Neurosurgical forum
Letters to the editor

Hemostasis

To The Editor: We read with great interest the important paper on neurosurgical checklists by Zuckerman et al.[1] (Zuckerman SL, Green CS, Carr KR, et al: Neurosurgical checklists: a review. *Neurosurg Focus 33(5)*:E2, November 2012). The authors highlight an upcoming and important issue in neurosurgery; that is, the use of checklists to improve the safety of care. A checklist is an informational tool maintained to reduce the risk of skipping something important or minute due to lack of attention or the potential limits of human memory/mind. Checklists are used in almost every industry, and the reasons are obvious: to minimize critical errors and get the work done right. The authors describe various checklists relevant to neurosurgical procedures, such as for general, vascular, and stereotactic and functional neurosurgery. It is generally assumed that such checklists do improve the procedure's safety.

We have developed a checklist for hemostasis in neurosurgery (Fig. 1) that in our opinion is worthy of sharing with the readers of *Neurosurgical Focus*. Obtaining adequate hemostasis is of great importance for patient and surgeon, both intraoperatively and postoperatively. It is as important as complete tumor removal or perfect clipping of an aneurysm, because insufficient hemostasis can ruin the whole operative procedure and thus harm the patient.

CHECKLIST FOR NEUROSURGICAL HEMOSTASIS

N Neurosurgeon A Anesthesiologist O OR nurse W Ward doctor

Admission to ward

Actual medical condition of the patient	Checked	N A W
History of bleeding diathesis	Checked	N A W
History of radiation or chemotherapy	Checked	N W
Laboratory test:	Completed & checked	A W
Normal hemostasis values	Completed & checked	N A W
Anticoagulants	Checked, discontinued, corrected & X checked	A W
Date stop anticoagulants	Checked	W
Blood products	Ordered	A
Other medication (that can lead to hemostasis disorders)	Checked & approved	A W

Operating room

Hemostasis equipment / instruments / materials present and functioning	Checked	O
Positioning of the patient	Done & approved	N A
Incision line infiltrated with lidocaine with adrenaline 1%	Done	N
Normotension during final inspection of the cerebral wound cavity during closure	Checked	N
Everything dry	Checked	N
Layer to layer closure	Completed	N
Dead spaces closed	Yes	N
Postoperative wound drainage	Inserted	N

Recovery / Intensive care unit

Instructions present about drains, medication, position and wound bandage	Checked	N A
Instructions about blood pressure	Set	N A
Instructions about position of the patient	Set	N A
Patient's head is not congested	Checked	N A
Aspect of the wound	Inspected	N W
Neurological function	Checked	N W
Blood loss in the suction drain	Checked	N W
Blood pressure within limits	Yes	W A
Laboratory test (Hb)	Completed & checked	W A

Ward

Blood loss in the suction drain	Checked	W
Suction drain	Removed	W
Aspect of the wound	Inspected	N W
Laboratory test (Hb)	Completed & checked	W
Neurological function	Checked	N W
Restart eventual anticoagulants	Approved	W

Fig. 1. Neurosurgical hemostasis checklist.

It is beyond question that intra- and postoperative bleeding in neurosurgery is a major threat to the patient and the surgeon.

We have implemented this checklist in our clinic to minimize complications related to problems with surgical hemostasis. All relevant pre-, intra-, and postoperative factors are taken into account in this checklist. On most occasions, one (surgeon and patient!) might get away with a "suboptimal" hemostasis without clinical sequelae. However, to make a comparison between the hemostasis process and the airline industry: many of the preflight checks are redundant, and consequently even without completing them, the majority of planes and flights will still be okay. However, sporadically the check might reveal a problem that could end in a disaster.

As can be seen from the checklist, application of the philosophy of correct neurosurgical hemostasis should start with the first consultation of the patient in the clinic and continue until discharge from the hospital. Surgical hemostasis starts from the moment the patient is positioned on the operating room (OR) table and continues until a couple of hours after the last stitch (for example, applying compressive bandages, checking the wound and blood in the drainage system, controlling the blood pressure). It is often overlooked that the most common cause of bleeding during or immediately after an operation is not a defect in the coagulation mechanism, but imperfect hemostasis by the surgeon him/herself.

We hope that checklists such as those described by Zuckerman et al. and by ourselves will gradually improve the safety of patient care in different subspecialities in neurosurgery.

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Disclosure

The authors report no conflict of interest.

Reference

1. Zuckerman SL, Green CS, Carr KR, Dewan MC, Morone PJ, Mocco J: Neurosurgical checklists: a review. **Neurosurg Focus 33(5):**E2, 2012

Response: We greatly appreciate the thoughtful response from Dr. Menovsky and his colleagues in Belgium. We share their enthusiasm for perioperative safety and OR checklists.

We chose to organize our review by neurosurgical subspecialty, with the thesis that each subspecialty would include a narrowed scope of cases. With a focused group of procedures, a more specific checklist could be applied, thus improving safety. However, there are several types of checklists that can bolster perioperative safety. The hemostasis checklist proposed by Dr. Menovsky and colleagues transcends all neurosurgical subspecialties. Adequate hemostasis is a prerequisite for achieving any successful operation, perhaps in neurosurgery more than in any other field. Postoperative hemorrhagic complications stemming from poor hemostasis can be catastrophic.[1]

The value of a hemostasis checklist is inarguable; moreover, the focus should be placed on successful implementation. Most of the elements in the proposed checklist are part of any surgeon's routine perioperative care, such as stopping all anticoagulants and obtaining laboratory testing. We believe the critical area to be what occurs in the OR. As Dr. Menovsky mentions (with which we wholeheartedly agree), a frequent cause of bleeding is imperfect hemostasis by the surgeon. One possible step toward successful checklist implementation is to further focus each OR checklist item; specifically, what checklist item is said when, and by whom. It has been our experience that without a strictly regimented procedure, successful checklist implementation and standardization can be difficult. The ultimate goal of any checklist is widespread use, and explicit instruction helps ensure correct, successful, standardized implementation. To use a hackneyed surgeon's axiom, "Do it the same way every time." Furthermore, care should be taken to avoid long, laborious, pre- and postprocedural checklists. An onerous checklist leads to increased OR time, inefficiency, staff frustration, and ultimately abandonment.

We greatly appreciate Dr. Menovsky and colleagues' addition to our review. It is only an international consensus and global implementation of operative checklists that will transform the culture of safety in our surgical theaters and for our patients.

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1. Seifman MA, Lewis PM, Rosenfeld JV, Hwang PY: Postoperative intracranial haemorrhage: a review. **Neurosurg Rev 34:** 393–407, 2011

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