

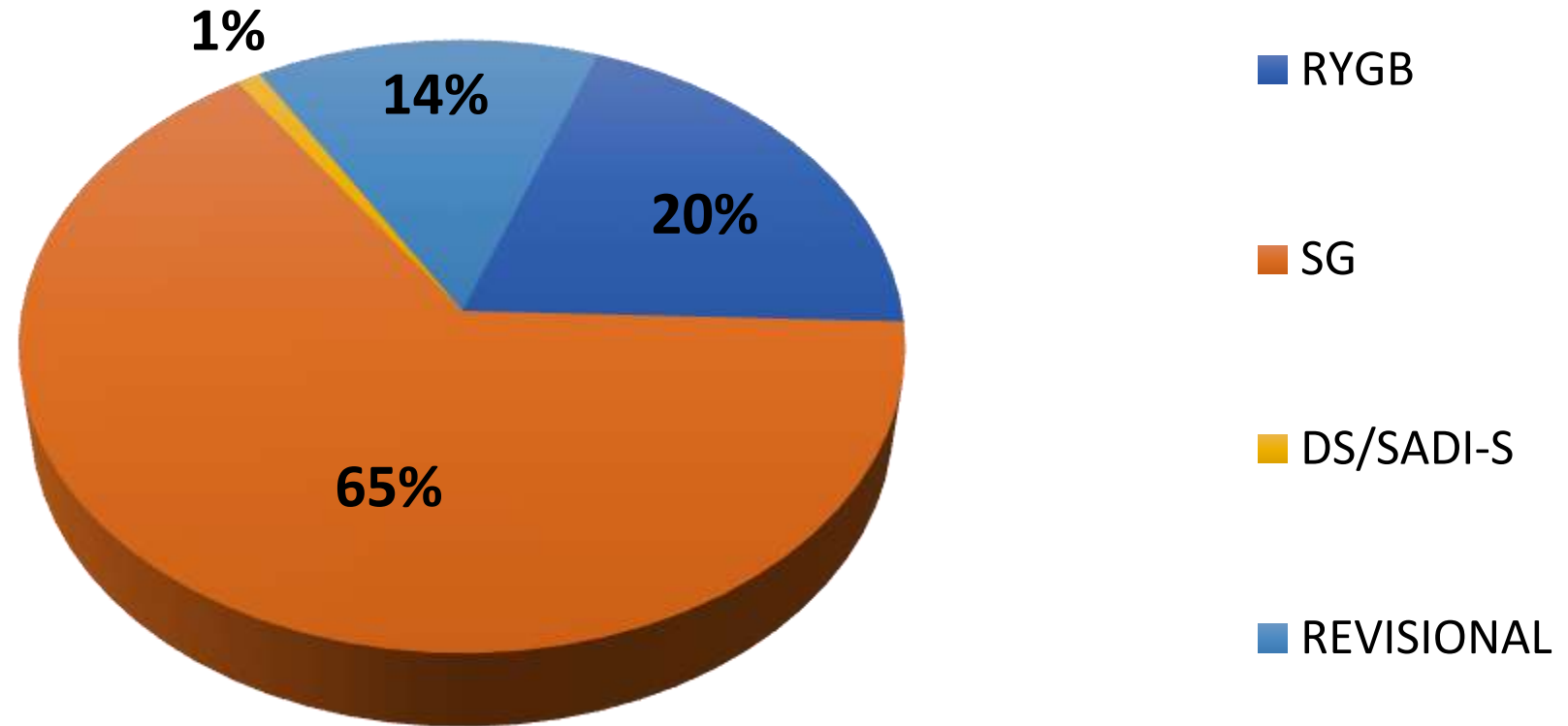
Challenges in Teaching and Training From Laparoscopic to Robotic Surgery



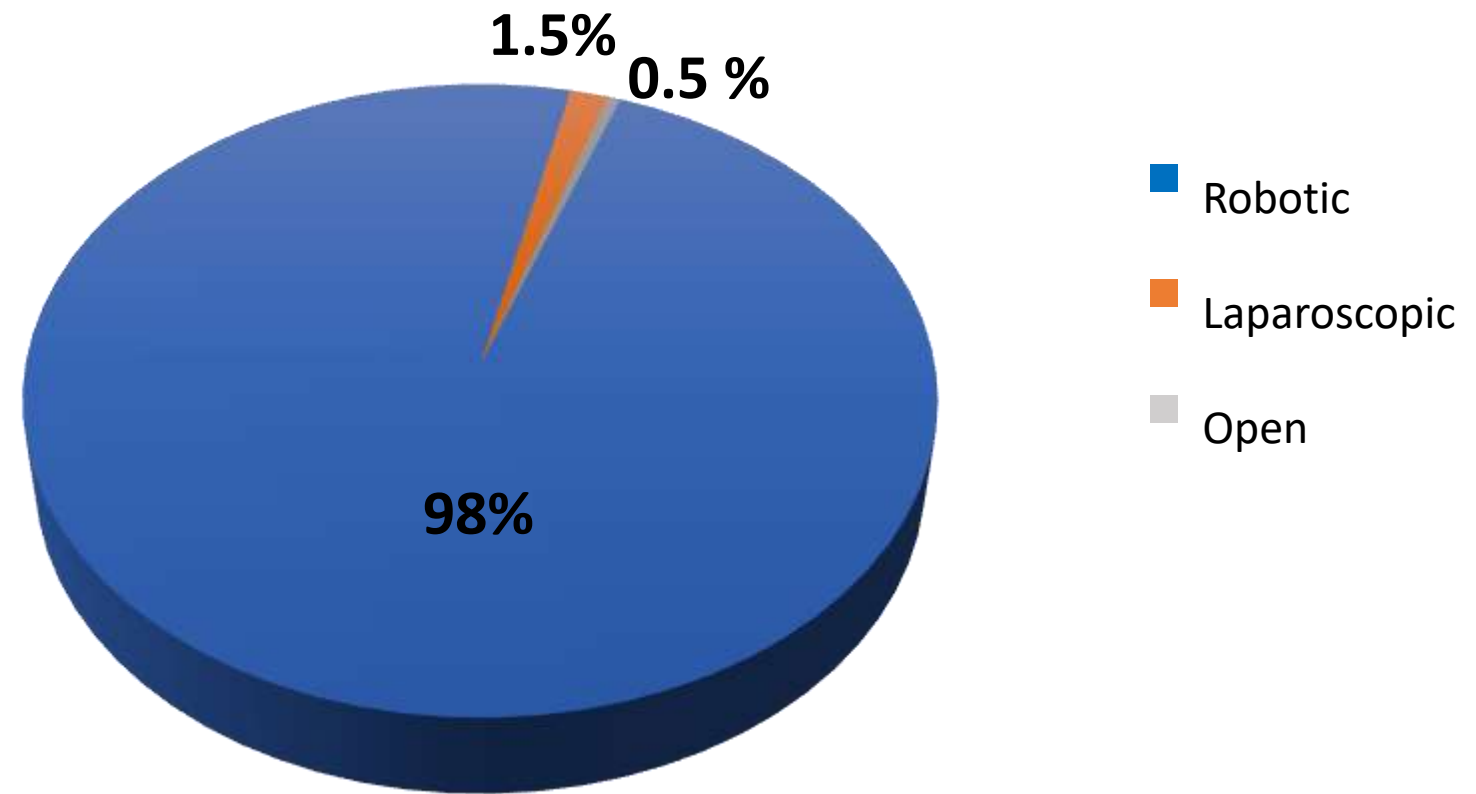
Ann M Rogers, MD, FACS
Director, Penn State Surgical Weight Loss Program
Co-Director, Penn State Fellowship in Advanced GI/MIS/Bariatric Surgery

I have the following potential conflict(s) of interest to report:

- **Intuitive Surgical - Speaker/Proctor**
- **WL Gore – Speaker/Proctor**
- **Medtronic - Speaker**



CASE MIX DISCLOSURE – ROBO vs LAP



This 2015-2020 MBSAQIP PUF analysis showed over 17% of SG, nearly 17% of RYGB, and over 28% of DS were being performed robotically

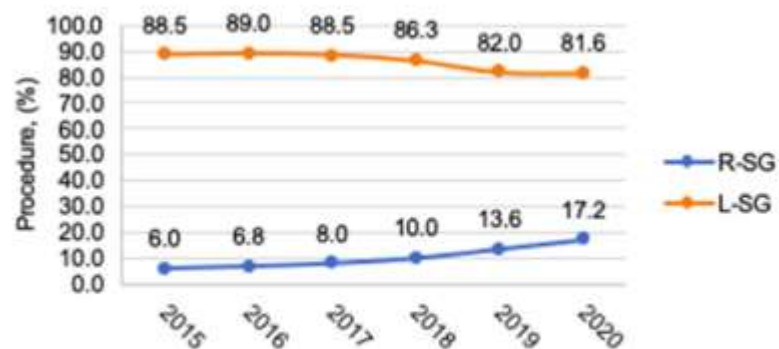
Obesity Surgery (2023) 33:482–491
<https://doi.org/10.1007/s11695-022-06378-1>

