beneficial as measured by *a priori* outcomes. Combined VR and conventional training appears to be beneficial compared to VR training alone. VR curricula grounded in educational theory, such as a progressive learning-based curriculum, provided benefit regarding composite score of competency. Definitive evidence for or against VR training in place of conventional training or another form of simulation is lacking.

### Abstract PTH-140 Table 1

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Studies (n)</th>
<th>Procedures (n)</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation training versus no training</td>
<td></td>
<td></td>
<td>0.73 [-0.10, 1.57]†</td>
</tr>
<tr>
<td>Procedure Completion</td>
<td>1</td>
<td>24</td>
<td>1.62 [1.15, 2.26]</td>
</tr>
<tr>
<td>Time</td>
<td>2</td>
<td>29</td>
<td>-0.39 [-1.13, 0.35]†</td>
</tr>
<tr>
<td>Discomfort</td>
<td>2</td>
<td>200</td>
<td>-0.30 [-0.89, 0.29]‡</td>
</tr>
<tr>
<td>Global Rating Competency</td>
<td>1</td>
<td>36</td>
<td>1.34 [0.67, 2.19]‡</td>
</tr>
<tr>
<td>Mucosal Visualisation</td>
<td>1</td>
<td>55</td>
<td>0.79 [0.24, 1.34]†</td>
</tr>
<tr>
<td>VR simulation training versus conventional training</td>
<td></td>
<td></td>
<td>0.45 [0.27, 0.74]†</td>
</tr>
<tr>
<td>Procedure Completion</td>
<td>2</td>
<td>174</td>
<td>0.12 [0.55, 0.80]‡</td>
</tr>
<tr>
<td>Time</td>
<td>2</td>
<td>34</td>
<td>-0.23 [-1.22, 0.76]‡</td>
</tr>
<tr>
<td>Mucosal Visualisation</td>
<td>1</td>
<td>18</td>
<td>0.00 [-0.92, 0.92]‡</td>
</tr>
</tbody>
</table>

**Conclusion**

VR training can effectively supplement early conventional endoscopy training. Comparative effectiveness studies of different simulation modalities are limited. Newer trials provide insight into simulation training approaches grounded in educational theory that improve subsequent clinical performance.

### PTH-141

**THE LEARNING CURVE FOR POLYPECTOMY AND ENDOSCOPIC MUCOSAL RESECTION (EMR): A SYSTEMATIC REVIEW**

Arun Rajendran, Samuel Parriwick, Swan Thomas-Gibson, Chukwemeka Anele, Siddartha Oke, Nick Sevdalis, Adam Haycock. King’s College London UK, Charing Cross Hospital, UK, St Mark’s Hospital, UK

**Introduction**

Lower gastrointestinal (LGI) endoscopy has evolved from being a diagnostic procedure to include therapeutic procedures such as polypectomy and EMR. For training purposes, there is a need to define the learning curve (LC) and competency markers for these procedures.

**Methods**

A systematic review of the literature from 1946 to August 2016 was conducted by searching Pubmed, Embase and Web of Science. The search strategy used key MeSH terms and text words related to LC in LGI polypectomy and EMR. Full-text review of eligible studies and a quality appraisal (modified Down’s and Black scale) was performed for each identified study. Outcome measures were analysed to try to identify LC and competency markers.

**Results**

Initial database search identified 754 articles and after applying exclusion criteria, 3 articles for polypectomy and 3 articles for EMR were identified for review. A variable range of predefined outcome measures were used to calculate LC and technical competence in the included studies.

