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## ORIGINAL ARTICLE

# Impact of the Joint Advisory Group on Gastrointestinal Endoscopy (JAG) on endoscopy services in the UK and beyond

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**ABSTRACT**

The Joint Advisory Group on Gastrointestinal Endoscopy (JAG) was initially established in 1994 to standardise endoscopy training across specialties. Over the last two decades, the position of JAG has evolved to meet its current role of quality assuring all aspects of endoscopy in the UK to provide the highest quality, patient-centred care. Drivers such as changes to healthcare agenda, national audits, advances in research and technology and the advent of population-based cancer screening have underpinned this shift in priority. Over this period, JAG has spearheaded various quality assurance initiatives with support from national stakeholders. These have led to the achievement of notable milestones in endoscopy quality assurance, particularly in the three major areas of: (1) endoscopy training, (2) accreditation of endoscopy services (including the Global Rating Scale), and (3) accreditation of screening endoscopists. These developments have changed the landscape of UK practice, serving as a model to promote excellence in endoscopy. This review provides a summary of JAG initiatives and assesses the impact of JAG on training and endoscopy services within the UK and beyond.

**INTRODUCTION**

**The role of Joint Advisory Group on Gastrointestinal Endoscopy (JAG) in quality assurance (QA)**

QA is the process of monitoring and assessing a product, service or process to ensure that it is of sufficient quality.<sup>1</sup> In the 1990s, the expansion and multidisciplinary nature of endoscopy led to calls for a unified advisory body to quality assure endoscopy training.<sup>2</sup> Thus, the JAG was

established in 1994 under the auspices of the Academy of Royal Medical Colleges with committee members from the Royal Colleges of Physicians, Royal Colleges of Surgeons, Royal Colleges of Radiologists and Royal Colleges of General Practitioners. Although the initial focus was on standardising training between specialties, the role of JAG has progressively evolved to meet its current vision of quality assuring all aspects of endoscopy to provide the highest quality, patient-centred care. Over the last two decades, drivers such as changes to healthcare agenda, national audits, advances in research and technology and the advent of population-based cancer screening have been key in this shift in priority.<sup>3</sup> Over this period, JAG has spearheaded various QA initiatives with support from other national stakeholders including the Department of Health (DoH), British Society of Gastroenterology (BSG), Association of Coloproctology of Great Britain and Ireland (ACPGBI), Association of Upper GI Surgeons and Specialist Advisory Committees (SACs). These have led to the achievement of notable milestones in endoscopy QA (table 1), establishing its role in the three major areas of: (1) training, (2) accreditation of services and (3) accreditation of screening endoscopists (figure 1). These developments have changed the landscape of endoscopy practice in the UK and serve as a model to promote excellence in endoscopy. This review provides a summary of JAG initiatives and assesses the impact of JAG on training and endoscopy services within the UK and beyond.



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## ENDOSCOPY

**Table 1** Timeline of JAG achievements and corresponding drivers

Year	JAG milestone	Driver(s)
1994	JAG established.	
1999	First JAG position statement: <i>'Recommendations for training in GI endoscopy'</i> .	
2002	First JAG committee meeting.	
2003	Development of endoscopy modernisation England – NHS endoscopy toolkit.	DoH support
2004	GRS piloted – part of NEP, aligned with JAG. <i>'Guidelines for training, appraisal and assessment of trainees in GI endoscopy and for the Assessment of units for Registration and Re-Registration'</i> . Endoscopy curriculum. DOPS in formative and summative assessment. Early preparation for JAG QA visits.	DoH support NCEPOD 'Scoping Our Practice' 1st National Colonoscopy Audit  DoH support
2005	National endoscopy training programme established. Endoscopy GRS handover to JAG to underpin accreditation. Bowel Cancer Screening Programme (BCSP).	DoH support, SACs
2006	Endoscopy service accreditation commenced to coincide with BCSP.	
2007	BSG Quality and Safety Indicators for Endoscopy document released.	
2008	Gastrointestinal Endoscopy for Nurses programme commenced.	NEP
2009	Formal handover of NEP work and all outputs to JAG. Release of JETS e-Portfolio. National Nurse Endoscopist project linked to training centres. GRS introduced for private providers.	DoH support
2011	JAG GRS released for use in New Zealand and Ireland. Electronic e-certification (diagnostic upper GI endoscopy, flexible sigmoidoscopy and colonoscopy). First DOPyS.	2nd National Colonoscopy Audit, Full BCSP Roll-out.
2013	National Endoscopy Database project started. JAG formally take on administration and governance of BCSP accreditation from Public Health England. Best Practice Tariff for JAG-accredited units. BCSP Bowel Scope accreditation started.	DoH support
2016	Updated Global Rating Scale census and JAG accreditation standards released. Updated DOPS forms and trainee certification criteria released.	
2017	JAG Research Group formed.	

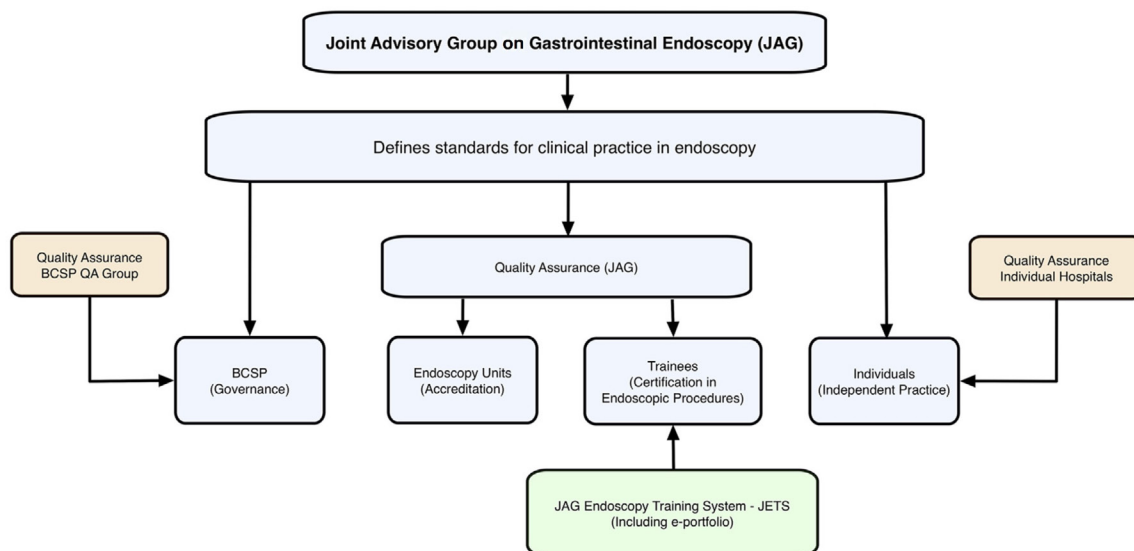
BCSP, Bowel Cancer Screening Programme; BSG, British Society of Gastroenterology; DoH, Department of Health; DOPS, direct observation of procedural skills; DOPyS, direct observation of polypectomy skills; GRS, Global Rating Scale; JAG, Joint Advisory Group on Gastrointestinal Endoscopy; JETS, JAG Endoscopy Training System; QA, quality assurance; NCEPOD, National Confidential Enquiry into Patient Outcome and Death; NEP, National Endoscopy Programme; SAC, Specialist Advisory Committee.

### Training

The unacceptable standards of practice reported in the 1999 UK colonoscopy audit,<sup>4</sup> in anticipation of national bowel cancer screening, raised questions over workforce competence. This catalysed a review of endoscopy training, which identified clear needs for defining standards for competent practice, methods for assessing competence and a structured endoscopy curriculum. In response, these elements were covered in a seminal 2004 JAG document,<sup>5</sup> which also called for training units to have shared responsibility in ensuring trainee competence. The concept of certification was proposed, which relied on trainee adoption of a 'JAG logbook of experience', engagement in summative assessment and supervisor sign-off.<sup>5</sup> Direct observation of procedural skills (DOPS) and direct observation of procedural polypectomy skills (DOPyS) were introduced to standardise assessment, and highly focused courses were developed for trainees

and trainers. JAG-approved basic upper and lower GI endoscopy courses became compulsory for certification, while specific training-the-trainer courses evolved to improve training standards at base hospitals. The guideline formed the foundations for quality assurance of training (QA-T) and service accreditation (described below).

In 2009, the JAG Endoscopy Training System (JETS) was launched. It had four main purposes: (1) an electronic record of trainee procedural experience and assessment, (2) a portal for accessing training courses, (3) to provide evidence of trainees meeting JAG standards of competence and (4) to provide feedback to trainers and training course organisers.<sup>1 6</sup> JETS enabled trainee competence to be monitored and determined centrally, paving the way for e-certification, which began in 2011 for upper and lower gastrointestinal (GI) endoscopy (figure 2). By January 2017,



**Figure 1** The role of JAG.<sup>12</sup> Courtesy of Dr John Anderson. BCSP, Bowel Cancer Screening Programme.

JETS had been adopted in >250 UK training centres, with 2857 instances of e-certification awarded.<sup>7</sup> JAG training courses are now regularly delivered in 28 UK centres, comprising 10 types of basic skills courses, 9 skills improvement courses and 4 endoscopy trainer courses.<sup>8</sup> JAG have also supported non-medical endoscopists and endoscopy nurses via the GI Endoscopy for Nurses programme.

