FUNDAMENTALS OF ENDOSCOPIC SURGERY PROGRAM FOR LOW- AND MIDDLE-INCOME COUNTRIES- A PILOT RANDOMIZED CONTROL TRIAL IN NIGERIA

Alex F Doyle[1]; Olusegun I Alatise[2]; Tajudeen Mohammed[3]; Israel A Owoade[3]; Oluseyi Olanrewaju[3]; Olujide Arije[3];Sahle Griffith[4]; Gregory Knapp[5]; Richard T Spence[5]; Betel Yibrehu[6]; Funmilola Wuraola[7]; Rivka Kahn[1]; Nafisat O Lawal[1]; T Peter Kingham[1]; Shilpa S Murthy[8]; [1]Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, USA; [2]Department of Surgery, College of Health Sciences, Obafemi Awolowo University, Ile Ife, Nigeria; [3]Department of Surgery, Obafemi Awolowo University Teaching Hospital, Ile Ife, Nigeria; [4]Caribbean Colon Cancer Initiative, Bridgetown, Barbados; [5]Department of Surgery, Dalhousie University, Halifax, Nova Scotia, Canada; [6]Department of Surgery, University of Toronto, Ontario, Canada; [7]Department of Surgery, Faculty of Clinical Sciences, Obafemi Awolowo University, Ile Ife, Osun State, Nigeria; [8]Yale School of Medicine, Yale University, New Haven, USA

❖ Background-

• In Nigeria, colorectal cancer remains underdiagnosed due to a lack of screening programs and limited access to endoscopy services.
• Simulation-based training is essential to equip medical practitioners with the necessary skills to perform colonoscopies, addressing Nigeria's endoscopic capacity challenges.

❖ Hypothesis-

• A locally designed low-fidelity (LF) colonoscopy simulator can be as effective as a high-fidelity (HF) simulator in improving colonoscopy skills.

❖ Methods-

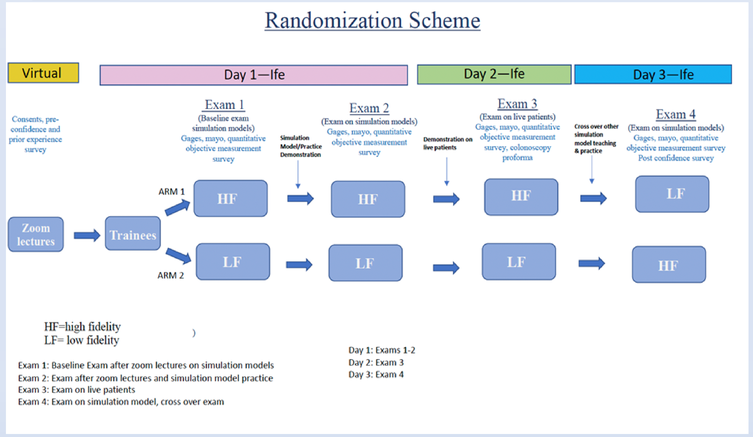


Figure 1: Project Methodology

- **Participants:** Surgeons, surgical residents, and gastroenterologists from Nigeria.
- **Intervention:** 9-week online lecture series followed by a 4-day hands-on workshop using HF and LF colonoscopy simulators.
- **Assessments Tools :**

1. Knowledge assessment through pre- and post-training tests.
2. Confidence levels assessed before and after the program via questionnaire.
3. Practical skills evaluated using Mayo Colonoscopy Skills Assessment Tool (MCSAT) and Global Assessment of Gastrointestinal Endoscopic Skills (GAGES)

- **Outcome Measures:**

a) **Primary outcome**: Performance scores post-training.
b) **Secondary outcomes**: Improvement in knowledge and confidence level

- **Statistical Analysis**: Fischer's exact test; mixed effects maximum likelihood linear regression model; paired t-test;