**Table 1** summarises the LC studies on polypectomy. Choung et al. noted a <1.2% DPPB rate for endoscopists who had performed >400 polypectomies, which was below the 2% predefined cut-off. In Boo et al., the enbloc resection rate for trainees increased steadily & average CP time decreased significantly with experience (p<0.001). The success rate of >80% was achieved by trainees after 250 snare polypectomies. Patwardhan

**Abstract PTH-141 Table 1**

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of trainees</th>
<th>Previous experience of trainees</th>
<th>Size of polyps included in the study</th>
<th>Type of polypectomy</th>
<th>No. of snare polypectomies performed by trainees</th>
<th>Outcome measure</th>
<th>Learning curve no. of cases: outcome measure achieved (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choung 2014</td>
<td>15</td>
<td>&gt;300</td>
<td>&gt;5mm</td>
<td>Snare</td>
<td>5981</td>
<td>Delayed Post Polypectomy Bleeding (DPPB)</td>
<td>&gt;400 polypectomies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Biopsy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1528 (25.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EMR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>143 (2.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boo 2015</td>
<td>3</td>
<td>&gt;150</td>
<td>&lt;15mm (sensible)</td>
<td>Snare</td>
<td>750</td>
<td>Enbloc resection</td>
<td>250 polypectomies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;20mm (pedunculated)</td>
<td></td>
<td></td>
<td>ColonoScopic Polypectomy (CP time)</td>
<td></td>
</tr>
<tr>
<td>Patwardhan 2016</td>
<td>10</td>
<td></td>
<td></td>
<td>Cold snare 924 (91.6%)</td>
<td>1009</td>
<td>Independent unsustained polypectomy completion rate</td>
<td>90% after 300 (colons)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot snare 85 (8.4%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*any size flat lesion excluded
et al. noted that rates of independent snare polypectomy were consistently >90% after 300 colonoscopies & >95% after 700 colonoscopies.

Table 2 summarises the LC studies in EMR. Bhurwal et al. observed that after 100 EMR procedures, the proportion of residual neoplasia (recurrence) at <2 years follow up was <20% & the frequency of incomplete EMR was between 20%-25%. Lamb et al. showed that the recurrence rates at 3 months & adverse events (bleeding & perforation) were comparable after 50 EMR procedures. Choi et al. demonstrated that complete resection rates increased significantly from 37.4% within the first 100 EMRs to 57.6% after 300 EMRs (on par with the expert group).

Conclusions There are very few studies examining the LC of polypectomy and EMR with wide variation in LC. Several outcome measures were identified that could be used to assess competency in polypectomy (DPPB, recurrence, and polypectomy completion rate) and EMR (recurrence and bleeding). There is a need for more robust studies to further understand the LC of polypectomy and EMR. Current training guidelines for polypectomy and EMR require further evaluation.

REFERENCES
1. JAG (UK) 2011
2. Downs, et al. 1998
4. Boo, et al. 2015

Table 2  Summary of EMR learning curve studies

<table>
<thead>
<tr>
<th>Study</th>
<th>No: of trainees</th>
<th>Previous experience</th>
<th>Mentorship</th>
<th>Size of polyps included in study</th>
<th>No: of EMRs performed by trainees (n)</th>
<th>Outcome measure</th>
<th>Learning curve no. of EMR cases: outcome measure achieved (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhurwal 2016</td>
<td>3</td>
<td>2.5 years' gastroenterology experience</td>
<td>Not defined</td>
<td>&gt;20 mm (median=30)</td>
<td>578</td>
<td>Residual neoplasia at &lt;24 months follow-up</td>
<td>100</td>
</tr>
<tr>
<td>Lamb 2012</td>
<td>1</td>
<td>Competent in colonoscopy*</td>
<td>BCSP* colonoscopy, with level 4 polypectomy competency as mentor throughout the early period of training</td>
<td>&gt;20 mm</td>
<td>129</td>
<td>Endoscopic assessment of incomplete EMR</td>
<td>Recurrence at 3m Bleeding</td>
</tr>
<tr>
<td>Choi 2015</td>
<td>7</td>
<td>&gt;2 yrs of experience &gt;500 OGDs &amp; &gt;50 sigmoidoscopies /yr</td>
<td>Performed CP under supervision of expert endoscopists for 1 month</td>
<td>5-9mm (75.8%)</td>
<td>2080</td>
<td>Complete resection</td>
<td>300</td>
</tr>
</tbody>
</table>