#### Accreditation of services

Shortly after publication of the national colonoscopy audit,<sup>4</sup> the 2004 National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report: 'Scoping our Practice' also highlighted shortfalls in quality of care.<sup>9</sup> The expectation for individual endoscopy units to meet quality standards of care led to centralised accreditation of endoscopy units being proposed in the 2004 JAG position statement.<sup>10</sup> The Global Rating Scale (GRS) was developed in 2004 as a quality improvement tool for endoscopy units to self-assess against a number of measures associated with high-quality and safe patient-centred care.<sup>11</sup> The GRS assesses patient experience within four domains (table 2), each with corresponding items. Items are scored A–D, with level B indicating attainment of minimum requirements, with level A being an aspirational target for high performing services. To be accredited, units are required to achieve at least level B in all GRS domains and provide substantiating evidence. Service standards are inspected through a peer-review site visit by trained JAG assessors. During the site visit, the unit environment is also assessed to evaluate privacy, dignity and safe decontamination practices. Once awarded, accreditation is renewed annually, with services required to provide interim evidence of eligibility via the annual report card.

By 2005, service accreditation achieved national roll-out and became required for services wishing to contribute to bowel cancer screening in England. A JAG subcommittee, now known as the Endoscopy Services Quality Assurance Group, administers and regulates the data collected. In 2013, the Best Practice Tariff was commissioned by the DoH in England, thereby enabling higher rates of reimbursement for accredited units. Additionally, service accreditation became a prerequisite for Trusts to receive trainees in endoscopy,<sup>12</sup> further incentivising units to participate in the QA process.

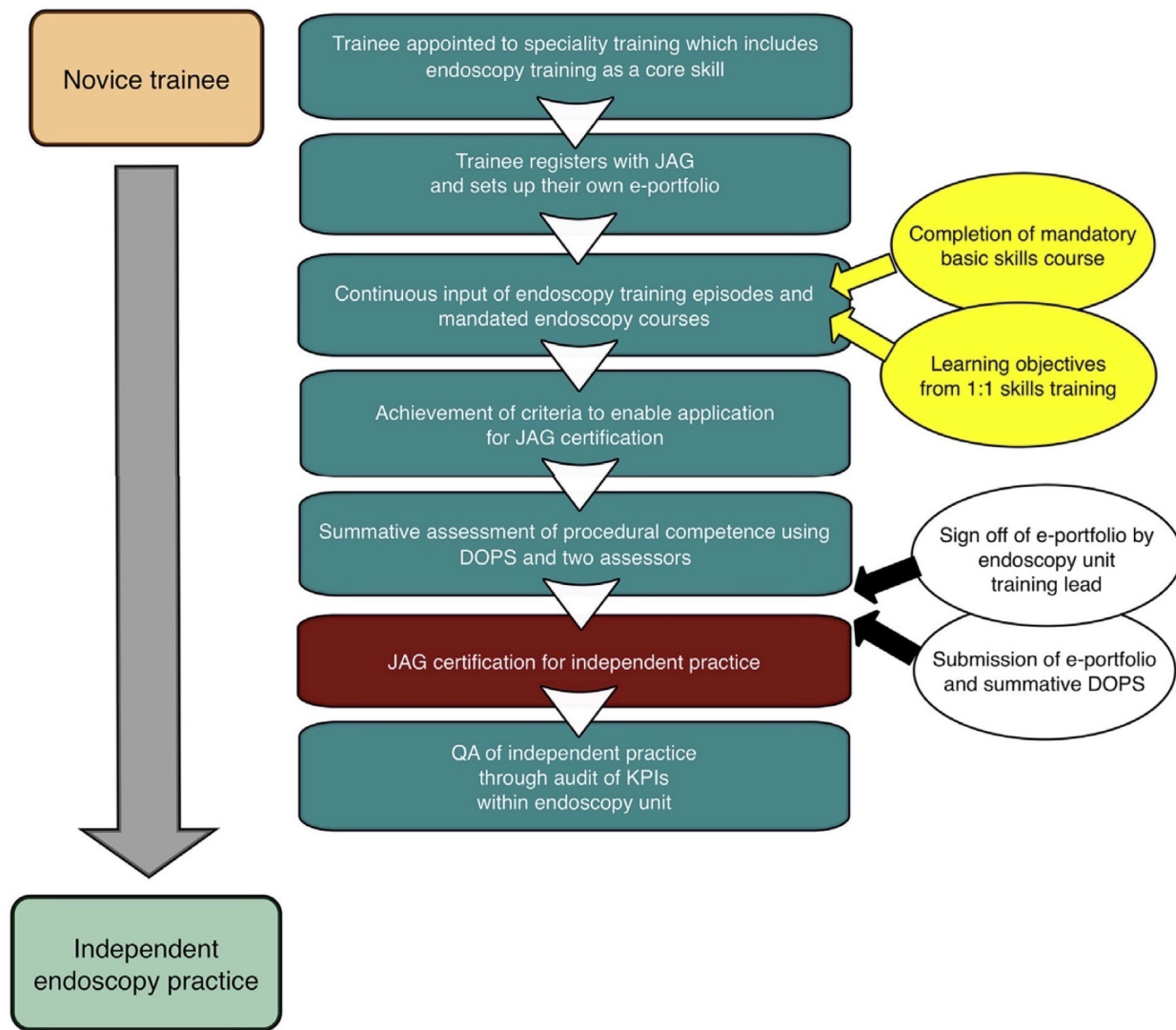
Today, the GRS has evolved into a web-based tool for unit-level quality improvement (figure 3). The GRS is in place in 485 UK units, with 228 units (47%) achieving full JAG accreditation in August 2017.<sup>11</sup>

#### Accreditation of screening endoscopists

The Bowel Cancer Screening Programme (BCSP) operates on the observation that population-based endoscopic screening reduces colorectal cancer (CRC) incidence and mortality.<sup>13</sup> In England, the BCSP commenced roll-out in 2006 for colonoscopy and 2013 for flexible sigmoidoscopy (Bowel Scope) screening. At the outset of screening, the Screening Assessment and Accreditation System (SAAS) was launched to quality assure the endoscopists within BCSP.<sup>4</sup> In order to achieve accreditation, endoscopists are required to provide evidence of locally verified key performance indicators (KPIs), complete knowledge-based assessments and demonstrate competence in summative assessment (figure 4).

#### AIMS

The primary aim of this review was to amalgamate published evidence supporting the impact of JAG on quality of care (ie, patient outcomes), services or training in endoscopy. Secondary aims included assessing the



**Figure 2** JAG trainee certification pathway.<sup>12</sup> Courtesy of Dr John Anderson. DOPS, direct observation of procedural skills; JAG, Joint Advisory Group on Gastrointestinal Endoscopy; KPIs, key performance indicators; QA, quality assurance.

impact of JAG on (1) service implementation and (2) research, where JAG tools were integral to the design.

**METHODS**

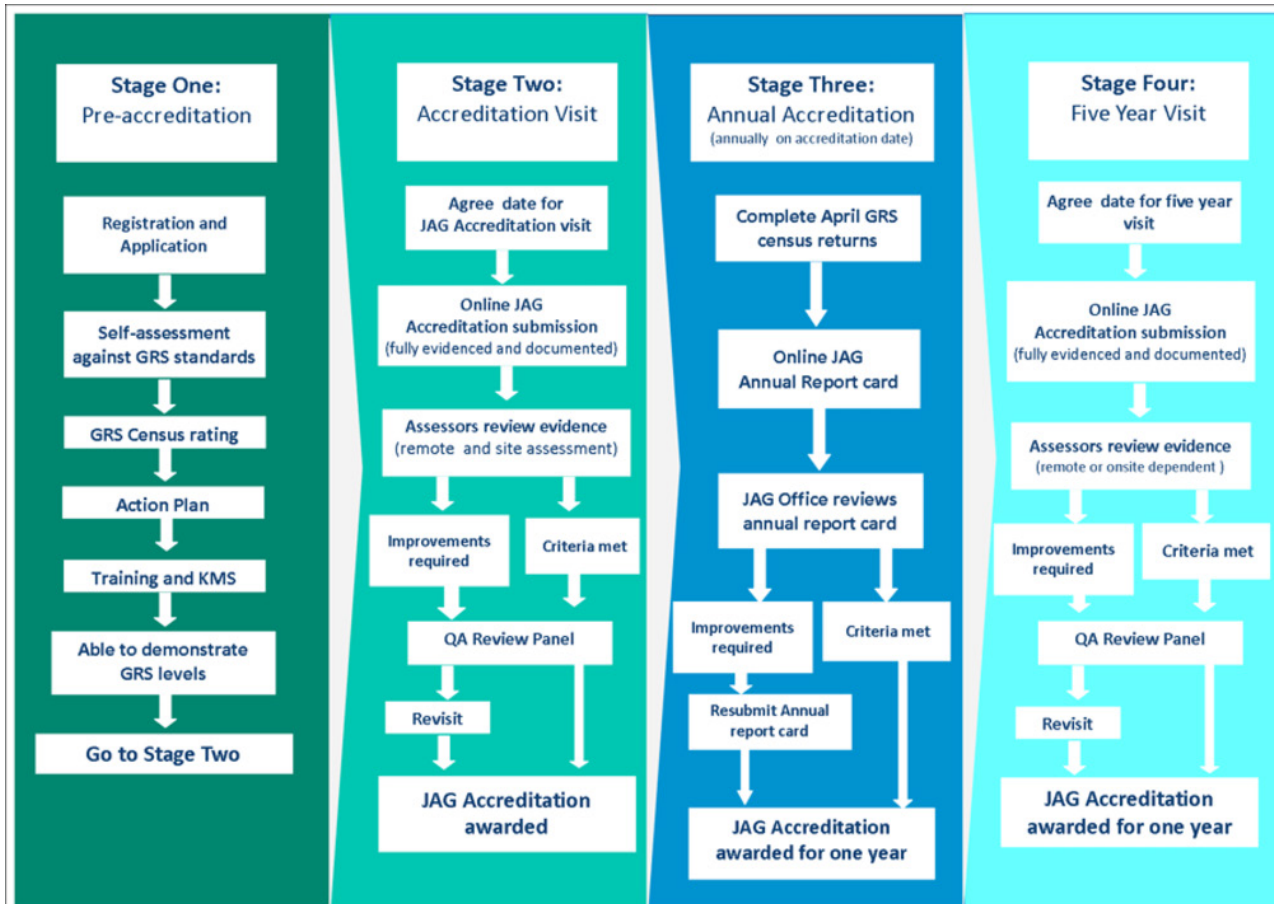
**Search strategy**

In order to assess the impact of JAG, a comprehensive literature search was conducted in July 2017 through

