



Letter to the Editor

## Neurosurgery theater-based learning: Etiquette and preparation tips for medical students

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Dear Editor,

### INTRODUCTION

Early surgical exposure increases the understanding of neurosurgery and affects the interest in neurosurgery as a career.<sup>[1]</sup> If medical students were given a chance to acquire and improve basic surgical skills early, they would be better equipped to gain confidence in their surgical internship.<sup>[5]</sup> The neurosurgery experience seemed to fulfill students' expectations to demystify neurosurgery.<sup>[6]</sup> Medical students frequently enter the neurosurgical operating room (OR) without the necessary skills for optimal team participation. Students who come for the 1<sup>st</sup> time may encounter challenges due to a lack of information about how to act and what to say in a neurosurgical OR and may benefit from indoctrination in theater etiquette. A set of rules and professional code of behavior govern how we act and collaborate with others, the so-called OR etiquette.<sup>[4]</sup> This article aims to guide the reader through a journey on how to prepare a medical student to attend a neurosurgery operation and highlight the do's and don'ts that should be kept in mind. Although our primary audience is medical students, for most individuals, we anticipate that the same content will prove interesting and valuable among interns and fresh residents. We share our experience in a neurosurgery teaching hospital between 2017 and 2022, during which a total of around 100 students, mainly attending neurovascular and neuro-oncology surgeries. We divided the operation attending experience into three stages: The day before surgery, the day of surgery, and the day after. Our primary focus is to provide the best possible or potential preparations and surgical etiquette to medical students by taking them through an example of an "Anterior communicating artery aneurysm clipping" surgery.

As an outline for expected behavior, students can use these steps to reflect good orientation while also giving them the advantage of being involved as part of the surgical team.

### DESCRIBING NEUROSURGERY OR

Neurosurgery OR is a place where the unexpected happens. It involves an interdisciplinary dance, in which different attending surgeons, residents, anesthetic teams, and nurses collaborate to achieve one shared goal; patient safety. A medical student will notice the leader concept,

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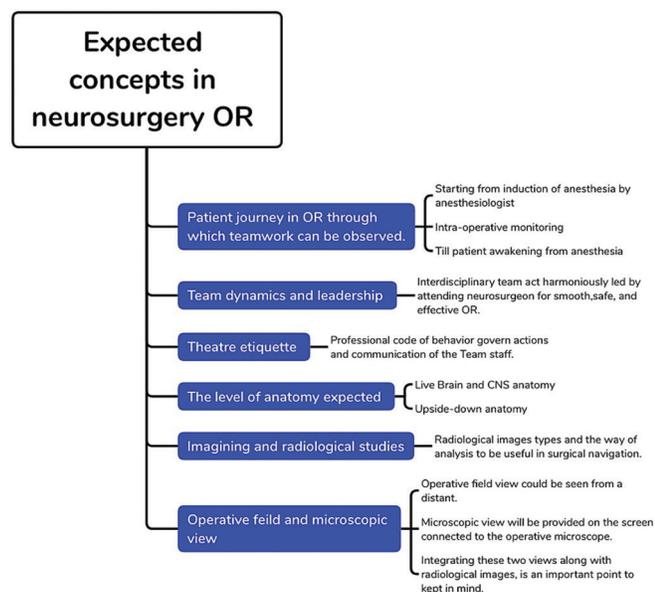
how the neurosurgeon acts in the OR, the team structure, and the communication that makes OR safe and effective for the neurosurgical patient who will undergo irreversible interventions and neurological scarifications.<sup>[7]</sup> These patients require ethical and behavioral considerations from the time of the diagnosis to the end after the operations.<sup>[3]</sup> In the OR, respect and learning from one another, as well as good communication within the group, is necessary for safety that is accompanied by good leadership.<sup>[8]</sup> This latter concept should be put in mind while attending a neurosurgical OR.

