elimination, or criticism; and 'P_2' is a new problem that emerges as a result of our criticism. The schema is, of course, an over-simplification, since we typically work with several different problems and several different theories at once. But Popper introduced it to emphasize that the search for errors is, or should be, an integral part of the learning process. The scientific method, for Popper, and the method of effective human learning in general, is the method of systematically searching for errors in an effort to eliminate them.

The Open Enterprise Construct

Based in part on Popper's work, the KMCI Research Center, in combination with private contributions from KMCI affiliates, has produced a normative model for high-performance learning and sustainable innovation known as 'The Open Enterprise' (McElroy, 2003; Firestone and McElroy, 2003a, 2003b). As an enterprise model, the Open Enterprise (OE) framework specifies an operating environment for knowledge production and integration optimized for error reduction and enhanced sustainable innovation.

Key to the idea of the Open Enterprise is the establishment of an operating environment for learning and innovation, via related policies and programs, that

encourages and supports greater levels of transparency, openness, and inclusivity in both organizational learning and associated outcomes. This, in large part, is based upon an underlying *epistemological ethic* that rejects the idea of justified true belief, or truth with certainty, and instead treats all knowledge as fallible and open to criticism and refutation. Thus, by creating operating conditions in which all knowledge is subject to open and objective criticism, the chances of catching and "killing our worst ideas before they kill us" are greatly enhanced.

Enterprise Portals, Communities of Practice, and Communities of Inquiry

Enterprise portal technology provides a new opportunity to craft problem-solving environments focused on systematic error elimination. These Open Enterprise environments and their Communities of Inquiry components are supported by an Information Technology environment called an Enterprise Knowledge Portal. A Community of Inquiry is a type of Community of Practice (CoP). A CoP is a group of individuals who freely associate with one another in order to communicate about knowledge claims each of them have, and about their experiences in attempting to solve work-related problems in areas in which they share an interest.

A Community of Inquiry (CoI) is a Community of Practice in which *knowledge claim evaluation* is based on critical analysis of knowledge claims alone, rather than on validation through social consensus. CoIs, by offering concrete assistance to members in job-related problem-solving, can have an impact on attitudes and behavior beyond that of educational programs alone. Open Enterprises are Communities of Inquiry writ large in which many smaller Communities of Inquiry can also be found.

Validation through social consensus substitutes the process of getting agreement on knowledge claims for the process of critical analysis (testing and evaluation) of these claims. The process of "validation" by getting agreement is a political process, not a process aimed at eliminating error.

Enterprise Knowledge Portals (Firestone, 1999, 2000a, 2000b, 2000c, 2001, 2003);

- ✍ are goal directed toward knowledge production, knowledge integration, and knowledge management, and also
- ✍ focus upon, provide, produce and manage information about the validity of the information they supply,
- ✍ provide information about problems and issues and meta-information about the degree to which one can rely on that information,
- ✍ distinguish knowledge (validated knowledge claims) from mere information,

    ✍ provide a facility for producing knowledge from information through critical analysis of knowledge claims, and

    ✍ orient one towards producing and integrating knowledge rather than information.

Enterprise Knowledge Portals support Open Enterprises and their Communities of Inquiry in a variety of ways, but their most important functions are to provide a:

(a) collaborative environment in which information acquisition, individual and group learning, knowledge claim formulation and the critical analysis of knowledge claims can occur; and

(b) continuous and readily accessible record of the history of critical analysis of knowledge claims in an organization.

Conclusion

The problem of medical errors, one of the most serious national problems in terms of social costs, can be addressed using a combined educational/Policy/Program/CoI/MKP approach to attitudinal and behavioral change focused on error elimination. The educational component proposed is a workshop program designed to train medical personnel in Popper's problem-solving approach focused on error elimination. The environmental component proposes the shift towards Open Enterprises and Communities of Inquiry, along with 'open' and 'inclusive' learning and innovation policies, supporting programs, and an IT infrastructure for supporting them called a Medical Knowledge Portal (MKP). An MKP is a type of Enterprise Knowledge Portal (EKP) that provides a virtual space for knowledge production through critical analysis and error elimination.

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