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TITLE: ENDOSCOPIC TRAINING DURING FELLOWSHIP: A NATIONWIDE FRENCH STUDY

Short title: Impact of theoretical courses and simulation-based training during fellowship

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Xavier Dray is a co-founder and shareholder of Augmented Endoscopy

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ABSTRACT

Background

In France, it is mandatory that gastroenterology fellows have mastered the basic level of endoscopy by the end of training. The aim of this study was to assess improvement in the quality of fellows' endoscopy training in France during the last four years.

Methods

All fellows in France in training were eligible for participation. A 21-item questionnaire was sent out. The primary outcome was the completion by fourth year fellows of all the number of procedures recommended. Results were compared with those of a 2016 survey.

Results

Two-hundred-and-sixty-five fellows responded to the survey. The participation rate was 47.0%. The mean age was 27.3 ± 1.0 years and 56.4% were female. Access to theoretical courses (63.7% vs 30.6%, $p < 0.001$) and simulation-based training (virtual reality simulator: 58.4% vs 28.2%, $p < 0.001$, animal models: 29.4% vs 17.2%, $p < 0.001$) was significantly higher in 2020. Although the number of procedures did not increase, significantly higher perception of skill acquisition in colonoscopy as well as diminished pressure to advance procedures were noted.

Conclusion

Access to theoretical courses and simulation-based training and perceived acquisition of numerous skills has gotten better. However, the quality of training in endoscopy still needs improvement.

Keywords: Endoscopic Training, fellowship, simulation-based training, theoretical courses, Skills acquisitions

Highlights:

- What is already known on this subject?

Evaluation of the quality of training of fellows in endoscopy is essential and competence assessment has mainly been based on a minimum number of procedures needed. In 2016, a French national survey evaluating fellows' perception of their training showed only 49% and 35% of last-year fellows had reached the threshold of recommended EGD and colonoscopies.

- What are the new findings?

The mean number of weeks fully dedicated to endoscopy training and the mean number of procedures performed by fellows during their training did not differ between 2016 and 2020. However, the access to theoretical courses and simulation-based training was significantly higher in 2020 compared to 2016. The perception of skill acquisition has also gotten better in the last four years.

- How might it impact on clinical practice in the foreseeable future?

These results argue in favor of a higher caseload during fellowship and suggests that theoretical and simulation-based training courses are helpful. A reform is likely warranted in this regard.

INTRODUCTION

Learning endoscopy is an important step in the training of a gastroenterologist. Quality evaluation is essential to guarantee future generations will receive proper training. Thus, an increasing focus has been placed on competency assessment in endoscopy. Ensuring that milestones are reached and that all trainees achieve that competence are part of this evaluation.

Evaluation tools for the assessment of competency in endoscopy have been edited in 2014 by the American Society for Gastrointestinal Endoscopy (ASGE) [1]. In Europe, competence assessment has mainly been based on a minimum number of procedures needed. According to the 2017 version of the *Blue book of the European section and Board of Gastroenterology and Hepatology*, it is recommended that trainees perform a minimum of 200 diagnostic esophago-gastro-duodenoscopies (EGD), 200 diagnostic total colonoscopies, 30 hemostatic techniques for upper gastrointestinal bleeding, 50 hemostatic and polypectomy procedures in the lower gastrointestinal tract, 10 balloon dilations, 15 percutaneous endoscopic gastrostomy (PEG) placements and the analysis of 30 small bowel capsule endoscopy (SB CE) [2]. Therefore, it is mandatory that Gastroenterology and Hepatology fellows have mastered the basic level of endoscopy by the end of their training. In 2016, we had conducted a national survey to evaluate fellows' perception of their training in endoscopy. Only 49% and 35% of last-year fellows had reached the recommended threshold of EGD and colonoscopies. Only 40% had access to theoretical and/or simulation-based training during fellowship. Based on these results, we suggested an increased access to simulation-based training, an emphasis on one-on-one teaching and mentorship and the establishment of a

personalized monitoring program evaluating the fellows throughout their 4 years of training [3]. Since then, the access to theoretical courses and simulation-based training has been promoted by fellowship program directors of nationwide academic centers.

The aim of this study was to assess the quality of endoscopy training during fellowship and to evaluate the impact of the implemented changes over the last four years in France.

METHODS

Study population

All fellows in France undergoing gastroenterology (GI) training at the start of summer 2020 were identified using a database maintained by regional program directors in charge of GI trainees as well as the registry of the *Agence Régionale de Santé* (state-run administration responsible for the distribution of fellows of all medical disciplines nationwide). All GI fellows were eligible for participation, regardless of how far along they were in their training. Each year, newly graduates are matched in one of seven regions for their GI fellowship: *Ile-de-France* (comprising Paris), Northern, Southeastern, Western, Southwestern, Rhône-Alpes, and Eastern. During four years of training, fellows follow a 6-month rotation program (i.e. 8 rotations) within their region. Fellow appointments are in November, so rotations start in November and May. Practical training is coordinated at the level of each GI department were fellows rotate. Theoretical training is under the coordination of each regions' program director.

