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Correspondence

The role of theory and political–organizational factors in risk management: a reply to Hrudey and Hrudey

We are pleased to have an opportunity to respond to Hrudey and Hrudey's commentary (Hrudey and Hrudey, this issue) on our article about risk management in complex sociotechnical systems [1]. Their perspective derives from the discipline of public health and adopts a practical perspective. Our research, however, derives from the discipline of cognitive engineering and adopts an explicit theory-based approach to advance the state of understanding in system safety. These different disciplines and aims are complementary, which may be the source of some of the criticisms outlined by Hrudey and Hrudey. By clarifying the relationship between their perspective and our own, it may be possible to enhance our understanding of how to design systems that better protect public health in diverse technological sectors.

1. Accuracy

We sent a draft of our manuscript to The Honourable Mr Justice Robert D. Laing—the Judge who conducted a 251-day investigation of the North Battleford outbreak. He heard the oral testimony of 32 witnesses and received 120 exhibits and documents over the 33 days of hearings, and authored the 372-page report of the commission of inquiry. Justice Laing pointed out one factual inaccuracy in our original manuscript which we corrected. Of course, we take responsibility for any remaining errors.

We appreciate Hrudey and Hrudey's efforts to improve the accuracy of our work further. Although some of the points they make are well-taken, none of them affect the overall conclusions we drew. For example, we referred to Mr Katzell's 'actions regarding the removal of the SCU' [1, p. 262], but it would have been more accurate to refer to his 'actions regarding the removal of part of the SCU' since only part of the SCU (i.e. the varidrive) was removed under his tenure [2, p. 86–87]. Other points they make seem to be based on a lack of clarity on our part. For example, we wrote that Hrudey et al. [3] analysis 'failed to reveal any common patterns at all across the 15 outbreaks' [1, p. 268]. The intended meaning of this statement was that there was no single factor that contributed to all 15 outbreaks, whereas Hrudey and Hrudey seem to have interpreted our statement to mean that there was no single factor that contributed to more than one outbreak.

Finally, some of the comments made by Hrudey and Hrudey seem to based on a misreading of our article or the research it cited. For example, they suggest that the primary findings we noted—that the high-level governmental and regulatory factors tended to be the same across cases—is based only on 'two Canadian outbreaks occurring 11 months apart' is misleading. In our article, we had already stated:

> Hopkins (2000) analyzed one accident from the mining industry and another from the petrochemical industry using a comparable framework and found that a similar set of government and regulatory factors played a key role in both of those cases too, leading him to conclude that 'the technical causes vary from one accident to another but the organisational failures which accident analyses reveal seem remarkably similar' [1, p. 268].

Similar findings have been documented in Rasmussen's [4] analyses of several accidents in complex sociotechnical systems. Although we did not say so in our original article, Reason [5] has come to the same conclusion using a different but comparable theoretical framework: 'The more one moves towards the upper reaches of such systems, the more similar their organizational processes—and weaknesses—become' (p. xvii). Therefore, the primary pattern we identified in our article using Rasmussen's [4] framework for risk management generalizes beyond drinking water systems, Canada, and the time frame of the North Battleford and Walkerton cases we analyzed.

2. The role of theory

Hrudey and Hrudey describe our research approach as 'a strictly theoretical vantage point on risk management' and their own approach as being based on 'authentic experience for addressing real problems'. Given our metatheoretical view of scientific research [6], we believe that this contrast is a false and unproductive dichotomy because theory, data, and pragmatic intervention need not—and should not—be in conflict. For example, the theoretical approach we adopted in our article is based on authentic experience, namely several accidents in diverse sociotechnical systems, and it has practical implications for improving system

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safety, both of which have been discussed at length elsewhere [4,7,16].

These differences about the role of theory appear to be strong. Whereas Hrudey and Hrudey draw inspiration from the public relations comments of a former security director of an airline to a daily newspaper, we instead draw primarily on a 40 year-old tradition of problem-driven scientific research that interweaves theory-building with field experience [4,5,8–11].

Not only are these differences strong, but they also have important implications. Without an explicit theory, generalizability is very difficult to come by. Hrudey and Hrudey do not address this issue, but we believe generalizability is one of the strengths of our research approach. The framework we adopted can be applied to many different technological sectors, not just public drinking water, whereas the five constructs used by Hrudey et al. [12] in their review of 15 waterborne outbreaks—source, treatment, distribution, monitoring, and response—do not appear to have this level of generalizability.

3. The role of political–organizational factors

Theory is also important because it provides a frame of reference for observation, and therefore, insight; what is obvious from one perspective may be less important, or sometimes even invisible, from another. The greater emphasis we place on political–organizational factors in improving system safety may be an example of this phenomenon. Like Hrudey and Hrudey, we believe that personal responsibility is important, but in our view, many accidents occur because of failures in system design, not just complacency. The Walkerton E. coli outbreak provides a good example [13,17]. There was certainly evidence of personal misconduct, but in the years leading up to the accident, the Ontario Ministry of the Environment's budget was cut in half despite warnings of potential harm to the public. In 1996–1998 alone, the budget was cut by over $200 million CAD, with an ensuing staff reduction of over 30% (more than 750 employees). Furthermore, the provincial government had a 'distaste for regulation' [13, p. 368] which kept it from passing a law that may have reduced the public health impact of the outbreak. These organizational and political factors played a very important role in the outbreak, are key dimensions of Rasmussen's [4] framework, and are consistent with the recommendations made in part two of the Walkerton Inquiry report which devoted several chapters to the role of government and organizational factors [15]. In contrast, the words 'organizational' or 'political' do not appear in Hrudey and Hrudey's commentary, nor in the five-way classification scheme used by Hrudey et al. [12] to analyze 15 waterborne outbreaks. The fact that Hrudey et al. [12] adopted a frame of reference that did not explicitly identify political–organizational factors may explain why they identified 'poor attitude or complacency' rather than inadequate political and organizational design as the over-riding contributing factor across outbreaks.

The theoretical framework we adopted views political and organizational decisions as part of the design of a sociotechnical system [4]. This is not to say that personal accountability is not important, but merely that systems can and should be designed at all levels to promote safety. As Reason [5] put it: 'You cannot change the human condition, but you can change the conditions under which people work' (p. 223). And as Berwick [14, p. 247]) pointed out in the context of medical errors that threaten patient safety:

> Just 'trying harder' makes no one superhuman. Exhortation does not help much, nor will suspending doctors, nor will outrage in the headlines, nor even will guilt. Suspend every doctor today who makes an error today, and the error rates… tomorrow will be exactly the same as today's. There is no remedy to be found in selecting heroes, nor in seeking Superman. Tomorrow, like today, we will be human. The remedy is in changing systems of work. The remedy is in design.

In summary, we need to urge individuals to be personally accountable, but we also need to design more robust sociotechnical systems. This will involve entering into the foray of political and organizational factors explicitly identified by Rasmussen's [4] framework and systematically analyzed in our article. This challenge has many dimensions and cannot be met by any one discipline. Public health scientists, cognitive engineers, lawyers, politicians, civil servants, CEOs, managers, the public, and many others need to work together to create 'vertically aligned' sociotechnical systems that can improve safety, thereby reducing the chances that deadly or harmful accidents such as Walkerton and North Battleford will happen again.

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