Appendix 1: Survey Instrument

Exploring the use of endoscopy simulation-based training in pediatric gastroenterology fellowship programs across North America

SECTION 1: PROGRAM DEMOGRAPHICS

1) Geographic location of fellowship program

- A. Northeast United States
- B. Midwest United States
- C. South United States
- D. West United States
- E. Canada
- F. Other (please specify _____)
- 2) Type of training program
 - A. Academic
 - B. Community
 - C. Both

3) Number of fellows per academic year: [Free text answer]

4) By the end of core fellowship training, how many clinical colonoscopies does each fellow perform on average?

- A. < 50
- B. 50-100
- C. 100-150
- D. 150-200
- E. 200-250
- F. >250
- G. Don't know/Not sure

5) By the end of core fellowship training, how many clinical upper endoscopies does each fellow perform on average?

- A. < 50
- B. 50-100
- C. 100-150
- D. 150-200
- E. 200-250
- F. 250-300
- G. >300
- H. Don't know/Not sure

6) How are skills/competence in performing endoscopic procedures assessed within your fellowship program (Check all that apply)?

- A. Number of procedures performed
- B. Clinical parameters (e.g. terminal ileal intubation rate, complication rate)
- C. EPA assessment forms
- D. GiECAT_{KIDS} assessment tool (Gastrointestinal Endoscopy Competency Assessment Tool)
- E. Other direct observation of procedural skills assessment form (e.g. Mayo, ASGE, DOPS) Please specify below

- F. Simulation-based assessment
- G. Other (please specify _____)
- H. Not Assessed

7) Does your fellowship program use simulation-based training for non-procedural skills such as breaking bad news?

- A. Yes
- B. No

SECTION 2: ENDOSCOPY SIMULATION-BASED TRAINING

1) Does your fellowship program use endoscopy simulator(s) during fellowship training?

- A. Yes
- B. No

If No, the survey directed participants to Question 20 in Section 2: If Yes, then the survey proceeded as follows:

- 2) Does your fellowship program use computerized (virtual reality) endoscopy simulator(s)?
 - A. Yes
 - B. No

2A) Please specify the type of computerized endoscopy simulator(s) used (Check all that apply):

- A. GI mentor/ Simbionix
- B. EndoVR (CAE Healthcare/ AccuTouch)
- C. Don't know
- D. Other (please specify _____)
- 3) Does your fellowship program use mechanical simulator(s)?
 - A. Yes
 - B. No

3A) Please specify the type of mechanical simulator(s) used (Check all that apply):

- A. Colonoscopy training model (e.g. Koken, Erlanger)
- B. Upper GI trainer
- C. Thompson Endoscopic Skills Trainer
- D. Don't know
- E. Other (please specify _____)

4) Please specify, if any other the type of endoscopy simulator(s) are used at your fellowship program (select all that apply):

- A. Ex-vivo (explanted organ) or animal model (e.g. EASIE)
- B. Live Animal model
- C. Hybrid simulation (simulated patient in combination with computerized or mechanical simulator)
- D. Don't know
- E. Other (please specify _____)

5) Does your program have to pay to access endoscopy simulators?

- A. Yes
- B. No

C. Don't know

D. Other (please specify _____)

6) Where are the endoscopy simulators that your fellows use located? (Check all that apply)

- A. Within the endoscopy unit
- B. Within the Division but outside the endoscopy unit
- C. Simulation lab/center within the hospital
- D. Simulation lab/center outside the hospital
- E. Other (please specify _____)

7) In what capacity does your fellowship program use endoscopy simulation? (Check all that apply)

- A. For training purposes
- B. For assessment purposes
- C. Other (please specify _____)

8) What procedures are included in simulation-based training for fellows? (Check all that apply)

- A. EGD
- B. Colonoscopy
- C. Foreign body removal
- D. Polypectomy
- E. Endoscopic non-technical skills
- F. Liver biopsy
- G. Other (please specify _____)
- H. Not applicable Simulators not used for training
- I. Don't know

9) Does your program use simulation to train non-technical skills related to endoscopic procedures such as the consent process, teamwork and communication?

- A. Yes
- B. No

10) Are fellows within your program required to use an endoscopy simulator prior to their first clinical endoscopy?

- A. Yes
- B. No

If Yes, then questions 10A appeared:

10A) If yes, then when are the fellows allowed to perform their first clinical endoscopy?

- A. No minimum simulation requirement prior to clinical training
- B. Required to complete a minimum number of hours of simulation training prior to clinical training
- C. Required to reach a threshold of competence on endoscopy simulator prior to clinical training
- D. Required to complete a simulation-based training curriculum/ course prior to clinical training
- E. Other (please specify _____)

11) Does your program keep track of the number of hours fellows spend on the simulator(s):

- A. Yes
- B. No
- C. Don't know

If Yes, then questions 11A appeared:

11A) On average, how many hours do fellows spend on the simulator per month:

- A. 1-5 hours/ month
- B. 5-10 hours/ month
- C. >10 hours/ month
- D. Not applicable Only used during first few months of fellowship and/or prior to fellowship training
- E. Other (please specify _____)

12) Are fellows required to complete a minimum number of required hours on the simulator during their training?

