

Exploration of Ways to Improve the Efficiency of Instrument Handling in the Operating Room During Microlaryngeal Surgery

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Background Information

- **What is microlaryngeal surgery**
 - A minimally invasive procedure used to biopsy or remove abnormal growths, such as granulomas or benign cysts, in the larynx
 - Usually performed to correct voice disorders or to diagnose or treat laryngeal cancer



Background Information

- **How is it performed?**
 - Patient is supine on operating room table
 - Surgeon sits at their head
 - Utilizes a laryngoscope that has a camera on it and large monitor to visualize the area of interest
 - Surgeons work ambidextrously
- **What are the known issues?**
 - Work postures
 - Limited workspace
 - High frequency of instrument passing
 - Sometimes over the patient



Project Purpose

- To observe the frequency of instrument passing between surgeon and surgical technician during a standard microlaryngeal surgery
- To evaluate the perceived efficiency and ergonomic challenges of instrument passing
- To develop a prototype to aid in the efficiency and ease of instrument use and passing

Study Design

- **Unstructured interview**
 - Discussed efficiency concerns and potential for efficiency improvements
- **Observation**
 - Recorded
 - Live
- **Cross-sectional survey**
 - Mixed methods survey instrument
 - Designed and distributed in REDCap

Study Population

- **Unstructured interview**
 - Surgeon at University of Cincinnati Medical Center (UCMC)
- **Observation**
 - At UCMC
 - 1 surgeon, 1 surgery technician, 1 laser technician
- **Cross-sectional survey**
 - Surgeons from various medical institutions
 - Surgical technicians from UCMC

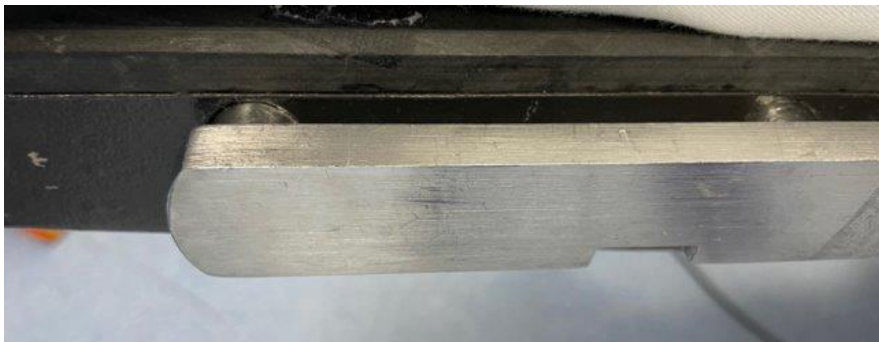
Methods

- **Operating Room Observation**
 - Tallied the number of times that the surgeon and surgical technician passed instrumentation back and forth
 - Counted separately for the left and right hand passing by the surgeon
 - Watched for other occurrences such as passing instruments/tubing over patient, tubing getting caught on equipment, etc.
 - Assessed current instrument trays
- **Brainstormed ideas for an effective prototype**
 - Narrowed down ideas until reaching a specific prototype that aids in efficiency and eases instrument passing

Methods



Instrument & equipment table



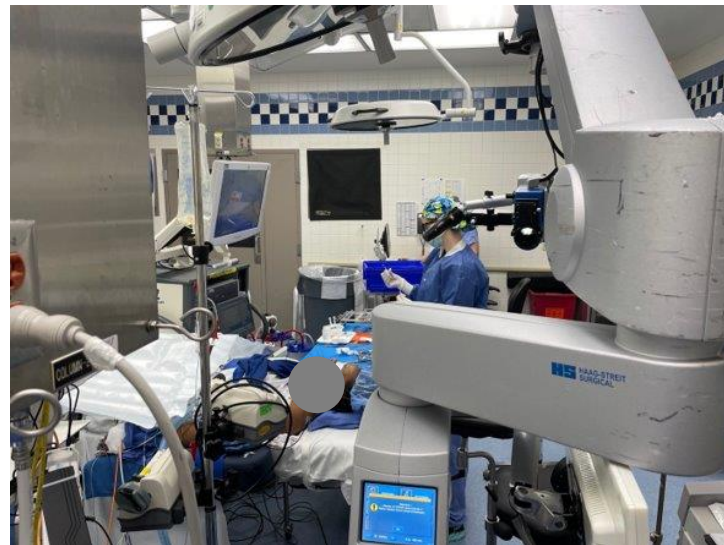
Strip of metal at head of patient allowing for a location to place clamp



View from patient's head (where the surgeon sits)



View from patient's feet



View from patient's left



View from patient's right

Operation Room Observation Results

INSTRUMENT PASSING COUNT

	Right Hand	Left Hand	Total Passes	Procedure Length	Passes/Minute
Surgery 1	54	24	78	35 min	2.23
Surgery 2	52	21	73	55 min	1.33
Surgery 3	85	22	107	38 min	2.82

Survey Results

Surgeon Demographics

36 Surgeons

26 males
10 females

Age

Males: 38.6 (8.3) years
Females: 35.1 (8.2) years

Resident: 15
Attending: 19
Fellow: 2

Handedness

Right: 32
Left: 4

Years Experience

<1 yr: 2
1-5 yrs: 14
6-10 yrs: 5
11-15 yrs: 4
16-20 yrs: 7
21-25 yrs: 2
26+ yrs: 2

