MIGS 26

55TH GLOBAL CONGRESS ON MIGS

BOSTON, MASSACHUSETTS
NOVEMBER 13-16, 2026

Syllabus

PG-26117

Surgical Ergonomics MasterClass

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SCIENTIFIC PROGRAM CHAIR
Nash S. Moawad, MD

PRESIDENT
Michael Hibner, MD, PhD



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PG-26117: Surgical Ergonomics MasterClass

Chair: Jacqueline M. Wong
Co-Chair: Sangeeta Senapati
Faculty: Kimberly Kho, Sangeeta Senapati, Jacqueline M. Wong, Riley Young

Course Description

MIGS is physically demanding. Thus, it is imperative that we take care of our bodies to ensure good health over the course of our careers. Ergonomics is the science of helping to create better work environments, simultaneously improving efficiency and productivity while preventing injuries and reducing discomfort. For this master class, join us as we discuss the importance of ergonomics in the OR, the office and in clinic. Learn practical ways to improve your movements posture, the importance of breaks as well as exercises to use while on the go. This course will cover topics including the ergonomic challenges of being pregnant in the OR, using instruments made for larger hands or those who are right-hand dominant, and how to return to work after an injury. We will explore new technologies such as artificial intelligence-based evaluations and exoskeletons to support good ergonomics. Lastly, this session will discuss how to be an advocate for ergonomics within your hospital system and how to ensure that training ensures that the next generation of gynecologic surgeons learn best movement practices. This course will teach pragmatic practices and movements that you can bring directly to the OR with you immediately after you leave Boston.

Learning Objectives: *At the end of this course, the participant will be able to:* 1) Identify risk factors for work-related musculoskeletal pain and describe both clinical and nonclinical implications of work-related pain; 2) Synthesize best practices to mitigate injury and disability; and 3) Identify each surgeon's role in preserving their own professional longevity as well as tools to advocate for system-wide improvements in ergonomics for the whole health care team.

Course Outline

2:00 pm	Welcome, Introduction and Course Overview	J. Wong
2:05 pm	Surgical Ergonomics for Ob-Gyns: What You Don't Know Can Hurt You	J. Wong
2:30 pm	Educating Our Peers, Trainees and Colleagues in Ergonomics: Tools to Make Change	S. Senapati
2:55 pm	Raising the Bar (and the OR Table): The Impact of Surgical Ergonomics on Our Careers as OB/GYNs	K. Kho
3:20 pm	Ergonomics Assessments and Ergonomics Coaching for Surgeons	R. Young
3:45 pm	Discussion Questions & Answers	All faculty
4:00 pm	Adjourn	

ADA Statement: In accordance with the Americans with Disabilities Act (ADA), please contact CMEsupport@aagl.org should you require any special assistance.

Disclosure of Relevant Financial Relationships

As an ACCME-accredited provider, AAGL is responsible for ensuring that accredited education is fair, balanced, free of commercial bias, and supports safe, effective patient care. AAGL maintains control over all aspects of educational planning, content, faculty selection, delivery, and evaluation.

All individuals in a position to control educational content are required to disclose financial relationships with ACCME-defined ineligible companies within the past 24 months. AAGL identifies and mitigates all relevant financial relationships before individuals assume their respective roles. Educational content is also subject to independent peer review by individuals without relevant financial relationships.

Disclosure information and acknowledgment of any commercial support are provided to learners before the activity to promote transparency and maintain the independence and integrity of the education.

Asterisk (*) denotes no financial relationships with ACCME-defined ineligible companies to disclose.

PLANNER DISCLOSURES

The following members of AAGL have been involved in the educational planning and/or review of this course (listed in alphabetical order by last name).

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Linda Bell, AAGL Admin Support*
Nancy Williams, COO, CME Consultants*

SCIENTIFIC PROGRAM COMMITTEE

Nash Moawad, MD, MS, Chairman – Consultant (ended 12/2024): Medtronic, Womed, Integra Life Sciences
Amani Harris, MD*
Ted Lee, MD – Advisory/Consultant: Johnson & Johnson, Regeneron Pharmaceuticals
Nucelio Lemos, MD, PhD – Speakers Bureau: Pfizer, Inc., Medtronic; Advisory Board: Knight Therapeutics, Vecfer Pharma
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Linda D. Bradley, MD, Medical Director*
Linda Michels, Executive Director, AAGL*

COURSE CHAIR DISCLOSURE

Jacqueline MK Wong, MD, MSCR – Contracted Research and Speakers Bureau: Stryker Sustainability Solutions

COURSE CO-CHAIR DISCLOSURE

Sangeeta Senapati, MD, MS – Ownership Interest: KLAAS

FACULTY DISCLOSURES

The following faculty have agreed to support their presentations and clinical recommendations with the best available evidence from the medical literature (in alphabetical order by last name).

Kimberly Kho, MD, MPH, MSc – Consultant: Channel MedSystems; Contracted Research: Hologic; Stock Ownership: Hera Biotech
Sangeeta Senapati, MD, MS – Ownership Interest: KLAAS
Jacqueline MK Wong, MD, MSCR – Contracted Research and Speakers Bureau: Stryker Sustainability Solutions
Riley Young, MD*

MITIGATION OF RELEVANT FINANCIAL RELATIONSHIPS

All relevant financial relationships have been mitigated.

Drs. Lee, Lemos, Mikhail, and Chaudhari's planning decisions, as part of the Scientific Program Committee (SPC), were peer reviewed by other planners on the SPC who had disclosed no financial relationships with ineligible companies, and found to be fair, balanced, and free of commercial bias. Dr. Moawad's financial relationships ended 12/2024, thus mitigating them. For most of his AAGL Professional Education Committee service, Dr. Mourad had no financial relationships to disclose. He recently disclosed a new relationship as a Proctor for Intuitive Surgical. Since then, he has not participated in activities involving control or influence over accredited educational content; therefore, no additional mitigation was necessary.

Drs. Wong and Senapati's roles as Course Chair and Co-Chair were limited primarily to course oversight and moderation, rather than development of educational content. Any planning decisions or content under their influence were subject to independent peer review by individuals without relevant financial relationships.

The presentation content for course faculty, Drs. Kho, Senapati, and Wong, has been peer reviewed and found to be fair, balanced, and free from commercial bias.

