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# PATIENT OUTCOMES: PRO

- Patient outcomes comparable between robotic and laparoscopic inguinal and ventral hernia repair (1)
- Primary defect closure achieved with ventral hernia robotic surgery resulting in fewer reoccurrences (2)
- Improved outcomes when comparing open vs robotic component separation and abdominal wall reconstructions (3)
  - Decreased LOS by about 3 days
  - Decreased overall complications (blood loss, SSI)
  - Decreased readmissions

1: Pradhu et al, LeBlanc et al, Pokala et al, Waite et al. 2: Warren et al 3: Martin Del Campo et al, Bittner et al



# COST: PRO

## ■ Money

- Robotic cases tend to have higher upfront and direct costs
- Cost is comparable in some surgeries
  - Direct cost between R (3.4 K) and L (3.2 K) TAPP was not significantly different (1)
- Decreased cost of recurrences and longer LOS seen in primary defect closure and R- TAR
- Development of reusable instruments
- Price of technology tends to decrease over time

## ■ Time

- Most studies find robotic cases have longer operative times
- The operative time can dramatically decrease with surgeon experience
  - Operative time (~ 70 min) of R-TAPP and L-TEP became equal after a surgeon performed > 110 cases (2)

1. Waite et al. 2. Kudsi et al



# SURGEON USE: PRO

- Decreased errors regardless of level (1)
  - Both novice and experienced laparoscopic surgeons had decreased errors with peg transfer, pattern cutting, and intracorporeal suturing
- Shorter learning curve of lap vs robot (2)
  - Surgical trainees randomized to robotic vs laparoscopic 6 hr training session had better technical skills
  - Surgical trainees had improved time and decreased error of creating intracorporeal knots with robot vs laparoscopic
- Better Ergonomics (3)
  - In a systematic review showed improved objective ergonomic measures and decreased surgeon reported strain with robot
- Lack of haptic feedback not significant disadvantage (4)
  - Technology to add haptic feedback in development

1. Zihni et al. 2. Gall et al, Stafanidis et al. 3. Wee et al. 4 Van der Meijden,O et al.



# SUMMARY

- Large patient benefit of robot use with complex ventral hernia repairs
- Cost will likely decrease over time
- Operative time decreases with surgeon experience
- Easier use for surgeons
- **Technology will only improve and will eventually become gold standard**



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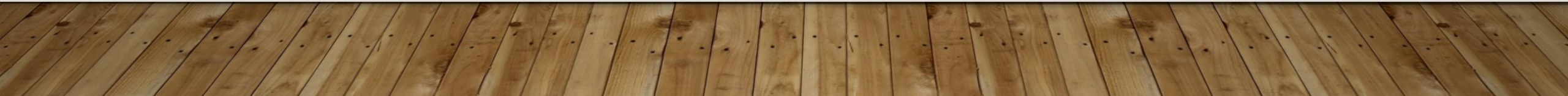


# ROBOTIC HERNIA REPAIR: GAME CHANGER OR EXPENSIVE GIMMICK

## CON ARGUMENT

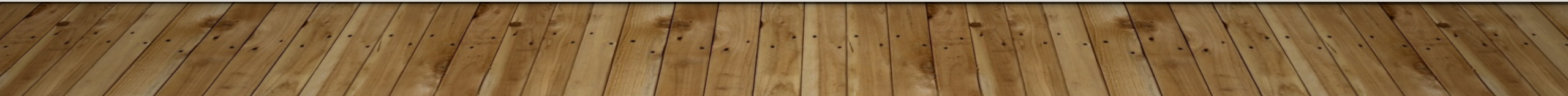
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# DISCLOSURES

- Currently training in robotic surgery as part of our residency curriculum
- Devil's Advocate - still considering Robotics as part of my future practice
- No conflicts of interest





# INTRODUCTION

- Robotic surgery has obvious benefits over open procedures
- Robotic surgery has not demonstrated the same advantages over laparoscopy for the majority of general surgery procedures
  - Exception: complex ventral hernia repairs
- Increased cost, without obvious benefit, limits the utility and advantages of robotic surgery compared to laparoscopy

# OUTCOMES – ROBOTIC VS LAP TAPP IHR

- No difference in
  - Length of stay<sup>1,4</sup>
  - Time for return to normal activities/work<sup>2,3,4</sup>
  - Overall complications<sup>4,8</sup>
  - Readmissions<sup>8</sup>
  - Quality of Life<sup>8</sup>
- Mixed results on postoperative pain<sup>1,2,3,8</sup>

# COST

- \$1-2 Million to purchase Robotic system
- 70% of systems are leased
  - Option to purchase/upgrade at end of lease
  
- Average robotic costs per procedure (2017) = \$3,568<sup>7</sup>
  - Instruments/accessories = \$1,866
  - Robots systems = \$1,038 (Sale/lease of platform)
  - Service contract = \$663 (Maintenance/training contract)
    - Based on SEC reporting for 2017 – Average of all robotic procedures performed
  
- Staff training, infrastructure upgrades, advertising add additional costs

# COST

- Unilateral Robotic vs Laparoscopic Inguinal Hernia Repair
  - Median total cost \$3258 vs \$1421 ( $p < 0.001$ )<sup>8</sup>
    - OR cost (OR time) \$1401 vs \$879 ( $p < 0.001$ )
    - Mean disposable/reusable cost \$1784 vs \$623 ( $p < 0.001$ )
    - Does not include capital expenditure costs
  - Another study demonstrated costs are similar with capital expenditures (cost of system) not included<sup>1</sup>

# OPERATIVE TIME

- Longer for Robotic vs Lap TAPP
  - Operative time
    - 77.5 vs 60.7 min, ( $p < 0.001$ )<sup>1</sup>
    - 83 vs 65 min, ( $p < 0.001$ )<sup>4</sup>
  - Room time
    - 109.3 vs 93 min, ( $p < 0.001$ )<sup>1</sup>

# TRAINING

- No consensus on minimum required surgeon experience for credentialing
- Need to learn on less complex cases to advance skills

# SURGEON FRUSTRATION<sup>8</sup>

## Unilateral Robotic vs Laparoscopic TAPP Inguinal Hernia Repair

- NASA Task Load Index Scale - Scores mental workload
  - Mental, physical, temporal task demands, effort frustration, perceived performance
  - Has been previously used to study surgeon workload in MIS
  
- Higher mean level of surgeon frustration
  - 32.7 vs 20.1 (p=0.004)
  
- Increased effort
  - 36.7 vs 27.4 (p=0.05)

# SURGEON ERGONOMICS<sup>8</sup>

## Unilateral Robotic vs Laparoscopic TAPP Inguinal Hernia Repair

- Rapid Upper Limb Assessment
  - Used to evaluate risk for work-related upper extremity injuries
  - Percent of use in MIS studies
- Similar Grand Composite Scores between robotic and lap ( $p=0.31$ ,  $p=.94$ )
- Worse mean scores for left upper limbs, arms, wrists for robotic ( $p=0.01$ )



# SUMMARY

- Robotic surgery has not demonstrated obvious advantages over laparoscopy for IHR
- Increased costs remain a disadvantage of robotic surgery
- Very few prospective studies overall
- Laparoscopy was heavily ridiculed early on, but outcomes improved with increased experience
  - Will this be the case for robotics if cost becomes more equivocal?

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