On-line questionnaire

A 21-item questionnaire was designed and data was collected using a web-based survey tool (Google Forms application). Survey questions were written by the authors based on the prior model of 2016. The following variables were collected: demographics, number of fully/partially weeks dedicated to training, access to theoretical and simulation-based training, conditions of training (teaching hospital vs general hospital, type of trainers, elective vs urgent procedures), number of procedures performed (EGD, colonoscopy, SB CE, hemostatic technics, polypectomy, PEG placement and balloon dilation), perception of skill acquisition and feedback. A five-level grading system was used for the evaluation of the perceived sense of skill

acquisition: untrained (fellow observed procedure only), novice, intermediate, advanced and superior; based on the ASGE assessment of competency in endoscopy evaluation tool [1]. A variety of skills was evaluated by this grading system. Feedback, via overall satisfaction as well as barriers to training (access to different types of procedures, pressure to advance procedures faster by the trainers, endoscopy nurses or anesthesiologists, access to theoretical training) was also evaluated. Data were collected anonymously. The survey could only be taken once.

Email invitations to complete the survey were sent out to all eligible fellows, and advertised on Facebook through the trainee section account, in June 2020. This ensured that during the first year, fellows had at least one rotation experience prior to answering the questionnaire. Four additional reminders were sent out subsequently between June and September 2020. Data entered by survey participants were self-reported. The study did not require approval by our Institutional Review Board.

Outcomes

The outcomes of the study were as listed herein. 1/ Training characteristics including the weeks fully or partially dedicated to endoscopy training, academic vs nonacademic trainers, the setting of practical training (elective with or without sedation vs urgent), access to theoretical and simulation-based training. 2/ Number of cases and threshold rates: number of EGD, colonoscopy, CE, hemostatic technics, polypectomy, PEG placements and balloon dilatation performed, overall rate of completion of the recommended threshold for each procedure, and complete training rate amongst the 4th year fellows. Complete training was defined according to the *Blue book of the European section and Board of Gastroenterology and Hepatology*, as having performed by the end of training at least 200 EGDs, 200 colonoscopies, 30 SB CE, 80

hemostatic technics, 50 polypectomies, 15 PEG placements and 10 balloon dilatations. 3/ Perception of skill acquisition and satisfaction feedback. Completion of at least 50 EGD and at 50 colonoscopies per year have also been evaluated in this setting. Finally, we compared our results for each outcome to that of the previously published study of 2016 [3].

Statistical analysis

Quantitative variables are expressed as means ± standard deviations or medians [interquartile range] whenever appropriate and were compared with Mann-Whitney test or ANOVA tests for quantitative variables. Qualitative variables were expressed as percentages and were compared with Chi^2 or Fisher's exact tests,as appropriate. A p value < 0.05 was considered statistically significant. Statistical analyzes were conducted with SPSS® (IBM, v23, Chicago, IL, USA).

RESULTS

Study population

A total of 567 participants from the French GI fellowship program were identified. Among them, 265 fellows responded to the survey (47.0%). The participation rate ranged from 37.4% to 66.7% depending on the region of training. The median age was 27.3 ± 1.0 years, and 56.4% of fellows were female. The median number of rotations was 4.5 ± 2.0, including 3.0 ± 1.6 in teaching hospitals and 1.5 ± 1.1 in general hospitals. The proportions of fellows in their first, second, third and fourth years of training were 21.2%, 31.2%, 30.7% and 17.0%, respectively. The demographic characteristics are reported in **Table 1**.

Training characteristics

The mean number of weeks fully dedicated to endoscopy training was 10.3 ±10.4 weeks per fellow. The mean number of weeks partly dedicated to endoscopy training (amongst other clinical duties) was 7.5 ± 10.8 weeks. Prior to endoscopic training on real life patients, theoretical courses were available for 76.3% of the fellows. Simulation-based training on virtual reality simulator was available for 58.4% of fellows and training on animal models for 29.4% of fellows. There were no differences in the access to a preliminary training course among the seven academic training areas. These results are detailed in **Table 2**. The fellows had access to endoscopic training in 57.1% of cases in teaching hospitals and in 88.8% of cases in general hospitals ($p < 0.001$). Training in the endoscopy room was under the supervision of assistant professors (35.4%), associate professors or professors (9.2%), attending gastroenterologists (34.4%), attending endoscopists (14.5%) and part-time attending gastroenterologist (7.0%). Fellows were trained in 72.3% of cases on elective procedures (46.3% with anesthesia or

sedation, 26.0% with no sedation) and in 27.7% of cases in the setting of urgent procedures within (18.3%) or outside (9.4%) of the endoscopy unit.

The mean number of weeks fully dedicated to endoscopy training did not significantly differ between 2016 and 2020 (10.5 vs 10.3 weeks, $p = 0.86$). The access to theoretical courses (63.7% vs 30.6%, $p < 0.001$) and simulation-based training (virtual reality simulator: 58.4% vs 28.2%, $p < 0.001$ and animal models: 17.2% vs 29.4%, $p < 0.001$) was significantly higher in 2020 compared to 2016. Trainers' implication did not significantly differ between 2016 and 2020 with the exception of a decrease in the participation of part-time trained gastroenterologists (7.0% *vs*. 10.9%, $p < 0.001$). The proportions of elective and urgent procedures did not significantly differ between 2016 and 2020, with the exception of an increase in emergency procedures performed outside of the endoscopy unit (9.4% *vs*. 3.4%, $p < 0.001$).

