INTRODUCTION
Evolution of the Science of Practice

Robert E. Harbaugh, MD,[1] Anthony L. Asher, MD,[2] Kevin M. Cockroft, MD, MSc,[1] John Knightly, MD,[3] and Ganesalingam Narenthiran, MBChB, MRCSE, FEBNS, FRCS(SN)[4]

[1]Department of Neurosurgery, Penn State Hershey Medical Center, Hershey, Pennsylvania; [2]Atrium Health Neuroscience Institute, Atrium Health Musculoskeletal Institute, and Carolina Neurosurgery and Spine Associates, Charlotte, North Carolina; [3]Department of Neurological Surgery, Atlantic Neurosurgical Specialists, Morristown, New Jersey; and [4]Neurosurgery, Wessex Neurological Centre, Birmingham Children's Hospital, Birmingham, United Kingdom

To improve the quality of neurosurgical care and produce reliable clinical research, it is necessary for neurosurgeons to collect data on patient characteristics, processes of care, and clinically meaningful outcomes, to analyze these data, and to make the analysis available to individual neurosurgeons and the neurosurgical community. This is the Science of Practice algorithm. This issue of *Neurosurgical Focus* addresses the evolution of the Science of Practice and how it contributes to quality improvement now and how it will expand our opportunities for clinical research in the near future.

We have lived our professional lives in the era of evidence-based medicine. However, despite multiple randomized trials, numerous guideline documents, and many millions of dollars spent, we still have not been able to reach consensus on the best management for many of our neurosurgical patients. Is this because neurosurgeons are simply recalcitrant and unwilling to be convinced by data, or because the constraints of randomized trials make neurosurgeons appropriately wary of applying their conclusions to their patients? Often, it is the latter. The Science of Practice approach to quality improvement and clinical research in neurosurgery will help to address this problem by generating real-world data that neurosurgeons can accept as applicable to the management of their patients. We believe that the Science of Practice will become an ever more important aspect of evidence-based medicine.

The authors have been involved in clinical research and evidence-based medicine for many years and have championed the use of prospective registries to improve the quality of neurosurgical care. Prospective, audited registries that allow us to analyze patient characteristics, processes of care, and clinically meaningful outcomes have enabled us to refine surgical indications, determine best practices, reduce the number of unsuccessful operations, and improve the quality of care we deliver to our patients. Ideally, all neurosurgeons should be included in the habitual and systematic collection of clinical data in a manner that is inseparable from other clinical activity. As the Science of Practice continues to evolve, prospective observational databases collecting data on large numbers of neurosurgical patients will be interrogated with sophisticated biostatistical analyses that will allow us to account for confounding variables and generate causal inferences from nonrandomized data. We believe that the Science of Practice, still early in its evolutionary history, will be an increasingly valuable component of neurosurgical quality improvement and clinical research.

https://thejns.org/doi/abs/10.3171/2020.2.FOCUS20128

Disclosures
Dr. Knightly is the chairman of the board of directors of NeuroPoint Alliance.

Correspondence
Robert E. Harbaugh: reh21@psu.edu.