Poster Exhibit 7: Training & Evaluation

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UP-135

Development of a portable endoscopic training system for urology

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Introduction: Mastering a surgical skill requires experience and repetition, yet opportunities for surgical trainees to gain real experience is variable and limited by case load. Surgical simulators have emerged to attempt to overcome these limitations. In urology, few commercially available simulators exist. One that has seen limited adoption, the URO Mentor, has been validated in several studies. However, this system is expensive, at $60 000 USD, and is not portable. The goal of this work is to develop and validate a low-cost, portable endoscopic simulation system for training urology residents.

Methods: We developed a system that simulates the experience of endoscopy in urology. The system consists of a smartphone/tablet application (app) that displays an endoscopic camera view, and a wireless controller modelled like a real endoscope (Figs. 1, 2). The app is designed like a game, with sequential levels adding complexity to tasks that must be completed. This initial study focuses on face validation of the prototype. Post-participation surveys were administered to urology residents and staff and a five-point Likert scale was used to evaluate simulator's realism and usefulness.

Results: Subjective scores were obtained relating to the look, feel, and physics of the system, and a global score rating the system's perceived utility in increasing residents' performance in real life. All users rated at least 4/5 in all domains of usefulness as a teaching tool and reasonable scores for realism (Figs. 3, 4)

Conclusions: We have created a portable endoscopic simulation system for training urology residents. In this phase of our study, we obtained feedback that will inform the next iteration of the system. This validation is essential to the next phase, which will quantify the system's ability to improve resident real-world performance.

UP-135. Fig. 1. Tablet application of the system that simulates the experience of endoscopy.

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Consistency of examiner scoring of an Objective Structured Clinical Examination (OSCE)

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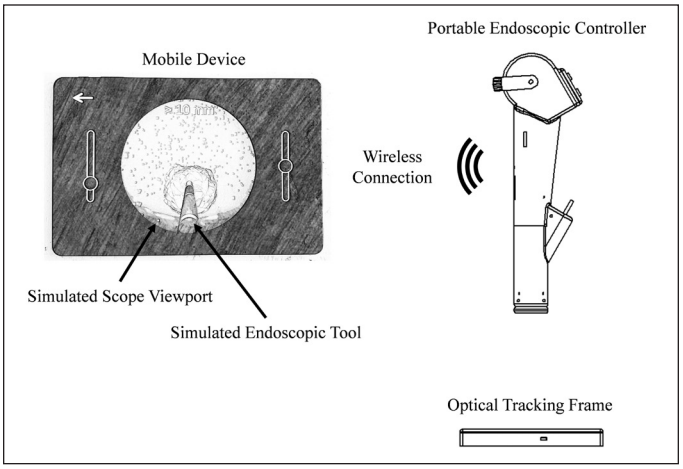
Introduction: Objective Structured Clinical Examinations (OSCE) form the cornerstone of evaluating competency attainment at all stages of medical training. In urology, specifically, OSCEs have been an integral part of the summative Royal College exam. The consistency of the clinical scenarios, along with uniform questions posed and answers expected make OSCEs attractive tools of assessment. However, it is not clear whether an examiner makes a difference in the scoring of an OSCE exam. Given a particular candidate with a specific clinical scenario, the aim of this study was to determine whether the scoring between two examiners is meaningfully different.