*An accredited Bowel Cancer Screening Programme consultant, **Competent in colonoscopy as defined by JAG, UK.
Abstracts

PTH-142 Table 1 TEAM BRIEF – 'The Huddle'

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>ENABLERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complacency</td>
<td>Unit staff drivers for huddle</td>
</tr>
<tr>
<td>Distractions</td>
<td>Motivation of unit staff</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>Equipment needed/problems identified</td>
</tr>
<tr>
<td>Lack of consistency</td>
<td>Introductions and roles identified</td>
</tr>
<tr>
<td>Non-compliance</td>
<td>Knowing what to expect from the list</td>
</tr>
<tr>
<td>Familiarity</td>
<td></td>
</tr>
<tr>
<td>Lack of assertiveness</td>
<td></td>
</tr>
</tbody>
</table>

PTH-142 Table 2 TIME OUT – 'The Pause'

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>ENABLERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not everyone recognises the value of time out</td>
<td>Brings the team together</td>
</tr>
<tr>
<td>Becomes a ‘tick box’ exercise</td>
<td>Patients kept safe</td>
</tr>
<tr>
<td>Poor time management</td>
<td>Makes everyone aware of risks and to remind each other</td>
</tr>
<tr>
<td>Getting everyone together at the same time</td>
<td>When everyone participates risks are highlighted</td>
</tr>
<tr>
<td>Loss of focus during timeout, concentrating</td>
<td>Identifies patient alerts, consent, medical on other tasks conditions, allergies</td>
</tr>
<tr>
<td>Distractions</td>
<td></td>
</tr>
<tr>
<td>Starting time out before all staff are in the room</td>
<td></td>
</tr>
<tr>
<td>Sign out not signed</td>
<td></td>
</tr>
</tbody>
</table>

PTH-142 Table 3 SIGN OUT – 'Sign Off/Strike Off'

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>ENABLERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time constraints</td>
<td>Right patient, right report and right diagnosis</td>
</tr>
<tr>
<td>Entire team not always present for sign out</td>
<td>Two nurses checking reports and specimens before next patient arrives in the room</td>
</tr>
</tbody>
</table>

PTH-142 Table 4 DEBRIEF

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>ENABLERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debrief does not happen</td>
<td>Boosts morale</td>
</tr>
<tr>
<td>Endoscopists leaving department without checking patients</td>
<td>Identifies any issues</td>
</tr>
</tbody>
</table>

Conclusions Endoscopy staff report that human factors present barriers to the performance of checklist.

There is a need to further explore the relationship between direct observation of practice and non-technical skills and whether training in human factors for endoscopy teams can reduce adverse events and improve safety behaviour.

PTH-143 MEDICAL STUDENTS’ PERCEPTION OF UNDERGRADUATE HEPATOLOGY TEACHING IN THE UK – A NATIONAL SURVEY

1Lubiana Leara Shabeer*, 2Shahid A Khan. 1School of Medicine, University of Leeds, Leeds, UK 2Department of Hepatology, St Mary’s Hospital, Imperial College London Healthcare NHS Trust, UK

10.1136/gutjnl-2018-BSGAbstracts.S42

Introduction Exposure to and teaching of clinical Hepatology during training at UK medical schools is anecdotally limited. Due to rising mortality rates, addressing liver disease has been identified as a national clinical priority and raises the question of whether Hepatology teaching on undergraduate curriculums is adequate for the increasing demand. To date, there has been no evaluation of the undergraduate Hepatology curriculum.

The aim of this study was to assess final year UK medical students’ attitudes towards their current hepatology curriculum and their confidence of knowledge regarding hepatology-related clinical conditions.

Methods 31 UK medical schools were approached to partake in this study. 10 medical schools gave permission to distribute our 9-question online questionnaire to their students. Responses were collected over ten weeks following two rounds of local advertising. Ethical permission was obtained from the Medical Education Ethics Committee, Reference MEEC1617-45.