Although the neurosurgical operating theater can be an intimidating environment for the medical student, it can also provide a wealth of learning opportunities.<sup>[6]</sup> In [Figure 1], we provide some concepts to consider generally when you attend OR for significant perceived benefits to neurosurgical theater-based learning; significant improvements can be made in terms of student preparation and perhaps induction on theater etiquette.<sup>[6]</sup>

Let us take a journey to learn the etiquette and preparations for the 1<sup>st</sup> time attending a neurosurgery operation; it is summarized in [Table 1]. For example, we will take “Anterior communicating artery aneurysm clipping” surgery.

## THE DAY BEFORE THE OPERATION

Having in mind that after the end of the surgery, the main events, steps of surgery, and lessons learned from this experience, should all be documented and preserved in any way like writing or even making a video would be an excellent start to make one work hard to be prepared in a



**Figure 1:** The expected concepts are to be considered and noticed by medical students when attending a neurosurgery operating room. (CNS: Central nervous system, OR: Operating room).

small amount of time in the day before surgery. Knowing the brief history and examination findings of the case, initial radiological images, and the name along with the time and place of the surgery, if requested politely by the surgeon or the resident, justified by the need to explore and learn about the surgery. Asking about details should be avoided here; take the case and start to learn on your own.

The resident sent you this: 54-year-old female presented with brief loss of consciousness, followed by meningismus, no weakness, and GCS 15), the radiological image of computed tomography (CT) and CT angiography are shown in [Figure 2].

To understand the case, start with anatomical orientation. Understand the pathology and its location (aneurysm projecting anteriorly from anterior communicating artery [AcomA] in our case), and then study the surgery steps to prepare yourself to benefit from the experience scientifically. To study anatomical relations to the surgery, we suggest starting with a simple online image search to go from the schematic representation of anatomy to the cadaveric and then operative surgical view. The next step would be a neurosurgical atlas to gain a deeper understanding of anatomy. Radiopedia can also benefit you, helping you grasp the radiological anatomy of the case. As an example, start by searching for the “Circle of Willis” and “Anterior communicating artery (AcomA)” schematic and cadaveric on Google images. Then search for AcomA aneurysm schematic and operative. Make sure to write the lesion site while searching to understand better the surgery you will attend. After that, search for the steps of surgery, you can use Google scholar to read an article describing the steps or look them up on websites like the Neurosurgical Atlas. It is summarized in the schematic representation [Figure 3] to make it easier to be remembered.<sup>[1]</sup>

Considering some concepts like these, you are a student to listen and learn, not speak a lot mainly. Even theoretically, how to dress appropriately (scrubs, caps) and wash hands is also beneficial. Please remember that long nails are forbidden. Prepare your scrub and slipper; please remember do not come dressing scrub from home. The last thing to put in mind on this day is to have good rest and enough sleep before the next day, which might be long. So be prepared for long hours, and tell your family you may be back late. Take in your backpack a piece of snack. It will save you as you never know how long the procedure will last and when you will get a chance to eat. This is neurosurgery OR!

## ON THE DAY OF THE SURGERY

### Preoperative phase

You should have well rested, eating, and arriving on time 15–30 min before the operation. Greeting the surgeon and the team, along with introducing yourself (name, medical school, and school year at least), is an essential social point.