ORIGINAL CONTRIBUTIONS

Current Trends in the Utilization of a Robotic Approach in the Field of Bariatric Surgery

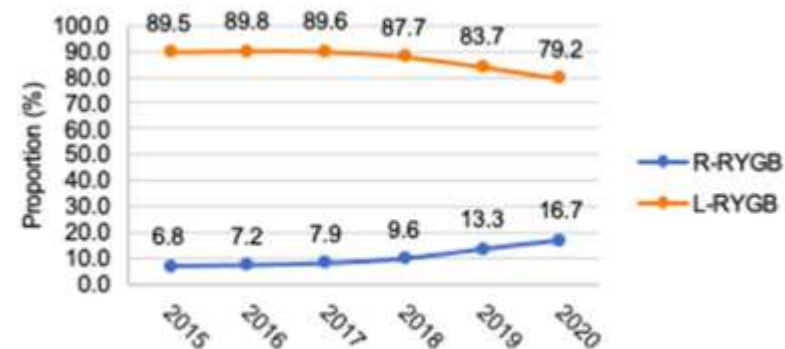
Wayne B. Bauerle¹ · Pooja Mody² · Allison Estep² · Jill Stoltzfus³ · Maher El Chaar²

Proportion of R- vs. L- SG Performed Annually



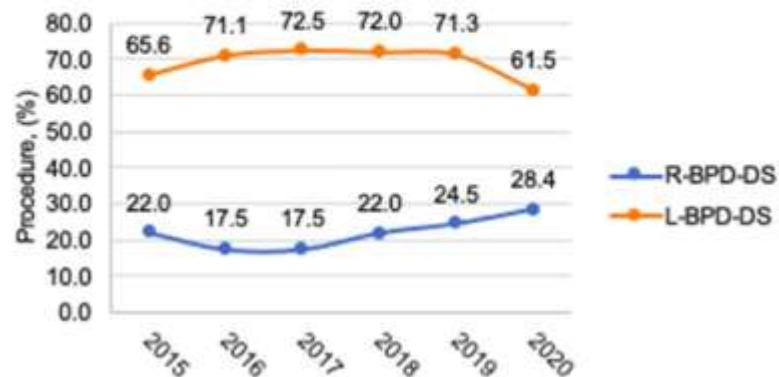
R-SG (n)	5229	6918	8868	11393	15350	17063
L-SG (n)	76908	90263	98522	98747	92552	80864

Proportion of R- vs. L- RYGB Performed Annually

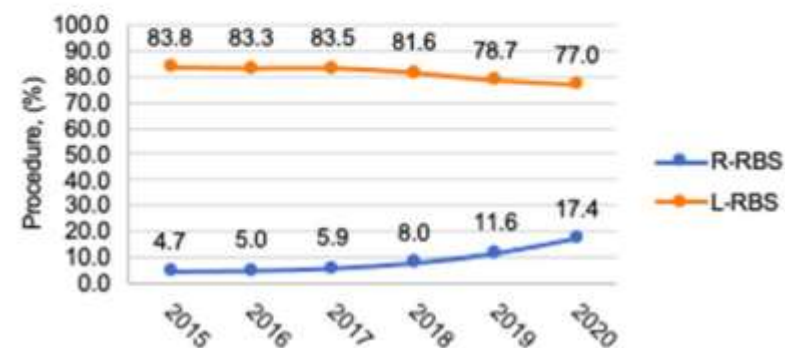


R-RYGB (n)	2554	2710	3023	3708	5372	6198
L-RYGB (n)	33661	33887	34445	33962	33781	29439

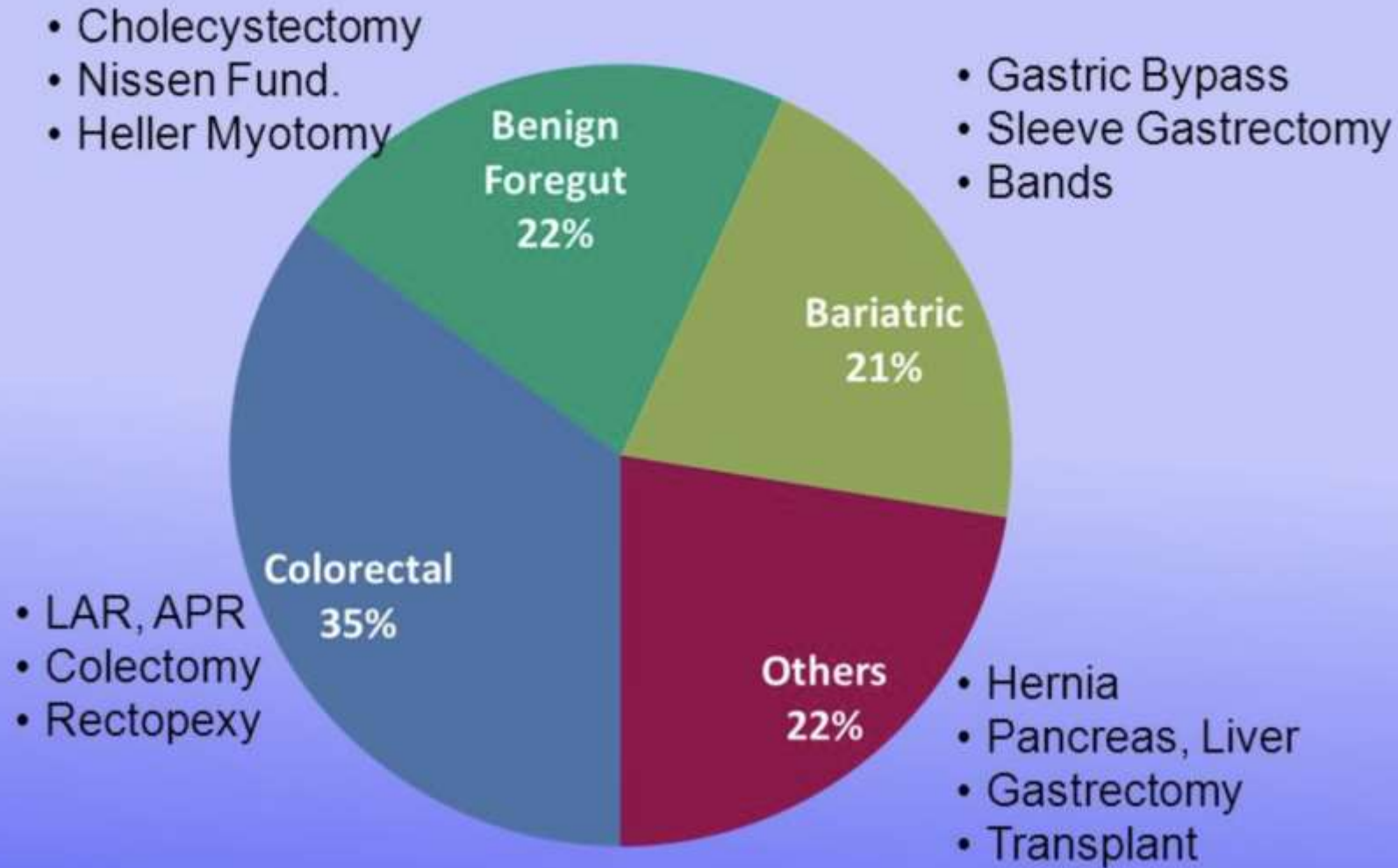
Proportion of R- vs. L- BPD-DS Performed Annually



Proportion of R- vs. L- RBS Performed Annually



da Vinci General Surgery Procedures (WW)



First steps for trainees – start at the bedside:

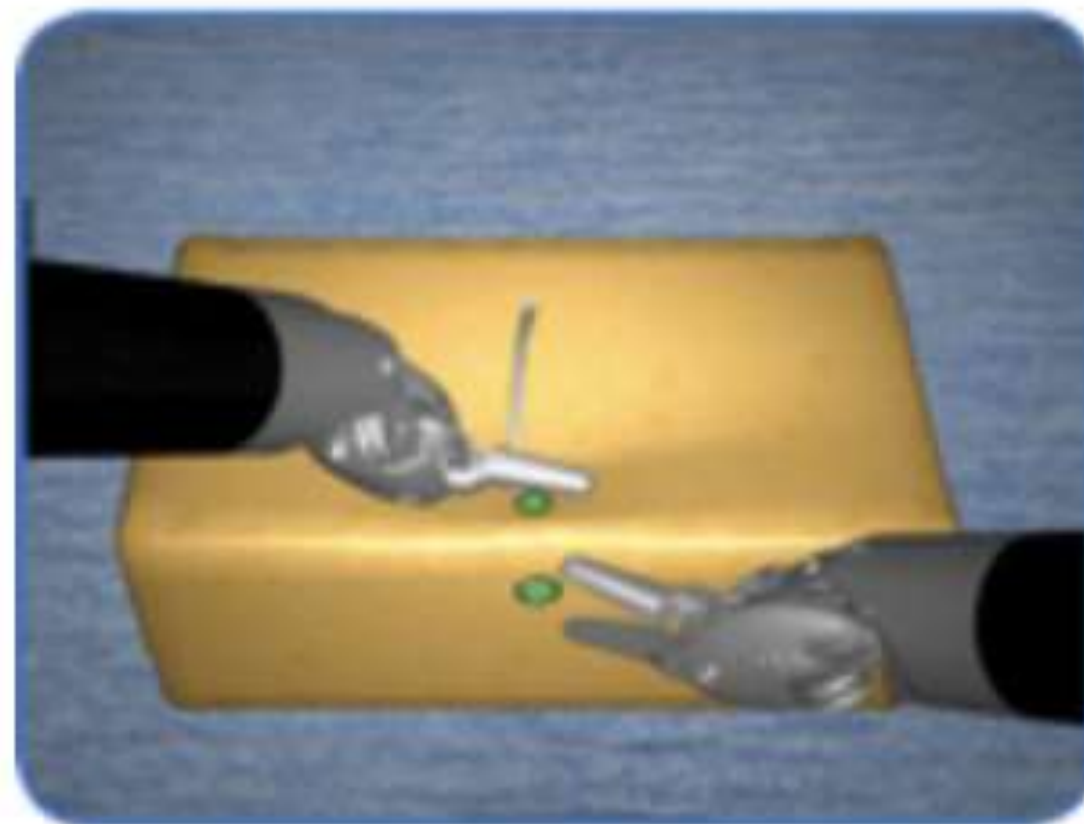
You don't do a Whipple before you do a lipoma!



First steps for trainees – start at the bedside:

- **Get practice at docking**
- **Get practice at targeting**
- **Get practice at setting up arms**
- **Get practice at inserting instruments**
- **Get practice at bedside assisting**

Next Step: Do the Modules!

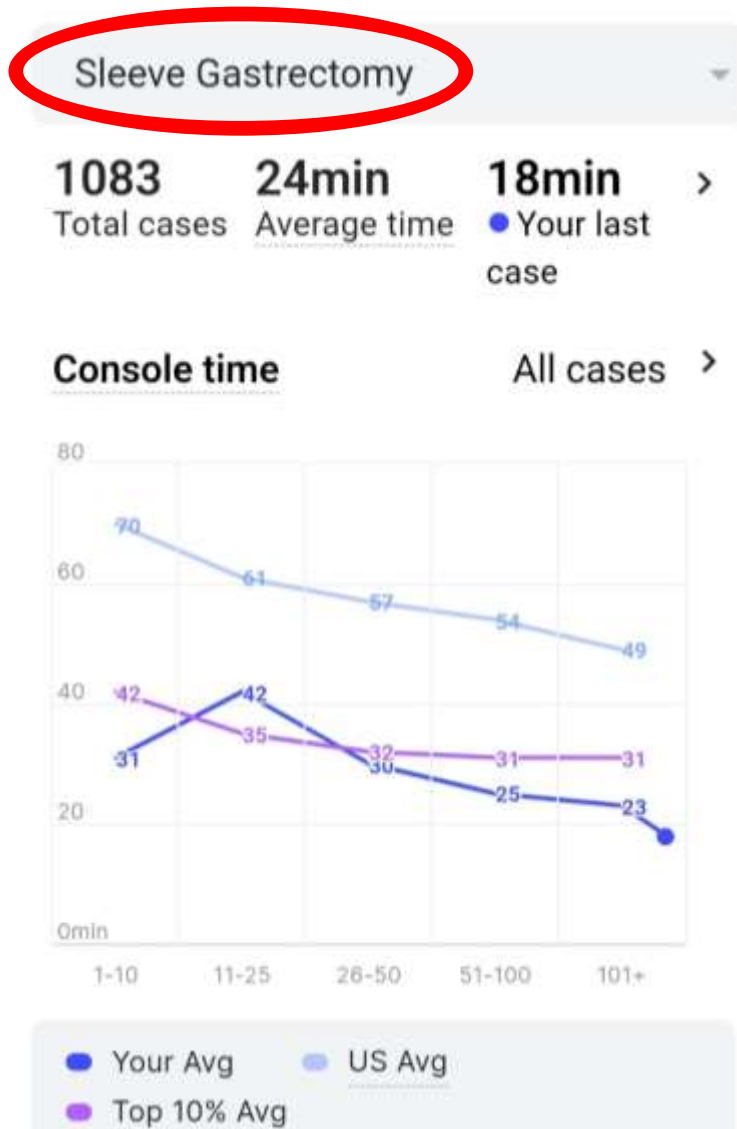


When to Get Trainees on the Console?

My advice: get over your own early learning curve first – then you and the trainee can continue learning together.

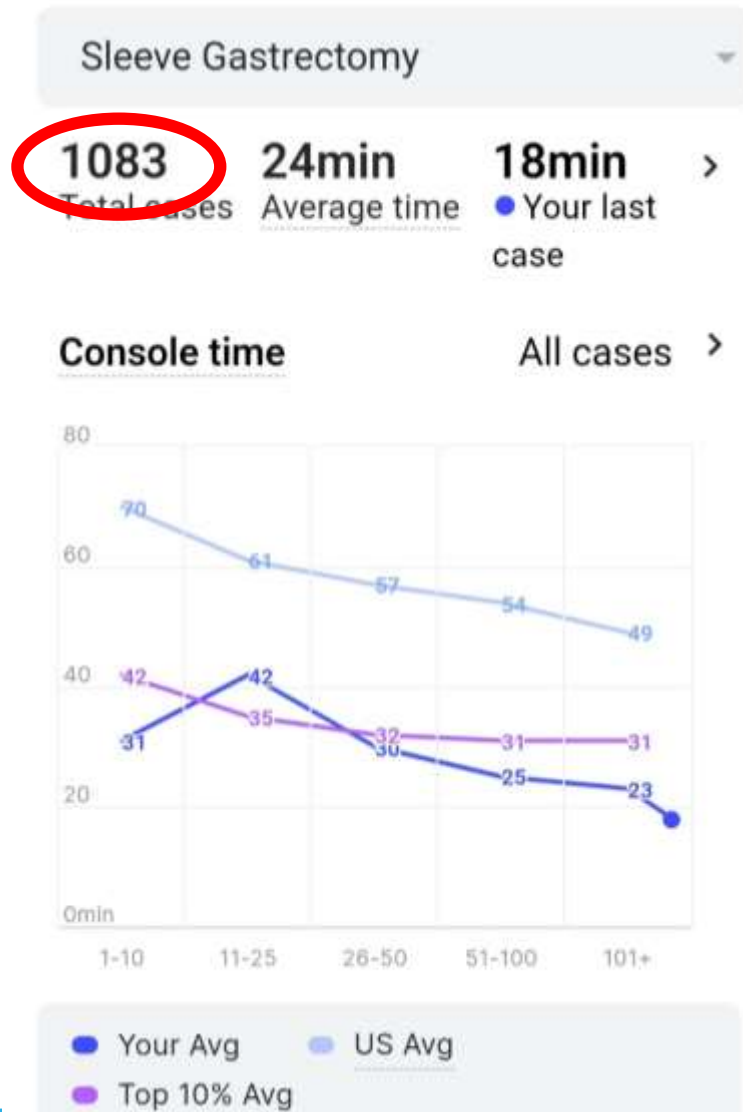


The Learning Curve



Stolen from Harvey Rainville: His console time for sleeve gastrectomy.