Embase, Ovid and PubMed to identify relevant publications and conferences abstracts over the last 10 years. The search strategy involved the combination of the following terms: ('Joint Advisory Group' or 'JAG' or 'Global Rating Scale' or 'JETS e-portfolio' or 'DOPS' or 'DOPyS' or 'bowel screening') AND ('endoscopy' or 'colonoscopy' or 'polypectomy' or 'accreditation'). Studies were limited

**Table 2** The four GRS domains and their corresponding items

Domains	Clinical quality	Quality of the patient experience	Workforce	Training of endoscopists
Items	<ul style="list-style-type: none"> <li>▶ Leadership and organisation.</li> <li>▶ Safety.</li> <li>▶ Comfort.</li> <li>▶ Quality.</li> <li>▶ Appropriateness.</li> <li>▶ Results.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Respect and dignity.</li> <li>▶ Consent process including patient information.</li> <li>▶ Patient environment and equipment.</li> <li>▶ Access and booking.</li> <li>▶ Planning and productivity.</li> <li>▶ Aftercare.</li> <li>▶ Patient involvement.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Teamwork.</li> <li>▶ Workforce delivery.</li> <li>▶ Professional development.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Environment, training, opportunity and resources.</li> <li>▶ Trainer allocation and skills.</li> <li>▶ Assessment and appraisal.</li> </ul>



**Figure 3** JAG unit accreditation pathway. GRS, Global Rating Scale; JAG, Joint Advisory Group on Gastrointestinal Endoscopy; KMS, Knowledge Management System; QA, quality assurance.

to those in English, with accompanying abstracts, and those published after January 2007.

#### Inclusion and exclusion criteria

To enable summation of the literature search results, thematic analysis was used to summarise suitable publications into the following categories: (A) quality of care, for example, KPIs related to patient outcomes such as caecal intubation rate (CIR); (b) quality of service provision, for example, waiting times; and (C) quality of training, for example, trainee performance/satisfaction

For each category, studies were subdivided based on: (A) impact; and (B) implementation: these may demonstrate impact, but specifically include studies where JAG tools/recommendations have resulted in quality improvement of patient or trainee-centred services.

For duplicate abstracts, either the full paper was referenced or the earliest instance was selected.

#### Data extraction

Data from eligible articles were extracted into tables to summarise the literature review. Column headings included: (A) first author, (B) year of publication (full papers marked with an asterisk), (C) country, (D) JAG division (ie, training/service accreditation/SAAS), (E)

study design, (F) outcomes, (G) results/conclusion and (H) impact of JAG.

#### RESULTS

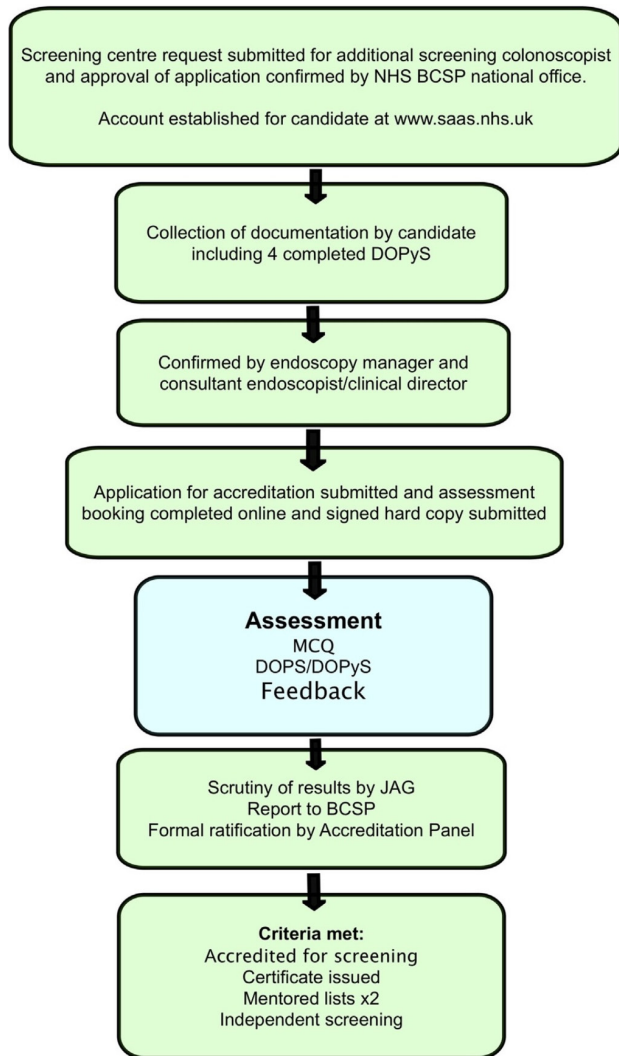
The search strategy yielded 887 results from full publications and conference proceedings. After removing 687 inappropriate results, 80 duplicate and 2 irrelevant studies, 118 publications (43 papers and 75 conference abstracts) were reviewed (figure 5). These were categorised according to the impact of JAG.

#### Impact on quality of care

Thirty-four studies were identified that related to quality of care (online supplementary appendix table 1),<sup>14-47</sup> with 31 relating to impact and three on implementation.

#### Key performance indicators

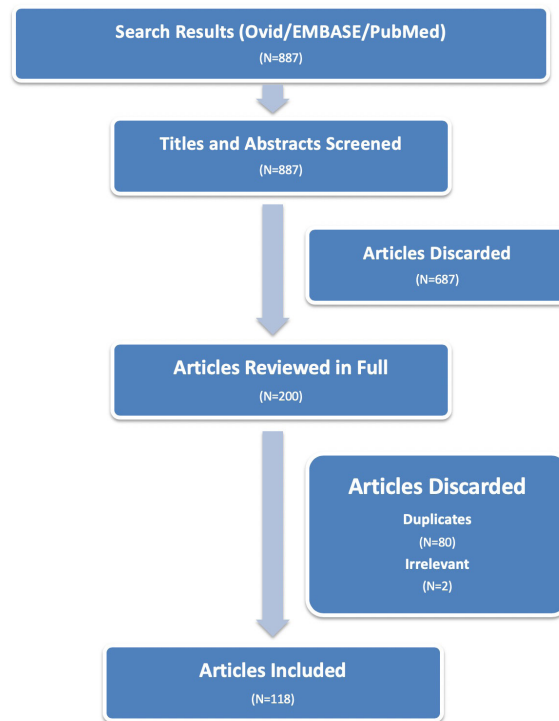
Evidence of variable practice between endoscopists has led to renewed focus on KPIs, which may be used as a surrogate marker for quality and safety in endoscopy. These may assess direct (eg, complication rates) or indirect effects on patient outcomes, for example, endoscopist's adenoma detection rates as a surrogate for lower post colonoscopy CRC rates and mortality,<sup>48</sup> longer colonoscopy withdrawal times correlating



**Figure 4** BCSP accreditation pathway.<sup>12</sup> Courtesy of Dr John Anderson. BCSP, Bowel Cancer Screening Programme; DOPS, direct observation of procedural skills; DOPyS, direct observation of polypectomy skills; JAG, Joint Advisory Group on Gastrointestinal Endoscopy; MCQ, Multiple Choice Questionnaire; NHS, National Health Service.

with adenoma detection rate (ADR)<sup>49</sup> and higher CIR with reduced discomfort and sedation use.<sup>50</sup> As such, audits involving KPIs allow services to safeguard patient outcomes and benchmark performance.

From the literature review, 20 studies identified were audits of JAG standards, which are aligned with BSG recommendations. Fifteen were based on colonoscopy KPIs, four on endoscopic retrograde cholangiopancreatography (ERCP)<sup>16 20 38 39</sup> and two on gastroscopy.<sup>15 37</sup> Quality measures of published audits mainly comprised procedural completion rates<sup>14 16 21–23 28 29 33 34 38 39</sup> and complications<sup>15 16 20</sup> and also included comfort scores,<sup>37 45</sup> gastric ulcer follow-up,<sup>31 42</sup> antibiotic concordance in percutaneous endoscopic gastrostomy (PEG),<sup>18</sup> quality of bowel preparation<sup>22 51</sup> and colonic biopsies for diarrhoea.<sup>41</sup> Seven studies pertained to Bowel Cancer



**Figure 5** Results from the literature search.

Screening (SAAS), reporting higher quality of care in accredited endoscopists compared with non-accredited counterparts in terms of CIR,<sup>19 27 43 52</sup> polyp detection rates (PDR),<sup>17 19 43</sup> ADRs,<sup>19 27 43</sup> adherence to tattoo placement<sup>17 25</sup> and polyp retrieval rate.<sup>43</sup>

National improvements in patient outcomes

Several national studies have attributed improvements in care to JAG. In the second UK colonoscopy audit (n=20 085) performed in 2011,<sup>30</sup> Gavin *et al* reported significant improvements in KPIs since the previous audit (table 3), including improvements in CIR from 76.9% in 1999 to 92.3% in 2011. The authors credited improved performance to advances in quality of training and service accreditation. Similar findings were reproduced in a retrospective comparison of colonoscopy KPIs between 2004 and 2012.<sup>32</sup> Valori *et al*<sup>36</sup> studied a composite measure coined the performance indicator of colonic intubation (PICI) which incorporated CIR with safe sedation use (midazolam <2 mg)

**Table 3** Comparisons in colonoscopy KPIs between the two national colonoscopy audits

	Bowles <sup>4</sup>	Gavin <sup>30</sup>
Year performed	1999	2011
Procedures	9223	20 085
Caecal intubation rate (%)	76.9	92.3
Polyp detection rate (%)	22.5	32.1
Conscious sedation (%)	94.6	88.9

and acceptable (mild–moderate) discomfort scores. On multivariate analysis, endoscopy performed within a JAG-accredited unit was an independent predictor of PICI (OR 1.26; 95% CI 1.16 to 1.35) and higher levels of JAG training were also associated with PICI. Britton *et al*<sup>35</sup> observed that in the UK, there was a lower postcolonoscopy colorectal carcinoma incidence compared with other countries. The authors suggested that advances in quality, driven by JAG and BCSP, may have contributed towards this finding.