Practice Location

UCMC: 15
Mayo: 5
Johns Hopkins: 3
Univ. of Chicago: 3
CCHMC: 2
VA: 2
Other: 10

of Microlaryngeal Surgeries/Month (prior to Covid-19)

0-5/mo: 12
6-10/mo: 7
11-15/mo: 6
16-20/mo: 7
21-25/mo: 4

Avg length of Microlaryngeal Surgeries

<30 min: 5
31-60 min: 4
61-90 min: 14
91-120 min: 3

Surgical Technician Demographics

10 Surgical Technicians

2 males
8 females

Age

Males: 27.0 (4.2) years
Females: 32.6 (7.6) years

Practice Location

UCMC: 10

Years Experience

<1 yr: 1
1-5 yrs: 5
6-10 yrs: 1
11-15 yrs: 3

of Microlaryngeal Surgery Asst/Month (prior to Covid-19)

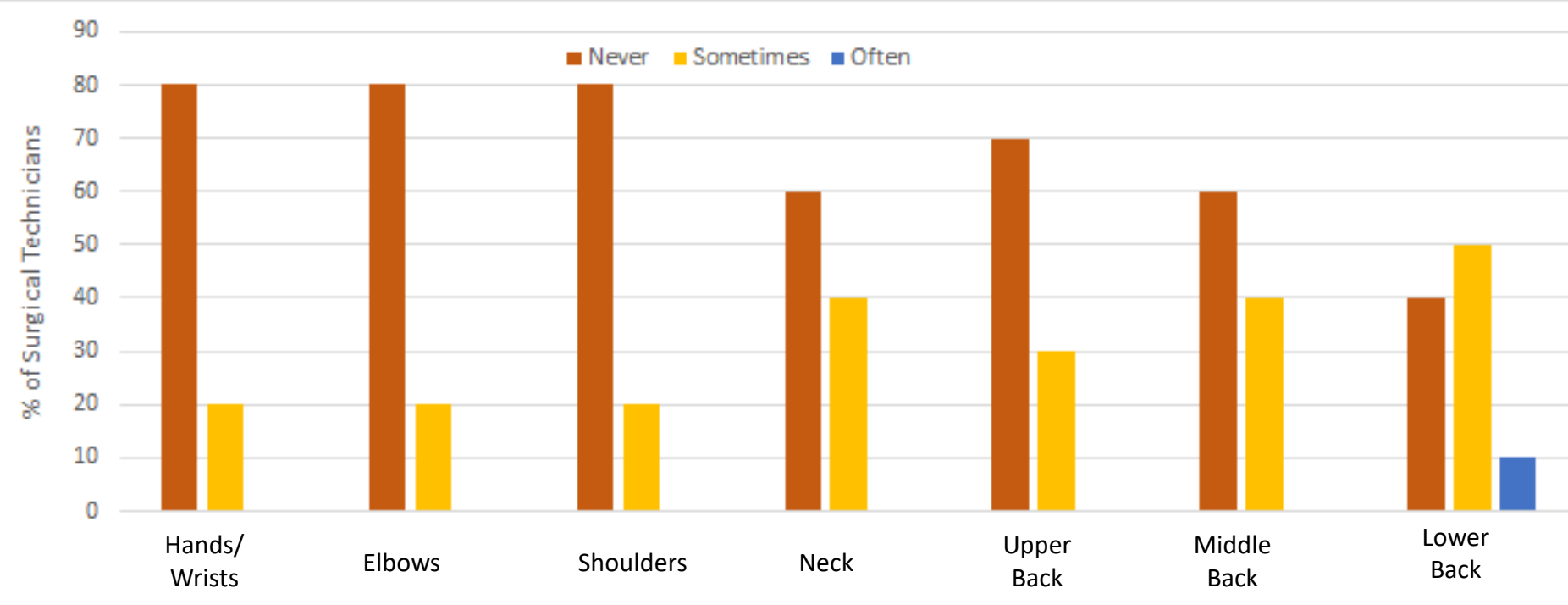
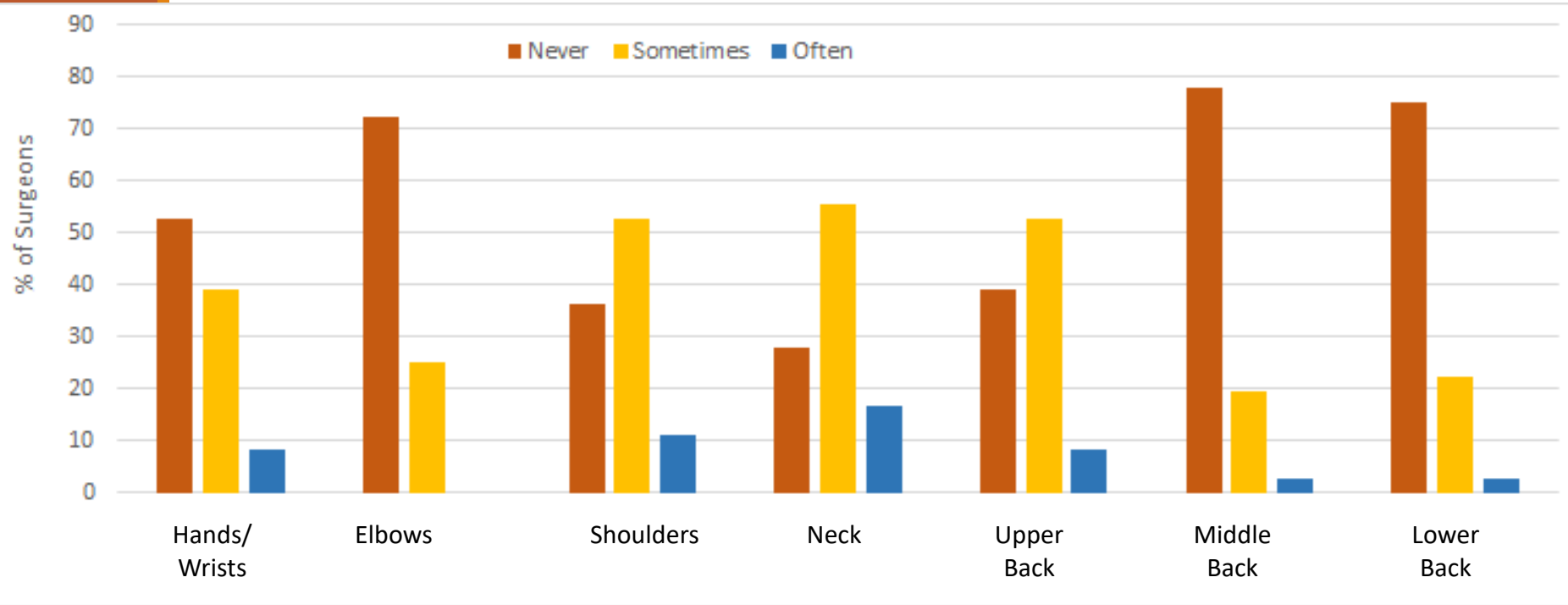
0-5/mo: 1
6-10/mo: 4
11-15/mo: 1
16-20/mo: 4