The Learning Curve



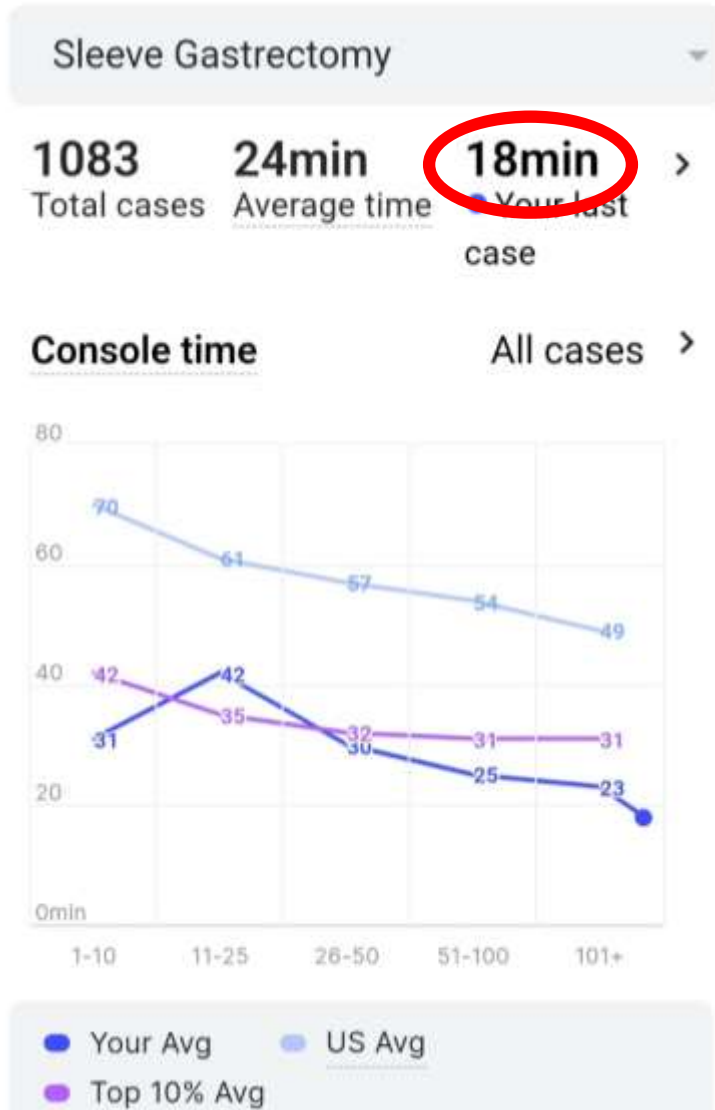
(At the time of theft he'd done over a thousand sleeves)

The Learning Curve



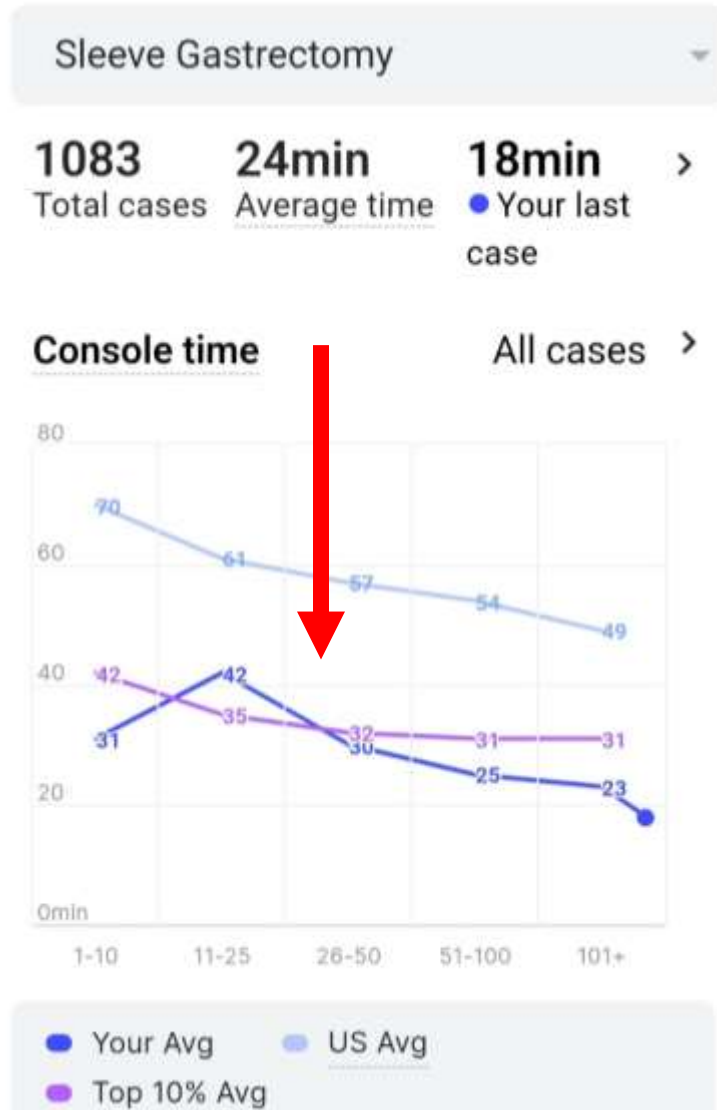
His average console time was 24 minutes...

The Learning Curve



His last case only took him 18 minutes...

The Learning Curve



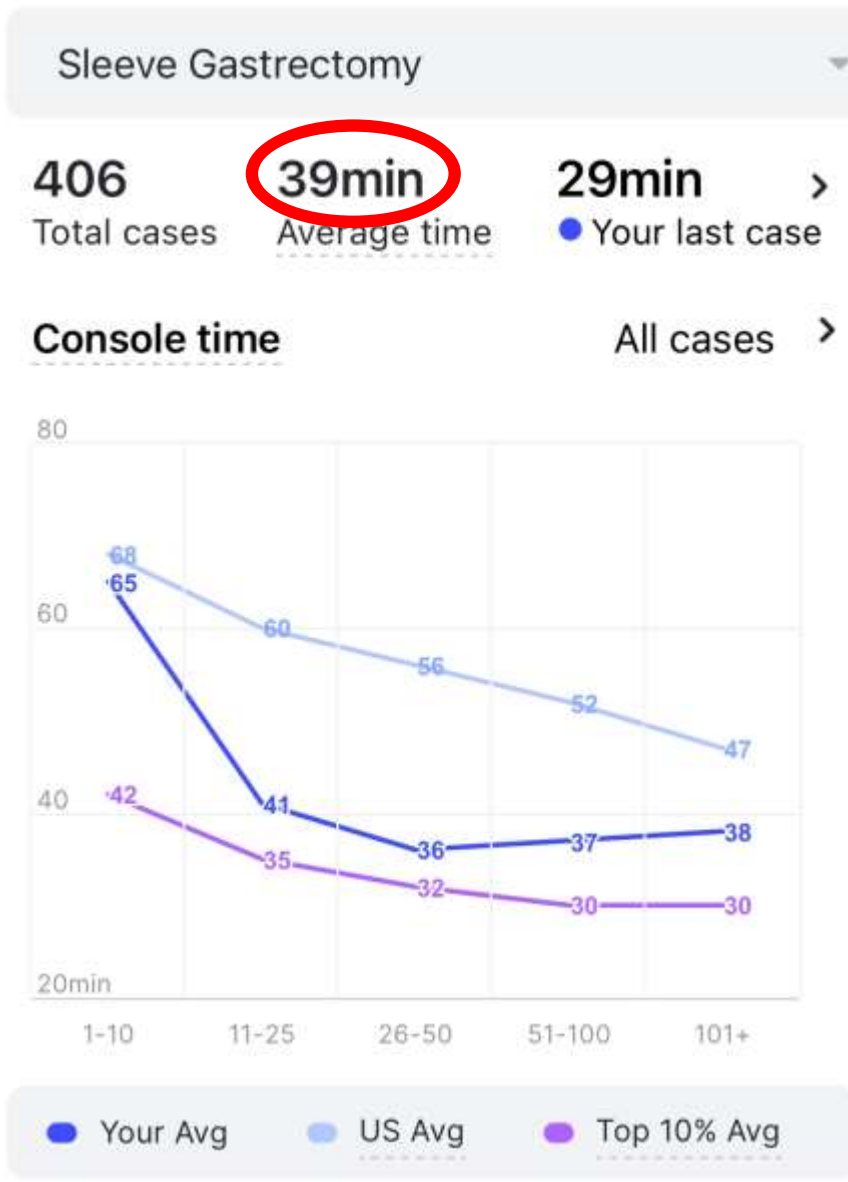
And he crossed over into the top 10% in terms of console time after only about 15-18 cases!

The Learning Curve



Then there's a mere mortal – me.
As of last month I'd done over 400
robotic sleeves.

