Outpatient GI, Hepatology, Inflammatory Bowel Disease, Nutrition) across three cognitive domain levels of Bloom's Taxonomy (Knowledge, Comprehension, Application). A parallel post-rotation assessment was used to assess the impact from the rotation. Face and content validity of the pre- and post-tests were established by three staff Gastroenterologists. Central tendency, dispersion, Wilcoxon matched pairs and paired student's tests were used for statistical analysis. Internal Medicine, General Surgery residents and medical students participated, completing 27 pre-tests and 19 post-tests. Participation rate was 94%. Paired pre- and post-test completion rate was 70%. The mean scores on the pre- and post-tests were not significantly different (59 +5.1% vs 57 +3.9%). There was no difference between paired pre- and post-test scores in Nutrition (43 +0.8% vs 49 +1.1%), Outpatient GI (53 +2.1% vs 50% +1.8%), Hepatology (59% +2.4% vs 57 +1.7%), IBD (62 +1.2% vs 68 +0.7%) and Inpatient GI (69% +1.5% vs 68 +1.1%). Paired pre- and post-test scores assessing overall Knowledge (59 +23% vs 63 +9.4%), Comprehension (57 +14% vs 58 +11%) and Application (59 +17% vs 52 +11%) did not differ. This is the first formal quantitative needs assessment of trainee knowledge following a GI rotation. Initial assessment reveals no significant overall post-rotation improvement in scores across clinical GI domains or cognitive levels of Bloom's Taxonomy. Particular areas of deficiency include Nutrition, Outpatient GI, and Hepatology, areas which are typically underrepresented during a hospital based GI rotation. These findings provide a clear indication for targeted educational interventions to address identified areas of persistent deficiency and overall performance. Future directions include the development of educational activities following established principles of curriculum development and adult learning theory in order to meet GI learners' identified needs.

Tu1002

Propofol Anesthesia for Colonoscopy - Quicker Examination Time but With a Potential Risk

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Introduction: The Colonoscopy Force Monitor (CFM) is a handheld, wireless device that continually measures forces applied to the colonoscope insertion tube. Previous studies demonstrated that there is significant variation in the magnitude and pattern of force applied to the colonoscope by experienced endoscopists(Korman GIE 2010:327) and that a force of 27N(10N=1kg) is associated with seromuscular tears(Wu GIE 1978:236). The purpose of this study was to compare forces when patients receive propofol(P) or conscious sedation(C). Methods: An observational study of force application measured by the CFM was performed. Five experienced and 8 trainee endoscopists used the CFM to perform colonoscopy in 51 patients. Patients were divided into 2 groups based on the sedation administered. Continuous force records were processed and maximum and average linear and torque forces, time derivative of force, combined linear and torque force vectors and total examination time were calculated. Results: Twenty seven patients received propofol(mean dose + SD: 272.6 ± 128 mg) and 24 conscious sedation with fentanyl(74.8 ± 30.6 μg) and midazolam(4.2 ± 1.9 mg). Average examination time with propofol was 14.4 ± 7.1 vs 26.0 ± 13.7 min($p<0.001$) with conscious sedation. Maximum longitudinal forces were significantly higher with propofol. Maximum Push and Pull were: P = 31.1 ± 14.7N vs C = 23.2 ± 12.0N ($p<0.05$) and P = -24.3 ± 9.3N vs C = -15.1 ± 7.3N ($p<0.001$), respectively. Maximum rotational forces were higher with propofol. Maximum clockwise and counter-clockwise torque were: P = 0.71 ± 0.24Nm vs C = 0.56 ± 0.19Nm ($p<0.02$); and P = -0.70 ± 0.21Nm vs C = -0.56 ± 0.14Nm ($p<0.01$), respectively. Average Push/Torque rate was also higher with propofol: P = 8.2 ± 2.0N/s vs C = 6.5 ± 1.5N/s ($p<0.02$). Significant differences for longitudinal and rotational forces ($p<0.01$) were also noted amongst experienced endoscopists but regression analysis of the relationship between applied force and examination time did not demonstrate a significant correlation between maximum or average push, clockwise/counterclockwise torque, average push/pull and torque rate and examination time. Conclusion: The present study demonstrates that with propofol endoscopists, on average, use more force to perform colonoscopy and this is associated with shorter procedure times when compared to conscious sedation using an opiate and benzodiazepine. Although individual endoscopists demonstrate different force application patterns, there does not appear to be a correlation between the magnitude of force and examination time. Finally, the quantitative difference in endoscopic technique when patients receive propofol can result in forces that exceed thresholds for seromuscular tears. Support: NIH/NIDDK SBIR 5R44DK068936-03