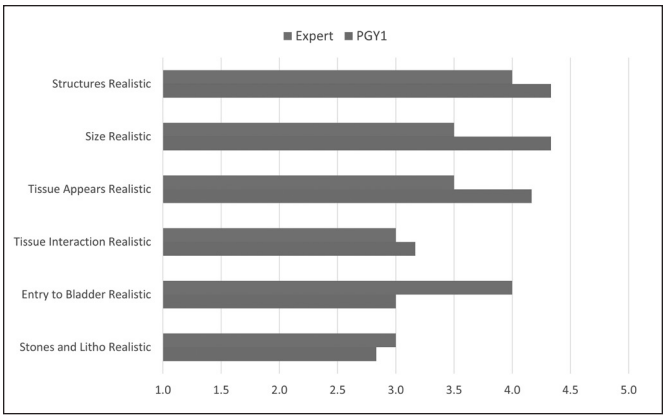
Methods: There were 39 participants who each completed four OSCE stations at the Queen's Urology Exam Skills Training (QUEST). The exam was carried out virtually over ZOOM in November 2020. The topics of the four stations were as follows: nephrolithiasis (NL), urinary incontinence (UI), prostate cancer (PCa), and general urology (GU). Each candidate was examined and scored by two different Royal College-certified examiners in a blinded fashion. An intra-class correlation (ICC) analysis to determine the inter-rater reliability of the two groups of examiners for each of these four OSCE stations was conducted.

Results: The PCa station scores were most strongly correlated (ICC 0.746. 95% confidence interval [CI] 0.556–0.862, p<0.001). The GU scores were the next most strongly correlated (ICC 0.688, 95% CI 0.464–0.829, p<0.001). This was followed closely by the UI station (ICC 0.638, 95% CI 0.403–0.794, p<0.001). With ICC coefficients >0.600, these three groups have substantial inter-rater reliability. However, the NL group was the least closely correlated (ICC 0.472, 95% CI 0.183–0.686, p<0.001). This shows a poor inter-rater reliability.

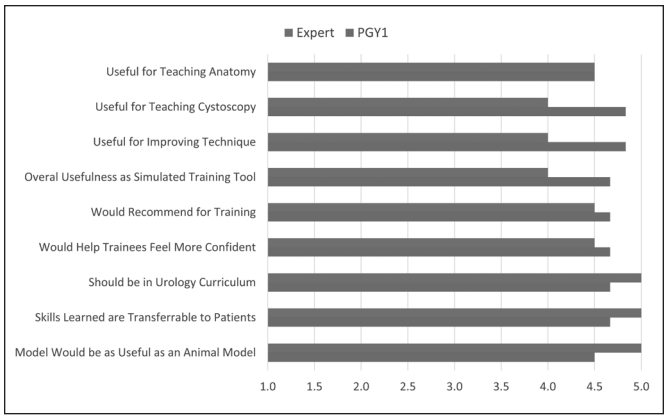
Conclusions: Given a specific clinical scenario in an OSCE exam, it would appear that inter-rater reliability of scoring can be compromised on occasion. The factors that play a role in this divergence in scoring will need



UP-135. Fig. 2. Wireless controller modelled like a real endoscope.



UP-135. Fig. 3. Results of survey for model's realism



UP-135. Fig. 4. Results of survey for model's usefulness as a teaching tool.

further research to elucidate, especially if the central role of OSCEs is to be maintained in high-stakes exams.

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A synchronous motion-tracking and video-capture system for objective assessment and training in ureteroscopy

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Introduction: Hand/instrument motion-tracking in surgical simulation provides valuable data to improve psychomotor skills and can serve as a more formative evaluation tool. Although motion analysis has been well-studied in laparoscopic surgery, it has been poorly studied in endoscopic surgery. There are essentially no studies looking at motion tracking for flexible ureteroscopy (fURS), a surgical procedure that requires significant hand dexterity. Our goal was to design an open-source, synchronized, motion-tracking and video-capture system for fURS. The aim is to provide trainee feedback and to collect metrics for use in objective skills assessment/examinations.

Methods: Position and orientation data of the ureteroscope handle and lever (used to manipulate the tip) was collected with a motion-tracking system (Polhemus™), off-the-shelf inertial measurement units (IMUs), and optical sensors. Video data of the surgeon's hands was captured with a Raspberry Pi camera. Video data of the scope view was collected from the video tower with an off-the-shelf USB video grabber. Open-source Python software was written to control and integrate the sensors and cameras with a Raspberry Pi 4.