- A. Yes (if yes, specify)
- B. No
- C. Don't know

If Yes, then questions 12A appeared:

12A) Please specify (in hours per month). Or please comment if there is another system for keeping a log of time spent on simulator(s) by fellows: [Free text answer]

- 13) Is there an organized endoscopy simulation curriculum for your fellows?
 - A. Yes
 - B. No

If Yes, then questions 13A appeared:

13A) If yes, please describe briefly (i.e., procedures/skills taught, length, timing during fellowship): [Free text answer]

14): Which level of fellows participate in endoscopy simulation-based training (Check all that apply) [Multiple choice answer]

- A. PGY 4 (1^{st} year fellows)
- B. PGY5 (2nd year fellows)
- C. PGY6 (3rd year fellows)
- D. PGY7+ (advanced clinical or research fellows)
- E. Other (please specify _____)

15) Does your program provide protected time for fellows for endoscopy simulation-based training?

- A. Yes
- B. No
- C. Don't know

If Yes, then questions 15A appeared:

15A) If 'yes', approximately how many hours per month?

- A. 1-5 hours/ month
- B. 5-10 hours/ month
- C. >10 hours/ month
- D. Not applicable Only a workshop based training for the first few months of fellowship/ prior to fellowship training

E. Other (please specify _____)

16) Which type of health professionals supervise the endoscopy simulation-based training activities in which your fellows participate (Check all that apply)?

- A. Unsupervised (independent practice)
- B. Pediatric GI physicians
- C. Adult GI physicians
- D. Endoscopy nurses
- E. Other (please specify _____)

If the option B, C or D was selected, then questions 17 and 18 appeared:

17) Do the supervisors receive formal training regarding how to teach endoscopy?

- A. Yes
- B. No
- C. Don't know
- D. Other (please specify _____)

18) Do the supervisors receive formal teaching regarding how to teach within a simulation-based environment?

- A. Yes
- B. No
- C. Don't know
- D. Other (please specify _____)

19) In your opinion, which of the following factors, if any, are barriers to successful integration of endoscopy simulation into your fellowship training program? (Check all that apply)

- A. Cost/budget constraints
- B. Time constraints for fellows
- C. Time constraints for faculty
- D. Lack of faculty training
- E. Complicated to set-up
- F. Lack of standardized simulation-based curriculum
- G. Accessibility (endoscopy simulator location)
- H. Not validated for procedural training in pediatric endoscopy
- I. Do not mimic real endoscopic procedures closely enough
- J. Lack of ability to assess skills improvement resulting from simulation-based training
- K. Not useful/ ineffective
- L. Other (please specify _____)

20) In your opinion, which of the following factors, if any, are barriers preventing the integration of endoscopy simulation into your fellowship program? (Check all that apply)

- A. Cost/budget constraints
- B. Time constraints for fellows
- C. Time constraints for faculty
- D. Lack of faculty training
- E. Small program size
- F. Not necessary due to high clinical endoscopy case load
- G. Fellows participate in adult endoscopy rotation (mandatory rotation/ elective)

- H. Complicated to set-up
- I. Lack of standardized simulation-based curriculum
- J. Accessibility (endoscopy simulator location)
- K. Not validated for procedural training in pediatric endoscopy
- L. Do not mimic real endoscopic procedures closely enough
- M. Lack of ability to assess skills improvement resulting from simulation-based training
- N. Not useful/ ineffective
- O. Other (please specify _____)

SECTION 3: PERCEPTIONS OF SIMULATION-BASED TRAINING

Please rate your level of agreement with the following statements:

		1 (Low agreement)	2	3	4	5 (High agreement)
1.	There is a need for endoscopic technical skills training outside the endoscopy suite					
2.	There is a need for endoscopic non-technical skills training outside the endoscopy suite					
3.	Simulation is a valuable education skill for training NON- TECHNICAL skills training related to endoscopy					
4.	Simulation is a valuable educational tool for technical skills training related to endoscopy					
5.	Simulation has a role in pre-clinical endoscopic training					
6.	Simulation is a valuable education tool for training basic skills to novice endoscopists					
7.	Simulation is a valuable education tool for training experienced endoscopists					
8.	Simulation can provide objective assessment of endoscopic TECHNICAL skills					
9.	Simulation can provide objective assessment of endoscopic NON-TECHNICAL skills					
10.	There is a role for simulation in the maintenance of endoscopic skills					
11.	There is a role for simulation in the endoscopic credentialing process					
12.	There is a correlation between hours spent on simulator and endoscopic performance					
13.	Simulation-based training can reduce patient risk and adverse events					
14.	Simulation-based training results in improved clinical performance of fellows in the endoscopy suite					
15.	Simulation is NOT an adequate substitute for hands-on instruction					
16.	Simulation canNOT be easily incorporated into the current training curriculum					
17.	Endoscopy simulators have NOT been adequately validated as an educational tool for pediatric endoscopy					
18.	Simulation is NOT a cost-effective method of learning					
19.	Gastroenterology fellows are willing to participate in simulation-based training					
20.	Gastroenterology faculty support simulation-based training					