**Table 1:** The do's and don'ts in neurosurgery OR for medical students, the day before, of the surgery, and after.

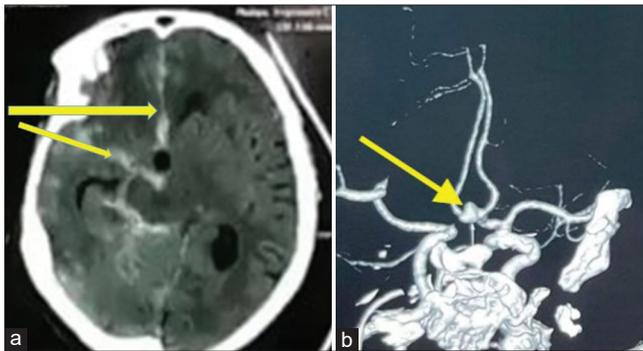
Dos and don'ts	Days				
	Before the surgery	Day of surgery			Day after
		Preoperative phase	Intraoperative phase	Postoperative phase	
Should DO	<ul style="list-style-type: none"> <li>- Tell your family you may be late</li> <li>- Have enough sleep</li> <li>- Prepare a snack to put in your bag</li> <li>- Request politely the case report, imaging, and the type of surgery</li> </ul>	<ul style="list-style-type: none"> <li>- Enough-rested.</li> <li>- Eaten well</li> <li>- Arrive 30 min before</li> <li>- Greeting the neurosurgeon, residents, and the team</li> <li>- Identify yourself (e.g., name, grade, and university)</li> <li>- Make your phone silent</li> <li>- If you want to shoot or record, ask for permission</li> </ul>	<ul style="list-style-type: none"> <li>- Do not touch anything (a blue towel is a warning sign)</li> <li>- Have enough distance between you and the surgeon</li> <li>- Maintain silence to allow communication between the operating team</li> <li>- If you scrubbed, keep your hand raised</li> <li>- For females, covering all hair under the head cup is mandatory</li> </ul>	<ul style="list-style-type: none"> <li>- Thank the surgeon and the team for accepting you to be with them</li> </ul>	<ul style="list-style-type: none"> <li>- If you want to share anything about the case, request from the surgeon or the team. (Send the image you want to share on social media with your request)</li> </ul>
Nice to DO	<ul style="list-style-type: none"> <li>- Set a goal of attending.</li> <li>- Study the case and surgery.</li> <li>- Keep in mind how to make this experience documented along with the lessons learned.</li> <li>- Be familiar with the scrubbing technique, simply by watching a video on YouTube</li> </ul>	<ul style="list-style-type: none"> <li>- Find an appropriate time and residents to ask them about the case and operative plan</li> <li>- Request being with the team before surgery when they check the patient</li> </ul>	<ul style="list-style-type: none"> <li>- If you are permitted to scrub, ask politely the nurse for help.</li> <li>- Make yourself useful</li> <li>- If you breach the sterility of your clothes, or encounter another breach, tell the nurse gently</li> <li>- If you experiencing fatigue, fear, or presyncope. Do not hesitate to ask and whisper to the resident about your condition</li> <li>- Shoot and record at the appropriate time the team, and the steps of operation.</li> <li>- Show interest even if you are not</li> </ul>	<ul style="list-style-type: none"> <li>- Have some notes in mind to tell them as feedback</li> <li>- Ask for pictures with the team at the appropriate time</li> <li>- Stay with the team furthermore after the operation to check up on the patient with them</li> <li>- Ask them for advice you</li> </ul>	<ul style="list-style-type: none"> <li>- Request the surgeon or the resident to come again to check the patient with them.</li> <li>- Study more about the case and surgery</li> <li>- Start to address the lessons learned and what you want to work on for the next surgery</li> <li>- It is good to share your experience on social media or with friends. It is nice to mention the name of the surgeon and the team with thanks</li> </ul>
Please Do not	<ul style="list-style-type: none"> <li>- Do not forget the long nail. It is forbidden</li> </ul>	<ul style="list-style-type: none"> <li>- Arrive late</li> <li>- Miss greet the team and tell your name</li> <li>- Come to the hospital dressing your scrub from home</li> <li>- Cross the midline unless dressing scrub, head cup, and mask</li> </ul>	<ul style="list-style-type: none"> <li>- Jewelry in the OR</li> <li>- Do not leave OR unless an important thing, if you won't find an appropriate time</li> </ul>	<ul style="list-style-type: none"> <li>- Do not rush to tell bad occurrences when tell feedback</li> <li>- Do not ask debatable questions</li> </ul>	<ul style="list-style-type: none"> <li>- Sharing the identity of the patient or part of operative events or photos without requesting</li> </ul>

OR: Operating room

It is an excellent time to ask the resident or nurses to figure out the rules: If you do not ask, then the rules are never really explained to you, and you may be in trouble when you break them. If you are not familiar with the case, find the appropriate time, but do not if you see the residents and attending surgeons are busy. Ask them about the case to be illustrated briefly, along with the operative plan.