Results: A preliminary prototype of the system was assembled with the Polhemus™ sensor, IMUs, and Raspberry Pi. A 10-minute trial demonstrated successful, synchronized data collection of the position and orientation of the instrument handle and lever, and video data of the hands. Average CPU use went from an 8% baseline to 33% during data collection.

Conclusions: We are building an open-source, data-collection system capable of gathering synchronized motion-tracking and video data in fURS. The data pool can be used by surgeons and engineers to improve and standardize objective assessment and simulation training for endoscopic surgery. Our next steps include integration of optical sensors for insertion point tracking and a sensor for scope tip tracking.

UP-138

Perceptions and attitudes of learners towards video recording of their operative performance for assessment of surgical skills

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Introduction: With the advancement of competency-based education, there has been increasing interest in video data collection in the operating room (OR) as a means for objective surgical skill assessment. However, studies evaluating feasibility of this new assessment method have had limited focus on the learner side. Our objective was to survey surgical trainees on their perceptions to videotaped surgical performance and its use in education and assessment.

Methods: A previously piloted, online survey was distributed to all Canadian surgical program administrative staff and program directors with the request to be internally distributed to residents. All participants were anonymous. The survey was administrated over a four-week time frame.

Results: A total of 138 of 548 responses were received (23.7% response rate). All surgical specialties and years of training were represented; 89% had no experience having their own operative skills recorded, while 66% reported the use of online surgical video recordings for surgical preparation. Most trainees (92%) were receptive to having their operative skills recorded for assessment, stating recordings would depict a true representation and be more objective than current methods. Ninety-five percent felt that videotaping one's operative performance could play a role in their learning; yet 52% indicated these should not be part of summative evaluation. A total of 66% expressed levels of concern with litigation issues, while 70% were not concerned with personal privacy. Trainees expressed that video recording in the OR would not be intrusive (55%), nor would it affect the "true" OR environment (56%).

Conclusions: Most surgical trainees were receptive to having their surgical skills recorded in the OR for educational purposes and felt that recordings would serve as an objective representation of surgical skills. Provided patient and trainee consent, surgical residency programs are encouraged to incorporate and increase accessibility of operative video recording of its residents.

UP-139

Practical telemedicine and digital health for learners: A new curriculum or a necessity?

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Support: Ontario Telemedicine Network (OTN), now Ontario Health. Staff, Richmond Hill Urology Practice and Prostate Institute RHUPPI.
Introduction: We are in an age where technology is driving the way we live, learn, and do business. Digital health, telemedicine, and artificial intelligence are expected to influence the way healthcare is delivered. The uptake of these technologies varies among specialties and healthcare professionals. Since we incorporated telemedicine in our office urology practice in 2006, we have received requests from learners in various universities and colleges to learn about new technologies in healthcare. This report is the outcome of our experience and those of the learners.
Method: Following requests from learners at various universities and colleges to learn about new technologies in healthcare, a curriculum was developed to teach basic practical telemedicine and digital health concepts in four-hour periods weekly for three weeks. Approved consent and learning contract were obtained from the learners. A learning curriculum was developed based on their learning needs and time resources. All aspects of telemedicine in office urology practice were taught. There were 15 learners at various stages of their undergraduate, nursing, or medical education.
Results: In 12 hours over three weeks, learners gained knowledge, attitude, and skill in telemedicine and digital health for future career success. Learners were engaged in designing the curriculum through their learning contracts. Excellent time management was key to keeping the learners keen. Feedback from 12 of the 15 learners we reached at this time suggest this experience had a positive impact in their learning and practice as they progressed in their chosen fields in healthcare.
Conclusions: Engaging learners early in their training on the application of telemedicine, digital health, and various upcoming technologies seem appropriate. This will help to grow and increase the uptake of technology in healthcare. Now that COVID-19 seem to have made telemedicine/telehealth go "viral," the need exists for well-structured design, implementation, and evaluation of a curriculum for healthcare learners.

