

## Guest Editorial

### Surveys and Safety in Perfusion Practice

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*“We know that single causes are rare, but we don’t know how small events can become chained together so they result in a disastrous outcome. In the absence of this understanding, people must wait until some crisis actually occurs before they can diagnose a problem, rather than be in a position to detect a potential problem before it emerges. To anticipate and forestall disasters is to understand the regularities in the way small events can combine to have disproportionately large effects.”—Karl Weick (1)*

The first airplane fatality in history occurred in 1908 when Flight Lieutenant Thomas E. Selfridge was killed in a plane piloted by Orville Wright. The accident was caused by propeller separation. Orville Wright suffered broken ribs, pelvis, and a leg. The aviation industry has subsequently become a model of innovation for safety systems both in terms of resource management and incident reporting. The medical fraternity has sought to embrace a similar safety culture, with anesthesiology arguably at the forefront. The Australasian Perfusion Incident Survey revealed rates of accidents resulting in serious injury or death that far exceed those in anesthesia (2). The first perfusion related incident/accident occurred on Dr Gibbon’s very first operation in 1953, when according to Dr Bernard J Miller, “near the termination of the operation, the machine suddenly shut down—reason being, clotting of the blood on the oxygenator took place, and the automatic arterial control sensed the sudden fall in the pool at the bottom and shut the entire machine down.” (3). Two factors were identified: a shortage of heparin caused by inadequate supply and a need to prime the pump many hours before the procedure.

In 2003, Jeff Riley wrote an editorial in *JECT* entitled “Are Perfusion Technology and Perfusionists Ready for Quality Reporting Employing Six-Sigma Performance Measurement?,” in which he highlighted issues relating to quality and safety in perfusion and the need for the journal to “facilitate perfusion technology quality improvement” by encouraging the reporting of quality improvement pro-



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cesses and initiatives (4). Riley also stated that “Perfusionists frequently call for a national database to collect and report perfusion-related events, equipment failure and accidents” describing the optimal method to achieve this as a “mandatory, prospective reporting protocol where clinicians feel free to report incidents in a non-retaliatory environment . . .”

In this issue of *JECT*, two original papers and a commentary return our focus to the important issues of monitoring and safety and how we as a professional group deal with them. Charriere et al. (5) and the accompanying commentary from Kurusz (6) provide us with the results of the most recent perfusion survey of monitoring and safety. This study highlights both the value and limitations of repetitive retrospective collection of incident and safety data in the absence of a comprehensive international perfusion reporting system. The authors have expanded on the previous surveys conducted in France and also included questions designed to evaluate the adoption of the 2004 French Working Recommendations for monitoring and incident reporting. In this survey, a number of centers prospectively collected data in perfusion registries; however, they reported no differences in incident rates compared with centers retrospectively reporting their events. Whether the immediacy offered by prospective reporting systems, as are found in the aviation and maritime industries, would change this result can only be hypothesized. Charriere et al. (5) focused on safety and monitoring and the potential relationships between the two. Kurusz (6) highlighted some apparent anomalies shown by their data, such as the reduction in perfusion-related events, reported previously by the authors, in the face of the relatively low rate of adoption of some of the safety devices and protocols currently reported to be in use in the other countries (7,8).

In contrast is the intriguing paper by Power and Miller (9), which introduces a novel concept for perfusion, a

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work domain analysis as a tool to understand the actions of perfusionists. They used this technique to study the actions of a group of perfusionists in a simulation model of perfusion. Perfusion simulation, as in other areas of medicine, has become an increasingly important component of perfusion training. One of the major limitations for the widespread adoption of simulation into medicine has been an inability to satisfactorily address issues relating to the assessment of the effectiveness of simulation training (10). A tool such as described by Power and Miller (9) may allow us to begin to quantify this training and has exciting potential.

The need to continually improve the practice of perfusion is an inherent part of increasing the safety of our specialty, and the current focus on quality improvement, assessment of practice, and the accurate recording and reporting of safety-related issues is extremely important. In 1998, Owen Jenkins established a perfusion incident reporting system (PIRS) for the Australia and New Zealand College of Perfusion (ANZCP, formerly the Australasian Society of Cardiovascular Perfusion [ASCVP]) after the publication of his Australasian perfusion incident survey (7). To enable feedback to the perfusion community, PIRS published anonymous reports of perfusion-related incidents in the ASCVP Gazette, with editorial comment on these incidents. This pioneered the way for the current online PIRS system (version 3, developed by TW) currently servicing Australia and New Zealand, which went live in 2004 and was revised in 2006.

Creating a reliable incident reporting culture in perfusion requires an understanding of the nature of incidents and accidents, the concepts of error within complex systems, normal accident theory, and human performance, and the application of high reliability theory in the context of perfusion safety. Accidents and near misses are variously contributed to by active failures and latent conditions within systems. Systems vary in both complexity and coupling, and the cardiac operating room represents extremes of these. Levels of human performance are influenced by rule-based, skill-based, and knowledge-based psychological and situational control modes, providing an understanding of the mechanisms of human error. The online PIRS platform, modeled on the Australian Incident Monitoring Study (11) and the Aviation Safety Reporting Scheme, provides the opportunity to report perfusion incidents anonymously, in a structured manner that will permit prospective analysis of perfusion-related events.

In brief, PIRS initially asks the reporter to define whether the incident was a near miss or an accident and asks for a detailed textual account of the event, any contributing factors, actions taken, and any preventative action plan that may have arisen from the event. However, PIRS explores in detail a number of additional areas including potential human factors, environmental factors,

monitoring, and procedural factors in a structured manner. Additionally, as in the current report of Charriere et al. (5), the impact on the patient is reported in a tiered manner (none to serious injury). A recent new feature is the "PIRS Alerts," which provide the facility through the ANZCP website for immediate feedback of very serious incident clusters and links to external reporting agencies. The aim, however, is to capture all events, particularly near miss events, to identify potential failure types such as training, communication, and design, and thereby, provide proactive and reactive safety in perfusion.

The Institute of Medicine "Quality of Healthcare in America" Committee's report "To Err Is Human: Building a Safer Health System" (12) has a number of key recommendations strongly promoting the development and funding of error reporting systems. Recommendation 8.1 states in part: "Health care organizations and the professionals affiliated with them should make continually improved patient safety a declared and serious aim by establishing patient safety programs with defined executive responsibility. Patient safety programs should provide strong clear and visible attention to safety and implement non-punitive systems for reporting and analyzing errors within their organizations . . ."

. . . Health care organizations must develop a culture of safety such that an organization's care processes and workforce are focused on improving the reliability and safety of care for patients. Safety should be an explicit organizational goal . . ."

The perfusion community needs to ensure that, as a professional group, we are proactive in adopting and developing the principles of quality improvement and safety, such that we may lead in this important area rather than be driven. Reporting of incidents through PIRS online has only been available to ANZCP members, but planning is underway to open PIRS to the international perfusion community.

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