BUT WHAT IF I'M.... ERGONOMICS FOR SPECIAL POPULATIONS

JACKIE WONG MD MSCR
TODU GUAM FOUNDATION, *Guam*
ADJUNCT ASSOCIATE PROFESSOR
OREGON HEALTH & SCIENCE UNIVERSITY, *Portland, OR*

AAGL 2026

1

DISCLOSURES

STRYKER SUSTAINABILITY SOLUTIONS - RESEARCH GRANTS, CONSULTING FEES

2

OBJECTIVES - WHAT ABOUT MY:

- HEIGHT
- HAND SIZE
- DEXTERITY
- GRAVIDITY

3

HEIGHT

4

MAKE THE ROOM FIT YOU

Shorter surgeons
Steps / platforms
Stools



Taller surgeons
If standing on the floor → antifatigue mats



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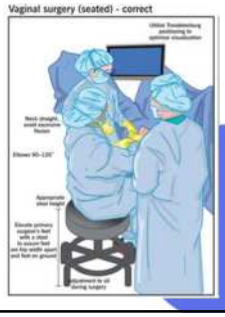
MAKE THE ROOM FIT EVERYONE

Both together?
Game plan!
Especially for trainees

Laparoscopy --
2 screens?
Get stools/steps nearby

Vaginal surgery --
Sit!
Switch sides

Robot --
Prep your console + pick your stool ahead of time



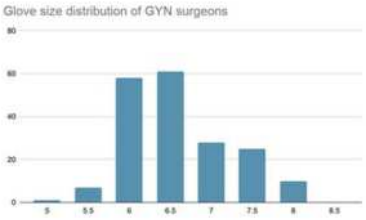
Yuteri-Kaplan et al. Obstet Gynecol. 2023.
Kelts et al. Allerg Rhinol. 2015.

6

HAND SIZE

7

HAND SIZE ≤ 6.5



Among GYN surgeons: 67% have glove size <7

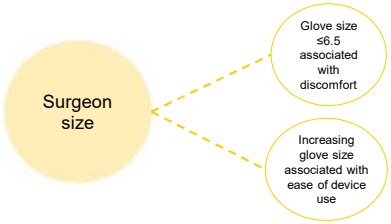
Among early attendings: 70% glove size <7

Among trainees: 75% glove size <7

Wolverton, Garg, Carey, Wong. Investigation of Hand Pain With Laparoscopy Among Gynecologic Surgeons, JMIG. 2026

8

Laparoscopic instrument ergonomics



Wong et al. *JMIG*. 2026
Wong et al. *JMIG*. 2022
Sutton et al. *Surg Endosc*. 2014
Adams et al. *Surg Endosc*. 2008
Berguer and Hreljac. *Surg Endosc*. 2004

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WHEN AT RISK, DECREASE OTHER RISK FACTORS

The Effect of Intraoperative Glove Choice on Carpal Tunnel Pressure

Edward W. Jernigan III[1] Brandon S. Smetana[1] Wayne A. Rummings[1] Hannah A. Dineen[1]
J. Megan M. Patterson[1] Reid W. Draeger[1]

J Hand Microsurg 2020;12:3–7

Table 1 Palm and cuff thickness (in mm) of each glove type used in the study

Glove type	Palm thickness (mm)	Cuff thickness (mm)
Blue	0.210	0.181
Micro	0.207	0.182
White	0.214	0.198
Ortho	0.289	0.247

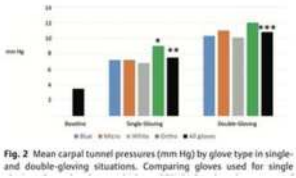


Fig. 2 Mean carpal tunnel pressures (mm Hg) by glove type in single- and double-gloving situations. Comparing gloves used for single

Jernigan et al. J Hand Microsurg. 2020.

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WHEN AT RISK, THINK ABOUT INSTRUMENT OPTIONS

Ratcheting or self-locking instruments





11

WHEN AT RISK, THINK ABOUT INSTRUMENT OPTIONS

Use rotational handles = Avoid extremes of positioning





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WHEN AT RISK, THINK ABOUT INSTRUMENT OPTIONS

Table 3

Normalized grip strength with device use based on surgeon characteristics

Device type	All participants (N = 38)	Surgeon sex			Surgeon glove size		
		Female (n = 19)	Male (n = 19)	p-value	Small (size <7) (n = 15)	Large (size ≥7) (n = 23)	p-value
All devices, mean (SD)	81 (10)	79 (11)	83 (8)	.08	77 (11)	83 (8)	<.01
LigaSure, mean (SD)	78 (8)	76 (7)	81 (8)	.04	75 (7)	81 (8)	.02
ENSEAL, mean (SD)	80 (11)	80 (14)	81 (7)	.74	79 (15)	82 (7)	.39
HALO PKS, mean (SD)	84 (10)	83 (12)	86 (8)	.32	79 (10)	88 (9)	<.01

SD = standard deviation.

Wong et al. JMIG. 2022.

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WHEN AT RISK, THINK ABOUT INSTRUMENT OPTIONS

Comparison of Industry-Leading Energy Devices for Use in Gynecologic Laparoscopy: Articulating ENSEAL versus LigaSure Energy Devices

Journal of Minimally Invasive Gynecology • ISSN: 15534650 • Volume: 25 • Issue: 3 • Pages: 467 - 473.e1
Article • 2018 • EID: 2-s2.0-85035019670 • DOI: 10.1016/j.jmig.2017.10.006

Shiber L.-D.J. + 5 authors

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WHEN AT RISK, THINK ABOUT INSTRUMENT OPTIONS





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JMIG

Evidence-Based Guidelines for Instrument and Handle Selection for Ergonomic Optimization in Laparoscopic Surgery

The Practice Guideline Committee of AAGL
Olga Bougie MD [1], Innie Chen MD [2], Mariah Colussi MD [3], Lia Gagliuso MD [4], Hye-Chun Hur MD [5], Kimberly A Kho MD [6], Aarti Kumar MD [7], Kari Plewniak MD [8], Stacey Scheib MD [9], Susan Tsai MD [10], Karen Wang MD [11], Jacqueline MK Wong MD [12], Linda Yang MD [13]

Certain design features, such as handles that permit a **power grip**, **energy control buttons within close reach** of the fingers, and **handles designed to accommodate variations** in hand size and grip mechanics, may offer ergonomic advantages to some users.