The Learning Curve



My average console time is apparently about 39 minutes.

The Learning Curve



My most recent console time was 29 minutes, and I happen to know the day of this image I had a chief resident at the console.

The Learning Curve



But my inflection point is different from Harvey's... I didn't cross over into the fastest 10%! I'm in a training program. I actually appear to have gotten *slower* at the inflection point - but that's because after 15-20 cases I finally felt confident about letting trainees onto the console!

Pairing the Bed

Trainees need to know when it is or isn't helpful to pair the bed with the robot – and why. Then they need to know HOW to pair, and how to move the bed when it's paired. If all this is too overwhelming, then they shouldn't use the pairing function.

Trainee at the Console – John Wooden effect

- Use a locking stool that fits with the console



Trainee at the Console

- Use a locking stool that fits with the console
- Adjust the height of the eyepiece and the arm rest
- Adjust where the foot pedals will be
- Save this setting



Read All that the Screen is Telling You

Trainees should learn to look at the screen and gather all possible information



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Trainees should learn to look at the screen and gather all possible information, such as 1) which instruments are active, 2) which hand is controlling which instruments, 3) which instrument their foot is hovering over



Read All that the Screen is Telling You

Trainees should learn to look at the screen and gather all possible information, such as 1) which instrument is active, 2) which hand is controlling which instruments, 3) which instrument their foot is hovering over, 4) whether a hot instrument is in “seal” or “bipolar” mode, etc.



Listen to the Various Noises!

Trainees should learn to listen to the various sounds the robot is making – these are intended to be informational.



Listen to the Various Noises!

Ba-donk, ba-donk, ba-donk...



Laser line is moving, clearance controls are moving, robot arms are deploying, etc

Listen to the Various Noises!

Ba-doop!



Docking appropriately

Listen to the Various Noises!

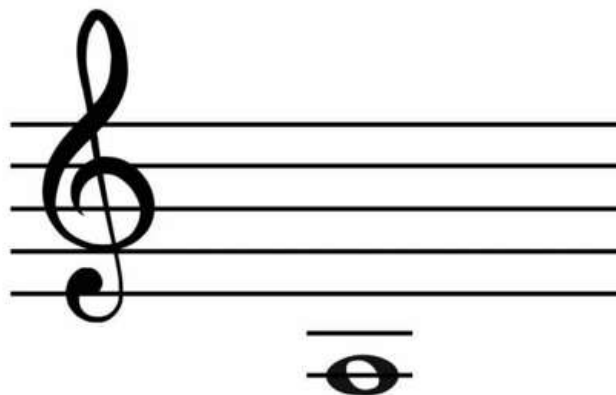
Bip-bip-bip-bip



Arm is sensing an instrument

Listen to the Various Noises!

Clunk!



Something's wrong with this instrument

Keep the Instruments in Sight

This is not laparoscopy.



Keep the Instruments in Sight

This is not laparoscopy. Until trainees develop robotic haptic feedback, they should try to keep all working instruments in sight.

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Keep the Instruments in Sight

This is not laparoscopy. Until trainees develop robotic haptic feedback, they should try to keep all working instruments in sight. Otherwise they can get lost in the abdomen and potentially cause harm. At the very least, time will be wasted finding their instrument again!



And Regarding Haptic Feedback...

There is no real haptic feedback with the currently available robot.



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There is no real haptic feedback with the currently available robot. It comes through visual cues. If you pull on the omentum that's attached to the greater curve and the spleen moves toward you, that means you are pulling on the spleen!! Eventually your brain starts to “feel” this.



External Collisions

Trainees first need to notice that they're even having a collision....



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External Collisions

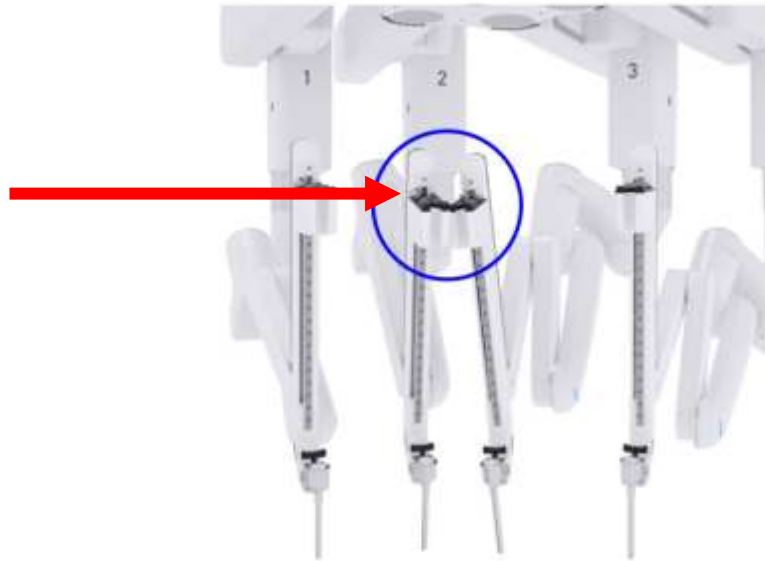
Trainees first need to notice that they're even having a collision.... If they come to a point where an instrument won't move, they must figure out if the arm is simply maxed out in one direction, or if the port needs to be burped in farther, or if there is an external collision of arms. If the latter, they need to figure out how to move the arms or instruments so this stops.



External Collisions

If the interference is on the front end of the arm (near the instrument):

- Use the flex joints to bring the arm close to the adjacent arm. This allows the arms to work in parallel, minimizing interference.



Interference



No interference



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Interference



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The Robotic Stapler

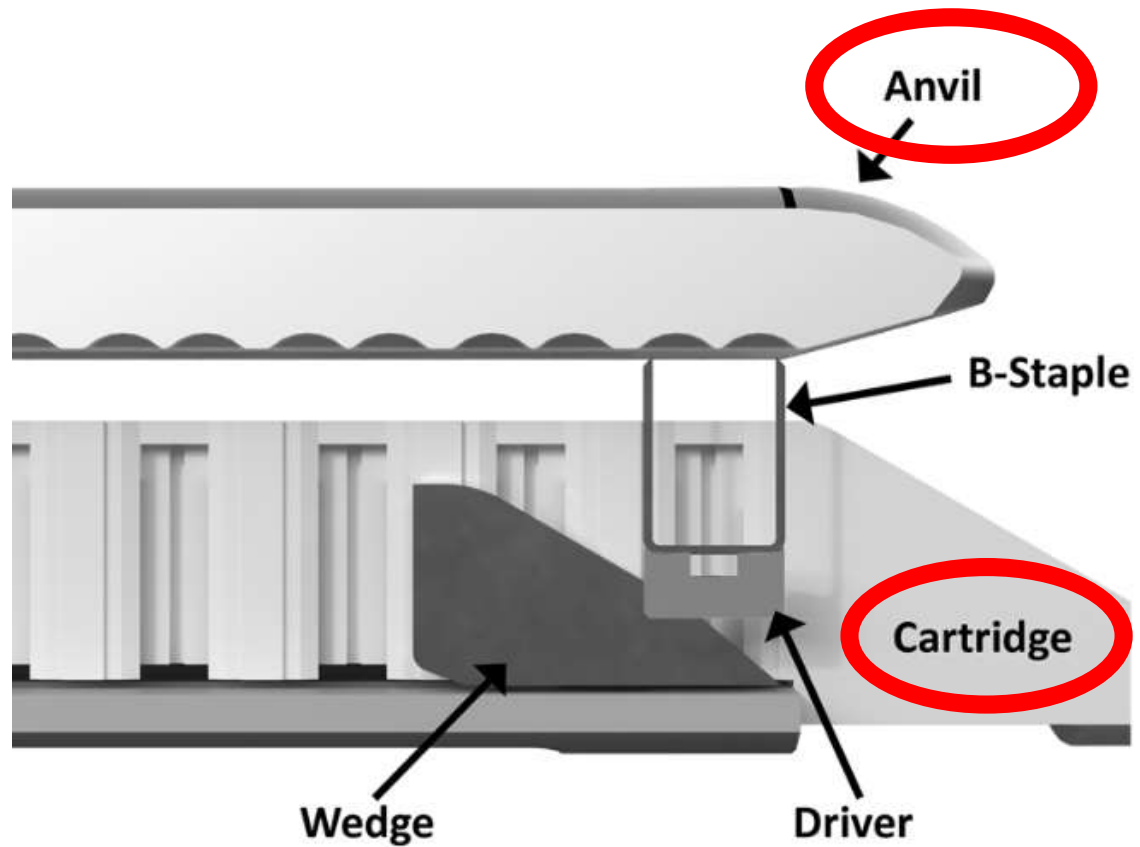
- The current stapler used with the Xi robot was developed by the same engineers who made laparoscopic staplers, so it will have many similarities. It can be trusted, but it's not God!!
- These staplers are intended to be used with the **anvil up** and the load down because of how the staples are loaded and how the B's form.