Handedness

Right: 10
Left: 0

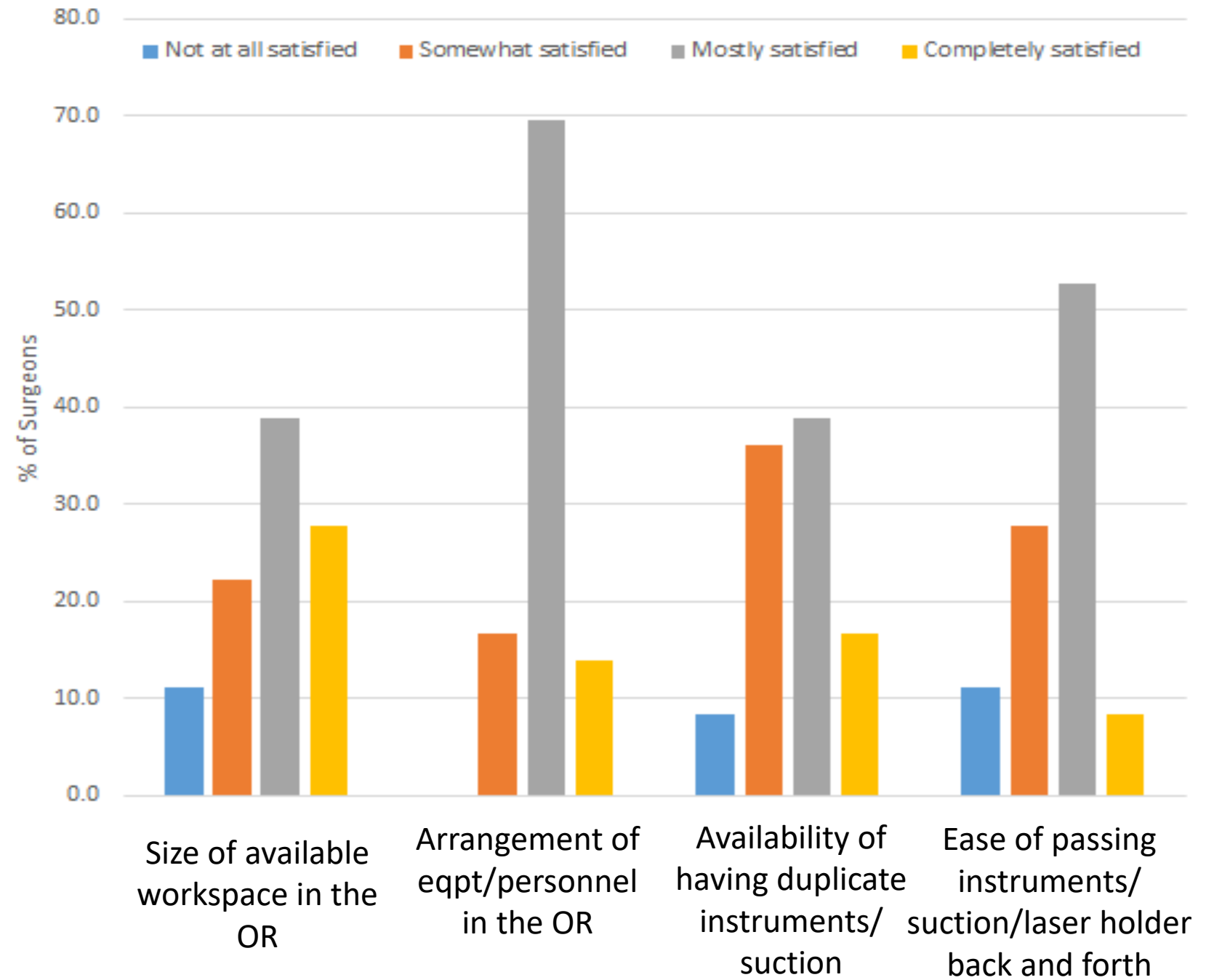
Survey Results

Pain & Discomfort



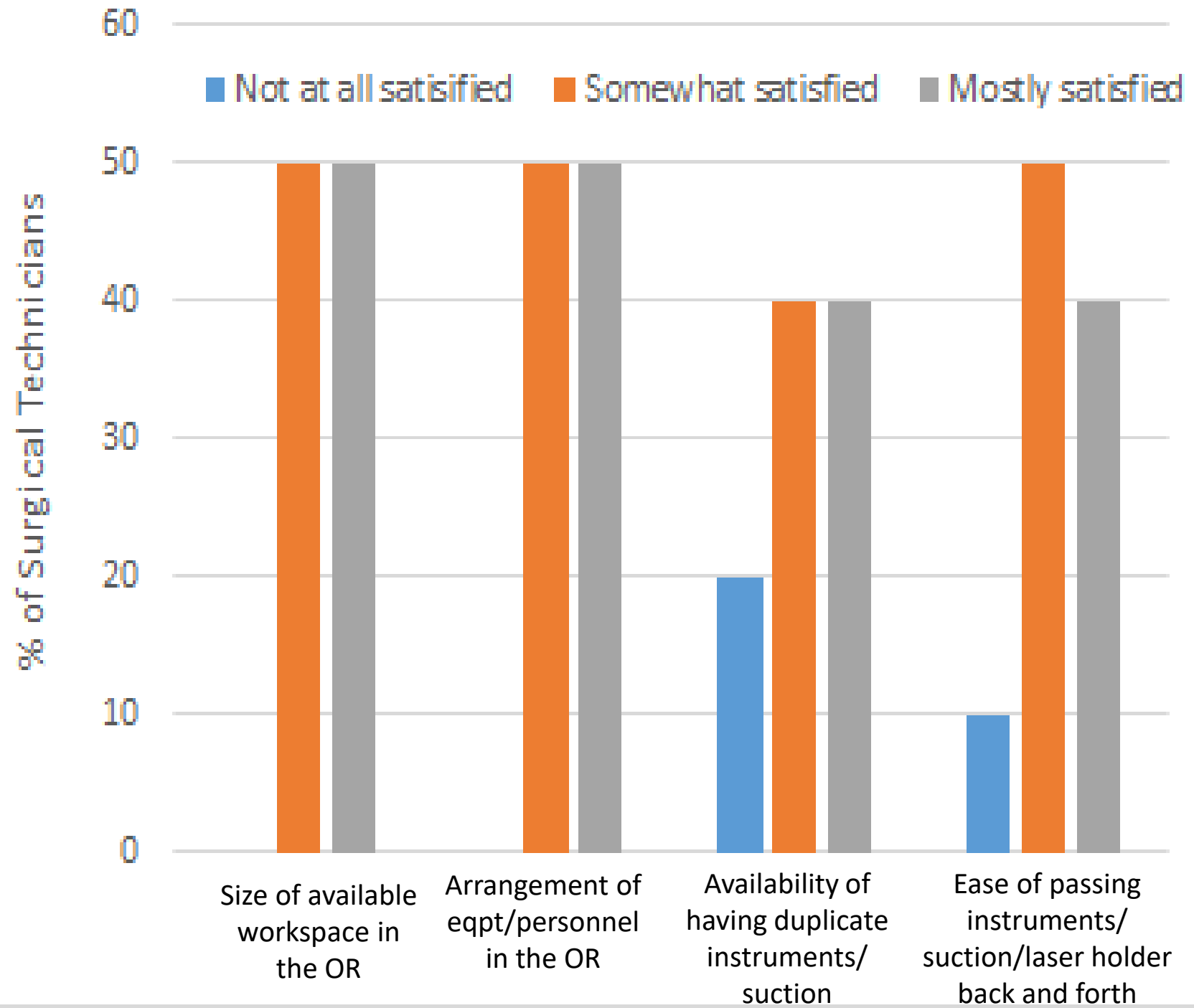
Survey Results

Level of Satisfaction: Surgeons



Survey Results

Level of Satisfaction: Surgical Technicians



How efficient do you think you currently think the instrument passing process is in the OR during microlaryngoscopy?

