



Contents lists available at ScienceDirect

# Australian Critical Care

journal homepage: [www.elsevier.com/locate/aucc](http://www.elsevier.com/locate/aucc)



## Editorial

### Living with uncertainty in clinical research

Three decades ago, the *CNSA Journal*, which today is *Australian Critical Care*, began as a periodical to inform specialist nurses, particularly those working in critical care areas, about clinical practice. Over the years, submissions to the journal have changed considerably. Initially, many of the articles published were opinion pieces, reflections on personal experiences and professional communications. However, in the past decade, there has been an increased shift towards publication of original research or reviews of original research. And, the quantity of original research published has increased, so too has the complexity of the science and expectations of quality. Herein lies a challenge for authors, editors, and peer reviewers. – Where is it appropriate and acceptable to draw the line when making decisions about what to publish?

The increasing amount of original research submitted to the *Australian Critical Care* aligns with the move of healthcare organisations and clinicians towards adopting a stronger evidence base for their clinical practice. The issues that arise in clinical practice are varied, and healthcare researchers use different approaches as a way of addressing these questions. To a large extent, we anticipate that undertaking this research will result in some resolution of the uncertainty, which has led to the research question. Yet, the notion of establishing certainty is more explicitly tied to particular scientific approaches such as the scientific method and where quantitative data and the use of statistics are used to convince us of the veracity of study results.

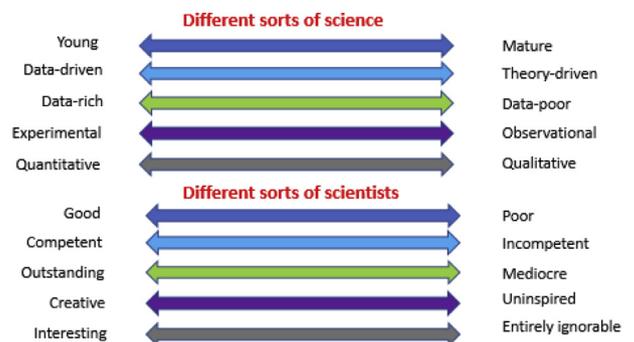
But to quote former British Prime Minister Benjamin Disraeli, “There are three kinds of lies: lies, damned lies and statistics.” In a recent special issue of *The American Statistician*, we are reminded of the perils of *p*-values and significance testing. While the arguments in this issue are not new, it seems that, as clinical researchers, we are perhaps stuck in the rut and persist with the use of *p*-values. In the Editorial of this special issue, Wasserstein et al.<sup>1</sup> commented, “It is as though statisticians were asking users of statistics to tear out the beams and struts holding up the edifice of modern scientific research without offering solid construction materials to replace them. Pointing out old, rotting timbers was a good start, but now we need more.” We are reminded that we should not 1) base our conclusions on whether an association or effect is statistically significant; 2) believe an association or effect exists just because it was statistically significant – or conversely believe that it is absent because statistical significance was not demonstrated; 3) believe that the *p*-value gives the probability that the hypothesis is true; and 4) conclude that either scientific or practical importance is present (or not) based on statistical significance.<sup>1</sup> Thus, even in statistics, there is uncertainty.

Therefore, what do we do? First, we need to accept uncertainty and remember that statistics do not negate uncertainty. Recognising that uncertainty exists will help us to identify better measures;

improved, smarter, and more sensitive research designs<sup>2</sup>; and larger samples – strategies which all help improve the rigour of research. But, we also need to recognise and accept that there are many different sorts of science and different sorts of scientists (Fig. 1), each of which can influence how sure we are of our research findings.<sup>3</sup>

In health care, researchers approach their work through different world views (paradigms), their general perspective on the complexities of the world. A range of different paradigms exist and are often characterised by how we view reality (the ontologic perspective) or the relationship between the researcher and those being studied (the epistemologic perspective). Two common paradigms seen in health research are the positivist and constructivist paradigms. The positivist contends that reality exists and is driven by natural cause and ensuing effects. The researcher is independent and not influenced by the findings – objectivity is sought. And thus, the methodological approach is necessarily controlled and generalisations are sought. Conversely, the constructivist asserts that reality is multiple and subjective – and constructed by individuals. The inquirer seeks to interact with those being researched, and findings are created interactively. In this case, we are looking for subjectivity and diversity to help us develop a deep understanding of a phenomenon.<sup>3</sup>

Whether a researcher uses a positivist approach (for example, a randomised controlled trial) or a constructivist approach (as might be used in qualitative research) does not introduce or limit uncertainty by virtue of the study design, data collected, or analytic approach used.<sup>4</sup> Statistics do not make the science better, and qualitative findings do not make the science worse. As a researcher and journal editor, I am comfortable with a range of research methodologies, but am regularly challenged by others’ perceptions of what is considered ‘worthwhile’ research. I am challenged by quantitative research being labelled ‘hard science’ and qualitative being labelled



**Figure 1.** Characteristics of scientific activity and scientists (adapted from the study by Bauer HH. Scientific literacy and the myth of the scientific method. University of Illinois Press: Chicago; 1992).

'soft. It suggests to me that one approach is valued over the other. Then, there are mixed-methods or multimethods research designs, which are one of the fastest-growing research designs today.<sup>5</sup> Mixed-methods research combines qualitative and quantitative methods, which can be difficult to achieve unless a pragmatic ontological approach is adopted. And, often mixed-methods research is performed poorly – adding yet more uncertainty.

As editors, it is our job to sift through the science – to identify the science that has addressed the issue of uncertainty and provided a rigorous, thoughtful, open, and modest account of their work. It is our job to balance the sometimes-opposing views of our reviewers – some who expect a high level of certainty in research work and are suspicious otherwise. While we work towards producing research of high rigour, we must accept that uncertainty will inevitably exist and with that comes opportunity.

“When nothing is sure, everything is possible.”

Margaret Drabble

## References

- [1] Wasserstein RL, Schirm AL, Lazar NA. Moving to a world beyond “ $p < 0.05$ ”. *Am Statistician* 2019;73(Sup 1):1–19. <https://doi.org/10.1080/00031305.2019.1583913>.
- [2] Bhatt DL, Mehta C. Adaptive designs for clinical trials. *NEJM* 2016;375:65–74.
- [3] Bauer HH. *Scientific literacy and the myth of the scientific method*. Chicago: University of Illinois Press; 1992.
- [4] Polit DF, Beck CT. *Nursing research: generating and assessing evidence for nursing practice*. Philadelphia: Wolters Kluwer|Lippincott Williams & Wilkins; 2012.
- [5] Bergman MM, editor. *Advances in mixed methods research*. Los Angeles: Sage; 2008.

Andrea P. Marshall  
Editor-in-Chief  
Australian Critical Care

1 April 2019