#### Evidence of implementation processes

Three studies described implementation processes related to quality of care. Dewi *et al* introduced root-cause analyses of perforations following screening colonoscopy, whereby suboptimal management was addressed with individual feedback and training.<sup>46</sup> Thompson *et al* assessed the robustness of the 90% CIR standard by factoring in the conversion of intended colonoscopy procedures to sigmoidoscopy.<sup>47</sup> Conversion to flexible sigmoidoscopy (FS) occurred in 4.7%, with the majority lacking valid reasons, which artificially boosted CIR. Falvey *et al* presented data regarding implementation of nurse-assisted reporting of comfort scores,<sup>45</sup> which was associated with significantly higher discomfort than endoscopist-reported scores. This enabled outlier performance to be identified and has since been adopted routinely as a QA measure.

Recently, two national recommendations have been released in partnership with JAG. These include the use of Buscopan in endoscopy procedures and the minimal and aspirational standards for colonoscopy practice and quality of service across the UK.<sup>44 53</sup>

#### Impact on quality of service

Thirty-one studies (online supplementary appendix table 2) were relevant to the impact of JAG on quality of endoscopy services.<sup>2 54–83</sup> Twenty-two were relevant to implementation of service, with the majority being GRS based.

#### Impact of the GRS

An overview of JAG unit accreditation has been described in detail by Stebbing,<sup>2</sup> who also reported improvements in quality of service. Valori *et al*<sup>64</sup> expanded on the national impact of the GRS by demonstrating a reduction in patients waiting >6 weeks for endoscopy from >250 000 in 2004 to <2000 in 2008. The components of the GRS have since been validated from a patient perspective.<sup>57</sup> Moreover, from a survey involving endoscopy staff ranging from administrative to nursing roles, >75% of staff felt that JAG recommendations had improved quality of service and care.<sup>60</sup>

#### Other service evaluations

Service evaluations were reported in several UK studies. Challand *et al*<sup>54</sup> combined quality of care

(CIR) and cost-effectiveness of a service (points per list) and found that this composite endpoint was met in 30% of endoscopists, with higher rates in trainer endoscopists and those with higher volumes. One study audited procedures that were overdue for surveillance,<sup>61</sup> reporting high rates of procedures requested at inappropriate intervals and implemented vetting procedures to rationalise surveillance requests. Another reported implementation of a propofol-based service to meet increasing service demand.<sup>72</sup> Two studies reported success with unit accreditation in the novel settings of community-based endoscopy<sup>76</sup> and within the independent sector,<sup>63</sup> both complemented by positive patient satisfaction. Three studies provided evidence to support the role of accreditation/GRS in paediatric services.<sup>70 82 83</sup> Implementation of strategies to improve patient outcomes within BCSP have also been presented.<sup>68 71 77</sup>

#### Impact on services abroad

Use of the GRS is not restricted to the UK. The JAG International subcommittee responds to international interest in JAG tools/services and facilitates implementation processes in those countries. The international impact of JAG is summarised in table 4. Adoption of the GRS has been described in studies from Ireland,<sup>78</sup> Canada,<sup>66 73 79</sup> the Netherlands,<sup>69 84</sup> New Zealand,<sup>85</sup> Iraq<sup>75</sup> and Malawi<sup>80</sup> following collaborative efforts with JAG International, which has been successfully used to benchmark quality of service and identify areas for improvement. In a service development initiative supported by BSG and JAG International in Malawi, Nyahoda *et al*<sup>80</sup> presented their experience of implementing a GI bleeding service, and Geraghty *et al*<sup>86</sup> described how a training network was established in three Malawian hospitals using JAG-based training, DOPS assessments, development of a local faculty and the application of a modified GRS for service evaluation. A similar international collaboration led to the introduction of a GRS in Iraq.<sup>75</sup> Carpentier *et al* provided evidence of test–retest reliability of the Canadian GRS (GRS-C), modified from the UK version, with evidence of quality improvement.<sup>79</sup> Use of the GRS-C has been reviewed in a 2013 publication,<sup>74</sup> which outlined its use in 39 Canadian units. Herein, 35% achieved improvements in 8/12 domains over a 2-year cycle, with 15% reporting improvements in wait times. GRS has also been referenced in international research, including the development of a novel comfort score<sup>55</sup> and the assessment of patient derived indicators of quality of care.<sup>56</sup>

#### Impact on quality of training

Fifty-three articles relevant to the impact of JAG on training were identified (online supplementary appendix table 3),<sup>1 6 7 12 86–130</sup> of which 29 assessed impact and 24 described training-related implementation. Two in-depth reviews of the role of JAG in



**Table 4** International use and involvement of JAG services (based on JAG International Committee minutes from July 2016) – courtesy of JAG office

Nation	Level of interaction with JAG
Australia	▶ JAG are advising Queensland Nursing and Midwifery Office regarding roll-out of training programme.
Canada	▶ Services have permission to use offline version of DOPS forms. ▶ Implementation of Canadian GRS. <sup>64</sup>
Hong Kong	▶ Implementation of nurse endoscopist bowel cancer screeners trained via JAG curriculum. <sup>134</sup>
Iraq	▶ Benchmarking of Iraqi endoscopy services using GRS. <sup>69</sup>
Ireland	▶ Services completed GRS census (36 public and 5 private endoscopy services registered with JAG). ▶ Majority of services working towards accreditation. ▶ Eight services accredited.
Malawi	▶ JAG supported training courses run in Malawi. <sup>70 71</sup>
Netherlands	▶ Use of GRS tools. <sup>116</sup>
New Zealand	▶ Services previously completed GRS census. ▶ On hold pending conversations with the Ministry of Health regarding future direction of work. <sup>68</sup>
Norway	▶ Interest in GIN courses and e-Portfolio, with members of Norway screening programme attending a GIN training the nurse trainer course.
Poland	▶ JAG-based Training Colonoscopy Leaders Course. <sup>38</sup>
Portugal	▶ JAG supported colonoscopy upskilling and Training and Trainer courses (2015).
Saudi Arabia	▶ King Abdullah Medical City Hospital leads approached JAG to ask about possibility of becoming JAG accredited. ▶ Conference call held to scope work and a proposal has been made to offer access to GRS and support via calls and documentation in the first instance.
Singapore	▶ Services have permission to use offline version of DOPS forms.
South Africa	▶ JAG supported colonoscopy upskilling and Training and Trainer courses (2015/2016).
Spain	▶ A trial version of the GRS was requested by Madrid Hospital and set up.
USA	▶ JAG setting up teleconference with representatives from the University of Colorado regarding EUS and ERCP training.

EUS, Endoscopic Ultrasound; ERCP, endoscopic retrograde cholangiopancreatography; DOPS, direct observation of procedural skills; GIN, GI Endoscopy for Nurses; GRS, Global Rating Scale; JAG, Joint Advisory Group on Gastrointestinal Endoscopy.

endoscopy training are provided by Dunckley<sup>1</sup> and Anderson.<sup>1 12</sup> The majority of studies relate to QA of training.

#### Trainee outcomes

Haycock *et al* surveyed changes in quality of training between 2002 and 2007 and reported significant improvements in standards of teaching, reduced trainee complication rates and increased trainee satisfaction, correlating with JAG's impact.<sup>88 89</sup> Dhar-masiri *et al*<sup>93</sup> reported high rates of trainee satisfaction with the e-certification system. Other surveys at regional and national levels have exposed disparities in training satisfaction by specialty<sup>87 95 103 107</sup> and training region.<sup>101 105</sup> In the recently published 2016 BSG trainees survey,<sup>130</sup> 85% were satisfied with the level of supervision during endoscopy training, with 12.5% reporting no access to regular training lists. Conflicting on-call commitments,<sup>130</sup> competition for and absence of training lists are cited as contributory factors,<sup>95 104 130</sup> despite the training domain of the GRS, which places onus on individual units to ensure sufficient training opportunities. To overcome these challenges, several studies have evaluated innovative approaches to improve trainee exposure. Walker *et al*<sup>115</sup> described the successful implementation of a dedicated training e-booking system, which improved the

uptake of dedicated training lists from 18% in 2007 to 61% in 2010. Similarly, by implementing generic training lists, Lamb *et al*<sup>117</sup> reported increases in mean training lists from 7.8 to 13.6 lists per quarter, which was associated with improvements in trainee KPIs and DOPS counts.

#### Upskilling interventions

Two studies reported improvements in endoscopist KPIs after attendance on a JAG-based course. Hussain *et al*<sup>131</sup> evaluated the performance of four certified endoscopists before and after attendance at a JAG-certified advanced colonoscopy course, specifying improvements in polyp retrieval and biopsy practice for chronic diarrhoea, although improvements in CIR (88%–93%) and minimal–mild discomfort scores (71%–82%) were not statistically significant. In an international study involving JAG faculty members, Kaminski *et al*<sup>132</sup> identified endoscopy leaders from 40 Polish bowel cancer screening centres with suboptimal ADR and randomised them to a Train-Colonoscopy-Leaders (TCL) programme with a 2-day hands-on component or feedback only. The study analysed 24582 colonoscopies performed by 38 leaders and 56617 colonoscopies performed by 138 endoscopists at participating centres. The TCL arm had larger improvement in ADR than the feedback group in

both early (OR 1.61;  $p < 0.001$ ) and late (OR 1.35;  $p = 0.004$ ) postintervention phases.