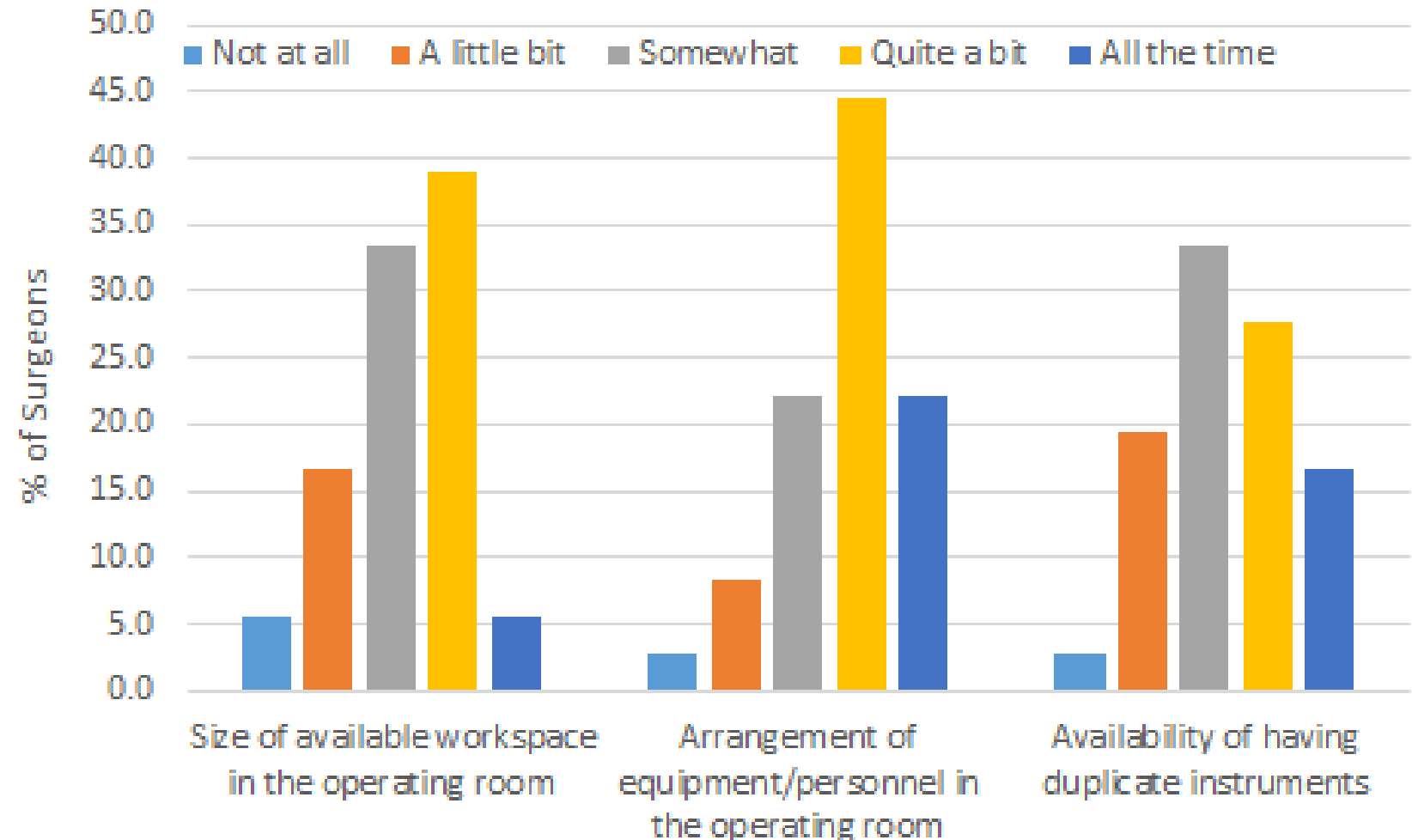
38.9% said "very inefficient" or "somewhat inefficient"

30.6% said "somewhat efficient"

30.6% said "efficient" or "very efficient"

Survey Results

Impact on Efficiency: Surgeons



How efficient do you think you currently think the instrument passing process is in the OR during microlaryngoscopy?