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LEFT HANDEDNESS

17

17

PORT PLACEMENT

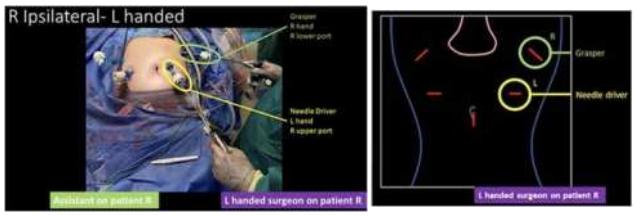
Laparoscopic Suturing from Any Port Configuration: Techniques for Both the Right- and Left-Handed Surgeon

A.B. McClurg [1], Y Qu [2], M Louie [3]

McClurg, Qu, Louie. AAGL. 2022.

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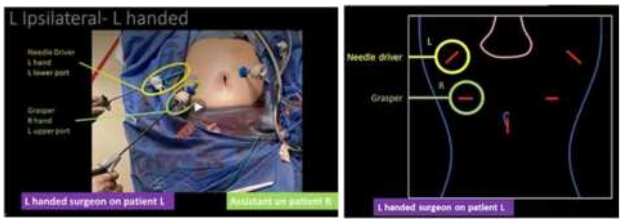
PORT PLACEMENT



McClurg, Qu, Louie. AAGL. 2022.

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PORT PLACEMENT

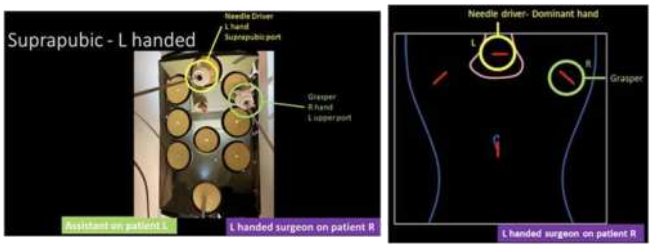


Complex ipsilateral L-handed suturing?
Think 5-port configuration!

McClurg, Qu, Louie. AAGL. 2022.

20

PORT PLACEMENT

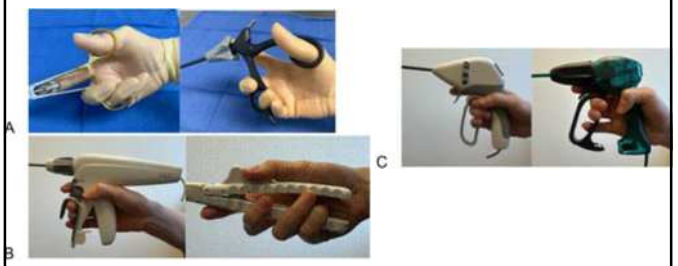


Suprapubic L-handed suturing?
Stand on patient R only!

McClurg, Qu, Louie. AAGL. 2022.

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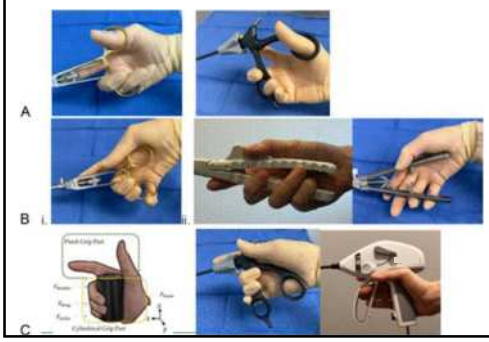
INSTRUMENT SELECTION



AAGL Practice Guidelines 2026.

22

INSTRUMENT SELECTION



AAGL Practice Guidelines 2026.

23

INSTRUMENT SELECTION



McClurg, Qu, Louie. AAGL. 2022.

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PREGNANT SURGEONS

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Pregnancy is associated with MSK discomfort in surgeons

Table 2: Intraoperative musculoskeletal (MSK) discomfort during each pregnancy stage (N = 140)

	Predicted mean MSK discomfort mean (95% CI)	P value
Pre-Pregnancy (N = 140)	2.40 (2.07, 2.73)	ref
1st Trimester (N = 137)	2.69 (2.36, 3.02)	0.08
2nd Trimester (N = 135)	4.07 (3.74, 4.40)	<0.001
3rd Trimester (N = 114)	6.12 (5.78, 6.47)	<0.001
Postpartum (N = 98)	3.36 (3.00, 3.73)	<0.001

Data is mean (95% Confidence Interval). Linear mean predictions and statistical significance determined using linear mixed effects model.

Qiao, Olig, Hess, Burns, Wong. Manuscript in progress.

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No route of surgery is superior

Surgical modality	N (%)	Musculoskeletal Discomfort Mean (SD)[a]
Open other area	11 (7.9)	5.17 (1.63)
Endoscopy	9 (6.4)	5.09 (2.00)
Vaginal surgery	31 (22.1)	4.68 (1.37)
Open abdominal	77 (55.0)	4.59 (1.60)
Robotic	21 (15.0)	4.59 (1.35)
Laparoscopy	71 (50.7)	4.45 (1.40)
Microsurgery	6 (4.3)	4.39 (1.04)
None	11 (7.9)	1.64 (1.28)

Qiao, Olig, Hess, Burns, Wong. Manuscript in progress.

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Some equipment is more uncomfortable

Intraoperative musculoskeletal (MSK) discomfort with surgical equipment usage (N = 140)

Surgical equipment used	N (%)	MSK discomfort (Mean/SD)[a]
Respirator (N95 or PAPR)	15 (10.7)	5.17 (1.62)
Surgical Helmet	3 (2.1)	4.50 (0.24)
Headlamp	26 (18.6)	4.49 (1.57)
Lead apron / Thyroid shield	36 (25.7)	4.46 (1.71)
Loupes	23 (16.4)	4.05 (1.76)
Microscope	20 (14.3)	3.30 (1.82)
Other	2 (1.4)	3.67 (0.0)
None of the above	75 (53.6)	4.21 (1.56)

Qiao, Olig, Hess, Burns, Wong. Manuscript in progress.

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Exercise helps!

A **decrease in musculoskeletal discomfort** was noted for surgeons who **exercised** versus who did not exercise!

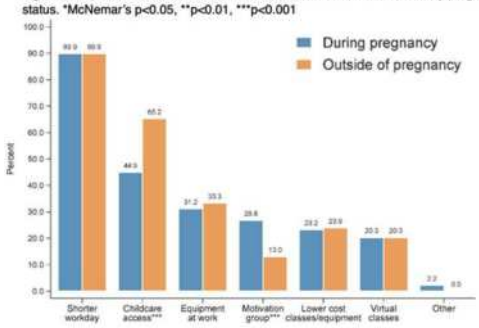
Days per week of exercise	Frequency (N, %)	Predicted average MSK discomfort (95% CI)	Average difference in MSK discomfort (95% CI)	p-value
During pregnancy[1]				
0	38 (27.5)	4.33 (3.85, 4.82)	ref	ref
1-2	40 (29.0)	3.53 (3.05, 4.00)	-0.81 (-1.49, -0.13)	0.02
3-4	44 (31.9)	3.30 (2.85, 3.75)	-1.03 (-1.69, -0.37)	0.002
5-7	16 (11.6)	3.30 (2.56, 4.05)	-1.03 (-1.92, -0.14)	0.02

Olig, Qiao, Hess, Burns, Wong. Manuscript in progress.