#### Non-medical endoscopists

In the UK, non-medical (nurse) endoscopists benefit from the flexibility of dedicated immersion training without competing medical and on-call commitments. The Health Education England sponsored clinical endoscopist programme has led to 31/40 non-medical endoscopists (78%) achieving gastroscopy or sigmoidoscopy certification within a 7-month timeframe.<sup>123 133</sup> In a randomised trial from Hong Kong, non-medical endoscopists trained according to the JAG curriculum had superior ADR during screening colonoscopies compared with medical endoscopists (43.8% vs 32.7%). The authors concluded that proper training, that is, completion of well-established training programmes such as JAG, may equip nurses with the competencies for screening colonoscopy.<sup>134</sup>

#### Competency-based certification

Effective training is key for competent unsupervised practice. The success of JETS implementation has been well characterised.<sup>6 7 114 116</sup> The robustness of endoscopy certification has been evidenced by precertification KPIs during training<sup>102</sup> and postcertification KPIs of independently performing specialty trainees.<sup>7 24</sup> Based on a 2011 analysis of JETS entries, 28% of specialist trainee procedures were logged as service lists.<sup>92</sup> Hence, supporting trainees to achieve certification enables effective contribution to an endoscopy service.

#### Competency assessment tools

The role of DOPS and DOPyS as competence-assessment tools have been evaluated since their introduction in 2004.<sup>5</sup> DOPS were first assessed in the context of BCSP, which showed validity and reliability.<sup>120</sup> In order to standardise polypectomy assessment, DOPyS were developed,<sup>118</sup> validated<sup>118 119</sup> and integrated into colonoscopy certification criteria in 2011, with subsequent improvements in trainee polypectomy exposure and standards.<sup>129</sup> This has provided a much-needed framework for polypectomy assessment. A recent survey involving 610 colonoscopists from 19 countries unearthed significant variation in polypectomy training internationally.<sup>113</sup> Only 4 of the 19 countries, including UK, had specific guidelines for polypectomy training and competency assessment. The impact of the post-July 2016 changes to DOPS has also been published. Implementation of novel DOPS for GI bleeding<sup>121</sup> and percutaneous endoscopic gastrostomy (PEG) have been described.<sup>135</sup> The endoscopic non-technical skills (ENTSS) domain introduced into new DOPS/DOPyS has also been validated.<sup>126</sup> The changes in DOPS scoring from a performance-based to supervision-based scale have improved the quality and validity of assessment tools.<sup>127</sup> From a research

perspective, DOPS and DOPyS have been integral to studies which appraise the impact of practical and simulator based training,<sup>96 99 100 106 108 110 112 136–138</sup> thereby contributing to current understanding of optimal training methods in endoscopy. Similarly, interrogation of the JETS e-portfolio has enabled learning curve analyses for competence in gastroscopy,<sup>111</sup> colonoscopy<sup>98</sup> and polypectomy,<sup>109</sup> which inform trainees, trainers and SACs regarding length of training and variation in learning curves.

#### Direction of training

Several publications provide insights into the future direction of training. As gastroscopy certification does not ensure competence in managing GI bleeding, certification specific for endotherapy has been proposed.<sup>128 130</sup> In response to trainee dissatisfaction regarding exposure to training,<sup>130 139</sup> the JAG QA-T committee has outlined strategic measures,<sup>130</sup> including placing further increasing emphasis on GRS to improve unit-level training delivery and appraisal of measures to reduce time to competency.<sup>130</sup> A trial roll-out of accelerated training to specialty trainees has been effective and well received.<sup>122</sup> 'Immersion training', where blocks of time are dedicated to endoscopy alone, is being considered.<sup>130</sup> These approaches may be paired with new e-learning tools to accelerate development of non-technical competencies such as lesion recognition.<sup>124</sup> However, the single innovation likely to have greatest impact on training is the impending National Endoscopy Database (NED).<sup>125</sup> NED has been designed to autopopulate KPIs from endoscopy reporting systems directly into future iterations of JETS and allow benchmarking of trainee learning curves nationwide.

## DISCUSSION

### Summary

This literature review provides evidence that supports the impact of JAG on quality of care, service and training in UK endoscopy over the last decade. The majority demonstrate a positive impact of JAG. Of note, comparisons of performance metrics between the two national colonoscopy audits<sup>4 30</sup> and the fall in national waiting times<sup>64</sup> are testament to advances in quality at both endoscopist and unit levels.

The promotion of the QA framework has underpinned the success of JAG. QA in endoscopy is reliant on: (1) definition of quality standards, (2) measuring quality by comparing against quality standards, (3) methods for improving quality and (4) providing incentives for participation.<sup>1</sup> Continuous audit and quality improvement is integral to the QA process and is supported by the centralised JAG infrastructure of JETS, GRS and SAAS. Importantly, a substantial proportion of publications (42%) in this review reported process implementation. Thus, it is encouraging that our review has uncovered the breadth of

innovative approaches undertaken to accomplish and surpass minimum JAG standards.

Moreover, the international impact of JAG has also been recognised through involvement with at least 16 countries (table 4), with further involvement facilitated by international affiliations at individual institutions. Although the use of JAG tools, for example, DOPS, DOPyS and GRS, have supported research abroad, these have also benefited from international validation.

### Strengths and limitations

This literature search was designed to be an objective and comprehensive summary of publications related to JAG. As the majority of publications were in abstract form, one limitation of this review is the lack of methodological rigour for selecting studies. The majority were retrospective, with only two abstracts excluded due to poor quality. However, some of these retrospective studies are well designed and have included patient numbers in excess of 100 000 (online supplementary appendix table 1). We acknowledge that there is crossover between JAG quality standards with other national guidelines. As some standards are ubiquitously recommended in guidelines, for example, CIR and ADR, it would not be appropriate to solely attribute these to the impact of JAG. Hence, the search strategy was limited to JAG-relevant terms and some studies may not have been captured. Next, search results were arbitrarily categorised into groupings of impact on care, services and training, which was intended to demonstrate outcomes on patients, units and trainees, respectively. We acknowledge there may be considerable overlap between the search results. This was also true for the subgrouping of studies according to impact and/or implementation. The relative lack of implementation-based data on patient outcomes (3/34 studies) may either indicate potential difficulties for units to implement change, which is a well-recognised barrier, or reflect publication bias, whereby unsuccessful interventions may be withheld. Sharing examples of successful (and failed) implementation measures are necessary to drive quality improvement, a strategy jointly promoted by JAG and the BSG Endoscopy Quality Improvement Project.

### Future directions

In addition to future initiatives described above, upcoming agenda include a review of existing certification pathways to ensure these remain current, evidence based and supported by competency-based milestones. Plans to introduce certification in additional modalities of GI bleed haemostasis, ERCP, endoscopic ultrasound (EUS) and capsule endoscopy are also underway, supplemented with procedure-specific curricula, e-learning and JAG-approved courses. The demand for a JETS-like platform for endoscopy nurses to record competencies has prompted the development

of JETS Workforce, an e-portfolio platform specific for endoscopy nurses for documenting assisting competencies that could be used to support revalidation. Pressures faced by endoscopy units,<sup>140</sup> notwithstanding the imminent plans to introduce faecal immunochemical testing<sup>141</sup> and lower the bowel cancer screening age to 50 years,<sup>142</sup> are likely to instigate a review of workforce requirements, with emphasis on recruitment and upskilling of existing Bowel Scope practitioners towards BCSP colonoscopy accreditation.

NED, which is hosted by JAG, went live in April 2018. The vision of NED is to autopopulate performance metrics of individual endoscopists to centrally benchmark performance, summate unit-level data pertaining to the Clinical Quality domain of the GRS and import trainee metrics directly into JETS. This will eliminate data entry bias and allow for reliable and detailed assessment of endoscopy performance and service activity. The NED promises a data-rich platform for research on endoscopy-based metrics. This is likely to boost the research impact of JAG and will further extend JAG's influence as an international model for facilitating endoscopy QA.

Finally, in recognition that errors in endoscopy are common and under-reported,<sup>143</sup> JAG has announced a 5-year strategy to Improve Safety and Reduce Error in Endoscopy,<sup>144 145</sup> which aims to improve training and the practice of error reporting, learning from error and implement system-level approaches for safety and performance improvement. This workstream will use the GRS and NED infrastructures and complement JAG's aspirations to improve communication with endoscopy services to disseminate learning and support services in the UK, and in renewing commitments for placing patient safety and clinical quality at the forefront of endoscopy practice.

### CONCLUSION

The UK experience shows that it is possible to achieve a transformation in quality, safety, patient experience and training with a strategic, centrally led, and modestly resourced approach.