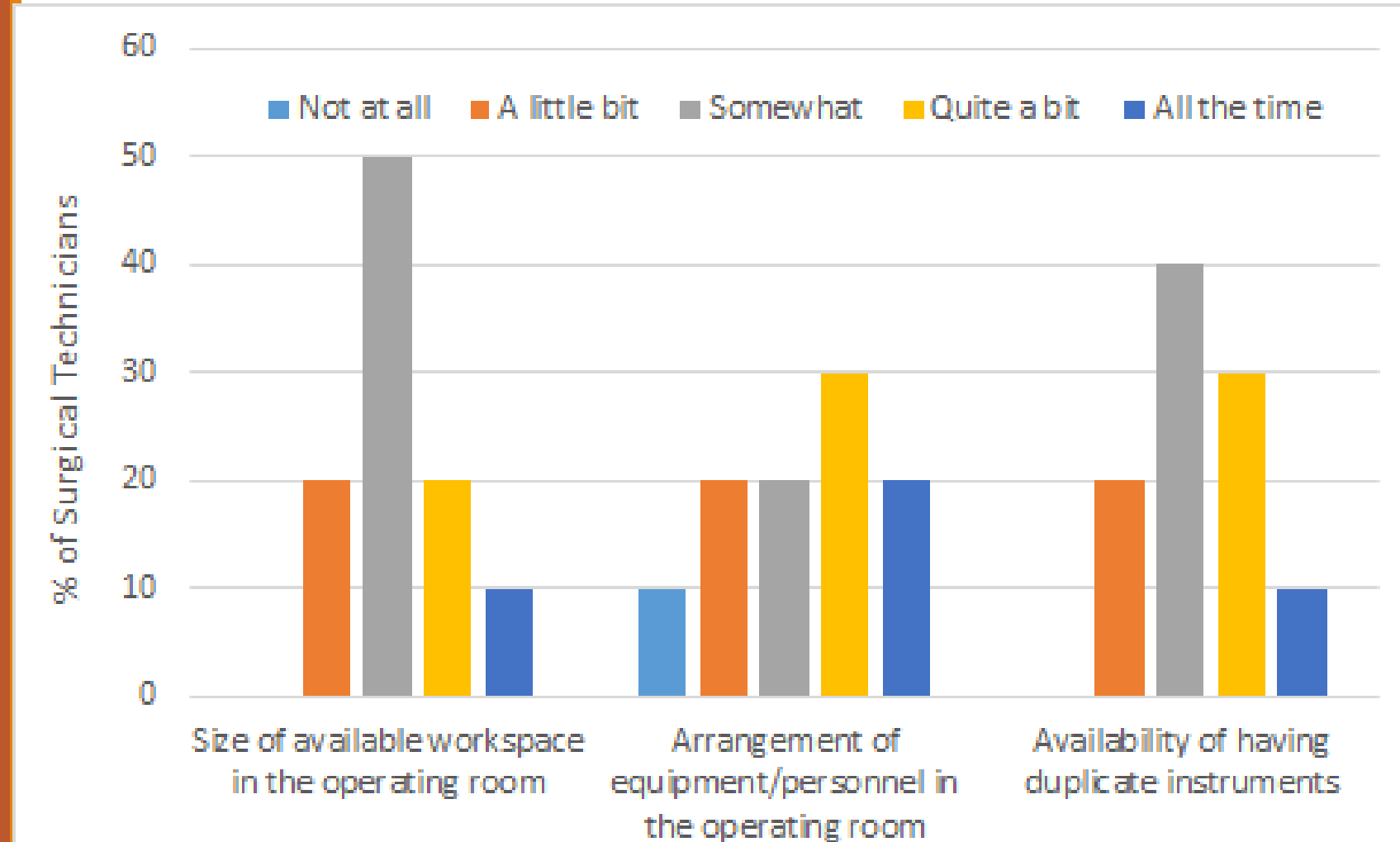
10% said "somewhat inefficient"

50% said "somewhat efficient"

40% said "efficient" or "very efficient"