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29

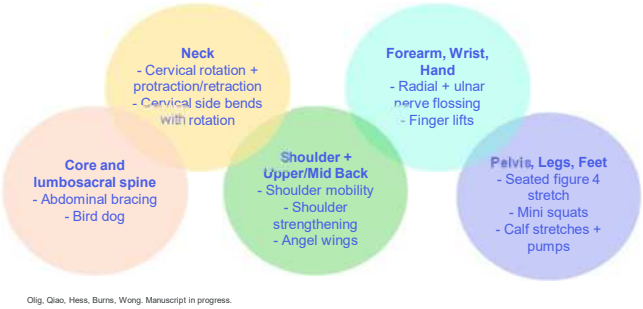
Figure 3. Reported interventions that would decrease barriers to exercise by pregnancy status. *McNemar's p<0.05, **p<0.01, ***p<0.001



Olig, Qiao, Hess, Burns, Wong. Manuscript in progress.

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Exercise helps!



Olig, Qiao, Hess, Burns, Wong. Manuscript in progress.

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Thank you!

Jackie Wong
Jacquelinemkwong@gmail.com



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1

Disclosure

- KLAAS – ownership interest
- I am not a physical therapist or an ergonomist

2

Objectives

- *Summarize pre, intra, and post-operative practices to reduce the risk of work-related injury.*
- *Describe ways to integrate these suggested interventions into your practice*

3

We expect perfection from ourselves; and yet our ability to see the long game regarding our capability to function perfectly is flawed.

Hamilton B World J Surg (2021) 45:3304–3305

4

A surgeon's journey

- Trained to pay attention to what is in front of us
  - Every minor detail
  - Sometimes to the surroundings around us – situational awareness
  - Usually not until the end of a case do we realize the tension in our neck and back, the numbness in our fingers
- Repetitive movements, the weight, the contorting angles, holding a position for an extended period of time (static posture)
  - Eventually takes a toll

5

Who benefits from attention to ergonomics?

- Surgeon
  - Decreased pain and discomfort
  - Fewer mistakes
- Patients
  - More efficiency
  - Surgeons have more longevity to their career
- Hospitals
  - Surgeons able to maximize productivity and volume

6

In the OR

- Joint positioning – joint flexion/extension of less than half of the available movement of the joint
  - No locked knees!
- Avoid static posture
  - Every 30-45min take 30-60sec break
  - Shoulder or neck rolls
  - Back stretch/bend

7

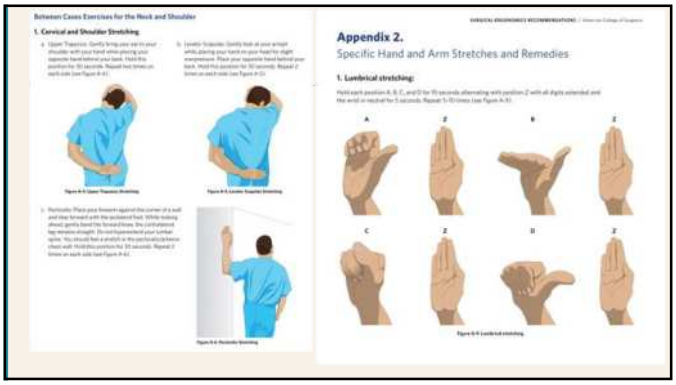
Pre Procedural Ergonomic Time Out

- Structured checklist (done at a similar times as other safety timeouts such as the WHO surgery time out)
  - Verify monitor heights
  - Table height
  - Arm tucking
  - Room setup
  - Anti-fatigue mat/step stools
  - Console adjustments with the robot
- Designate an ergonomics buddy

8



9



10

OR Stretch

- video

11

Microbreaks

- Microbreaks are short breaks involving stretching or movement
  - Reduce musculoskeletal discomfort and fatigue
- May be beneficial intraoperatively
  - Englemann et al 2010 - peds laparoscopists
  - Reduced stress hormone levels
- Park et al 2017 - variety of surgical specialties
  - Reduced pain and fatigue in multiple body regions (open and MIS)
  - Majority perceived performance improvement
- Hallbeck et al 2017 - variety of surgical specialties
  - 57% improved physical performance
  - 87% wanted to incorporate into practice
  - Did not increase surgical duration

Coleman Wood et al., 2018, Park et al., 2017
Englemann et al 2010, Hallbeck et al 2017

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Impact of Intraoperative Microbreaks on Surgeon Pain, Physiologic Stress, Perceived Workload, and Mechanical Pain Sensitivity in Laparoscopic Surgery*

1	**Primary objective:** Determine the perceived impact of microbreaks on the physical pain and ergonomic workload of gynecologic surgeons.	No statistical significance
2	**Secondary objective:** Determine the physiologic impact of microbreaks on the physical pain and ergonomic workload of gynecologic surgeons.	Smaller heart rate increase with microbreaks. PPT trends towards decreased sensitivity.
3	**Tertiary objective:** Determine the feasibility of implementing microbreaks into routine practice.	In process

Unpublished data*
AAGL 2026 -Dai

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CORE

- Comprehensive Operating Room E



14

Core components

- Live coaching
  - Team observes surgeons in the OR and advises on proper body positioning, posture, and equipment placement
- Ergonomic Gear & Modifications
  - Recommends anti-fatigue mats, step stools, supportive shoes, specialized footwear, and external equipment adaptations
- Pre-Procedure Ergonomic Timeout
  - A structured check performed alongside standard safety checklists to verify monitor heights, table levels, arm tucking, and room setup.
- Micro-Breaks
  - Built-in physical breaks every 30 to 60 minutes during lengthy procedures to release static muscle tension
- Everyday Life Ergonomics
  - Extends ergonomic principles and training outside the OR to build physical durability and prevent cumulative strain

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Key Themes

- **Postural Alignment:** Maintaining neutral joints and avoiding prolonged forward bending or twisting.
- **Pain and Discomfort Areas:** Addressing high-risk strain zones like the lower back, neck, shoulders, and wrists.
- **OR Environment Setup:** Optimizing operating table heights (elbow level for open surgery; lower for laparoscopy), monitor placement (eye level), and lighting.
- **Surgical Ergonomics Training:** Educating faculty and trainees through targeted instruction and real-time feedback.
- **Everyday Life Ergonomics:** Translating healthy movement habits and conditioning into daily routines.