It is good, and actually will give a good impression on you, to ask the attending surgeon or residents to be with them when encountering the patient before bringing him/her to the OR to observe the process of assurance, evaluation, and taking them through the consent form.

Please remember not to cross the red line unless wearing your head cover, masks, and scrubs in the dressing room,



**Figure 2:** (a) Brain computed tomography, axial section shows diffuse subarachnoid hemorrhage in the basal cistern right sylvian, interhemispheric, ambient, and thickest in the anterior hemispheric fissure (Yellow arrows). (b) Anterior view computed tomography angiography shows an anteriorly projecting saccular “anterior communicating artery” aneurysm (Yellow arrow).

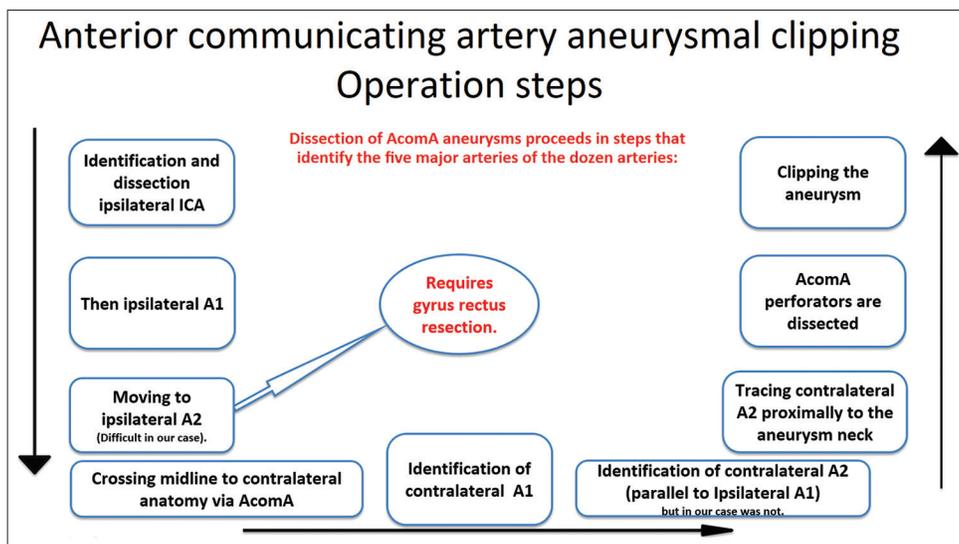
do not bring your bag, computer, and iPad to OR. You can eat your snack before entering OR. And please remember to keep your phones on silent. If you want to record during the operation, it is a good time to have permission from the attending surgeon and the team. Avoidance of jewelry in the OR should be considered.

**Intraoperative phase**

Neurosurgery is a complex specialty: in addition, neurosurgery OR means multiple individuals of an interdisciplinary team, sterile theater, operative microscope, drill sets, and various sophisticated machines and monitors surrounding the operating table within a relatively small-sized room. All should be kept in mind when you are there. As you enter the neurosurgery ORs be careful not to touch anything. A peculiar thing to consider is the sterile theater; it affects patient safety and should be on top when in OR observing the operation. If not scrubbed in, recognize the sterile field and how to avoid it. Remember to stay away from the sterile field. Any blue towel or covering should raise red flags in your mind.

Keep quiet enough not to disturb the operating staff’s communication. It is best not to take part in discussions unless you have been invited and there is an opportunity to speak. You will be encouraged to ask questions, but please do so when the atmosphere is calm. Always find the appropriate timing.<sup>[10]</sup>

Furthermore, it is better not to use the phone in the operating theater unless you need to record part of the surgery. Please do not take a personal photo of the staff unless you take their permission. Try to be useful in OR; if you are not scrubbed



**Figure 3:** Schematic presentation of the anterior communicating artery aneurysm clipping operation steps. (AcomA: Anterior communicating artery, ICA: Internal carotid artery).<sup>[11]</sup>

in, find yourself a role. Find a job you can do, like recording information (e.g., write down the incision and closing times). In our case, “AcomA aneurysm” we were asked to record the time for temporary clipping as it was applied before the permanent one. Try to be the last one to exit from the OR to have the full experience, even the part of the patient awakening from anesthesia after requesting from the surgeon and anesthesiologist, “Can I stay to observe?”. Try to look interested even when you’re not. It is part of showing thanks to the team.