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B-shaped Stapler



The Robotic Stapler

- Trainees should understand that when they do flip the stapler so that the anvil is down



The Robotic Stapler

- Trainees should understand that when they do flip the stapler so that the anvil is down, **which is sometimes fine**



The Robotic Stapler

- Trainees should understand that when they do flip the stapler so that the anvil is down, which is sometimes fine, **they need to alternate clockwise and counterclockwise turns between staplings**



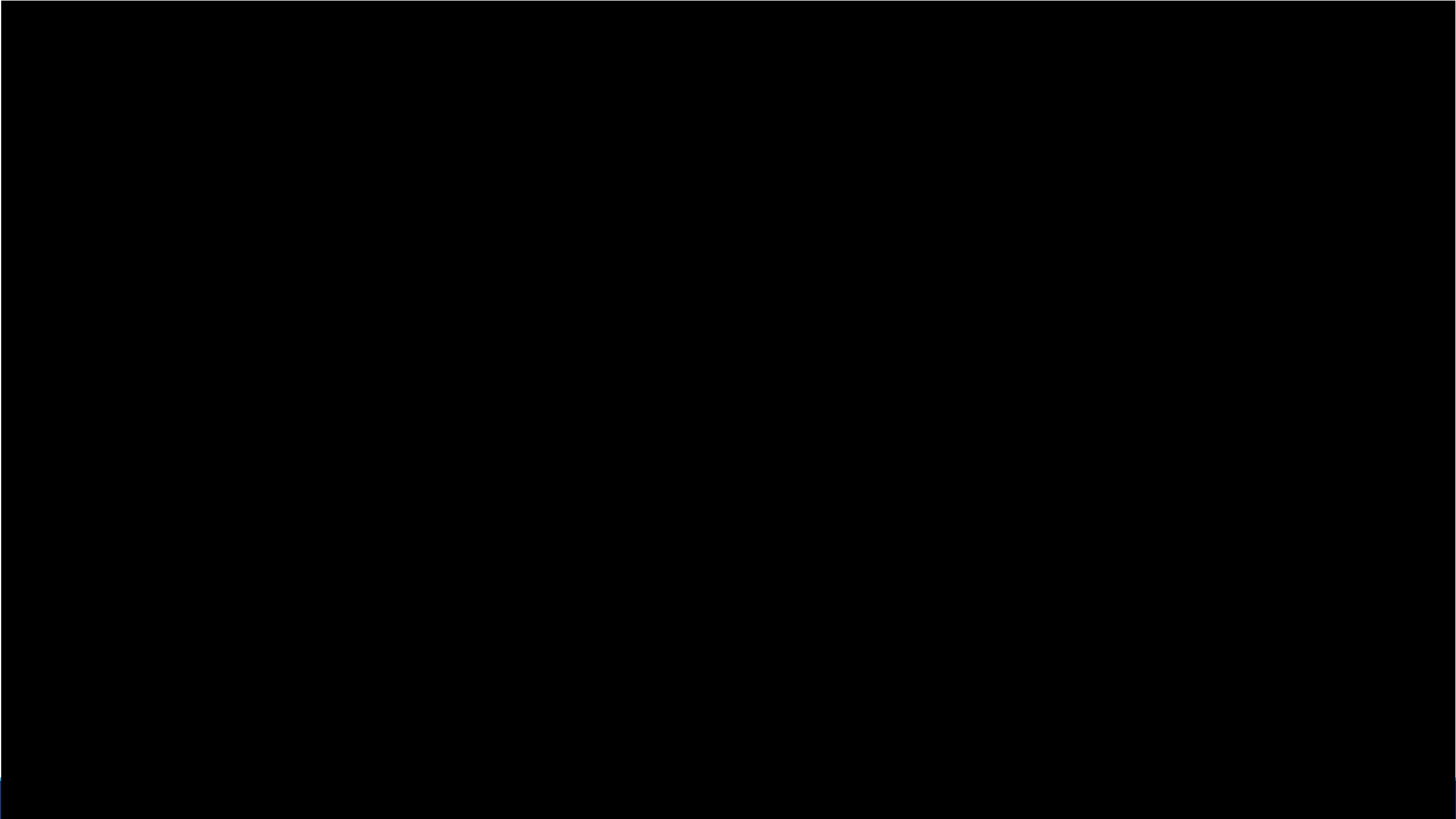
The Robotic Stapler

- Trainees should understand that when they do flip the stapler so that the anvil is down, which is sometimes fine, they need to alternate clockwise and counterclockwise turns between staplings, otherwise **the arm gets overwound!!** Eventually it will insist on spinning back to an unwound position and this can be dangerous.





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**THIS ACTUALLY HAPPENS
TO STAPLERS IN THE BODY**



More About the Robotic Stapler



More About the Robotic Stapler

When clamped, the stapler runs through thousands of internal tests per second to determine if the tissue is too thick for the load. But a “tissue too thick” warning CAN be bypassed by opening and reclosing – do this if you feel certain the staple height is appropriate for the current tissue.

The Robotic Stapler

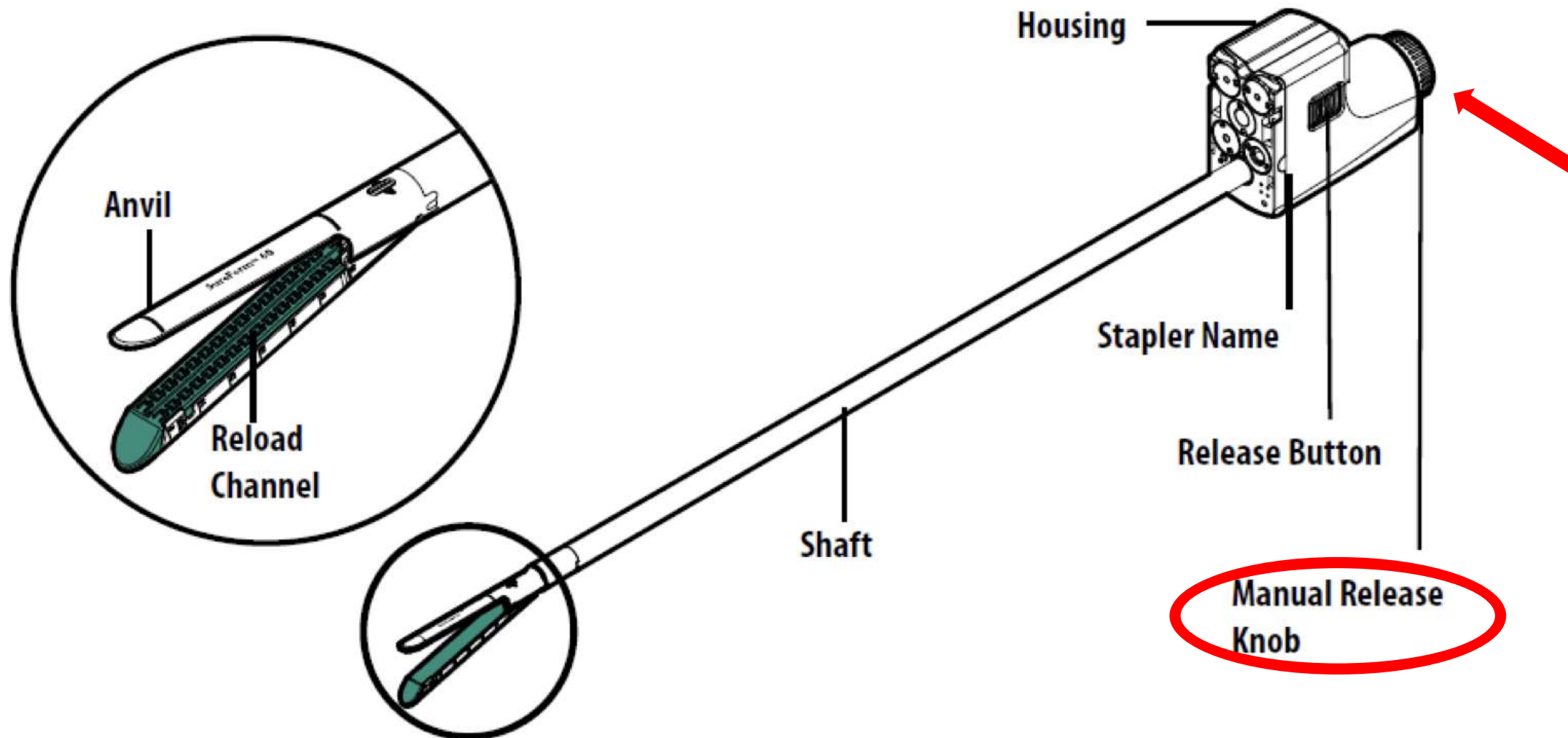
However, the stapler will sometimes stop **midload** and decide that the tissue really is too thick.