Tu1003

Colonoscopy: What Endoscopists Inspect Under Optimal Conditions

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Background: The protective effect of colonoscopy, in particular for right-sided colorectal cancer (CRC), is disappointingly low. Two main reasons for this low protective effect are thought be (1) existing lesions are not seen and thus not removed, and (2) rapid development of *de novo* CRC. **Aim**: To assess the amount of colon mucosa inspected during routine colonoscopy under optimal conditions. **Methods**: Optimal conditions were defined as (1) patient age between 45 and 60 years, (2) good or excellent colon preparation, (3) no previous surgery of the colon, and (4) evident ileocecal valve identification. Colonoscopies were automatically recorded as digital video files at 30 frames/sec during 2009 and 2010 and analyzed using dedicated software. A scoring system was developed that allowed grading the inspection of both proximal (back of fold from endoscopist view) and distal (front of fold from endoscopist view) part of each fold. Both proximal and distal part of each fold were divided into 4 quadrants, and each quadrant was scored as inspected [=1] or not inspected [=0] giving a score of (4+4=)8 for complete fold inspection. A video frame was assigned to the beginning of each fold. Time spent between two folds, "inter-fold" time, was calculated by the difference between starting frames of two consecutive folds. A frame marking the transition between right and left colon, just prior to the splenic flexure, was annotated; this allowed us to calculate the number of folds of and the time spent within the right and left colon separately. **Results**: 65 colonoscopic videos were analyzed; cecal intubation was not achieved in 1 patient. The average number of folds identified during the withdrawal phase was 31±8 (M±SD): 15.5 folds proximal and 15.4 folds distal of the splenic flexure. Mean time spent on each inter-fold in the right colon was 11±8 (M±SD) sec, range <1 to 72 sec. Mean time spent on each inter-fold in the left colon was 10±8 (M±SD) sec, range <1 to 71 sec. The mean proximal and distal fold scores in the right colon were 3.0 and 3.5 and for the left colon 3.0 and 3.5. Based on fold scores on average an estimated 81% of colonic mucosa was inspected. Folds in the right colon were inspected 1.2 times on average vs. 1.1 times in the left colon; additional inspections were included in the overall fold score. Best inspection was characterized by an overall fold score of 9.6; worst inspection by an overall fold score of 4.9. **Conclusions**: Under optimal conditions: (1) the amount of colon mucosa seen and the time spent on visualization of folds vary greatly per colonoscopy; (2) on average about 81% of colonic mucosa is visualized; (3) distal parts of folds are examined significantly better than proximal parts; (4) colon anatomy and preparation do not explain the variability and the range of visualization from worst to best; and (5) lesions likely are missed.

Tu1004

Virtual Reality Curriculum in Endoscopy: Modular Self-Directed Training on Simulator (Simbionix GI Mentor) Using Expert Benchmark

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Background: There is increasing interest in the use of virtual reality (VR) simulators in endoscopy training. This is in parallel with the reduction in working hours available for junior doctors to train (European working time directive) and the demand of good clinical governance. Aim: To analyse the impact and didactic value of a VR curriculum in endoscopy using GI Mentor simulator for the training of junior doctors naive to endoscopic procedures. Materials & Methods: We created a VR curriculum in endoscopy on GI Mentor simulator using benchmark results obtained by expert endoscopists in previous published studies. This was divided in 3 modules: psychomotor skills, gastroscopy (OGD) and colonoscopy. Table 1 shows criteria necessary to pass each consecutive module. Participants were recruited among junior doctors interested in a career in gastroenterology or gastrointestinal surgery. They were given an induction on the simulator and then left to practise in their own time. The trainee was not allowed more than 4 attempts per day. Each module was considered to be successfully completed when the goals were met in 2 consecutive attempts. Results: Thirty-eight junior doctors were recruited (M/F:21/17; mean age 28±3 years). 15 (40%) completed the first module in 60 days; other 7 are still ongoing. Median number of attempts necessary to pass endobasket was 9, 9 for endobubble level 1 and 8 for endobubble level 2. 8 trainees passed the OGD module after a median of 7 attempts, 5 are still practising. 3 passed the colonoscopy module after a median of 10 attempts, 2 are still in training. At first attempt, mean time to finish for endobubble 1 was 6.26 minutes; mean time to reach the duodenum was 1.20 minutes and for the caecum was 2.22 minutes. Main reason for failure to complete the module was lack of time due to oncall commitments and long travel distance for non-internal doctors. Conclusions: Self-directed learning following pre-established goals through a modular curriculum is an effective way to train novices in endoscopy with the potential of improving patient comfort and safety during the initial phase of the learning curve. This should be included in training and available in teaching hospitals. Further studies are required to assess the ability to transfer skills learnt in a simulator on a real clinical setting and to overcome those barriers which are preventing trainees from completing the curriculum.

table 1

Psychomotor skills	Endobasket level 1	Endobubble level 1	Endobubble level 2
Time to finish	<90sec	<90sec	<2min
N balloon	N/A	20	>24
		OGD any case	Colonoscopy 1st module case 1-3
time to reach D2/caecum		<60sec	<4min
% mucosa visualized		>85%	>85%
% time clear view		>90%	>85%

Tu1005

Recognition of Mucosal Surface Patterns With Narrow Band Imaging Among GI Fellows: Pre and Post-Test Analysis

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Background: Narrow band imaging (NBI) enhances the ability to evaluate the surface pit patterns and vascular architecture of colonic polyps. These patterns differ between adenomas and hyperplastic polyps, allowing for real time endoscopic interpretation to differentiate benign from potentially malignant tissue. As the use of NBI increases, it is important that gastroenterology (GI) fellows become familiar with the interpretation of these endoscopic patterns. Aim: The aim of this study was to determine the ability of GI fellows to accurately differentiate and predict polyp histology following a formal NBI training session. Methods: A pre-test consisting of 34 NBI and white light (WL) images was administered to GI fellows at a tertiary care center. These images were obtained from a separate prospective IRB-approved study conducted at our institution. Following the pre-test, a formal teaching session was given describing characteristics of polyps suggestive of adenomatous or hyperplastic histologies. After a period of 3 months, the same set of polyp images were administered to the same GI fellows (post-test). The results of the pre- and post- tests were compared with polyp histology as the standard for comparison. Results: 14 GI fellows participated in the study. Of the set of images, 20 were adenomas, 9 were hyperplastic, and 5 were normal colonic mucosa. The mean number of correct answers on the pre-test was 45%, while the mean number of correct answers on the post-test was 46% (p= NS). No significant difference between the scores of junior and senior fellows was noted. Improvement in scores from pre- to post-test was greater among the junior fellows than senior fellows. More junior fellows changed their initial incorrect answer to a correct one on the post-test, while more senior fellows changed their initial correct answer to an incorrect one on the post-test. Conclusion: The accuracy of fellows in predicting colonic histology with the assistance of