Most neurosurgery OR provide video screens in the OR for monitoring surgeries as most neurosurgical operations are conducted under a microscope. You do not have to be scrubbed to observe a case. Make sure to notice the positioning of the patient’s body, head, and the site of craniotomy, as this will make a huge difference when you try to imagine and understand the surgery. We recommend taking photos and recording from the screen as well. Hence, you can later arrange the operation steps in a way like in [Figure 4].

The view under the microscope is far superior; if you have the opportunity to scrub, this would be a tremendous advantage to watch the field from different perspectives and compare them.

### Scrubbing

When you get the opportunity to scrub in, you may have trouble dressing the gown; politely ask the nurse to help you. In general, the scrubbing technique is the same, although you may see neurosurgeons put double gloving. Even if you are

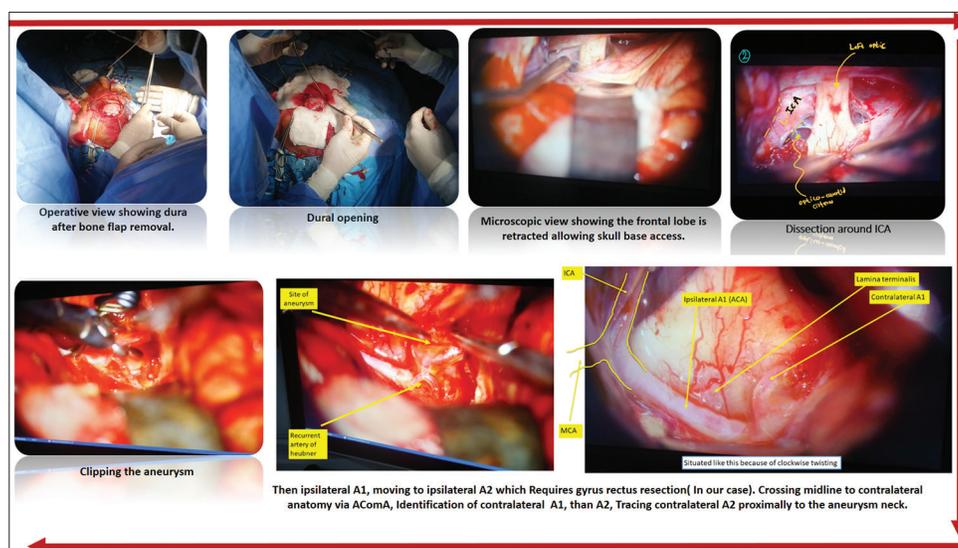
scrubbed in and sterile, do not touch anything, especially the surgical field. When scrubbed, get close to the surgeon and the field and try not to move a lot not to affect the surgeon’s position, as neurosurgery is done in small corridors between vital brain structures. Any disturbance or unexpected movements can be dangerous.<sup>[10]</sup> Keep your hands in front and above your waist level at all times. Asepsis is more critical in neurosurgery than in any other OR.<sup>[10]</sup> In case, you touch anything not sterile, like your nose mask or goggles, or even notice something might breach the sterile field, tell the nurse; honesty affects the patient. Do not be shy.

We suggest keeping this in mind and taking advantage of scrubbing by looking at the lesion’s operative field and surgical corridor to correlate it with the microscopic view on the operative screen for a better understanding of the surgery and how the neurosurgeon operates.

There will be some questions for you, particularly the anatomical one. Please do not jump to answer questions immediately; it is not a race. If you know, tell; otherwise, say I do not know.

If you are requested to assist during a case, mostly your role might be holding the sucker or participating in irrigation. You might have a chance to do a few stitches when closing the patient up. In general, Do just what is required from you, and do not anticipate surgical stages. If you do not understand or feel like you are not up to the task, do not hesitate to ask for help.