Survey Results

Impact on
Efficiency:
Surgical
Technicians



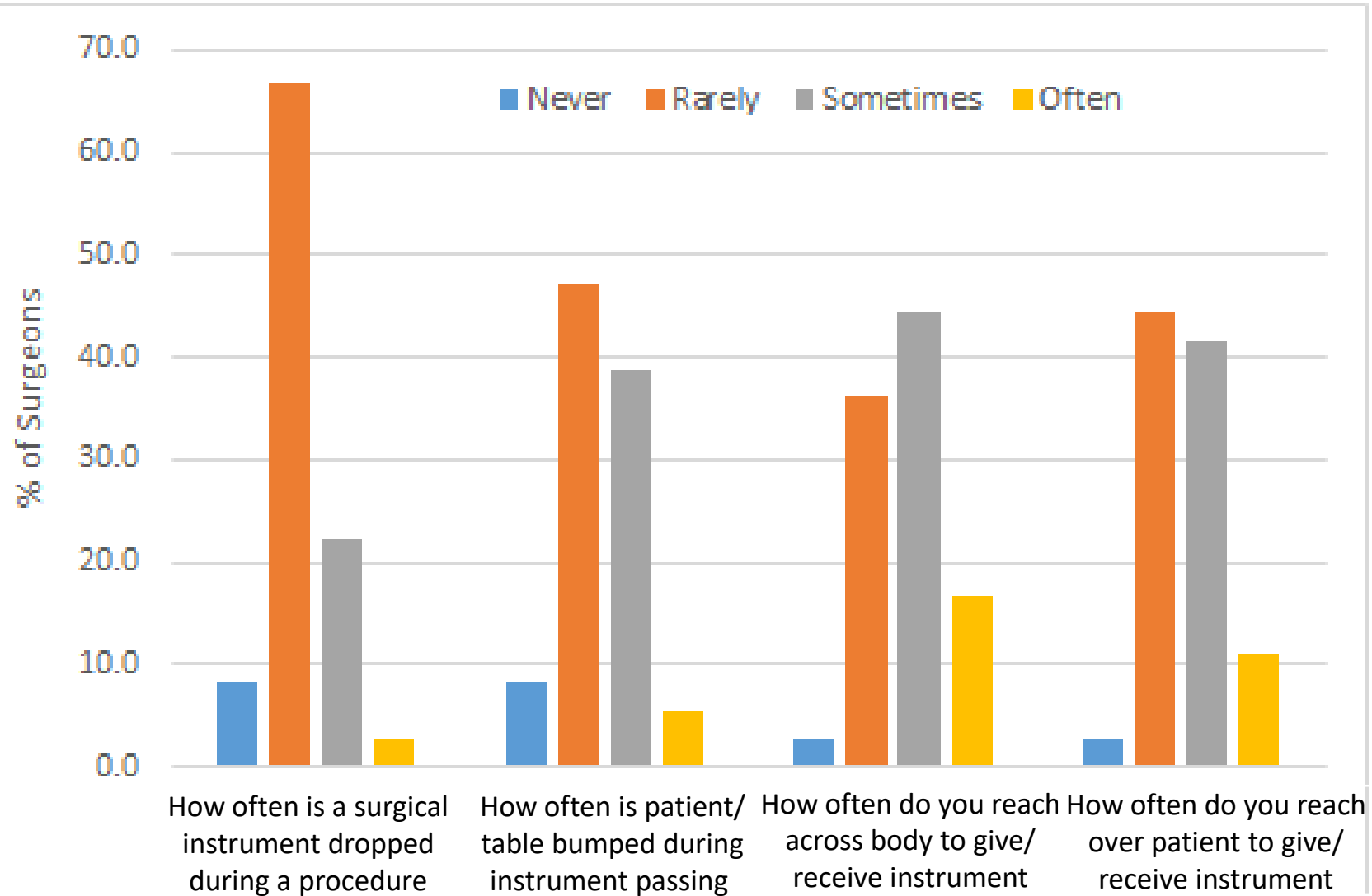
Survey Results

Impact on Performance: Surgeons

Does the suction tubing ever become caught or tangled as it is passed back and forth?