Metrics and threshold numbers

The mean number of each type of procedure was 149.7 ± 210.5 EGDs, 68.2 ± 83.3 colonoscopies, 1.4 ± 3.9 SB CE, 35.5 ± 57.6 hemostatic technics, 38.8 ± 58.7 polypectomies, 8.6 ± 13.3 PEG placements and 1.1 ± 2.2 balloon dilatations. The overall rate of completion of the recommended threshold for each procedure was as follows: 26.1% performed ≥ 200 EGDs, 8.8% performed ≥ 200 colonoscopies, 2.3% performed ≥ 30 SB CE, 11.2% performed ≥ 80 hemostatic technics, 29.2% performed ≥ 50 polypectomies, 19.2% performed ≥ 15 PEG placements and 3.9% performed ≥ 10 balloon dilatations. By the fourth and last year of training, the rate of completion of these thresholds were as follows: 42.5% performed ≥ 200 EGDs, 17.5% performed ≥ 200 colonoscopies, 2.2% performed ≥ 30 SB CE, 18.2% performed ≥ 80 hemostatic technics, 44.2% performed ≥ 50 polypectomies, 38.1% performed ≥ 15 PEG

placements and 7.0% performed ≥ 10 balloon dilatations. Amongst the fourth-year fellows (n = 89), 6.0% achieved the completion of all the number of procedures recommended. Overall, 18.9% of fellows complete at least 50 EGD and 50 colonoscopies by year of training. Compared to 2016, there were no significant differences in terms of mean number of procedures and percentage of fellows having achieved the recommended threshold number per type of procedure. These results can be seen in **table 3 and figure 1**.

Perception of skill acquisition and feedback

Competence level was perceived as advanced or superior in 82.0% of cases for EGD, 28.0% for terminal ileal intubation, 34.0% for abdominal compression, 54.0% for variceal band ligation, 44.0% for clip placement, 36.0% for hot-snare polypectomy, 23.0% for endoscopic mucosal resection, 47.0% for PEG placement and 7.0% for balloon dilation. Characterization of esophagus, stomach, duodenum, colon and ileum lesions was well mastered (advanced or superior) in 35%, 37%, 27%, 48% and 33% respectively. There was a significantly higher rate of advanced or superior level of perceived skill acquisition for colonoscope introduction (73.0% vs 64.0%, p 0.007), advancement into the sigmoid (32.0% vs 27.0%, p 0.006), advancement passed the hepatic flexure (19.0% vs 12.0%, p = 0.02), performance of random (53.0% vs 47.0%, p 0.03) and targeted biopsies (43.0% vs 27.0%, p < 0.001), characterization of colonic lesions (18.0% vs 8.0%, p = 0.002), management of colon polyps (17.0% vs 7.0%, p 0.002), cold forceps polypectomy (28.0% vs 20.0%, p < 0.001) and PEG placement (24.0% vs 18.0%, p 0.04) in 2020 compared to 2016. Detailed results are described in **figure 2**.

Regarding the overall satisfaction of the fellows, on a scale from 1 to 10 (10 being the highest level of satisfaction), University hospitals scored 4.9 ± 2.5 and general hospitals 6.6. ±

2.4 ($p < 0.001$). Overall, 30.4% of fellows felt confident enough that they could perform digestive endoscopy unsupervised. Regarding barriers to training, access to EGD, colonoscopy and urgent endoscopic procedures was insufficient in 26.3%, 51.0% and 46.3% of cases respectively. Pressure to advance procedures faster by the trainers, endoscopy nurses or anesthesiologists was reported as problematic in 6.9%, 12.3% and 30.8% of cases respectively. Access to theoretical training was reported as insufficient in 32.3% (86/266) of cases. The overall satisfaction of the fellows was significantly lower in 2020 compared to 2016 for both University hospitals (4.9 ± 2.5 vs. 5.3 ± 2.1, p 0.05) and general hospitals (6.6 ± 2.4 vs. 7.1 ± 1.8, $p = 0.01$). Compared to 2016, excessive pressure experienced by the fellow was lower whether it be from the trainers (6.9 vs 13.8%, p 0.008), endoscopy nurses (12.3 vs 13.9%, $p = 0.001$) or anesthesiologists (30.8 vs 37.6%, $p = 0.001$). Conversely, claim for insufficient access to EGD, colonoscopy, urgent endoscopies as well as theoretical courses remained unchanged. These results are described in **table 3**.

DISCUSSION

In this French nationwide study, we investigated on the quality of the training of fellows in digestive endoscopy. We also compared the quality of training to those of 2016 (i.e. after a full 4-year cycle of training). Two-hundred-and-sixty-five fellows responded to the survey (participation rate of 47.0%). We found that the mean number of weeks fully dedicated to endoscopy training did not significantly differ between 2016 and 2020. The mean number of procedures and percentage of fellows having achieved the recommended threshold number per type of procedure did not differ either. Access to theoretical courses and simulation-based training was significantly higher in 2020 compared to 2016. Finally, a significantly higher perception of skill acquisition in colonoscopy as well as diminished pressure to advance procedures were noted.