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Post op - RECOVERY



17

Short Yoga Routine

- 10 min of stretch
  - Focus on back, neck ,shoulders,
  - If standing – leg stretches
- Sun salutation
  - Full body stretch
  - Strengthens core, shoulders, back



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Recovery

- Pilates reformer classes
  - Sometimes discouraged
  - People overuse their traps and lower backs when trying to do spring loaded exercises for upper body and lower body.
- Cardio
  - Generally encouraged – endorphin release

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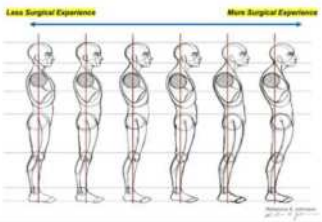
Surgilates

- Dr. Pamela Hess
- Core strength, flexibility, balance, posture
- Mind and body conditioning
- Focus on areas prone to strain
  - Neck, back, shoulders

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Avoid "Surgeon Swayback"

Evolution of the Surgeon Swayback Posture Based on Years of Experience



Hess et al, Am J of Occup Therapy 2024

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Acknowledgments

- Kim Kho, MD
- Riley Young, MD
- Jacqueline Wong, MD

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References

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23

Suffering Is Not a Credential:
Ergonomics, Culture, and Career Longevity in Obstetrics & Gynecology

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1

Disclosures

- PI – RAFA Trial: Radiofrequency Ablation for Adenomyosis, Hologic, Inc.
- Investor – HERA Biotech
- Consultant – Channel MedSystems
- Chair, AAGL Surgical Ergonomics Task Force

- I'm a high-volume surgeon who has experienced back pain

2

Patient #1: Meet KAK

- 44-year-old P2, 10-year history of intermittent lower back pain
- Dull/achy LBP, worse with prolonged OR standing; improves with rest, massage, yoga
- December: constant LBP unimproved with NSAIDs, radiating to L buttock (piriformis distribution)
- Obtained steroid injection → complete resolution; able to enjoy 20,000-step/day Disneyland vacation
- February : After LSC Stage IV endometriosis resection — awakened from sleep with acute sharp LBP radiating down L leg, 9/10 pain

3



MRI demonstrating a large L4-L5 disc herniation(arrow) resulting in significant narrowing of the spinal canal and pressure on the L5 nerve

4

Learning Objectives

- Analyze the role of surgical culture in perpetuating underreporting and undertreatment of occupational injury
- Explain the relationship between physical ergonomic strain, cognitive performance, and clinical outcomes
- Discuss we can effectively implement culture change for improved ergonomics

5

Pain in Gynecologic Surgeons — Key Findings

95.7%
responded YES to ever experiencing discomfort or pain during/after surgery

62.5%
are concerned about their ability to operate in the future

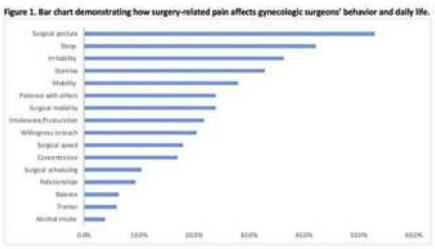
- Average pain over last 30 days after OR day: 3.3/10 (SD=1.8)
- No significant difference in pain score by specialty
- Risk factors for severe pain:
  - female (p=0.018)
  - glove size <7 (p=0.025)
  - height <5'5" (OR=2.4, 95% CI [1.1, 5.4])

Young, Kho. JMIG 2025

6

Clinical Implications of Work-Related Pain

- Changing surgical modality (23.9%)
- Adjusting surgical schedule (10.4%)
- Negative effect on surgical speed (18%) and concentration (17%)
- Negatively impacted willingness to teach trainees (20.4%)



Young, Kho. JMIG 2025

7

An Insidious Process

Stage 1	Stage 2	Stage 3	Stage 4
Starts during work hours Resolves with rest	Repetitive use and sustained injury	Persists at rest lasting longer periods	Transitions: days → months → years

Physical and psychological strain on surgeons follows a predictable trajectory — yet is rarely acted upon early enough to prevent career impact.

We must change this trajectory.

Epstein S et al. JAMA Surg 2018

8

Surgeon = High Performance Athlete

- Years of education
- Rigorous training
- Mentally demanding profession
- Complete focus on patient well-being

*** Physical strain of surgeon forgotten ***

9

Culture, Strength, and Silent Suffering

- Culture of self-sacrifice and being 'strong'
  - The result: **only 19% of surgeons reported injuries to their institutions**
- **Over 50% of surgical residents feel surgical culture dissuades asking for intraoperative adjustments**
- 22% of injured surgeons missed work
- 35% performed fewer surgeries due to injury
- 12% of surgeons required a leave of absence, practice modification, or early retirement



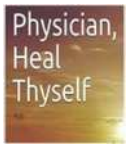
Stucky CH, Ann Med Surg 2018 | Davis WT, J Surg Res 2014

10

Suffering in Silence Could Be Catastrophic

AAMC Projections 2019–2034

- Projected shortage of 16–30K surgeons by 2034
- 40% of physicians nearing retirement age (>65 yo) within the next decade
- 40% of physicians reported burnout even prior to COVID-19 pandemic
- At-risk physicians comprise 20% of the active physician workforce



11

Beyond the Body: Cognitive Ergonomics in the OR

The mental workload of surgery is real — and often invisible

12

What is Cognitive Ergonomics?

Cognitive ergonomics examines how mental workload, attention, memory, and decision-making interact with the work environment — and how poor fit leads to error and fatigue.

