

I. Specific educational aims. The primary goal of this project is to improve laparoscopic surgical performance and operator perceived confidence in Obstetrics & Gynecology (Ob/Gyn) resident trainees using a cost-effective, high-fidelity porcine simulation training model. **Aim 1** will evaluate the effectiveness of high-fidelity simulation on laparoscopic skills improvement in fourth year Ob/Gyn residents using the Global Operative Assessment of Laparoscopic Skills (GOALS) criterion¹. **Aim 2** will assess the impact of high-fidelity simulation experience on perceived surgical confidence using a 5-point Likert scale. As a secondary goal, **Aim 3** will expand high-fidelity simulation training to departmental Fellows performing advanced laparoscopy. For all learners we aim to 1) provide advanced surgical practice in a low-risk surgical learning environment and 2) evaluate perceived effectiveness of high-fidelity simulation experience to improve real-world case confidence using a validated Perceived Confidence Rating Scale². This proposal addresses three priority areas including: scholarship and training innovation, scholastic collaboration, and long-term impact and sustainability. The core study team comprises interdisciplinary surgical educators (Gyn Onc, MIGS, UroGyn), anesthesiologists, large animal veterinarians, surgical technology suppliers/representatives, residents, and surgical fellows. This project will establish a high-fidelity laparoscopic teaching simulation that is currently unavailable within the Ob/Gyn department at Stanford University Hospital with the goal to incorporate this as a standard tool in the surgical education of our trainees.

II. Project rationale. Improving the surgical education of Ob/Gyn trainees expands the access and quality of care women across all communities receive. Women's health research remains continuously underfunded and other efforts to improve the equity of care patients receive is critical. Ob/Gyn is unique in the wide array of surgical modalities trainees must master prior to graduation (open, laparoscopic, robotic, vaginal). The use of minimally invasive surgical (MIS) approaches is emphasized among providers given improved patient reported outcomes making it critical Ob/Gyn graduates excel in these techniques. As surgical procedures become increasingly complex, senior Ob/Gyn residents require additional preparation to improve their MIS skills³. For this reason, graduates of Ob/Gyn residency training programs pursue fellowship training⁴. Simulator-based training tools have emerged as innovative tools for advanced surgical training and includes the use of low-fidelity (box trainers) and high-fidelity (cadaveric, porcine) training models. The majority of Ob/Gyn laparoscopic surgery training utilizes low-fidelity simulators which lack procedural complexity and a realistic surgical environment. In contrast, high-fidelity training models in General Surgery improve residents' motor and communication skills in risk-free surgical settings and have been demonstrated to translate technical improvements to real-world cases (i.e., laparoscopy for cholecystectomy) – thus shortening the clinical learning curve and improving patient safety^{5,6}. Thus, this study proposes to establish a high-fidelity porcine simulation model for Ob/Gyn resident trainees currently unavailable at Stanford University Hospital and will evaluate its impact on resident laparoscopic surgical performance within a tertiary care center.

III. Approach. Residents will first complete a baseline case collection where a preceptor independently scores the resident's technical ability (GOALS criteria). The resident will also complete a baseline Perceived Confidence Rating Scale for each case. Next, in collaboration with our multidisciplinary team, I will coordinate and implement a laparoscopic surgical training curriculum. For this, residents will be provided access to the American Association of Gynecologic Laparoscopists (AAGL) member portal housing expert video content. Each resident will engage in a 1-hour didactic session and be required to watch 4 assigned instructional videos from the AAGL portal. They will then proceed with a 4-hour training session using the porcine model where residents will perform a series of procedures: port placement, laparoscopic hysterectomy, laparoscopic suturing, peritonectomy and cystotomy repair. Subsequently, each learner will collect a GOALS assessment and Perceived Confidence Rating Scale on their next three hysterectomies as a post-training assessment.

Aim 1: Evaluate high-fidelity simulation training on laparoscopy surgical skill improvement using the GOALS criterion. Consenting fourth year Ob/Gyn resident volunteers will perform three laparoscopic hysterectomy procedures per institutional guidelines and have the procedures objectively scored by their attending physicians via the GOALS 5-point scoring system as a baseline. GOALS include evaluation of 5 categories: Depth Perception, Bimanual Dexterity, Efficiency, Tissue Handling, and Autonomy. Participants will next attend and perform high-fidelity porcine simulation training (described above). Following simulation training, each participant's next three laparoscopic hysterectomies will again be objectively scored using GOALS criterion. A within subjects' comparison will be calculated between baseline versus post-simulation GOALS scores. Values will be presented as mean \pm SD. A One-Way ANOVA will test for statistical significance ($p < 0.05$).

Aim 2. Evaluate resident trainees' perceived confidence in laparoscopic skills before and after high-fidelity simulation. Current Ob/Gyn laparoscopic training utilizes low-fidelity simulators which lack procedure complexity in realistic surgical environments. Resident Ob/Gyn graduates do not feel confident performing complex laparoscopy³. Thus, we will evaluate participants' 'perceived confidence' in laparoscopic surgery skill using a previously validated 5-point Likert scale self-assessment survey² in conjunction with real-life hysterectomy.

Aim 3. Interdepartmental expansion of high-fidelity simulation training. Surgical fellows within the Ob/Gyn departmental divisions (i.e., Gynecologic Oncology, Uro-Gynecology) will have opportunities to practice advanced laparoscopic procedures using porcine simulation tools. Participants will perform a Perceived Confidence Rating Scale² before high-fidelity simulation practice and 2 months after to evaluate perceived effectiveness of simulation practice on real world clinical practice.

IV. Timeline and plan for implementation.

Aug-Oct (Pre-funding period): Finalization of surgical curriculum. Begin to have residents collect pre-simulation GOALS baseline assessments.

Nov-Dec: Porcine simulation sessions (3 sessions)

Jan-March: Post-simulation GOALS assessments with residents. Data analysis.

April-June: Manuscript preparation, conference presentations.

V. Anticipated work product. The project will establish a sustainable, innovative, and objective training resource with high translational potential for patients and scholastic collaboration within Stanford University Hospital. It is our goal to establish porcine-modeling as the standard high-fidelity simulation tool available throughout the Ob/Gyn Department.

VI. Evaluation plan. Initial data on resident PGY-level, number of prior laparoscopic hysterectomy, number of other laparoscopic cases, and prior rotations completed will be collected. Pre- and post-simulation assessments will be given to assess self-perceived readiness and confidence will be administered. Perceived usefulness and overall realism of each of the previously described surgical tasks (Section III) will be self-assessed by the learner. Post assessment data collection will be performed using both self-reported scoring as well as through use of objective attending evaluation via the GOALS score. The GOALS score is a validated global rating scale for laparoscopy and consists of five items scored on a 1-5 scale (depth perception, bimanual dexterity, efficiency, tissue handling, and autonomy). Readiness and confidence data will be collected on a standard 5-point Likert scale. We will conduct multivariate analyses to measure associations between self-assessed scores, procedures performed prior to simulation, and post simulation performance.

VII. Dissemination of results. Project results will be presented at the Obstetrics & Gynecology Resident Research Day and nationally at the CREOG/APGO annual meeting. Results will be prepared for submission to *Obstetrics & Gynecology*.