91.7% said YES

8.3% said NO

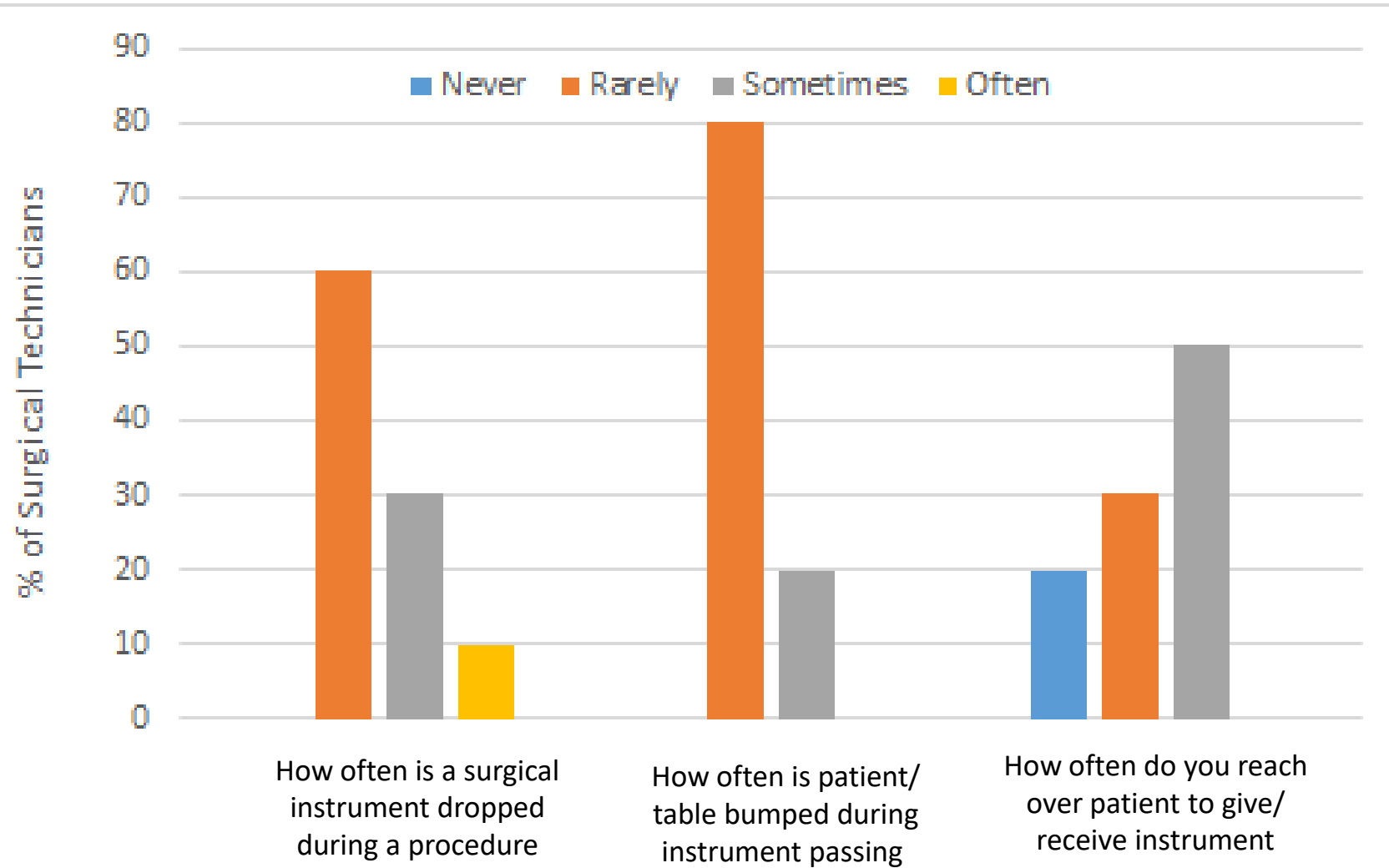


Survey Results

Impact on
Performance:
Surgical
Technicians

Does the suction tubing ever become caught or tangled as it is passed back and forth?