Table 1: Trainee Background Information

Background information	Simulator Model Type		p-value
	High-fidelity	Low fidelity	
Sex			
Male	9 (56.3%)	7 (43.7%)	
Female	0 (0.0%)	2 (100.0%)	p = 0.527*
Cadre			
Trainee	4 (44.4%)	5 (55.6%)	
Specialist	5 (55.6%)	4 (44.4%)	P =1.000*
Years of medical practice since after medical school			
Mean, SD	13.4 ±2.5	13.4 ±2.5	p = 1.000
Years as a registrar in the specialty field			
Mean, SD	7.17 ± 2.7	6.5 ±2.3	p = 0.594
Years as a consultant in your specialty field			
Mean, SD	2.5 ± 2.3	2.4 ± 1.3	p = 1.000
Previous colonoscopy training attendance			
No	6 (42.9%)	8 (57.1%)	p = 0.576
Yes	2 (66.7%)	1 (33.3%)	
Previous colonoscopy performance ever			
No	3 (40.0%)	3 (60.0%)	p = 1.000 *
Yes	6 (50.0%)	6 (50.0%)	
Performing colonoscopy on the simulator in the past			
No	7 (53.8%)	6 (46.2%)	p = 1.000*
Yes	2 (40.0%)	3 (60.0%)	
Performing colonoscopy on live patients in the past			
No	2 (40.0%)	3 (60.0%)	p = 1.000*
Yes	7 (53.8%)	6 (46.2%)	
Performing colonoscopies under the supervision of a consultant			
No	4 (57.1%)	3 (42.9%)	p = 1.000*
Yes	5 (45.5%)	6 (54.5%)	

❖ Results

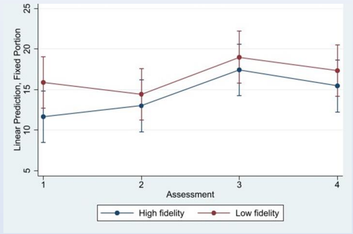


Figure 2: Comparison of MCSAT Performance Score for HF and LF Model

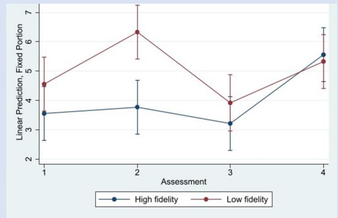


Figure 3: Comparison of MCSAT Overall Score for HF and LF Model

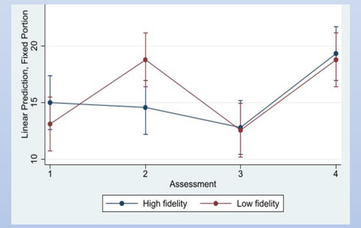


Figure 4:Comparison of GAGES Overall Score for HF and LF Model

Table 2: Paired t-test showing the mean difference in scores before and after the online lectures.

Variable	N	Mean ± SD	p-value
Pre-test	15	27.5 ± 5.5	p <0.001
Post-test	15	34.5 ± 4.0	

Table 3: Difference in Assessment Scores Between the HF and LF Simulators

Assessment Score	Difference
MCSAT – Performance Score	4.2 (-0.3- 8.7) p= 0.066
MCSAT-Overall Score	1.0 (-0.3-2.3) p=0.131
GAGES- Overall Score	-1.9 (-5.3-1.5) p=0.272

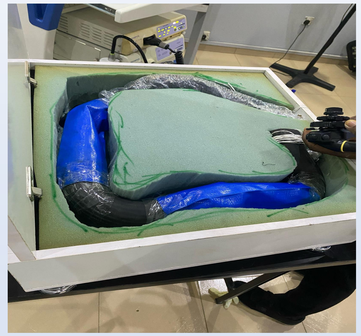


Figure 5: The Low Fidelity Model

Table 4: Comparison of mean pre and post training confidence levels for HF and LF Simulators

Assessment of Confidence	High fidelity Mean (SD)			Low fidelity Mean (SD)		
	Pre	Post	t-test	Pre	Post	t-test
Steps in a colonoscopy	2.2 (0.7)	4.1 (0.3)	t=-7.3 p=0.0001	2.8 (1.5)	3.9 (0.9)	t = -2.3, p=0.0509
Colonoscopy on a patient	1.9 (0.6)	4.0 (0.0)	t = -10.5, p>0.001	2.8 (1.5)	3.9 (1.3)	t = -2.2, p=0.0619
Steps using a simulator	2.7 (0.9)	4.2 (0.4)	t = -4.1, p=0.0033	2.8 (1.3)	4.6 (0.5)	t = -4.9, p=0.0012

❖ Discussion

- This is the first randomized control trial to compare the performance of trainees using different colonoscopy simulator models in Africa with a locally produced model.
- No statistically significant differences in the performance scores between the HF simulator and the LF simulator.
- Participation in the training program led to an increase in both the knowledge surrounding the performance of a colonoscopy and the participants confidence in performing a colonoscopy using a simulator and on a patient.

❖ Conclusion-

- The low-cost LF colonoscopy simulator demonstrated comparable effectiveness to the HF model in training participants.
- LF simulators are a viable solution to increase colonoscopy capacity in Nigeria, offering a scalable model for other LMICs.
- The program provided a framework for future colonoscopy training initiatives in resource-limited settings.

Clinical Trial ID- NCT05686499