UP-140

Predictors of ureteroscopic aptitude among novice trainees

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Support: Boston Scientific.
Introduction: Non-surgical skills involving hand-eye coordination and bimanual dexterity, such as video game and musical instrument activities, may have a transferable impact on the acquisition of ureteroscopy skills. In this study, we aimed to investigate the predictors of initial ureteroscopy skills among novice trainees.
Methods: This was a prospective cohort study involving novice trainees with no prior ureteroscopy exposure. Non-surgical parameters were assessed with detailed survey, including age, gender, video game history, and musical background. Musical ability was further objectively evaluated with the mini-Profile of Music Perception Skills (mini-PROMS) test. Ureteroscopic performance was then evaluated using a Boston Scientific flexible ureteroscope on a bench model. Each participant completed diagnostic ureteroscopy and stone extraction with a basket. Outcomes included both speed and quality of performance, based on an Objective Structured Assessment of Technical Skills (OSATS) rubric.
Results: A total of 28 pre-clerkship medical students were included. Age and musical background were not associated with ureteroscopic aptitude, regardless of length or type of musical training. Those with video game history tended to perform ureteroscopy tasks faster, with a higher OSATS

UP-140. Table 1. Participant demographics vs. ureteroscopy performance

	Diagnostic ureterorenoscopy		Ureteroscopic stone extraction		
	Time (s)	Total locations checked (/5)	Time (s)	OSATS score (/35)	Can they perform in the OR?
Overall	237±85	4.0±1.0	159±110	15.7±4.9	61%
Age					
<25 yrs (n=16)	216±72	4.0±1.2	187±128	14.3±4.7	56%
>25 yrs (n=12)	266±96	3.9±0.9	122±67	14.2±4.7	67%
p	0.12	0.84	0.10	0.97	0.59
Gender					
Male (n=14)	214±62	4.2±1.1	132±104	16.6±4.5	79%
Female (n=14)	260±100	3.7±1.1	185±112	12.0±3.3	43%
p	0.16	0.22	0.21	<0.01	0.05
Video game history					
Yes (n=13)	217±67	4.1±1.1	148±107	15.6±4.1	69%
No (n=15)	256±97	3.9±1.1	159±115	13.1±4.8	53%
p	0.24	0.60	0.62	0.20	0.41
Musical instrument history					
Yes (n=19)	257±82	4.0±1.1	171±124	13.9±4.9	53%
No (n=9)	195±81	3.9±1.2	133±69	14.9±3.7	78%
p	0.68	0.81	0.39	0.60	0.20
Urology residents					
Juniors (PGY 1-3) (n=5)	132±60	5.0±0.0	48±20	26.4±2.1	100%
Seniors (PGY 4-5) (n=5)	116±52	5.0±0.0	33±7	28.8±2.8	100%
p	0.92	1.0	0.076	0.012	1.0

score, although no statistical significance was reached. Male gender was associated with faster task completion with statistically higher OSATS score independent of video game activities (p=0.011), however, the absolute score difference was small (4.6 points).
Conclusions: Among novice trainees, musical background was not associated with ureteroscopy skills. Video game experiences and male gender were associated with slightly faster and higher ureteroscopy technique scores, however, the differences are small and unlikely to represent clinical significance. Nevertheless, the ureteroscopy models provide useful insights and should be adopted in training programs as a marker of skills progression.