90% said YES
10% said NO



Prototype Development - Goal

To develop an auxiliary instrument tray to be situated on the opposite side of the patient as the surgical technician

- Hold 3-4 of most commonly used instruments
- Hold suction
- Hold laser

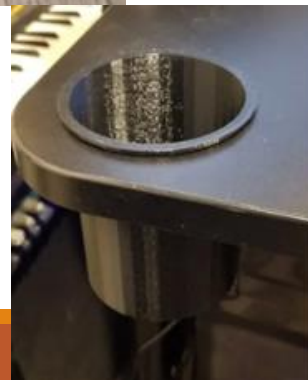
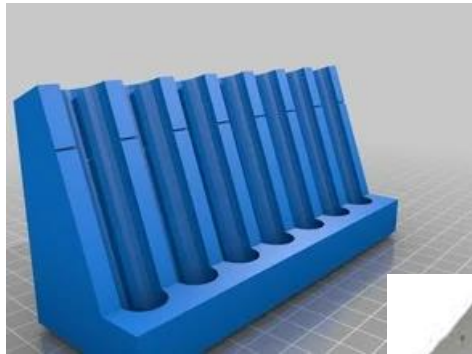
Must be able to:

- Be able to position it easily
- Securely hold instruments
- Put instruments in/take out with one hand
- Not damage instruments
- Be disposable or able to be cleaned in autoclave

Prototype Development - Approach

Brainstorming

- Any "off the shelf" items that would work?
- Similar concepts that could be scaled/modified
- Materials

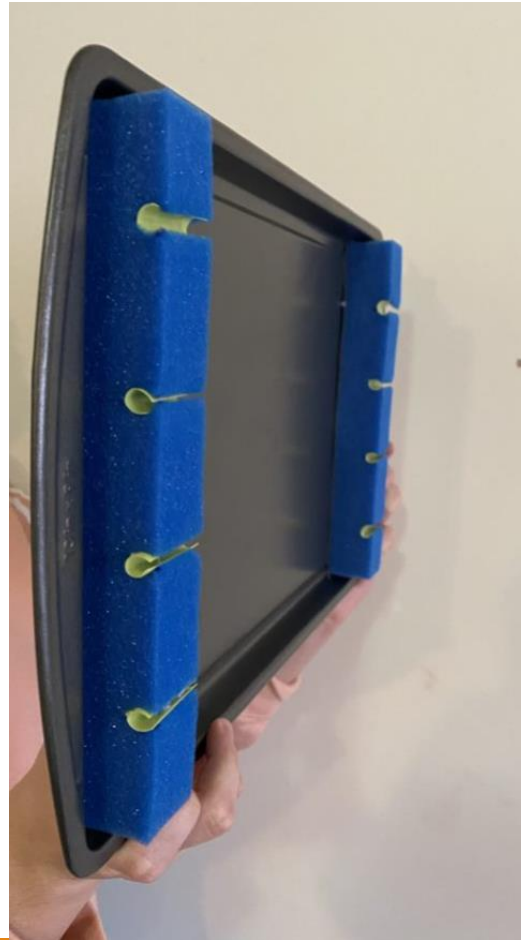
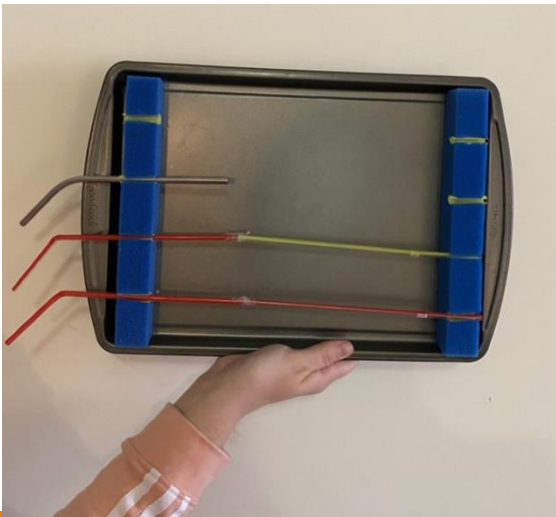


Roll over image to zoom in

Prototype Development – Mock-Up

Materials

- Metal baking tray
- Foam
- Straws
- Glue



Discussion

- **Several challenges exist instrument passing efficiency during microlaryngeal surgery**
 - Space/equipment/instrument/personnel
- **An auxiliary tray may help mediate some of these issues**
- **Study strengths**
 - Consulted with a microlaryngeal surgeon regularly
 - Multiple prong approach: interview, observation, surveys
- **Study Challenges**
 - Limited literature regarding efficiency for specialized procedure
 - Limited access to materials/equipment for prototype because of COVID-19 restrictions

Future Direction

- Advance prototype
 - More suitable materials, solidify design
- Take prototype into OR
 - Modifications
 - Test with actual instruments
- Apply feedback from surveys
 - Discussion of methods to resolve additional efficiency concerns