Results 123 responses were obtained from 10 UK based universities. The undergraduate medical education in Hepatology was rated as poor or unsatisfactory by 47.2% of respondents. 67.5% of participants strongly agreed or agreed that the inclusion of a Hepatology rotation would be useful to students and should be in the curriculum. Completing an additional component, such as student selected module, in hepatology was associated with higher confidence levels in key hepatology-related conditions.

Conclusions This is the first study to look at medical students’ perception of clinical Hepatology teaching in the undergraduate curriculum. High levels of inadequacy associated with the current teaching suggest the need for a revised curriculum. There is potential to increase Hepatology exposure to students through optional modules and a mandatory Hepatology rotation, to improve confidence levels and equip students for the future challenges with liver disease.

PTH-144 ALIGNING JETS SEDATION KEY PERFORMANCE INDICATOR MEASUREMENTS WITH CURRENT UK STANDARDS: IMPACT ON TRAINEE OUTCOME


10.1136/gutjnl-2018-BSGAbstracts.S43

Background The measurement of sedation KPIs in colonoscopy varies between JETS certification criteria and recent UK standards. To align standards in preparation for the National Endoscopy Database (NED), changes were recently made on JETS: 1) measuring average sedation doses, when used, with mean vs. median, and 2) reducing the maximum recommended midazolam dose in patients aged 70+ from mean of 2.5 mg to median. We aimed to explore the impact of these changes on trainee outcomes of exceeding recommended average doses.

Methods Sedation KPIs for midazolam [M], fentanyl [F] and pethidine [P] were extracted from the JETS e-Portfolios of trainees awarded provisional colonoscopy certification (PCC) between June 2011–2016, and stratified by drug and age (<70 vs. 70+). Calculations were applied at trainee level in the 50 procedures pre-PCC. Unsedated procedures were excluded. Normality testing was performed using the Shapiro-Wilk method, with skewed data expressed in medians and
pairwise comparisons of KPI data made using Wilcoxon and McNemar’s tests.

**Results**

733 trainees performed 36,650 procedures with M (75.6%), F (49.6%) and P (25.3%). Normality testing indicated the skewed distribution of sedation doses, which supported the use of medians. At trainee-level, changing mean to median resulted in smaller average doses of M, F and P for patients aged <70 and 70+ (figure 1), with lower estimates in 41.6%. Fewer trainees exceeded the 2.5 mg midazolam dose threshold in 70+ (table 1) when averaged with median (4.4%) vs. mean (8.1%) [p<0.001]. In this group, limiting the median M dose from 2.5 mg to 2 mg led to an increase in trainees failing to meet this standard (from 4.4% to 10.7%, p<0.001). Overall, the change of KPI measurement increased the proportion of trainees exceeding the new sedation threshold at PCC from 8.1% to 10.7% (p=0.010).

**Conclusions**

The JETS sedation KPIs have aligned with UK standards. As this may affect trainee outcome, all colonoscopy trainees and trainers should take note and exercise caution with sedation use, particularly in elderly patients.

<table>
<thead>
<tr>
<th>Patient Age</th>
<th>&lt; 70</th>
<th>70+</th>
<th>&lt; 70</th>
<th>70+</th>
<th>&lt; 70</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trainers</td>
<td>732</td>
<td>729</td>
<td>607</td>
<td>579</td>
<td>392</td>
<td>346</td>
</tr>
<tr>
<td>Trainers&gt;JETS* (mean)</td>
<td>0.1%</td>
<td>8.1%</td>
<td>0.2%</td>
<td>10.2%</td>
<td>0</td>
<td>0.9%</td>
</tr>
<tr>
<td>Trainers&gt;JETS* (median)</td>
<td>0</td>
<td>4.4%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.3%</td>
</tr>
<tr>
<td>Trainers&gt;UK standards (median)</td>
<td>0</td>
<td>10.7%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

---

**Abstract PTH-144 Figure 1** Scatterplot demonstrating differences between mean and median averages for each trainee’s sedation KPIs. Thick line denotes median of differences and thin line denotes the mean of differences.