The Robotic Stapler

However, the stapler will sometimes stop midload and decide that the tissue really is too thick. In this case, the trainee needs to open the stapler and remove it, and be aware that there is a message that the blade is exposed.

The Robotic Stapler

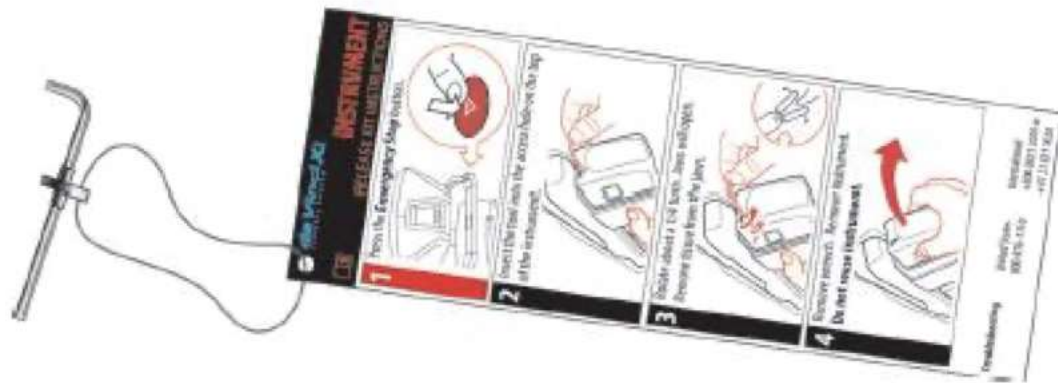
On rare occasions, the stapler will stop but refuse to open. This can be troubling when tissue is in the jaws of the stapler! In this event, there is a knob on the back end of the stapler that can be turned to open the stapler so that it can be taken off tissue.



(And By The Way)

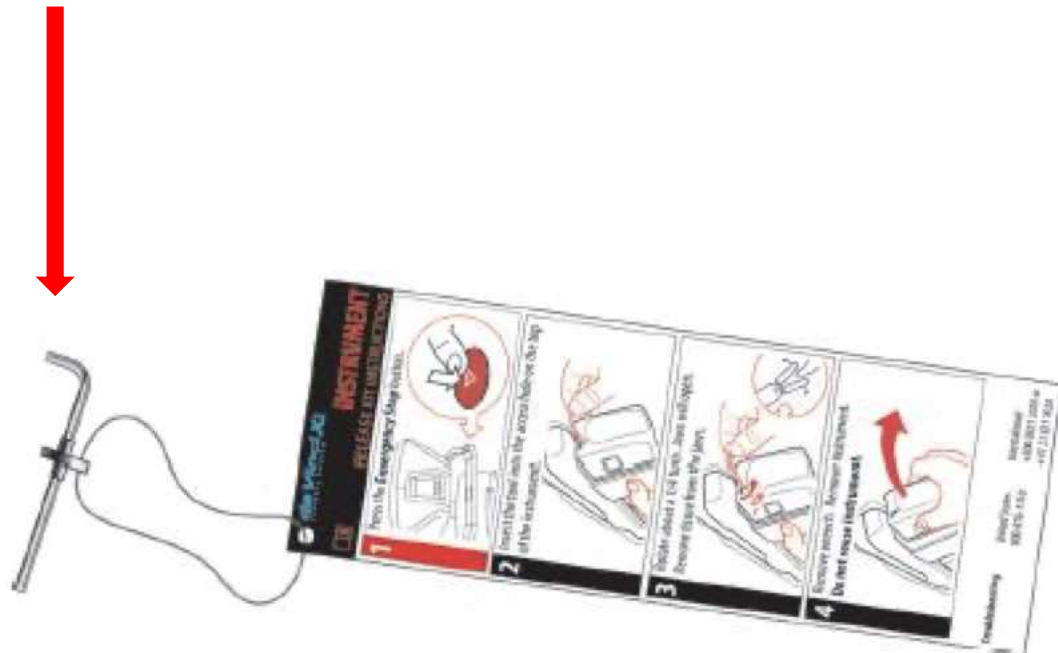
On rare occasions, OTHER instruments will refuse to open – equally troubling when on tissue!

Instrument Release Kit



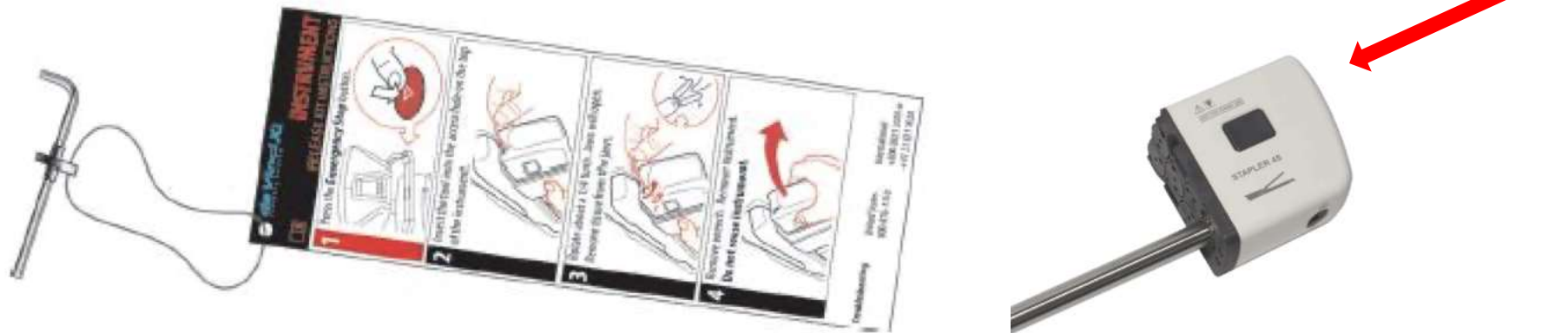
(And By The Way)

This tool lives in a drawer in the vision cart.



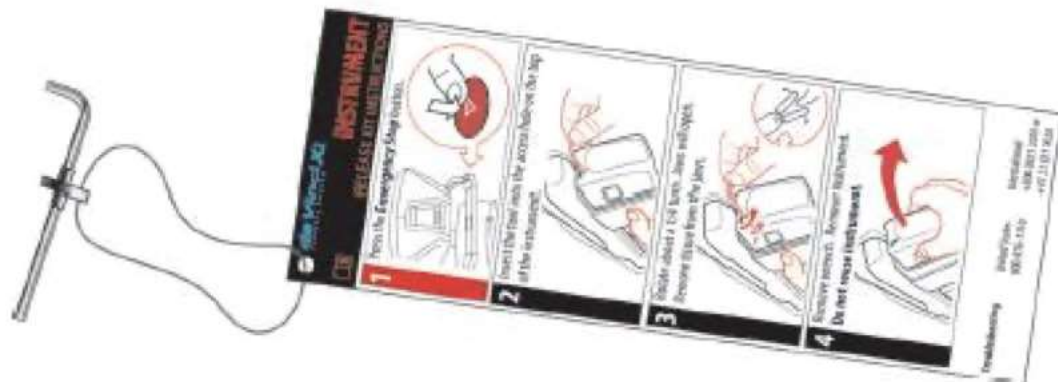
(And By The Way)

Look for a corresponding hole on the instrument handle.



