

## EDITOR'S PAGE

# Take care to avoid pitfalls in research

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We wish you a very happy 2016 and look forward to working together on our journals *Spinal Cord* and *Spinal Cord Series and Cases*.

In this first issue you will find nice manuscripts on different topics related to SCI management. We are sure that in them you will find information that can benefit your knowledge, education, and care.

It is good to know that new evolutions are coming up that may change our actual way of looking at basic and clinical scientific work. Interesting papers have recently appeared in the journals *Nature*<sup>1</sup> and *BMJ*<sup>2</sup> which have great relevance to all of us.

The first has the challenging title 'Fooling Ourselves'. It starts by stating that 'humans are remarkably good at self-deception and that growing concern about reproducibility is driving many researchers to seek ways to fight their own worst instincts'. What follows is a summary of the paper which leads to reflection and can help researchers today. It is not that many researchers are committing fraud; that is not the case. However now it has become more and more clear how rarely study results can be reproduced by others, and therefore a next step is needed in dealing with methodology and results analysis. One last major progress is mentioned from half of the 20th century, when it became apparent that researchers and those studies changed unconsciously to match the expectations, and the use of double-blind methods became mandatory.

Today we have many different challenges. The research environment has expanded impressively and has become more competitive, the need for presenting positive results is increasing, and the danger of always searching for better results are just some of the aspects we are dealing with. The paper presents solutions such as considering different hypothesis for an outcome and developing investigations to study these, open science with greater transparency, registration of research before it is actually started which can offer the likelihood that whatever outcome a publication will be possible, the collaboration with rivals, and blind data analysis where results become available only when all research work has been done.

The *BMJ* paper was devoted to the issue of sub-group analyses- something commonly done as part of clinical trials. The authors argued that a positive sub-group analysis is usually a false positive and a negative sub-group analysis is usually a false negative. That is, we should be very wary of any sub-group analysis. Authors of systematic reviews need to be equally careful before reporting the results of the sub-group analyses of included trials.

The only sub-group analyses that should be interpreted with any confidence are those which were pre-planned. They should be part of a published protocol and statistical plan. However, even then most sub-group analyses will be underpowered. That is, the sample size will be insufficient to be confident that any between-group differences that may exist will be detected. Unfortunately, it is the exceptional clinical trial involving people with spinal cord injuries that has a sufficient sample size for robust sub-group analyses. Multiple sub-group analyses are rarely appropriate even when planned because of the high risk of type I errors.

Post-hoc sub-group analyses which are exploratory and hypothesis generating have their place provided authors are very clear that the results of these analyses should not be used for anything more than the intended purposes. Authors also need to declare the total number of sub-group analyses performed even if the results of each sub-group analysis are not reported in the final manuscript. This at least provides some indication of the likelihood that a positive sub-group analysis is merely a chance finding. It is particularly dangerous if researchers slice and dice data post hoc without every declaring it.

In all, sub-group analyses are fraught with problems and should be interpreted with caution. Researchers need to resist the temptation of performing multiple sub-group analyses without declaring them and without being appropriately reserved about their importance.

1 Nuzzo R. Fooling ourselves. *Nature* 2015; **526**: 182–187.

2 Burke JF, Sussman JB, Kent DM, Hayward RA. Three simple rules to ensure reasonably credible subgroup analyses. *BMJ* 2015; **351**: h5651.