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## REFERENCES

- Dunckley P, Elta G. Quality assurance of training. *Best Pract Res Clin Gastroenterol* 2011;25:397–407.
- Stebbing JF. Quality assurance of endoscopy units. *Best Pract Res Clin Gastroenterol* 2011;25:361–70.
- Valori R. Quality improvements in endoscopy in England. *Techniques in Gastrointestinal Endoscopy* 2012;14:63–72.
- Bowles CJ, Leicester R, Romaya C, *et al*. A prospective study of colonoscopy practice in the UK today: are we adequately prepared for national colorectal cancer screening tomorrow? *Gut* 2004;53:277–83.
- JAG, 2004. Guidelines for the training, appraisal and assessment of trainees in gastrointestinal endoscopy and for the assessment of units for registration and re-registration. [http://www.bsg.org.uk/pdf\\_word\\_docs/jag\\_recommendations\\_2004.pdf](http://www.bsg.org.uk/pdf_word_docs/jag_recommendations_2004.pdf) (cited 10 Aug 2017).
- Mehta T, Dowler K, McKaig BC, *et al*. Development and roll out of the JETS e-portfolio: a web based electronic portfolio for endoscopists. *Frontline Gastroenterol* 2011;2:35–42.
- Siau K, Anderson J, Beales I, *et al*. PTU-013 Trends in certification for gastrointestinal endoscopy and variations between trainee specialities: results from the UK JETS database. *Gut* 2017;66(Suppl 2):A57.
- JETS, 2012. Course finder. <https://www.jets.nhs.uk/FindCourseHome.aspx> (cited 10 Aug 2017).
- Cullinane M, Gray AJG, Hargraves CMK, *et al*, 2004. Scoping our practice: the 2004 report of the confidential enquiry into patient outcome and death. <http://www.ncepod.org.uk/2004report/> (cited 10 Aug 2017).
- JAG, 2015. Joint Advisory Group on Gastrointestinal Endoscopy (JAG) accreditation standards for endoscopy services. <https://www.thejag.org.uk/downloads/Accreditation/JAG%20accreditation%20standards%20for%20endoscopy%20services.pdf> (cited 10 Aug 2017).
- JAG. JAG accreditation. <https://www.jagaccreditation.org> (cited 10 Aug 2017).
- Anderson JT. Assessments and skills improvement for endoscopists. *Best Pract Res Clin Gastroenterol* 2016;30:453–71.
- Hewitson P, Glasziou P, Irwig L, *et al*. Screening for colorectal cancer using the faecal occult blood test, Hemoccult. *Cochrane Database Syst Rev* 2007:CD001216.
- Dhayatker V, Tutton M. Colonoscopy preparation should be tailored to the patient. *Colorectal Disease* 2009;11:45.
- Moore AR, Ormerod C, McMahon M, *et al*. 891c: Emergency readmission following elective endoscopy: audit of 29,868 day case procedures performed at four teaching hospitals in Northwest England. *Gastrointestinal Endoscopy* 2010;71:AB137.
- Chatterjee S, Rees C, Dwarakanath AD, *et al*. Endoscopic retrograde cholangio-pancreatography practice in district general hospitals in North East England: a Northern Regional Endoscopy Group (NREG) study. *J R Coll Physicians Edinb* 2011;41:109–13.
- Gavin D, Sidwell A, Scott M, *et al*. Endoscopic tattoo practice at a district general hospital. *Gut* 2011;60(Suppl 1):A128.
- Kurien M, Westaby D, Romaya C, *et al*. National survey evaluating service provision for percutaneous endoscopic gastrostomy within the UK. *Scand J Gastroenterol* 2011;46:1519–24.
- Horner R, Baranowski E, Raman S, *et al*. Quality assurance in colonoscopy – numbers not speciality? An audit of 10 026 colonoscopies. *Colorectal Disease* 2011;13:1–14.
- Bodger K, Bowering K, Sarkar S, *et al*. All-cause mortality after first ERCP in England: clinically guided analysis of hospital episode statistics with linkage to registry of death. *Gastrointest Endosc* 2011;74:825–33.
- Leyden JE, Doherty GA, Hanley A, *et al*. Quality of colonoscopy performance among gastroenterology and surgical trainees: a need for common training standards for all trainees? *Endoscopy* 2011;43:935–40.
- Butt S, Lygoe S, Defoe H, *et al*. Tu1481 Photographic documentation of caecal intubation: how good is it? *Gastrointestinal Endoscopy* 2011;73:AB423.
- Verma AM, McGrath N, Bennett P, *et al*. A multi-centre audit of 16,064 colonoscopies looking at caecal intubation rates, over a 2-year period. Non-GI operators and those doing. *Gut* 2012;61:A150.
- Nayagam S, Selvapatt N, Auguste JL, *et al*. OC-138 Quality of colonoscopic procedures among independently practising gastroenterology trainees in a NW London cohort: are they reaching national standards? *Gut* 2012;61:A59.3–A60.
- Travers H, Shirazi T, Mansfield S. PMO-223 Tattooing of suspicious colonic lesions at colonoscopy: is adherence to local protocol better if identified through the Bowel Cancer Screening Programme? *Gut* 2012;61:A165.
- Butt S, Defoe H, Besherdas K. PWE-200 The impact of bowel preparation on other colonoscopy quality indicators. *Gut* 2012;61(Suppl\_2):A378.
- Bhangu A, Bowley DM, Horner R, *et al*. Volume and accreditation, but not speciality, affect quality standards in colonoscopy. *Br J Surg* 2012;99:1436–44.
- Kong C, Young AN, Benson K, *et al*. OC-048 Colonoscopy: what is the number required to maintain competency? – a retrospective audit. *Gut* 2013;62(Suppl 1):A21.
- Verma AM, McGrath N, Dixon A, *et al*. Tu1323 gender differences - analysis of 6704 colonoscopies over 5 years

- reveals lower caecal intubation rates in female patients. *Gastrointestinal Endoscopy* 2013;77(5):AB499.
- 30 Gavin DR, Valori RM, Anderson JT, *et al.* The national colonoscopy audit: a nationwide assessment of the quality and safety of colonoscopy in the UK. *Gut* 2013;62:242–9.
  - 31 McGlacken-Byrne S, Lahiff C, MacMathuna P, *et al.* A review of gastric ulcer follow-up practices in a tertiary care gastroenterology service. *Gut* 2013;62:A40.
  - 32 El Menabawey TM, O'Donohue J, Srirajaskanthan R. PWE-065 Colonoscopy performance in a district general hospital. has the standardisation of training standardised performance? *Gut* 2014;63(Suppl 1):A152.
  - 33 Verma AM, Dixon AD, Chilton AP. Correlation of caecal intubation rate to volume: colonoscopists should undertake at least 120 procedures per year. *Frontline Gastroenterol* 2014;5:156–60.
  - 34 Lee HY, Gashau W, Willert RPWE-041 Management of large colonic polyps in a Bowel Cancer Screening Programme. *Gut* 2014;63(Suppl 1):A140.
  - 35 Britton J, Chan L, Allan K, *et al.* Post-colonoscopy colorectal cancer in the United Kingdom: a double-center experience. *American Journal of Gastroenterology* 2014;109:S608.
  - 36 Valori RM, Damery S, Gavin DR, *et al.* A new composite measure of colonoscopy: the Performance Indicator of Colonic Intubation (PICI). *Endoscopy* 2018;50:40–51.
  - 37 Rafferty H, Hutchinson J, Ansari S, *et al.* PWE-040 Comfort scoring for endoscopic procedures: who is right – the endoscopist, the nurse or the patient? *Gut* 2014;63(Suppl 1):A139.
  - 38 Cretu I, Kelleher B, Stewart S, *et al.* Audit of ERCP key performance indicators in a high volume interventional/biliary endoscopy centre. *Irish Journal of Medical Science* 2015;184(Suppl 1):S99.
  - 39 Sheppard D, Craddock S, Warner B, *et al.* PTH-007 ERCP cannulation success benchmarking: implications for certification and validation. *Gut* 2014;63:A210.
  - 40 Davies J, Mills S. Assessment of accuracy in predicting site of colorectal cancer at endoscopy. *International Journal of Surgery* 2013;11:621.
  - 41 Easaw J, Bennett A, Leslie F, *et al.* Routine colonoscopic biopsies-should practice change? *United European Gastroenterology Journal* 2015;3(Suppl 1):A420.
  - 42 Aslam NS, Ingram RJM, Mandal A. PTH-035 Does repeat gastroscopy for gastric ulceration have an impact on cancer detection and mortality across Lincolnshire? *Gut* 2016;65(Suppl 1):A235.
  - 43 Ahmed S, Naumann DN, Karandikar S. Differences in screening vs non-screening colonoscopy: scope for improvement? *Colorectal Dis* 2016;18:903–9.
  - 44 Rees CJ, Thomas Gibson S, Rutter MD, *et al.* UK key performance indicators and quality assurance standards for colonoscopy. *Gut* 2016;65:1923–9.
  - 45 Falvey J, King C, Dixit A, *et al.* Comfort during colonoscopy: do nurses tell us more? *Gut* 2009;58(Suppl 1):A1.
  - 46 Dewi F, Heard H, Davies M, *et al.* PWE-316 Incidence and management of iatrogenic perforations in the Welsh bowel screening programme. *Gut* 2015;64(Suppl 1):A349.
  - 47 Thompson C, Ismail T, Radley S, *et al.* Conversion of colonoscopy to flexible sigmoidoscopy: an unintended consequence of quality measurement in endoscopy. *Frontline Gastroenterol* 2016;7:202–6.
  - 48 Corley DA, Jensen CD, Marks AR, *et al.* Adenoma detection rate and risk of colorectal cancer and death. *N Engl J Med* 2014;370:1298–306.
  - 49 Vavricka SR, Sulz MC, Degen L, *et al.* Monitoring colonoscopy withdrawal time significantly improves the adenoma detection rate and the performance of endoscopists. *Endoscopy* 2016;48:256–62.
  - 50 Ekkelenkamp VE, Dowler K, Valori RM, *et al.* Patient comfort and quality in colonoscopy. *World J Gastroenterol* 2013;19:2355–61.
  - 51 Butt SK, Defoe H, Besherdas K. The impact of bowel preparation on other colonoscopy quality indicators. *Gut* 2012;61:A378.
  - 52 Verma AM, McGrath N, Bennett P, *et al.* PMO-187 A multi-centre audit of 16 064 colonoscopies looking at caecal intubation rates, over a 2-year period. *Gut* 2012;61:A150.
  - 53 Lee T, Anderson J, Thomas-Gibson S, *et al.* Use of intravenous hyoscine butylbromide (Buscopan) during gastrointestinal endoscopy. *Frontline Gastroenterol* 2018;9.
  - 54 Challand CP, Bullen N, Wu E, *et al.* How do you measure performance as a colonoscopist? *Colorectal Dis* 2011;13:939–43.
  - 55 Rostom A, Ross ED, Dubé C, *et al.* Development and validation of a nurse-assessed patient comfort score for colonoscopy. *Gastrointest Endosc* 2013;77:255–61.
  - 56 Sewitch MJ, Dubé C, Brien S, *et al.* Patient-identified quality indicators for colonoscopy services. *Can J Gastroenterol* 2013;27:25–32.
  - 57 Williams T, Ross A, Stirling C, *et al.* Validation of the global rating scale for endoscopy. *Scott Med J* 2013;58:20–1.
  - 58 Boereboom C, Lund J, Watson N. A descriptive longitudinal assessment of the endoscopy requirements of 183 consecutive consultant colorectal surgeon posts. *Colorectal Disease* 2014;16:202–3.
  - 59 O'Brien C, Walsh K. An audit of GI endoscopic follow up in Sligo regional hospital. *Irish Journal of Medical Science* 2014;183(Suppl 1):S137.
  - 60 Mahmood T, Aung KYI. A study of gap analysis between perception of the Joint Advisory Group (JAG) and staff members of endoscopy unit regarding quality of care in UK. *Journal of Gastrointestinal & Digestive System* 2015;5:319.
  - 61 Kilmartin DM, Khan T, Walsh K. An audit of GI endoscopic surveillance in sligo regional hospital. *Irish Journal of Medical Science* 2015;184(Suppl 1):S323.
  - 62 Valliani T, Dowler K, Dunckley P. OC-021 Flexible sigmoidoscopy completion rates. Time to change certification criteria? *Gut* 2015;59(Suppl 1):A9.
  - 63 Caronia S, Murkin A, Ludford H. A year in the life of an Independent Sector Treatment Centre (ISTC): the endoscopy service at St Mary's NHS treatment centre. *Gut* 2009;58(Suppl 1):A1.
  - 64 Valori RM, Barton R, Johnston DK. The English national endoscopy quality assurance programme: quality of care improves as waits decline. *Gastrointestinal Endoscopy* 2009;69:AB221.
  - 65 Shah R, Chan D, Dewar D. Audit of clinical indication for recall endoscopy in 974 patients. *Gut* 2009;58(S1).
  - 66 de Jonge V, Sint Nicolaas J, Lalor EA, *et al.* A prospective audit of patient experiences in colonoscopy using the Global Rating Scale: a cohort of 1,187 patients. *Can J Gastroenterol* 2010;24:607–13.
  - 67 Sint Nicolaas J, de Jonge V, ter Borg F, *et al.* Evaluation of a quality assurance program for endoscopy services in the Netherlands. *Gastroenterology* 2011;140:S-558–S-559.
  - 68 Coleman L, Fretwell I. \* NHS bowel cancer screening programme in England. *Gut* 2011;60(Suppl 1):A250.
  - 69 Sint Nicolaas J, de Jonge V, Korfage IJ, *et al.* Benchmarking patient experiences in colonoscopy using the Global Rating Scale. *Endoscopy* 2012;44:462–72.
  - 70 Muhammed R, Thomson M, McGrogan P, *et al.* The provision of paediatric gastrointestinal endoscopy services in the United Kingdom. *Frontline Gastroenterol* 2012;3:263–6.
  - 71 Kyte R. PMO-001 The role of the specialist screening practitioner within the Bowel Screening Wales programme. *Gut* 2012;61(Suppl 2):A73.