Training in digestive endoscopy during fellowship is crucial for future gastroenterologists. In France, by the end of the 4 years of fellowship, proficiency in several diagnostic procedures is expected. Recently published articles showing that the COVID-19 has deeply affected GI fellowship training, including in endoscopy, confirms that fellows are very much concerned by this issue [4,5]. Monitoring and measuring trainees' progress and performances, thereby allowing an assessment of the quality of training, is a difficult task. Studies have shown repeatedly that the quality of training cannot be exclusively measured by the number of procedures performed, although this represents a competence safeguard [6,7]. Tools are needed to establish generalizable learning curves and competency benchmarks. These competence assessment metrics would allow to identify and help trainees falling behind the normal learning curves, identification of skills needing focused attention, as well as

indicating readiness for certification. In 2014, the Training Committee of the ASGE released evaluation tools for assessment of competency in endoscopy (ACE) thus adding quality metrics to the existing competency benchmarks [1]. A validation study by Sedlack et al. published in 2016 focused on colonoscopy identified an average ACE score of 3.5/4, cecal intubation rates of 90%, and intubation times under 15 minutes as competency thresholds. On average, it took 250 procedures to achieve competence in colonoscopy [8]. Another study published in 2019 by Miller et al., focused on EGD, identified an average ACE scores of 3.5/4, independent D2 intubation rates of 95%, and D2 intubation times of ≤4.75 minutes as competency thresholds. On average, it took 250 procedures to achieve minimum competence in cognitive and motor skills [9]. In 2019, the ASGE in collaboration with the World Endoscopy Organization published a list of principles for endoscopic training. The main highlighted points were the need for formal training of endoscopy teachers, feedback to trainees and teachers to improve performance, incorporating simulators into endoscopy teaching and competence assessment metrics [10]. In Europe, the 2017 version of the *Blue book of the European section and Board of Gastroenterology and Hepatology*, recommended a minimal number of procedures to be carried out by the trainee [2]. A European survey on training in endoscopy (144 physicians in their last year of training or recently trained), showed that a minimum number of procedures was required in nine of 16 countries (56 %), that trainees dedicate a median of 12 months of their training period to endoscopy, and that most trainees were not proficient in hemostatic technics and polypectomy. This study highlighted the heterogeneity of training in Europe, the shortcomings of the overall quality of training, and the need for formalization of educational programs across the continent [11].

Our study provides new data on the training of fellows in endoscopy in France. First, the mean number of weeks fully dedicated to endoscopy training and the mean number of procedures did not differ between 2016 and 2020. Further, the rate of last year fellows having completed the recommended number of procedures was low and did not change significantly in the last 4 years (6.0% vs. 2.3%, p = 0.62). In a British survey published in 2016 (281 trainees), 53% of final year trainees had yet to achieve full certification in colonoscopy (> 300) and 7% in EGD (> 200) [12]. In a more recent British survey published in 2018 (291 trainees), only half (51.1%) of the trainees achieved complete colonoscopy certification by their final year. Comparison with the prior survey showed that the number of sigmoidoscopy (p 0.006) and colonoscopy (p<0.001) were lower [13]. Finally, a recent European survey showed that only 70%–89% of trainees performed the total number of endoscopic procedures to fulfil the requirements of the European Board (200 EGDs and 200 colonoscopies) [14]. This data shows that the number of diagnostic procedures performed by fellows in France during training is insufficient and has not progressed in four years. The fact that the characteristics of training have not changed (dedicated number of weeks, type of trainers, barriers) account for these results. This probably explains the lower level of global satisfaction of the fellows. Implementing a reform is a long and difficult task; however, our results suggest that this is a necessary undertaking. Recently, the training of GI fellows in France has been extended to 5 years. This might increase the rate of fellows having achieved the recommended thresholds. However, this will result in a higher number of fellows being in training at the same time, which might annul the effects of this extra year. Moreover, the quality of training will not benefit from this change either. Second, the access to theoretical courses and simulation-based training was

significantly higher in 2020 compared to 2016. Simulation-based training allows for repetitive instruction in risk-free environment. Virtual reality simulators are most frequently used for initial training in gastrointestinal endoscopy. Studies show that simulation-based training accelerate the acquisition of technical skills early in training and may provide an advantage for those who have benefited from this type of training in terms of procedure completion and performance time [6,15–17]. However, the benefits seem to plateau after a while and virtual reality simulation does not replace conventional apprenticeship on real live patients [18]. Nonetheless, its implantation has progressed in France and this could account for the significantly higher perception of skill acquisition. Simulation-based training prior to endoscopy on human patients may also facilitate integration of the fellows in the endoscopy units, resulting in diminished pressure to advance procedures. Third, the perception of skill acquisition has gotten better in the last four years. This suggests that raw numbers are not the only metric to consider when evaluating competence acquisition as discussed previously. However, the sensation of skill acquisition was low in numerous competency benchmarks. Competence level was perceived as advanced or superior in 28.0% of cases for terminal ileal intubation only (36.8% in 4th year fellows). A rate of 90.0% for independent cecal intubation was identified as a competency threshold in published data, so we can surmise that this skill acquisition is insufficient. In addition, characterization of gastrointestinal lesions was mastered in 27 to 48% of cases depending on which organ was considered. In 2020, European guidelines were published by the European Society of Gastrointestinal Endoscopy (ESGE) on training in optical diagnosis during gastrointestinal endoscopy [19]. All endoscopist should achieved general competence in EGD and colonoscopy prior to training in optical diagnosis (experience

of at least 300 EGD and 300 colonoscopies) [19]. This explains why the fellows who responded to this survey did not feel comfortable with lesion characterization. Overall, the quality of training has gotten better with an easier access to theoretical and simulation-based training, as well as diminished pressure from colleagues in the endoscopy unit. However, the mean number of weeks fully dedicated to endoscopy training and the mean number of procedures and percentage of fellows having achieved the recommended threshold number per type of procedure did not significantly differ between 2016 and 2020. The global level of satisfaction of the fellows is significantly lower as a result. This further argues in favor of a higher caseload during fellowship and suggests that theoretical and simulation-based training courses are helpful.