Although it is improper to quit while surgery is on if you need to go, do not declare it. If you have not been scrubbed, ask one of the residents for permission to exit. If you are



**Figure 4:** Intraoperative images show a step-wise arrangement of some photos taken by a student in the operating room that summarizes the “anterior communicating artery aneurysm clipping” operation. (ACA: Anterior cerebral artery, ICA: Internal carotid artery, MCA: Middle cerebral artery).

scrubbed and need to leave, you must pick an opportune moment and obtain permission from the senior surgeon.

Presyncope and syncope have previously been recorded in the OR and are prevalent among students entering the OR for the 1<sup>st</sup> time.<sup>[2]</sup> Although the real loss of consciousness (syncope) among medical students in the OR is uncommon, presyncope is a common incident. Anxiety, worry, and anticipation, as well as a warm atmosphere, low food intake, weariness, and long-standing, are likely to contribute to medical students' presyncope and syncope.<sup>[9]</sup> If you think you are about to pass out, ask or whisper to the resident about your situation; never be hesitant; out-of-OR syncope is better and less disruptive to the team than in-OR syncope. It has been shown that all students may benefit from staff surgeons or residents normalizing this common experience.<sup>[9]</sup>

### Postoperative phase

Make sure while in operation to have some notes in mind and address what you find unique to your experience, whether scientifically or even feelings about your first experience in neurosurgery OR. The latter is preferable feedback delivered to the team and neurosurgeon. Start with the positive thing that affects you and what you have learned. For example, "it was an interesting experience; I did not imagine neurosurgery to be like this, I see how good the teamwork is and how you act in harmony, all targeting the patient safety, thank you for accepting me to be part of your work today." Then go to the bad thing but try to use appropriate words and ways to be delivered well like "I wish I could participate, or do that thing" which makes a real difference. If you have questions, make sure not to make them debatable, and try not to ask deep scientific questions. Ask them for advice to be prepared better next time. Ask them to have a picture with them and the possibility of sharing it on social media.

It is better to stay with the team when they check the patient after the surgery, but it is not mandatory. Before leaving, thank everyone from the surgeon, nurses, residents, and anesthesiologists. This will give the team an overall good impression of you.

### THE DAY AFTER THE OPERATION

To have the entire patient journey experience, you can request the resident to come and check the patients with them or even ask them if the patient's condition has improved or not. Try to have this experience documented, write the lessons you have learned and the suggestions that were delivered to you, study more about the case and the surgery you have been in, and prepare a document or film from the videos and photos you have recorded. In [Figure 3], we provide an example. We suggest starting to make a logbook for photos and preserving your video of every surgery you will attend. Work on your

fault and try to address the skills – technical or otherwise – related to the neurosurgery field. To make yourself as useful as possible when attending the next time.

It is good to share your experience on social media and thank the team for their time and work and for hosting you. Never share any patient-identifying information like name or face, and do not share any part of the surgery unless you take permission from the surgeon.

### DISRUPTIVE BEHAVIOR OF MEDICAL STUDENTS

Arriving lately, do not show respect to the surgeon and the team, laughing in front of patients when it is not the appropriate time, Yelling in OR, talking and whispering, touching the sterile, moving haphazardly, being too close to the surgeon and affecting his position. Not showing interest. Not showing thanks to the team for accepting their presence or showing only bad things when giving feedback about the operations. Sharing the identity of the patient or part of the procedure without permission from the surgeon.

### CONCLUSION

The overall experience of neurosurgical theater-based learning is positive, as the surgical exposure intervention increased the understanding of neurosurgery and affected the interest in neurosurgery as a career. Based on our experience, in this article, we provided some potential considerable preparations and etiquette to medical students that, if kept in mind, will reflect good orientation. Better preparation, such as reading up on the case and operation, an introduction to theater etiquette, how to act, and what to say, would improve the learning experience.

### Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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### Conflicts of interest

There are no conflicts of interest.

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