UP-141
Current educational interventions for improving crisis resource management skills in surgery

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Introduction: Crisis resource management (CRM) is an established model for non-technical skills development, widely used across high-reliability industries. CRM has become an important model for team-based education in surgery, used in simulation and didactic-based methods. The purpose of this systematic review is to synthesize and examine published CRM-based educational paradigms designed to improve trainee performance in surgery, and to analyze their strengths and limitations.
Methods: A literature search of the Excerpta Medica dataBASE (EMBASE), the Medical Literature Analysis and Retrieval System Online (MEDLINE), the Cochrane Library, and PsycINFO databases were performed to identify literature focused on current educational interventions for improving crisis resource management in surgery. The Medical Education Research Study Quality Instrument (MERSQI) was used to evaluate the overall quality of evidence.
Results: A total of 1785 articles were identified, of which 15 were selected for full-text review. Studies were categorized into the intraoperative and postoperative phases of surgery. The types of educational interventions included simulation, didactic seminars, and debriefing scenarios. Metrics used to measure the effectiveness of the educational interventions included ANTS, Ottawa GRS, NOTSS, NOTECHS, and Trauma Management Skills Score. Overall, the studies had an average MERSQI score of 13.7/18.
Conclusions: CRM in a surgical setting requires further study to discover what constitutes an effective educational intervention in the operative setting. Further work is needed to link CRM training with educational and patient outcomes and to develop an effective approach to integrating these interventions longitudinally into training curricula.

UP-142
Urology and academic productivity in Thunder Bay Regional Heath Science Centre surgical specialities

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Introduction: The h-index was recently introduced as a bibliometric measure of academic productivity and impact of authors and their publications. We aim to evaluate the scientific research output in Thunder Bay Regional Health Science Center (TBRHSC) surgical departments in the setting of a remote academic center.
Methods: A database of all surgical departments was identified through the TBRHSC website. For each faculty member, the automated h-index, number of publications, total citations, and the first year of publication from Scopus (http://www.scopus.com) was obtained using the author search function. M-quotient and citation years were calculated as formula. Demographic comparison was conducted using descriptive statistics and analysis of variance for continuous variable.
Results: From 259 physicians, 36 surgeons were identified in TBRHSC in December 2020. The median (interquartile range) and mean h-indices for the entire cohort were 2 (1–2.8) and 3.6, respectively. Urology, maxillofacial surgery, and ophthalmology demonstrated the first three highest h-indices and total citations in this academic institute (Table 1).
Conclusions: This report represents the first thorough analysis of academic productivity in the surgical department of TBRHSC. Urology has the highest absolute number of publications. Urology, among a few other specialities, has above median h-index despite the more recent initiation of the urology program. These results may provide a benchmark for comparison with other Canadian hospitals and urology speciality in a remote academic setting.

UP-142. Table 1. Academic productivity among surgical specialities in TBRHSC

Speciality	No. of publications	Publication*	Total citations*	h–index*	Rank	h–index median (IQR)	m-quotient*	Citation years*	Academic rank** (assistant professor, associate professor, professor)	Gender** (male/ female)
General surgery	12	2.4	82.4	2.2	7	1 (1–1.5)	0.30	11.2	7, 1 ,0	8/0
Neurosurgery	1	1	1	1	9	1 (1–1)	0.05	20	1, 1, 0	2/0
Ophthalmology	57	11.4	164.6	4.6	3	3 (1.75–5.75)	0.19	23	3, 1, 0	4/0
Oral & maxillofacial Surgery	47	23.5	325	8.5	1	8.5 (1–16)	0.79	14.5	1, 0, 1	2/0
Orthopedics	38	4.7	68.5	2.2	6	1 (1–2.5)	0.55	7.25	4, 3, 1	6/2
Otolaryngology	2	2	0	0	10	0 (0–0)	0.00	2	2, 1, 0	2/1
Plastic surgery	24	12	49.5	3	4	3 (0–6)	0.30	20	0, 2, 0	2/0
Urology	113	28.2	275	7.7	2	8 (4–11.5)	0.68	13.7	4, 0, 0	4/0
Vascular surgery	12	4.0	23.0	2.3	5	2 (1.25–3.5)	0.60	5.3	3, 0, 0	3/0

*Values have been presented as mean. **Values have been shown as numbers.