Several limitations of this study can be noted. First surveys carry an inherent risk of bias given data are derived from a self-reported questionnaire. Self-reported experience may not provide an insight on the trainees' competence. Further, data suggests substantial differences between self-evaluation and evaluation by trainers, which also constitutes a bias [13]. Second, over 50% of fellows did not respond to the survey. However, this response rate was high for this type of survey, with responses from all regions of France and from fellows at various stages of training [12,13]. Third this survey was conducted after the first 2020 lockdown due to the COVID-19 pandemic which, as mentioned, has significantly impacted on training [4,5].

In conclusion, we found that amongst Gastroenterology and Hepatology fellows in their fourth and final year of training, the rate of complete endoscopic training was 6.0%. Compared to 2016, there was no significant difference in terms of mean number of procedures. We also show that access to theoretical courses and simulation-based training were significantly higher

compared to 2016. Overall, we believe, based on these results, that although progress has been made in the last four years, the quality of training in endoscopy in France remains inferior to what is expected. A revision of the training system is necessary.

TABLES

Table 1: Demographic characteristics of the French fellows in Hepatology and Gastroenterology who responded to the survey and the characteristics of their fellowship.

	2016's survey (n = 291)	2020's survey (n = 265)	p-value
Age (***mean ± SD***)	27.4 ± 1.6	27.3 ± 1.7	0.58
Female sex (%)	164/255 (64.3)	149/264 (56.4)	0.07
Number of participants (%)	291/484 (60.1)	265/564 (47.0)	<0.001
Number of semesters of training (***mean ± SD***)	4.6 ± 2.1	4.5 ± 2.0	0.45
- University hospital	3.3 ± 1.8	3.0 ± 1.6	0.02
- General hospital	1.3 ± 1.0	1.5 ± 1.1	0.02
Region of training (%)			
Ile-de-France (Paris metropolis)	72 (24.7%)	54 (20.6%)	0.26
Northern (Lille; Amiens; Rouen; Caen)	36 (12.4%)	38 (14.5%)	0.53

Western (Brest; Rennes; Nantes; Angers; Tours; Poitiers)	57 (19.6%)	43 (16.4%)	0.38
Eastern (Nancy; Strasbourg; Reims; Dijon; Besancon)	41 (14.1%)	40 (15.3%)	0.72
Rhône-Alpes (Lyon; Saint-Etienne; Grenoble; Clermont-Ferrand)	16 (5.5%)	48 (18.3%)	<0.001
Southwestern (Limoges; Toulouse; Bordeaux)	36 (12.7%)	20 (7.6%)	0.07
Southeastern (Nice; Marseille; Nîmes; Montpellier)	32 (11.0%)	19 (7.3%)	0.14
Year of training (%)	n = 291	n = 264	
- First year	57 (19.6%)	56 (21.2%)	0.67
- Second year	90 (30.9%)	82 (31.1%)	0.99
- Third year	91 (31.3%)	81 (30.7%)	0.93
- Fourth year	53 (18.2%)	45 (17.0%)	0.74

Variables are presented as n (%), mean ± standard deviation (SD). P values are based on a two-sided chi-square or Fisher's exact tests for all categorical variables and on Mann-Whitney test for all quantitative variables.

Table 2: Characteristics of endoscopic training of the French fellows in Hepatology and Gastroenterology who responded to the survey, in 2020, compared to 2016

	2016's survey (n = 291)	2020's survey (n = 265)	p-value
Time dedicated to training in endoscopy (weeks)			
- Full time	10.5 ± 10.5	10.3 ± 10.4	0.86
- Part time (shared with other clinical tasks)	6.2 ± 9.0	7.5 ± 10;8	0.17
Setting of endoscopic training			
- Teaching hospital	60.7%	57.1%	0.25
- General hospital	84.8%	88.8%	0.38
Supervision			
- Fellow	0.6%	0%	0.02
- Assistant professor	32.3%	35.4%	0.14
- Associate professor or Professor	10.9%	9.2%	0.10
- Attending gastroenterologist	32.2%	34.4%	0.29
- Attending endoscopist	12.8%	14.5%	0.19
- Part time attending gastroenterologist	10.9%	7.0%	<0.001
Type of procedures			

- Elective procedures			
with anaesthesia/sedation	31.7%	26.0%	<0.001
without sedation	45.2%	46.3%	0.55
- Urgent procedures			
within the endoscopy unit	19.7%	18.3%	0.17
outside of the endoscopy unit	3.4%	9.4%	<0.001
Theoretical and simulation-based courses	40.2%	76.3%	<0.001
- Theoretical courses	30.6%	63.7%	<0.001
- Virtual simulator	28.2%	58.4%	<0.001
- Animal models	17.2%	29.4%	0.001

Variables are presented as n (%), mean ± standard deviation). P values are based on a two-sided chi-square test for all categorical variables and on Mann-Whitney test for all quantitative variables.