- 72 Rogers D, Robinson R, Shah S. PMO-211 Propofol sedation for colonoscopy: a single centre's experience. *Gut* 2012;61(Suppl 2):A160.
- 73 MacIntosh D, Dubé C, Hollingworth R, *et al.* The endoscopy Global Rating Scale-Canada: development and implementation of a quality improvement tool. *Can J Gastroenterol* 2013;27:74–82.
- 74 Dubé C. Use of the endoscopy global rating scale by endoscopy services in Canada. *Canadian Journal of Gastroenterology* 2013;27:684–5.
- 75 Hawkes N, Al-Rubaiy L, Hawkes B, *et al.* PTH-046 Benchmarking endoscopy services In Iraq – results of a national survey. *Gut* 2014;63:A229.
- 76 Hitchen A, Kompo B, Phillips P, *et al.* OC-040 community-based endoscopy in a car park. fantasy or reality? *Gut* 2014;63(Suppl 1):A19–A20.
- 77 Hawkes N, Heard H, Dolwani S. PWE-050 development of a performance management framework For Bsw Colonoscopists. *Gut* 2014;63(Suppl 1):A144–A145.
- 78 El Ouali S, Sharara N, Carpentier SM, *et al.* Mo1079 patient perspectives on their colonoscopy experience and impact on the global rating scale - the adult McGill Experience. *Gastroenterology* 2015;148:S-599.
- 79 Carpentier S, Sharara N, Barkun AN, *et al.* Pilot validation study: canadian global rating scale for colonoscopy services. *Can J Gastroenterol Hepatol* 2016;2016:1–7.
- 80 Nyahoda R, Uledi S, Kibrete W, *et al.* PTH-134 Setting Up An Endoscopy Unit in Northern Malawi. *Gut* 2016;65(Suppl 1):A286.
- 81 Rossos P, Xenodemetropoulos T, Lane K, *et al.* A80 The snare project: closing the loop on synoptic endoscopic reporting and skills assessment - program and abstracts from the canadian digestive diseases week 2016. *Canadian Journal of Gastroenterology and Hepatology* 2016;2016:51.
- 82 Narula P, Broughton R, Bremner R, *et al.* Development of a paediatric endoscopy global rating scale: Results of a national pilot. *Journal of Pediatric Gastroenterology and Nutrition* 2017;64:25–6.
- 83 Jwy W, Thomson M, Campbell D, *et al.* G189(P) Development of an annual endoscopy audit plan using measures in the P-GRS(paediatric global rating scale for endoscopy) in a tertiary paediatric endoscopy service to facilitate quality improvement. *Archives of Disease in Childhood* 2017;102(Suppl 1):A76.
- 84 Sint Nicolaas J, Jonge de V, de Man RA, *et al.* The global rating scale in clinical practice: a comprehensive quality assurance programme for endoscopy departments. *Digestive and Liver Disease* 2012;44:919–924.
- 85 Livesey A, Esplin J, 2015. Report prepared for the Ministry of Health: Governance of endoscopy quality and related initiatives - report for stakeholder feedback. [https://www.surgeons.org/media/21905792/2015-06-05\\_rpt\\_governance\\_of\\_endoscopy\\_quality\\_and\\_related\\_initiatives\\_report\\_for\\_sta.pdf](https://www.surgeons.org/media/21905792/2015-06-05_rpt_governance_of_endoscopy_quality_and_related_initiatives_report_for_sta.pdf) (cited 21 Aug 2017).
- 86 Geraghty J, Kankwatira A, Feeney M, *et al.* OC-028 developing sustainable GI endoscopy training in Malawi. *Gut* 2012;61(Suppl 2):A12.
- 87 Cornish J, Horwood J, Maw A. Attaining JAG endoscopy competency during higher surgical training - The trainees experience. *Colorectal Disease* 2010;12:42.
- 88 Haycock AV, Flanagan P, Ignjatovic A, *et al.* Endoscopy training in 2008: Results from the TiG/BSG national training survey. *Gut* 2009;58(S1).
- 89 Haycock AV, Patel JH, Tekkis PP, *et al.* Evaluating changes in gastrointestinal endoscopy training over 5 years: closing the audit loop. *Eur J Gastroenterol Hepatol* 2010;22:368–73.
- 90 Kelly NM, Moorehead J, Tham T. Is the 'driving test' a robust quality indicator of colonoscopy performance? *World J Gastrointest Endosc* 2010;2:112–20.
- 91 Samji S, Dowler K, Valori R, *et al.* Analysis of trainer feedback from the JETS E-portfolio. *Gut* 2011;60(Suppl 1):A123–A124.
- 92 Griffiths LP, Dowler K, Valori R, *et al.* UK endoscopy trainees provide a significant quantity of service delivery. *Gut* 2011;60:A120.
- 93 Dharmasiri S, Wells C, Flexer L, *et al.* PTU-266 Trainee satisfaction with JAG e-certification. *Gut* 2012;61:A295.
- 94 Macdougall L, Corbett S, Welfare M, *et al.* PTU-007 Evaluating endoscopy trainers; how reliable are peer evaluators? *Gut* 2013;62(Suppl 1):A44.
- 95 Hammond JS, Watson NFS, Lund JN, *et al.* Surgical endoscopy training: the Joint Advisory Group on gastrointestinal endoscopy national review. *Frontline Gastroenterol* 2013;4:20–4.
- 96 Ansell J, Hurley J, Horwood J, *et al.* The WIMAT colonoscopy suitcase is a valid simulator for polypectomy training. *Surgical Endoscopy and Other Interventional Techniques* 2013;27:S340.
- 97 Hawkes N, McDonald J. PTU-011 Identifying The Learning Needs Of Bsw Colonoscopists Using An Active Learning Diary During Screening Lists. *Gut* 2014;63(Suppl 1):A42.
- 98 Ward ST, Mohammed MA, Walt R, *et al.* An analysis of the learning curve to achieve competency at colonoscopy using the JETS database. *Gut* 2014;63:1746–54.
- 99 Ansell J, Hurley JJ, Horwood J, *et al.* Can endoscopists accurately self-assess performance during simulated colonoscopic polypectomy? A prospective, cross-sectional study. *Am J Surg* 2014;207:32–8.
- 100 Ansell J, Hurley JJ, Horwood J, *et al.* The Welsh Institute for Minimal Access Therapy colonoscopy suitcase has construct and concurrent validity for colonoscopic polypectomy skills training: a prospective, cross-sectional study. *Gastrointest Endosc* 2014;79:490–7.
- 101 Beejoo G, Prasad N, Shields P. PTU-005 Factors influencing the quality of colonoscopy training in the North West Deanery. *Gut* 2014;63(Suppl 1):A39.
- 102 Ewing I, Lim J, Bryce K, *et al.* PTU-008 Dedicated colonoscopy training lists improve trainee completion rates to match a consultant benchmark. *Gut* 2014;63:A40–A41.
- 103 Jones RP, Stylianides NA, Robertson AG, *et al.* National survey on endoscopy training in the UK. *The Annals of The Royal College of Surgeons of England* 2015;97:386–9.
- 104 Chadwick G, Budihal S. PTU-050 Is current UK colonoscopy training fit for purpose? – results of the 2014 BSG training survey. *Gut* 2015;64(Suppl 1):A81.
- 105 Bhatt S, Ambrose T, Dunckley P, *et al.* PWE-440 Trainee endoscopic procedures by deanery and grade in the United Kingdom: September 2013 – August 2014. have we improved? *Gut* 2015;64:A403.
- 106 Axe K, Hawkes E, Turner J, *et al.* PWE-432 Learning curve for upper GI endoscopy – qualitative assessment of developmental phases of novice trainees. *Gut* 2015;64(Suppl 1):A399–A400.
- 107 Everett S, Welman T, Younis J, *et al.* A survey of the delivery of endoscopy training amongst higher surgical trainees. *Int J Surg* 2015;23:S101–S102.
- 108 Amadio JM, Walsh CM, Scaffidi MA, *et al.* Su1553 Can novice endoscopists accurately self-assess performance during their initial clinical colonoscopies? A prospective, cross-sectional study. *Gastrointest Endosc* 2015;81:AB325.
- 109 Rajendran A, Thomas-Gibson S, Bassett P, *et al.* PTH-116 Time to achieve competency in lower gastrointestinal polypectomy in the United Kingdom, a retrospective analysis. *Gut* 2016;65(Suppl 1):A276–A277.
- 110 van Doorn SC, Bastiaansen BAJ, Thomas-Gibson S, *et al.* Polypectomy skills of gastroenterology fellows: can we improve them? *Endosc Int Open* 2016;04:E182–E89.