(And By The Way)

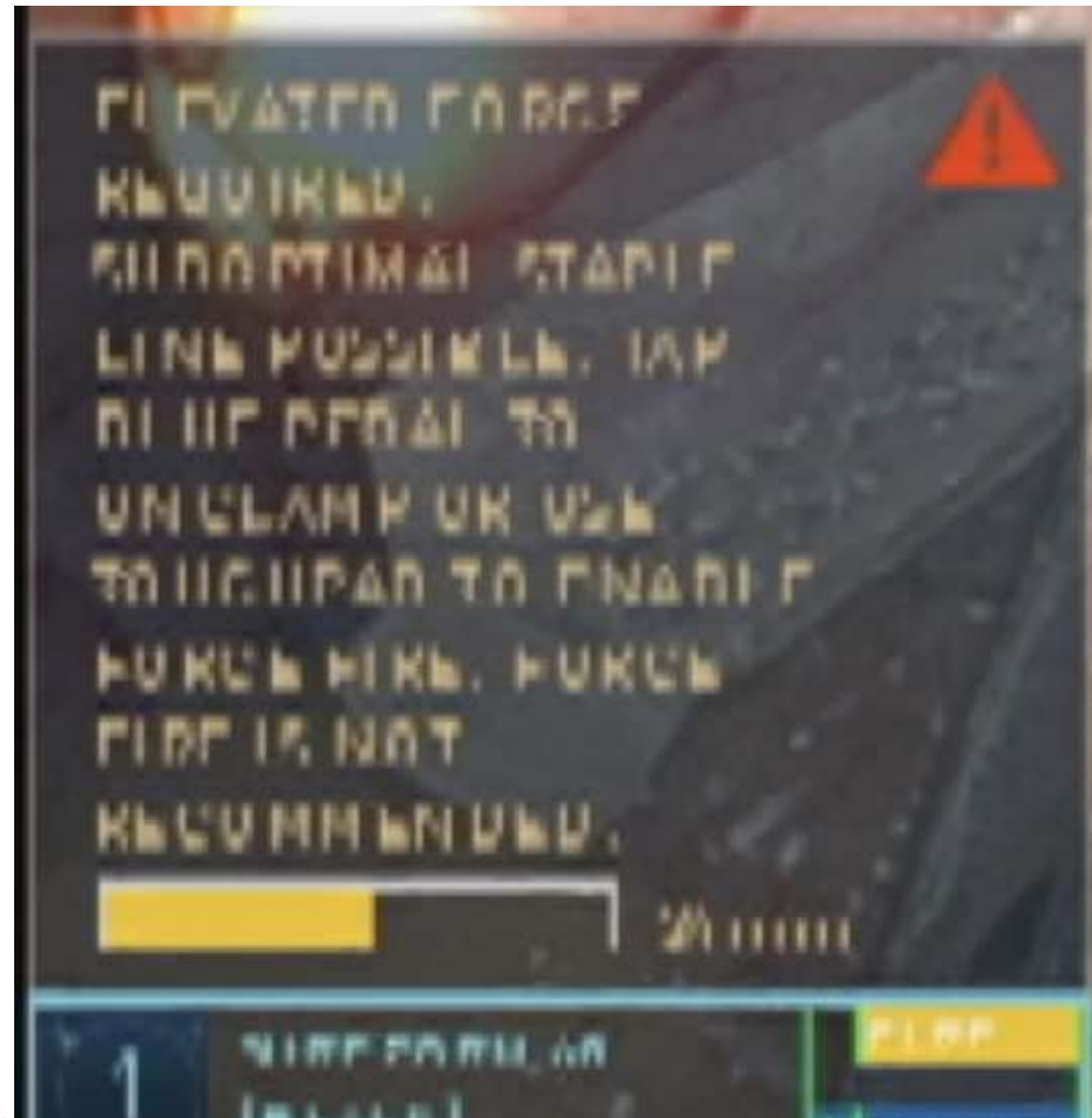
Use the tool to wind open the instrument jaws.



But Back to the Robotic Stapler

- “Force fire” was created for times when the stapler deems the tissue to be too thick for a current **BLACK LOAD** – there is a message on the console for how to activate force fire.
- The day may come when force fire is available on other load heights, but I’m not holding my breath...

“ELEVATED FORCE
REQUIRED.
SUBOPTIMAL STAPLE
LINE POSSIBLE. TAP
BLUE PEDAL TO
UNCLAMP OR USE
TOUCHPAD TO ENABLE
FORCE FIRE. FORCE
FIRE IS NOT
RECOMMENDED.”



Last Thoughts About the Robotic Stapler

- Too much tissue in the jaw (“bunching”) can be a problem for the stapler.
- This stapler extrudes more edema fluid than other laparoscopic staplers, so it will often not staple quite as far as the trainee may be used to.



It staples this far

It cuts this far





But sometimes it
extrudes this far!

Video Editing

Get trainees involved in video editing



Video Editing

Get trainees involved in video editing – it prepares them to submit videos to meetings



Video Editing

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Video Editing

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AND FINALLY



Letting them Loose on the Console

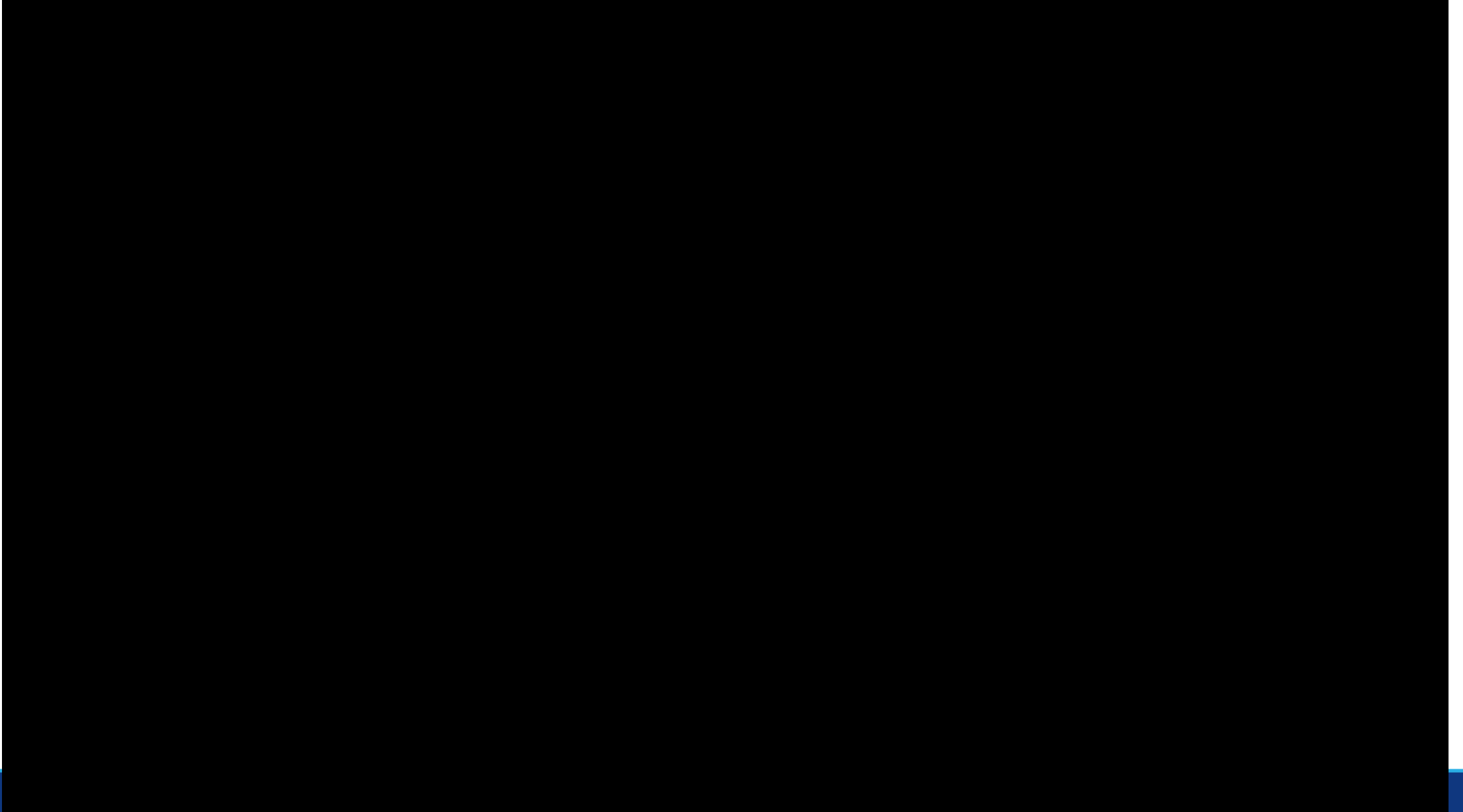
- Dual console
- Telestration
- Dual consoles with fellow teaching a resident and attending is on telestration

Teaching With a Dual Console

Stolen
from
Andre
Teixeira

Teaching With Telestration

Teaching More Advanced Trainees With Telestration



Bottom Line

I believe robotics actually gets trainees BETTER prepared for independent practice.



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Bottom Line

I believe robotics actually gets trainees BETTER prepared for independent practice. In laparoscopy you're helping them without knowing it. You make small moves that facilitate things. With robotics they have to do the moves themselves!



Thanks

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