Table 3: Metrics and threshold numbers of endoscopic training of the French fellows in Hepatology and Gastroenterology who responded to the survey, in 2020, compared to 2016

	2016's survey (n = 291)	2020's survey (n = 265)	p-value
EGD			
- Mean number of procedures	136.8 ± 140.9	149.7 ± 210.5	0.41
- Rate of fellows ≥ 200 procedures	26.6%	26.1%	0.92
Colonoscopy			
- Mean number of procedures	73.2 ± 80.6	68.2 ± 83.3	0.49
- Rate of fellows ≥ 200 procedures	10.9%	8.8%	0.46
SB CE			
- Mean number of procedures	2.2 ± 6.3	1.4 ± 3.9	0.09
- Rate of fellows ≥ 20 procedures	2.3%	0.4%	0.07
Hemostatic techniques			
- Mean number of procedures	31.2 ± 44.5	35.5 ± 57.6	0.34
- Rate of fellows ≥ 80 procedures	9.7%	11.2%	0.57
Polypectomy			
- Mean number of procedures	46.4 ± 63.6	38.8 ± 58.7	0.16
- Rate of fellows ≥ 50 procedures	32.6%	29.2%	0.45
PEG			

- Mean number of procedures - Rate of fellows ≥ 15 procedures	9.2 ± 11.0 23.0%	8.6 ± 13.3 19.2%	0.59 0.34
Balloon dilatation - Mean number of procedures - Rate of fellows ≥ 10 procedures	1.3 ± 2.7 3.3%	1.1 ± 2.2 3.9%	0.45 0.82
Full training completion rates in 4th year fellows	3/50 (6.0%)	1/43 (2.3%)	0.62
Completion of at least 50 EGD and 50 colonoscopies	47/249 (18.9%)	56/268 (20.9%)	0.58

EGD: eso-gastro-duodenoscopy; SB CE: small bowel capsule endoscopy; PEG: percutaneous endoscopic gastrostomy.

Variables are presented as n (%). mean ± standard deviation). P values are based on a two-sided chi-square test for all categorical variables and on Mann-Whitney test for all quantitative variables.

FIGURE LEGENDS

Figure 1: Rates of fellows having completed the recommended threshold of number of procedure in 2020, compared to 2016.

Figure 2: Perception of skill acquisition by fellows in 2020, compared to 2016.

Figure 3: Barriers during endoscopic training in 2020, compared to 2016.