- 111 Ward ST, Hancox A, Mohammed MA, *et al.* The learning curve to achieve satisfactory completion rates in upper GI endoscopy: an analysis of a national training database. *Gut* 2017;66:1022–33.
- 112 Grover SC, Scaffidi MA, Khan R, *et al.* Progressive learning in endoscopy simulation training improves clinical performance: a blinded randomized trial. *Gastrointest Endosc* 2017;86:881–9.
- 113 Patel K, Rajendran A, Faiz O, *et al.* An international survey of polypectomy training and assessment. *Endosc Int Open* 2017;5:E190–E197.
- 114 Sinha A, Dowler K, Valori R, *et al.* National uptake of JETS E-portfolio. *Gut* 2011;60(Suppl 1):A124.
- 115 Walker NAF, McNair A, Beale A, *et al.* E-booking system for endoscopy training lists enhances their utilisation. *Gut* 2011;60(Suppl 1):A51.
- 116 Mehta T, Dowler K, McKaig B, *et al.* PTH-018 Results on the national uptake of the JETS e-Portfolio. *Gut* 2010;59(Suppl 1):A129–A130.
- 117 Lamb CA, Singh JN, Eltringham M, *et al.* Generic medical and surgical endoscopy training lists can improve the number of opportunities for training in colonoscopy. *Gut* 2011;60(Suppl 1):A121.
- 118 Gupta S, Anderson J, Bhandari P, *et al.* Development and validation of a novel method for assessing competency in polypectomy: direct observation of polypectomy skills. *Gastrointest Endosc* 2011;73:1232–9.
- 119 Gupta S, Bassett P, Man R, *et al.* Validation of a novel method for assessing competency in polypectomy. *Gastrointest Endosc* 2012;75:568–75.
- 120 Barton JR, Corbett S, van der Vleuten CP, *et al.* The validity and reliability of a Direct Observation of Procedural Skills assessment tool: assessing colonoscopic skills of senior endoscopists. *Gastrointest Endosc* 2012;75:591–7.
- 121 China L, Johnson GJ. Su1594 A novel training and assessment tool for the endoscopic management of Upper GI Bleeding (UGIB). *Gastrointest Endosc* 2014;79:AB333.
- 122 Hawkes N, Turner J, Hurley J, *et al.* Accelerated training in upper GI endoscopy-an analysis of SPRINT programme outcomes. *United European Gastroenterology Journal* 2015;3(Suppl 1):A368–A369.
- 123 Watson H, Hibberts F. PWE-427 The development of a national nurse / non-medical endoscopist course. *Gut* 2015;64:A397.
- 124 Axe K, Hawkes E, Turner J, *et al.* PWE-433 A qualitative assessment of cognitive framework development in novice endoscopists: implications for programmed lesion recognition training. *Gut* 2015;64(Suppl 1):A400.
- 125 Lee TJW, Macdougall L, Broughton R, *et al.* PTH-044 The National Endoscopy Database (NED) Project. *Gut* 2016;65(Suppl 1):A240.
- 126 Siau K, Dunckley P, Anderson J, *et al.* PTU-009 Competency of endoscopic non-technical skills (ENTS) during endoscopy training. *Gut* 2017;66(Suppl 2):A54.
- 127 Siau K, Dunckley P, Valori R, *et al.* Changes in scoring of Direct Observation of Procedural Skills (DOPS) forms and the impact on competence assessment. *Endoscopy* 2018;50:770–8.
- 128 Siau K, Dunckley P, Anderson J, *et al.* PTU-010 Exposure to endotherapy for upper gastrointestinal bleeding at the point of gastroscopy certification – is it sufficient? *Gut* 2017;66(Suppl 2):A55.
- 129 Patel K, Faiz O, Rutter M, *et al.* The impact of the introduction of formalised polypectomy assessment on training in the UK. *Frontline Gastroenterol* 2017;8:104–9.
- 130 Biswas S, Alrubaiy L, China L, *et al.* Trends in UK endoscopy training in the BSG trainees' national survey and strategic planning for the future. *Frontline Gastroenterol* 2018;9.
- 131 Hussain Z, Reynolds K, Smales S, *et al.* Colonoscopy quality and safety indicators: 356. *Colorectal Dis* 2011;13:57.
- 132 Kaminski MF, Anderson J, Valori R, *et al.* Leadership training to improve adenoma detection rate in screening colonoscopy: a randomised trial. *Gut* 2016;65:616–24.
- 133 Office for Public Management, 2017. Accelerated non-medical endoscopist training programme: report to health education England. [http://www.opm.co.uk/wp-content/uploads/2017/06/OPM\\_NME-Year-1-Evaluation-Report-Final.pdf](http://www.opm.co.uk/wp-content/uploads/2017/06/OPM_NME-Year-1-Evaluation-Report-Final.pdf) (cited 18 Oct 2017).
- 134 Hui AJ, Lau JY, Lam PP, Ppy L, *et al.* Comparison of colonoscopic performance between medical and nurse endoscopists: a non-inferiority randomised controlled study in Asia. *Gut* 2015;64:1058–62.
- 135 Bonnington S, Wells CW. Su1566 Development of a DOPS assessment tool for Percutaneous Endoscopic Gastrostomy (PEG) Insertion. *Gastrointest Endosc* 2015;81:AB332.
- 136 Thomas-Gibson S, Bassett P, Suzuki N, *et al.* Intensive training over 5 days improves colonoscopy skills long-term. *Endoscopy* 2007;39:818–24.
- 137 Ansell J, Hurley J, Horwood J, *et al.* Colonoscopists can accurately self-assess their performance when using the wimat colonoscopy suitcase polypectomy trainer. *Surgical Endoscopy and Other Interventional Techniques* 2013;27:S340.
- 138 Grover SC, Garg A, Scaffidi MA, *et al.* Impact of a simulation training curriculum on technical and nontechnical skills in colonoscopy: a randomized trial. *Gastrointest Endosc* 2015;82:1072–9.
- 139 Greenaway D, 2013. Shape of training. [http://www.shapeoftraining.co.uk/static/documents/content/Shape\\_of\\_training\\_FINAL\\_Report.pdf\\_53977887.pdf](http://www.shapeoftraining.co.uk/static/documents/content/Shape_of_training_FINAL_Report.pdf_53977887.pdf) (cited 18 Oct 2017).
- 140 Shenbagaraj L, Thomas-Gibson S, Stebbing J, *et al.* Endoscopy in 2017: a national survey of practice in the UK. *Frontline Gastroenterol* 2018;fgastro-2018-100970.
- 141 Murphy J, Halloran S, Gray A. Cost-effectiveness of the faecal immunochemical test at a range of positivity thresholds compared with the guaiac faecal occult blood test in the NHS Bowel Cancer Screening Programme in England. *BMJ Open* 2017;7:e017186.
- 142 Public Health England, 2018. Bowel screening to start at 50. <https://www.gov.uk/government/news/bowel-screening-to-start-at-50> (cited 17 Sep 2018).
- 143 Matharoo M, Haycock A, Sevdalis N, *et al.* A prospective study of patient safety incidents in gastrointestinal endoscopy. *Endosc Int Open* 2017;5:E83–E89.
- 144 JAG, 2018. Joint Advisory Group for GI Endoscopy (JAG) Improving Safety and Reducing Error in Endoscopy (ISREE) Implementation strategy [https://www.thejag.org.uk/Downloads/General/180801-Improving%20Safety%20and%20Reducing%20Error%20in%20Endoscopy%20\(ISREE\)%20Implementation%20strategy%20v1.0.pdf](https://www.thejag.org.uk/Downloads/General/180801-Improving%20Safety%20and%20Reducing%20Error%20in%20Endoscopy%20(ISREE)%20Implementation%20strategy%20v1.0.pdf)
- 145 Thomas-Gibson S, Matharoo M, Siau K, *et al.* PTH-044 Improving safety and reducing error in endoscopy (ISREE) – a JAG initiative. *Gut* 2018;67(Suppl 1):A34.