Mental Workload	Situational Awareness	Decision Fatigue
• The total cognitive demand placed on the surgeon at any given moment • High workload narrows attention and reduces ability to detect errors • Exceeding capacity leads to cognitive overload and performance decrements	• Perception of operative field, patient status, team state, and time • Degraded by fatigue, distractions, and unfamiliar environments • Loss of awareness precedes most surgical adverse events	• Quality of decisions deteriorates after a long series of choices • Affects intraoperative judgment and postoperative orders • Compounded by on-call obstetrics and gyn and back-to-back complex cases

Wickens et al. Hum Factors 2021 | Healey et al. Surg Endosc 2006

13

Cognitive Load and Dual-Task Interference

Dual-task interference:
- Performing two concurrent cognitive tasks degrades performance of both tasks
  - *Surgeons routinely manage simultaneous demands: operative technique, team communication, patient monitoring, and teaching.*
- Technical **errors increase 3-fold** during high-cognitive-demand events

OR-specific cognitive burdens:
- Intraoperative teaching requires significant attentional resources
- EHR documentation, phone calls, and paging during cases

Volume of disruption:
- Distractions occur on average every 2 minutes during surgery
- OR noise levels regularly exceed safe occupational thresholds (85 dB)
- Communication breakdowns account for ~43% of preventable adverse event

Physical ergonomic strain amplifies cognitive load:
- Pain and discomfort consume attentional bandwidth
- Young et al. (2025): 17% of GYN surgeons reported decreased concentration due to pain

High-risk interruption types:
- Case-irrelevant conversation; equipment failures; team turnover mid-case

Mentis et al. AMIA 2012 | Antoniadis et al. BJS 2016 | Wheelock et al. Ann Surg 2015

14

Cognitive Fatigue: Safety and Career Implications

Cognitive fatigue — mental depletion from sustained high-demand work — is distinct from physical fatigue and is poorly recognized in surgical culture.

Performance effects:
- Increased operative errors in laparoscopic simulators after long cases
- Reduced ability to recognize and respond to unexpected complications
- Impaired communication: less proactive, more reactive

Specific to OB/GYN:
- On-call obstetrics adds unpredictable high-stakes demands after long operative days
- Administrative and EHR burden compounding clinical cognitive load

Protective strategies:
- Microbreaks reduce physical AND cognitive fatigue (Park et al. 2017)
- Pre-case briefings reduce situational demands
- Limit non-critical interruptions during complex operative steps

Tribovich et al. Surg Endosc 2010 | Grantcharov et al. BJS 2014 | Arora et al. Ann Surg 2011

15

What Health Systems Can Do

From individual coping to institutional responsibility

Ergonomics is not a luxury — it is a patient safety and workforce sustainability issue

16

Ergonomics Programs: Making the Business Case

Work-related injuries cost healthcare systems an estimated $20 billion annually.

The cost of inaction:
- Workers' compensation claims, disability leave, locum coverage
- Recruitment and onboarding costs when surgeons retire early or reduce hours
- Downstream patient care disruptions from reduced surgical capacity

Evidence-based program components:
- Formal ergonomics needs assessment using validated tools (RULA, REBA, NASA-TLX)
- Anonymous injury reporting infrastructure — only 20% of surgeons currently report
- Occupational health integration: proactive screening, not just reactive treatment

ROI data:
- **Every $1 invested in ergonomics returns $2–6 in reduced injury costs (OSHA)**
- **In other industries, ergonomic programs have been shown to reduce MSK injury rates by 50–60% in high-risk occupations**

OSHA Guidelines 2023 | Nelson A, AAOHN J 2001 | Davis WT, J Surg Res 2014

17

Culture Change: From Silent Suffering to Systemic Support

The current culture problem:
- Only 2% of training programs have an ergonomics curriculum
- Only 19–20% of injured surgeons report injuries to their institutions
- Over 50% of residents feel culture discourages asking for intraoperative adjustments
- "Surgeon toughness" narrative normalizes preventable suffering and delayed treatment

What WE can do:
- Normalize ergonomic accommodations — requesting table adjustment is not weakness
- Senior surgeons modeling ergonomic behaviors for trainees (both physical and cognitive)
- Grand rounds, M&M discussions that include ergonomics as a quality issue

Institutional accountability:
- Annual ergonomic well-being surveys; ergonomic incidents tracked alongside quality metrics
- Investments in ergonomic aids and equipment (start with mats, chairs, move to timed breaks)
- Time and resources for strength training, physical therapy, and recovery

Stucky CH, Ann Med Surg 2018 | Sengupta-Isetter et al. J Surg Res 2019 | Young, Kho (2025)

18

Well-Being, Clinical Excellence, Sustaining a Workforce

- The majority of Ob/Gyns are experiencing work-related pain and seeking treatment
  - Surgeon pain is not an individual complaint — it is an occupational health problem with documented impact on the workforce and on patient care
  - Work-related pain is affecting clinical care: altering modality, decreasing volume, driving early retirement
- Physical and cognitive ergonomics are both essential — and inseparable — dimensions of surgeon well-being
- Health systems must move from individual coping to institutional responsibility



Fig. 1. American College of Obstetricians & Gynecologists Well-Being Domain Wheel.
Connolly. ACOG Well-Being Program for Physicians. Obstet Gynecol 2026.

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Concluding Thoughts: The Case of KAK

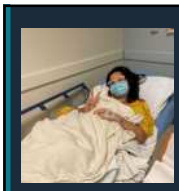
We need to BE THE CHANGE:

- Surgeon pain is not an individual complaint — it is an occupational health problem with documented impact on the workforce and on patient care
- The single greatest obstacle to addressing surgical ergonomics is not lack of evidence or lack of solutions — it is a professional culture that has systematically normalized, romanticized, and rewarded suffering
  - When a resident feels they cannot ask for the OR table to be adjusted, that is not a personal failing…that is a safety culture failure — the same category as not feeling able to call a timeout.

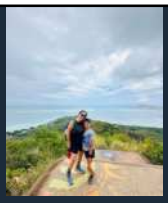
Our trainees, our colleagues, and WE deserve better

- We are sending surgeons into physically and cognitively demanding careers with no preparation — and then expressing surprise when they are injured
- Surgeon injury is not bad luck or personal weakness — it is the predictable, measurable, and preventable result of environments, cultures, and training systems that have never treated the surgeon's body as worth designing for

20



Mahalo!



Questions or Comments?

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Surgical Ergonomics MasterClass

Kimberal A Kho, MD
Sangeeta Senapati, MD
Jacqueline Wong, MD
Riley J Young, MD

NOVEMBER 13-16, 2026 · BOSTON · #AAGL26

1

Disclosure

- *I have no financial relationships to disclose.*

2

Objectives

- Identify the impact of ergonomics on physician well-being and patient care.
- Demonstrate basic ergonomic recommendations by surgical modality.
- Summarize pre, intra, and post-operative practices to reduce the risk of work-related injury.
- Discuss cognitive ergonomics and promoting a culture of safety.
- Address ergonomic concerns for specific populations.
- Develop a framework for incorporating ergonomic recommendations into your practice, as well as teaching others.