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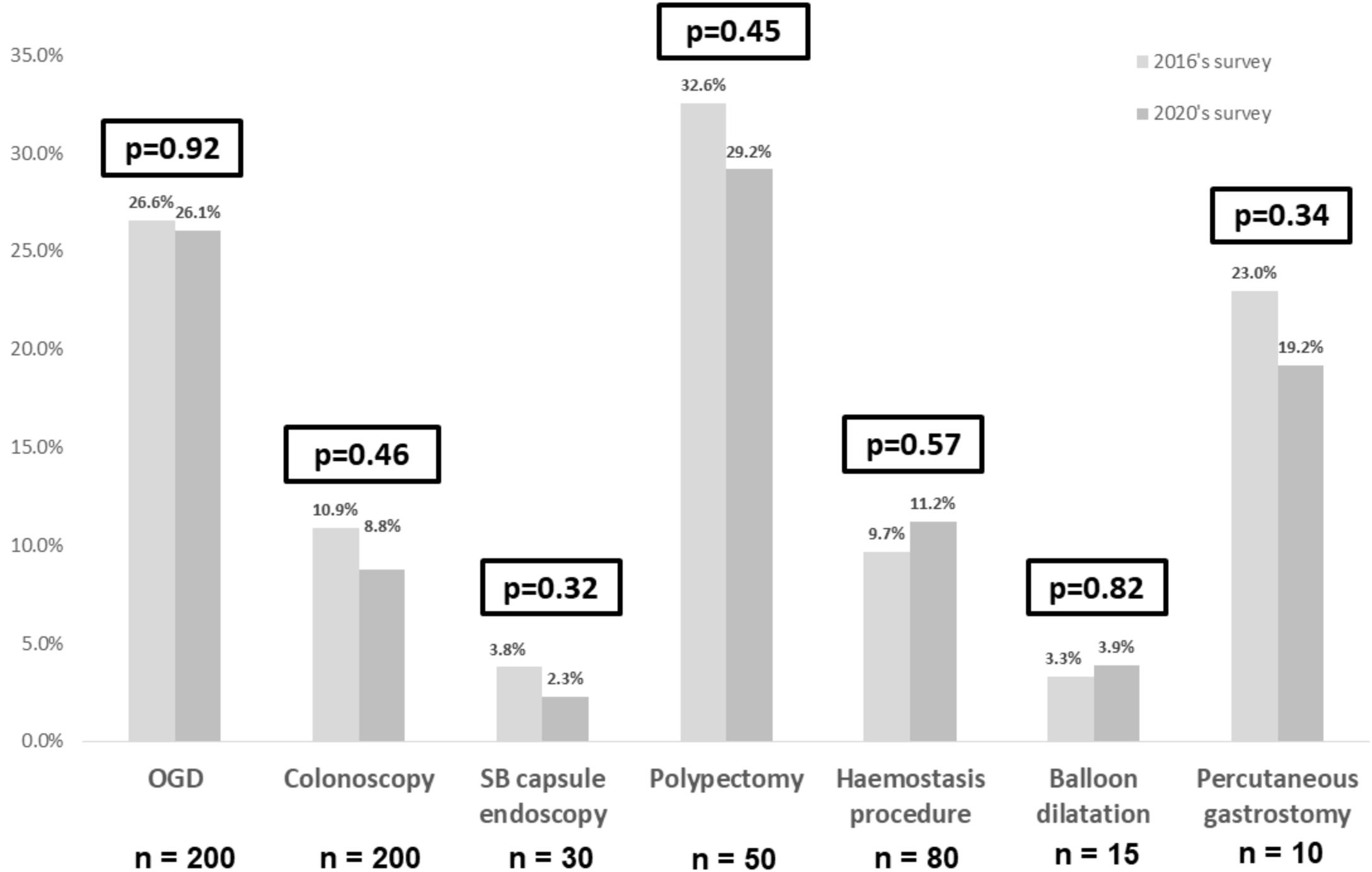
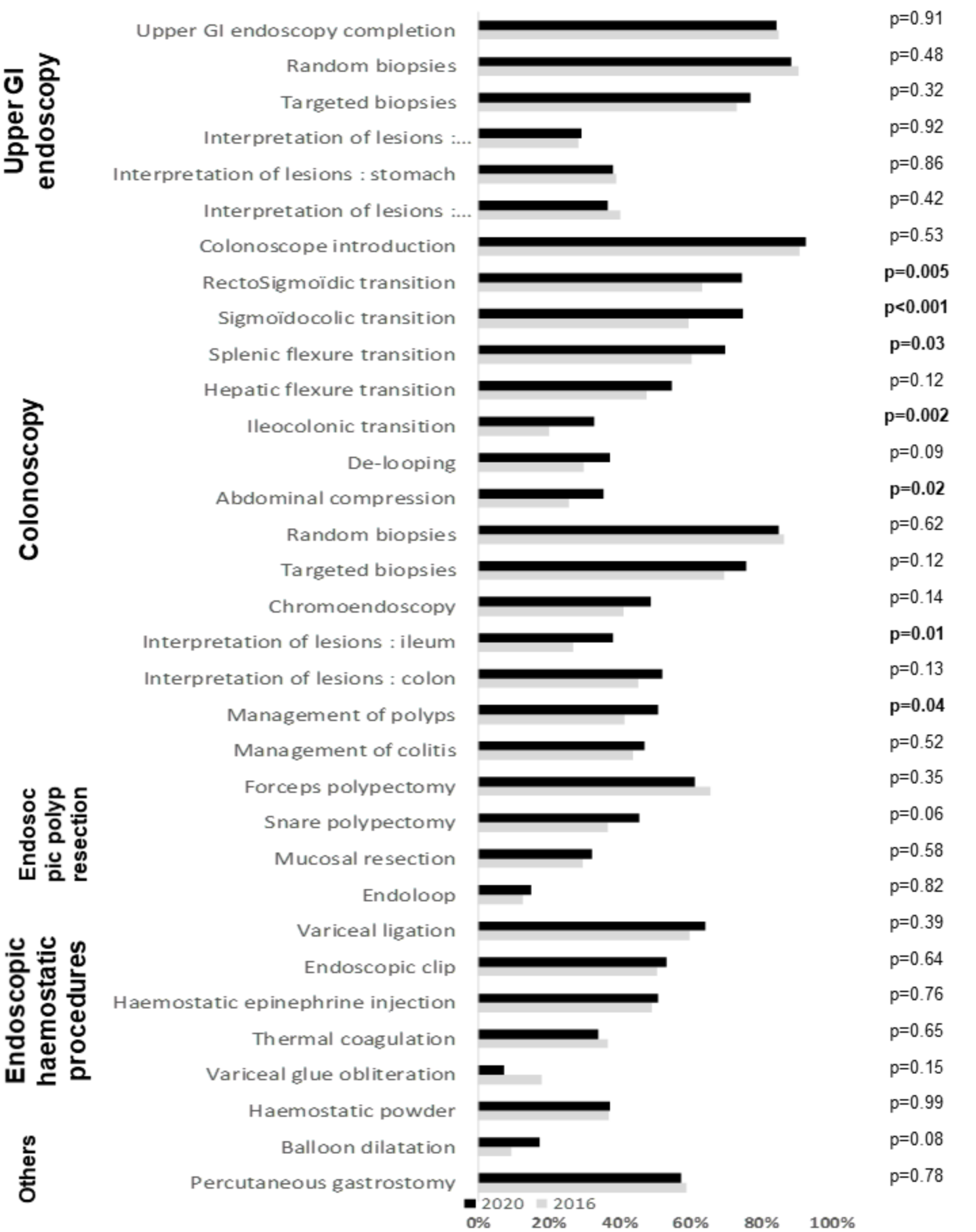
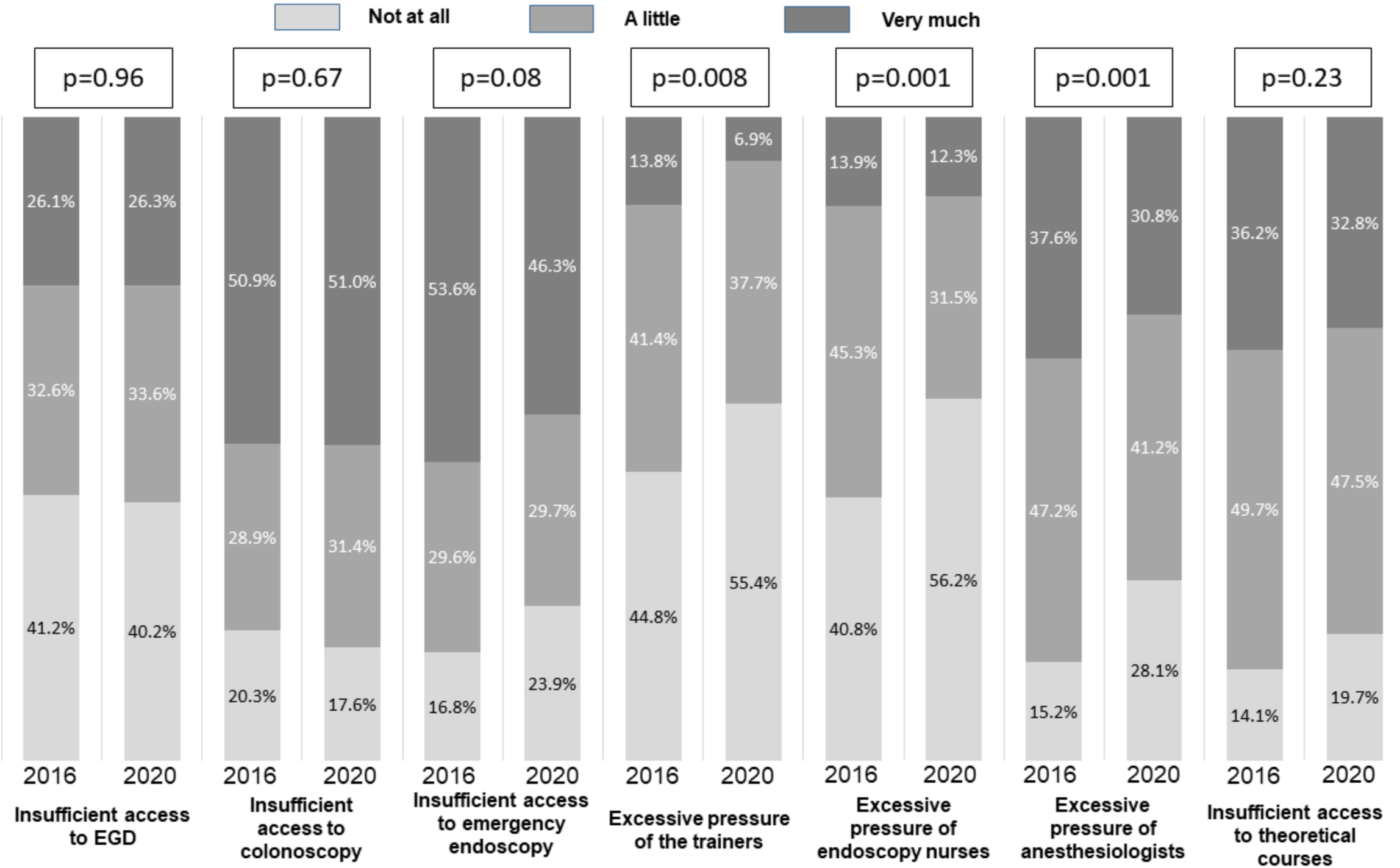

