

Letter to the Editor

How to compare outcomes and complications in neurosurgery: We must make the mission possible!

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We have read with great interest the paper entitled: “How to compare clinical results of different neurosurgical centers? Is a classification of complications in neurosurgery necessary for this purpose?” published by Brock *et al.* on *Surgical Neurology International*.^[1] This is a crucial topic, which is finally gaining the long-yearned attention it deserves, both in modern medicine and in neurosurgery. The definition and classification of complications in neurosurgery are, in fact, two important instruments for quality assessment within and among different neurosurgical centers.

Specifically, the question Brock and coauthors are trying to address is how to compare surgical results of different hospitals and whether a classification of complications in neurosurgery is really necessary for this purpose. As a matter of fact, outcomes and complications are delicate issues in every surgical specialty and even more so in neurosurgery, where no shared definition nor classification of complications exist yet.

The authors surely offer a nice historical perspective and general overview on the current state-of-the-art regarding complications report and analysis. However, one of the limitations of the study becomes immediately evident, because it is centered only on surgical complexity assessment. Complication reporting, on the other hand, is unavoidably linked to the concept of quality assessment, whose achievement in healthcare management and especially in the surgical disciplines is an endeavor on many levels.

First and foremost, the definition of quality itself may widely differ between patients, the society, the administrators, and the healthcare policymakers.^[3] Therefore, it becomes clear how several factors should be evaluated to make sure all these different perspectives are taken into account. These include, but are not confined

to, postoperative complications, surgical complexity, clinical outcome, and case volume.

It has been demonstrated, for example, that the hospital and surgeon case volume have an impact on outcomes across a variety of subspecialties, including neurosurgery. These volumes’ relationship with mortality and neurological deficits after biopsy or resection of primary brain tumors have also been shown.^[5]

Moreover, the role played by surgical complexity on the occurrence of complications and therefore on the outcome is still undervalued, even though its significance was already proposed by Clavien, a general surgeon, more than 20 years ago.^[2] In accord with Clavien philosophy, which is correctly remarked by Brock and coauthors, we also agree that surgical complexity should be considered when comparing outcomes and complications of different neurosurgical

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hospitals. However, not only the objective rating of surgical complexity is challenging, but its evaluation alone is also inadequate to develop a structured program of quality assessment in neurosurgery. Considering all these aspects, are we embarking on a “mission impossible?”^[3]

In the past years, our group has been deeply committed to complication recording and outcome evaluation.^[4-6] As a matter of fact, the five factors rightly cited^[4] in this work by Brock *et al.* (major brain vessel manipulation, cranial nerve manipulation, eloquent area surgery, posterior fossa surgery, and tumor dimension; the so-called “Big Five”) were further analyzed, yielding a scale of complexity for brain tumor surgery, named “Milan Complexity Scale” (MCS) [Table 1].^[5] The MCS seems exactly what Brock *et al.* are advocating for, that is a simple, practical, and applicable tool to grade surgical complexity. Furthermore, Brock’s suggestion that each center of excellence should develop a proper classification of surgical complexity seems quite ambitious and somewhat pointless to achieve, especially considering that what is needed nowadays is a consensus among different centers that will allow to create rules for quality assessment generalizable to everyone. In addition, which are the criteria to be classified as a “center of excellence”? Isn’t the definition of objective criteria indicating which center is best for a specific surgical procedure one of the goals of comparing different neurosurgical centers in the first place?

Besides, the concept of evaluating outcome based on the modification of the patient’s condition between the pre- and postoperative status rather than considering the

absolute Karnofsky Performance Status (KPS) value is undeniable and actually quite obvious. Not surprisingly, the MCS was created by comparing the delta-KPS between the preoperative status and the discharge clinical conditions.^[5]

The paragraph concerning biases due to multiple variables also deserves some scrutiny; it indeed confirms once again how difficult is the task of complexity and complications assessment and outcome measurement, but without offering any solution to the problem. For instance, no clear indication on which medical complications should be considered for the statistical analysis is given. In fact, although it might be true that pulmonary thromboembolism (PE) is not directly related to surgery, on the other hand, if the patient did not undergo surgery, he would not have developed PE in the first place. In the same way, considering a postoperative infection as something not directly related to the surgical procedure is very disputable.

Finally, as much as we are fervent supporters of the importance of surgical complexity grading, we also believe in the significance of creating a common definition and classification of complications.^[6] These are in fact the bases onto which any discussion on surgical outcome and quality assessment should be based. Without a common ground, no significant comparison between centers, and therefore, no shared policy to improve the quality of healthcare would ever be possible.

And even if, as the authors believe, surgical complexity was enough to pursue this plan, we have not found in this work any real proposition on how the grading should take place, if not for a timid indication on the need of designing the scale using numerical parameters. In truth, it seems like Brock and coauthors stepped into the very same mistake they warned the reader about at the beginning of their work, that is, a “mere intellectual exercise lacking any practical usefulness.”

What we propose, on the other hand, is an algorithm which may still not be perfect, but at least is trying to realistically address the problem. This consists, first and foremost, of a shared definition of complications.^[6] The second step involves the classification of those same complications, either by the Landriel-Ibanez or the Clavien-Dindo grading systems, which are based on the treatment employed to solve the complication itself. Additionally, we even devised our own classification system that is based on the etiology of the complication and which, in our opinion, adds important information to the evaluation. The MCS is also a pivotal point in our strategy and it is used to grade surgical complexity preoperatively and to predict the postoperative outcome in brain tumor surgery. Finally, outcomes are measured by means of multiple objective clinical and functional

Table 1: Milan Complexity Scale (MCS)

The big fives	Score
Major brain vessels manipulation*	
No	0
Yes	1
Posterior fossa	
No	0
Yes	1
Cranial nerve manipulation	
No	0
Yes	2
Eloquent area**	
No	0
Yes	3
Tumor’s size	
0-4 cm	0
≥4, 1 cm	1
Total Score	0-8

*Major arteries: ICA, ACA, MCA, Acom, Pcom, Anterior Choroidal, Ophthalmic, VA, BA, PICA, AICA, SCA, PCA. Major veins: Superior sagittal, transverse, sigmoid sinus, internal cerebral veins, vein of Galen. ** Motor, sensory, language or visual areas, hypothalamus, thalamus, internal capsule, brainstem, and pineal region

scales, such as the KPS, the National Institutes of Health Stroke Scale (NIHSS), and the modified Ranking Scale (mRS). Quality of life and patients' perspective are also recorded through Patient Reported Outcome Measurements.

The other seminal characteristic of this project is that data, gathered by means of standardized protocols, scales, and classifications, should be shared among hospitals and multicenter trials involving big case-load-hospitals should be designed. Only by joining these efforts, true progress will happen. Only by applying proper quality tools, we, doctors, surgeons, and neurosurgeons, will be able to regulate our own practices, before others, such as insurances companies and hospital administrators, will do it for us.^[3] We must make this mission possible.

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Conflicts of interest

There are no conflicts of interest.

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