3

Work-Related Musculoskeletal Disorders

Work-related musculoskeletal disorders (WMSDs) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs in which:

1. The work environment and performance of work contribute significantly to the condition

and/or

2. The condition is made worse or persists longer due to work conditions

Ergonomics is the science of fitting workplace conditions and job demands to the capability of the working population. The goal of ergonomics is to reduce stress and eliminate injuries and disorders.

4

Risk Factors

- Static and awkward postures
- Repetitive work
- Static shoulder load
- Twisting
- Overhead loads
- Wrist deviations and forceful exertions
- Long work hours

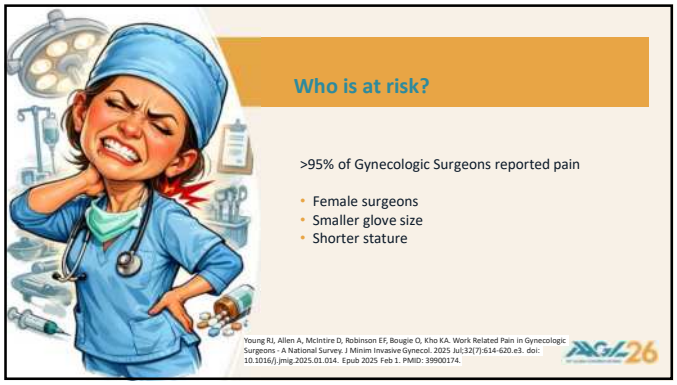
Please indicate how frequently workers are exposed to the following job conditions:
1. Perform tasks that are externally paced[1].
2. Exert force with their hands (e.g., gripping, pulling, pinching).
3. Use handtools or handle parts/objects.
4. Stand continuously for periods of more than 30 minutes.
5. Sit for periods of more than 30 minutes without the opportunity to stand or move around freely.
6. Use electronic input devices (e.g., keyboards, mice, joysticks, track balls) for continuous periods of more than 30 minutes.
7. Kneel (one or both knees).
8. Perform activities with hands raised above shoulder height.
9. Perform activities while bending or twisting at the waist.
10. Are exposed to vibration.
11. Lift/lower objects between floor and waist height or above shoulder height.
12. Lift/lower objects more than once per minute for continuous period of more than 15 minutes.
13. Lift, lower, or carry large objects or objects that cannot be held close to the body.
14. Lift, lower, or carry objects weighing more than 50 lbs (23 kg).

5

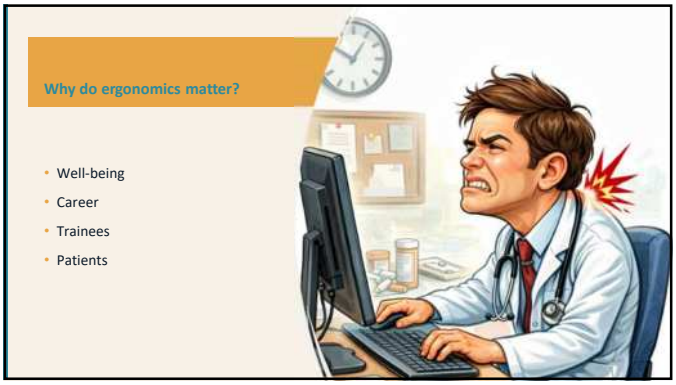
Risk Factors – Pelvic Surgery

- Oblique approach to access the pelvis
- Accommodating to optimal patient positioning
  - Dorsal lithotomy
  - Steep Trendelenburg for exposure
- Lighting and retraction in a confined space
  - Downfalls of head lamps and lighted retractors
- Pelvic anatomy and proximity to critical structures

6


Who is at risk?
>95% of Gynecologic Surgeons reported pain
• Female surgeons
• Smaller glove size
• Shorter stature
Young RJ, Allen A, McIntire D, Robinson EF, Bougie O, Kho KA. Work Related Pain in Gynecologic Surgeons - A National Survey. J Minim Invasive Gynecol. 2025 Jul;32(7):614-620.e3. doi: 10.1016/j.jmig.2025.01.014. Epub 2025 Feb 1. PMID: 39900174.

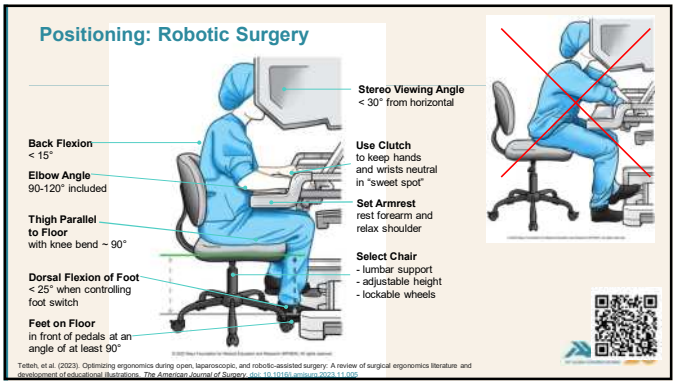
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Why do ergonomics matter?
• Well-being
• Career
• Trainees
• Patients

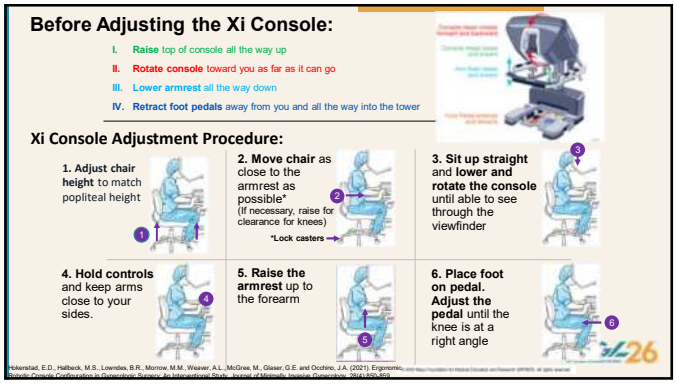
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The American Journal of Surgery
Surgical Ergonomics Recommendations
Growing pains: strategies for improving ergonomics in minimally invasive gynecologic surgery
Personal Perspectives
Surgical Ergonomics and Preventing Work-Related Musculoskeletal Disorders