35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
2016's survey
2020's survey
p=0.92
26.6%
26.1%
p=0.46
10.9%
8.8%
p=0.32
3.8%
2.3%
p=0.45
32.6%
29.2%
p=0.57
9.7%
11.2%
p=0.82
3.3%
3.9%
p=0.34
23.0%
19.2%
OGD
n = 200
Colonoscopy
n = 200
SB capsule endoscopy
n = 30
Polypectomy
n = 50
Haemostasis procedure
n = 80
Balloon dilatation
n = 15
Percutaneous gastrostomy
n = 10


Upper GI endoscopy
Colonoscopy
Endoscopic polyp resection
Endoscopic haemostatic procedures
Others
Upper GI endoscopy completion
Random biopsies
Targeted biopsies
Interpretation of lesions :...
Interpretation of lesions : stomach
Interpretation of lesions :...
Colonoscope introduction
RectoSigmoïdic transition
Sigmoïdocolic transition
Splenic flexure transition
Hepatic flexure transition
Ileocolonic transition
De-looping
Abdominal compression
Random biopsies
Targeted biopsies
Chromoendoscopy
Interpretation of lesions : ileum
Interpretation of lesions : colon
Management of polyps
Management of colitis
Forceps polypectomy
Snare polypectomy
Mucosal resection
Endoloop
Variceal ligation
Endoscopic clip
Haemostatic epinephrine injection
Thermal coagulation
Variceal glue obliteration
Haemostatic powder
Balloon dilatation
Percutaneous gastrostomy
p=0.91
p=0.48
p=0.32
p=0.92
p=0.86
p=0.42
p=0.53
p=0.005
p<0.001
p=0.03
p=0.12
p=0.002
p=0.09
p=0.02
p=0.62
p=0.12
p=0.14
p=0.01
p=0.13
p=0.04
p=0.52
p=0.35
p=0.06
p=0.58
p=0.82
p=0.39
p=0.64
p=0.76
p=0.65
p=0.15
p=0.99
p=0.08
p=0.78
2020
2016
0%
20%
40%
60%
80%
100%


Not at all
A little
Very much
p=0.96
p=0.67
p=0.08
p=0.008
p=0.001
p=0.001
p=0.23
26.1%
32.6%
41.2%
26.3%
33.6%
40.2%
50.9%
28.9%
20.3%
51.0%
31.4%
17.6%
53.6%
29.6%
16.8%
46.3%
29.7%
23.9%
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41.4%
44.8%
6.9%
37.7%
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31.5%
56.2%
37.6%
47.2%
15.2%
30.8%
41.2%
28.1%
36.2%
49.7%
14.1%
32.8%
47.5%
19.7%
2016
2020
Insufficient access to EGD
Insufficient access to colonoscopy
Insufficient access to emergency endoscopy
Excessive pressure of the trainers
Excessive pressure of endoscopy nurses
Excessive pressure of anesthesiologists
Insufficient access to theoretical courses