Appendix 2: Types of Endoscopy Simulators

Simulator	Description
Mechanical Simulator	Inanimate (physical) models which mimic human anatomy or engage leaners in specific tasks designed to improve their endoscopic skill acquisition. Tasks are usually performed using a real endoscope.
Ex-vivo Simulator	Simulators fabricated from a combination of plastic parts and explanted animal organs that provide an intestinal tract that can be used to simulate basic or advanced therapeutic endoscopy techniques.
Virtual Reality Simulator	Interactive computerized simulators that model endoscopy by using a mock endoscope that is inserted into a computer-based module that displays a 3-D image of the gastrointestinal lumen on a monitor and provides real-time visual and tactile feedback to the user.
Hybrid Simulation	Hybrid Simulation is a technique combining a virtual reality or mechanical simulator with a simulated patient (actor portraying a patient) and other healthcare providers (e.g. nurse, anesthetist) to mimic a real-life clinical scenarios focusing on endoscopic non-technical skills such as communication and teamwork, along with technical and cognitive endoscopic skills.

Appendix 3: Program directors' perceptions of endoscopic simulationbased training

Item	Programs with simulation (n = 24) Mean ± SD	Programs without simulation (n = 19) Mean ± SD	Overall (n = 43)* Mean ± SD
There is a need for endoscopic TECHNICAL skills training outside the endoscopy suite	3.8 ± 1.3	3.3 ± 1.2	3.6 ± 1.2
There is a need for endoscopic NON-TECHNICAL skills training outside the endoscopy suite	3.5 ± 1.4	3.1 ± 1.2	3.3 ± 1.3
Simulation is a valuable educational tool for endoscopic TECHNICAL skills training	3.7 ± 1.2	3.4 ± 1.1	3.5 ± 1.1
Simulation is a valuable educational tool for endoscopic NON-TECHNICAL skills training	3.1 ± 1.3	3.3 ± 1.2	3.2 ± 1.2
Simulation has a role in pre-clinical endoscopic training	4.0 ± 1.1	3.5 ± 1.0	3.8 ± 1.0
Simulation is a valuable education tool for training basic skills to novice endoscopists	4.0 ± 1.1	3.5 ± 1.2	3.8 ± 1.1
Simulation is a valuable education tool for training experienced endoscopists	2.9 ± 1.3	2.7 ± 1.1	2.8 ± 1.2
Simulation can provide objective assessment of endoscopic TECHNICAL skills	3.2 ± 1.1	3.2 ± 1.0	3.2 ± 1.1
Simulation can provide objective assessment of endoscopic NON-TECHNICAL skills	3.0 ± 1.2	3.1 ± 1.0	3.0 ± 1.1
There is a role for simulation in the maintenance of endoscopic skills	2.7 ± 1.2	2.5 ± 1.2	2.6 ± 1.1
There is a role for simulation in the endoscopic credentialing process	2.5 ± 1.2	2.2 ± 1.1	2.4 ± 1.1
There is a correlation between hours spent in simulation-based training and endoscopic performance	2.7 ± 1.2	2.5 ± 1.0	2.6 ± 1.1
Simulation-based training can reduce patient risk and adverse events	3.2 ± 1.2	2.5 ± 0.8	2.9 ± 1.1
Simulation-based training results in improved clinical performance of fellows in the endoscopy suite	3.3 ± 1.1	3.2 ± 1.1	3.2 ± 1.1
Simulation is NOT an adequate substitute for hands- on instruction	4.3 ± 1.2	4.1 ± 1.1	4.2 ± 1.1
Simulation CANNOT be easily incorporated into the current training curriculum	2.6 ± 1.2	2.7 ± 1.1	2.7 ± 1.1
Endoscopic simulators have NOT been adequately validated as an educational tool for pediatric endoscopy	2.8 ± 1.2	3.1 ± 1.1	2.9 ± 1.2
Simulation is NOT a cost-effective teaching method	2.5 ± 0.9	3.0 ± 0.9	2.7 ± 0.9
Gastroenterology fellows are willing to participate in simulation-based training	4.1 ± 1.0	3.8 ± 1.0	3.9 ± 0.9
Faculty support simulation-based training	3.5 ± 0.8	3.4 ± 0.9	3.5 ± 0.9

Items rated on a 1 (low agreement) to 5 (high agreement) scale

SD: standard deviation

*No significant differences between perceptions of program directors regardless of simulation use (P > 0.05)