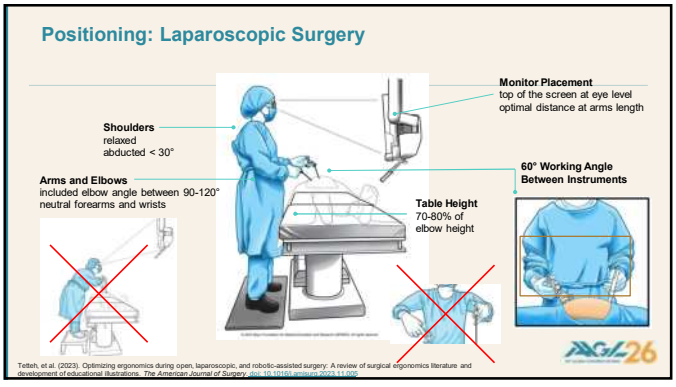
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Positioning: Robotic Surgery
Stereo Viewing Angle
< 30° from horizontal
Back Flexion
< 15°
Elbow Angle
90-120° included
Thigh Parallel to Floor
with knee bend ~ 90°
Dorsal Flexion of Foot
< 25° when controlling foot switch
Feet on Floor
in front of pedals at an angle of at least 90°
Use Clutch
to keep hands and wrists neutral in "sweet spot"
Set Armrest
rest forearm and relax shoulder
Select Chair
- lumbar support
- adjustable height
- lockable wheels
Tetteh, et al. (2023). Optimizing ergonomics during open, laparoscopic, and robotic-assisted surgery: A review of surgical ergonomics literature and development of educational illustrations. The American Journal of Surgery. doi: 10.1016/j.amjsurg.2023.11.005

10


Before Adjusting the Xi Console:
I. Raise top of console all the way up
II. Rotate console toward you as far as it can go
III. Lower armrest all the way down
IV. Retract foot pedals away from you and all the way into the tower
Xi Console Adjustment Procedure:
1. Adjust chair height to match popliteal height
2. Move chair as close to the armrest as possible* (If necessary, raise for clearance for knees)
*Lock casters
3. Sit up straight and lower and rotate the console until able to see through the viewfinder
4. Hold controls and keep arms close to your sides.
5. Raise the armrest up to the forearm
6. Place foot on pedal. Adjust the pedal until the knee is at a right angle
Hokenstad, E.D., Hallbeck, M.S., Lowndes, B.R., Morrow, M.M., Weaver, A.L., McGree, M., Glaser, G.E. and Occhino, J.A. (2021). Ergonomic, Robotic Console Configuration in Gynecologic Surgery: An Interventional Study. Journal of Minimally Invasive Gynecology. 28(4):850-859.

11


Positioning: Laparoscopic Surgery
Monitor Placement
top of the screen at eye level
optimal distance at arms length
Shoulders
relaxed
abducted < 30°
Arms and Elbows
included elbow angle between 90-120°
neutral forearms and wrists
60° Working Angle Between Instruments
Table Height
70-80% of elbow height
Tetteh, et al. (2023). Optimizing ergonomics during open, laparoscopic, and robotic-assisted surgery: A review of surgical ergonomics literature and development of educational illustrations. The American Journal of Surgery. doi: 10.1016/j.amjsurg.2023.11.005

12



13

instruments

- Ideal instrument choice depends on individual surgeon & specific task
- General recommendations:
  - Avoid instruments with high-pressure contact areas
  - Utilize trigger locks & ratchets when appropriate to minimize sustained squeezing force
  - Use instrument rotation feature to avoid awkward hand/wrist/arm/shoulder positioning
  - Employ power grip when able/appropriate
  - Maintain neutral wrist position
    - Consider trocar placement, handle type



Figure 6. Lap finger grip

Figure 7. Lap power grip

SURGICAL ERGONOMICS RECOMMENDATIONS / American College of Surgeons

14

CULTURAL AND LINGUISTIC COMPETENCY & IMPLICIT BIAS

The California Medical Association (CMA) outlines standards for Cultural Linguistic Competency and Implicit Bias in CME. The goal of the standards is to support the role of accredited CME in advancing diversity, health equity, and inclusion in healthcare. These standards are relevant to ACCME-accredited, CMA-accredited, and jointly accredited providers located in California. AAGL is ACCME-accredited and headquartered in California.

CMA developed the standards in response to California legislation (Business and Professions (B&P) Code Section 2190.1), which directs CMA to draft a set of standards for the inclusion of cultural and linguistic competency (CLC) and implicit bias (IB) in accredited CME.

The standards are intended to support CME providers in meeting the expectations of the legislation. CME provider organizations physically located in California and accredited by CMA CME or ACCME, as well as jointly accredited providers whose target audience includes physicians, are expected to meet these expectations which began on January 1, 2022. AAGL has been proactively adopting processes that meet and often exceed the required expectations of the legislation.

CMA CME offers a variety of resources and tools to help providers meet the standards and successfully incorporate CLC & IB into their CME activities, including FAQ, definitions, a planning worksheet, and best practices. These resources are available on the CLC and IB standards page on the CMA website.

Important Definitions:

Cultural and Linguistic Competency (CLC) – The ability and readiness of health care providers and organizations to humbly and respectfully demonstrate, effectively communicate, and tailor delivery of care to patients with diverse values, beliefs, identities and behaviors, in order to meet social, cultural and linguistic needs as they relate to patient health.

Implicit Bias (IB) – The attitudes, stereotypes and feelings, either positive or negative, that affect our understanding, actions and decisions without conscious knowledge or control. Implicit bias is a universal phenomenon. When negative, implicit bias often contributes to unequal treatment and disparities in diagnosis, treatment decisions, levels of care and health care outcomes of people based on race, ethnicity, gender identity, sexual orientation, age, disability and other characteristics.

Diversity – Having many different forms, types or ideas; showing variety. Demographic diversity can mean a group composed of people of different genders, races/ethnicities, cultures, religions, physical abilities, sexual orientations or preferences, ages, etc.

Direct links to AB1195 (CLC), AB241 (IB), and the B&P Code 2190.1:

Bill Text – AB-1195 Continuing education: cultural and linguistic competency.
Bill Text – AB-241 Implicit bias: continuing education: requirements.
Business and Professions (B&P) Code Section 2190.1

CLC & IB Online Resources:

Diversity-Wheel-as-used-at-Johns-Hopkins-University-12.png (850×839) (researchgate.net)
Implicit Bias, Microaggressions, and Stereotypes Resources | NEA
Act, Communicating, Implicit Bias (racialequitytools.org)
https://www.contemporaryobgyn.net/view/overcoming-racism-and-unconscious-bias-in-ob-gyn
https://pubmed.ncbi.nlm.nih.gov/34016820/
https://hr.ucdavis.edu/departments/learning/certificate/implicit-bias
https://pmc.ncbi.nlm.nih.gov/articles/PMC7011228/