

Endoscopy International Open

Advances and challenges in endoscopy training: a mixed methods study among endoscopy trainers in the Netherlands

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DOI: 10.1055/a-2370-5812

Please cite this article as: Mousset R A, Diemers A, de Vos tot Nederveen Cappel W H et al. Advances and challenges in endoscopy training: a mixed methods study among endoscopy trainers in the Netherlands. *Endoscopy International Open* 2024. doi: 10.1055/a-2370-5812

Conflict of Interest: The authors declare that they have no conflict of interest.

This study was supported by Innovation Research Fund Isala Zwolle, Research grant, Innovation and Research Fund Educational Region North-East Netherlands, PhD research grant

Abstract:

Background and study aims: Variation between trainers in providing the traditional gastrointestinal endoscopy training, in which residents learn endoscopy by doing under the supervision of endoscopy trainers, may cause differences in endoscopy competence between residents. In this study, we explored endoscopy trainers' views on the current status and desired future best practices regarding endoscopy training.

Patients and methods: This mixed-methods study comprised quantitative survey data collected from 158 endoscopy trainers working in the 26 gastroenterology teaching hospitals in the Netherlands and semi-structured interviews with 15 gastroenterology residency (associate) program directors (PDs). Survey data were analyzed using descriptive statistics, and interview results with thematic analysis.

Results: There was considerable variability in endoscopy training practices between teaching hospitals in the structure of endoscopy supervision, the criteria used to determine the level of supervision, and the participation of trainers in endoscopy teaching courses. Interview participants agreed that an endoscopy training supervisor requires several teaching strategies, highlighting the importance of formal education in endoscopy teaching. Interview participants perceived self-regulated learning strategies as essential for residents to learn endoscopy effectively. The perceived main barriers to effective supervision were a lack of time and heavy workload. Participants expressed the desire for more standardization in endoscopy training programs between teaching hospitals.

Conclusions: Considerable variability in endoscopy training practices between gastroenterology teaching hospitals was identified. Formal education on endoscopy teaching, promotion of self-regulated learning, and standardization of endoscopy training programs and supervision practices have the potential to improve future endoscopy training.

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Accepted Manuscript

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Introduction

Training gastrointestinal (GI) endoscopy is a cornerstone of gastroenterology residency programs. Traditionally, endoscopy has been taught following the apprenticeship model in which residents learn endoscopy through hands-on experience under the supervision of different trainers [1, 2].

This way of endoscopy training is challenging for several reasons. Firstly, trainers must explicitly verbalize complex cognitive and psychomotor skills and communicate in an understandable manner to residents, without having control of the endoscope [3, 4]. Secondly, trainers must balance the learning needs of residents while ensuring patient safety, procedural time and quality [3]. Thirdly, the increasing focus on endoscopy quality and safety has led to a growing emphasis on resident competence. Trainers are required to use competency-based assessment, such as Entrustable Professional Activities (EPAs) [5], to optimize individualized endoscopy learning and ensure resident competence prior to independent practice [6]. Finally, in contrast to the United Kingdom (UK), trainers in most countries do not standardly receive formal education how to teach endoscopy effectively [2, 7, 8]. This may lead to inconsistencies that create confusion to residents [9, 10].

In 2017, the European Section and Board of Gastroenterology and Hepatology introduced the European curriculum of Gastroenterology and Hepatology training, in order to harmonize and set standards in gastroenterology education, including endoscopy training [11]. Despite this, studies among gastroenterology residents revealed considerable variability, both between and within countries, regarding the type and number of endoscopies performed during residency training, resident participation in a preclinical endoscopy course, exposure to simulator training, criteria used to determine the level of supervision, and supervisor uniformity [10, 12]. These studies, however, did not cover the trainers' perspectives, which is essential to develop a robust understanding of the current educational process and to explore future best practices.

In the Netherlands, the duration of gastroenterology residency varies from 65 to 72 months, depending on the residents' individual competencies [13]. Following 20 months of internal medicine training, residents learn to perform endoscopies on patients under direct supervision of trainers (EPA level 2) in their first year. After completing a specified level of proficiency, residents are declared competent to perform endoscopies under indirect supervision (EPA level 3) or with supervision at request (EPA level 4). Direct Observations of Procedural Skills (DOPS) of individual endoscopic procedures are used to assess residents' competencies and provide structured feedback [13, 14].

Although the training schedules of individual residents may differ, most residents complete their first two years of gastroenterology residency in a general teaching hospital, and the final two years in a university hospital. Whether there are training differences between university hospitals and general teaching hospitals has not been studied to date.

To explore the aforementioned gaps in the literature, we conducted a mixed-methods study that aims to evaluate and compare the endoscopy trainers' views on the current status and desired future best practices of endoscopy training.

Material and methods

Study design

This mixed-methods study was conducted in all 26 gastroenterology teaching hospitals in the eight training regions in the Netherlands. Each training region consists of one university hospital and two or three affiliated general teaching hospitals. The study comprised a quantitative survey, intended to assess the current status of GI endoscopy training practices from the perspective of endoscopy trainers, followed by semi-structured interviews. The survey results provided input for the topic guide of the interview study. The interviews aimed to elaborate upon the quantitative findings, with a particular emphasis on perceived strengths, barriers and opportunities regarding endoscopy training.

Participants and procedure

Online survey

Recruitment for the online survey started with an introductory e-mail to the PDs of the 26 gastroenterology teaching hospitals, outlining the study aims and methods and requesting their participation in the study. After all PDs gave their consent, a survey hyperlink was sent to all 306 endoscopy trainers (185 in general teaching hospitals and 121 in university hospitals) in January 2022 with two subsequent e-mail reminders. Written informed consent was obtained from all participants.

The 38-item survey (Appendix 1), developed by the research team and largely based on our previously performed survey among gastroenterology residents [10]. Questions were open- and closed-ended and were presented as single answer, multiple choice, 5-point Likert scale (ranging from 1 – “strongly disagree” to 5 – “strongly agree”), and free-text questions. Questionnaires were collected using the secure web application REDCap (Research Electronic Data Capture).

Semi-structured interviews

For the semi-structured interviews, we purposefully invited one (associate) PD working in a university hospital and one (associate) PD working in a general teaching hospital from each training region [15]. All participants were experienced endoscopy trainers. Participants were invited by e-mail, stating the purpose of the study and assuring anonymity and confidentiality of all data. During the invitation period, two university hospitals formally merged, which reduced the number of teaching hospitals in the Netherlands from 26 to 25 and the number of training regions from eight to seven. Therefore, we decided to enroll 15 PDs: seven working in university hospitals and eight working in general teaching hospitals. All invited participants consented to participate. After two pilot interviews with members of the research team through which the interview guide was refined, RM conducted semi-structured interviews with all participants between 1 May and 31 July 2023. Oral (recorded) and written informed consent was obtained prior to the interviews. The interviews were conducted in-person or online, depending on the participants' preference, and guided by a semi-structured interview guide (Appendix 2). The interviews lasted 30 to 45 minutes, were audio-recorded and transcribed verbatim using Amberscript [16]. Member checks were conducted afterwards. Minor feedback was given by one participant. Iterative data collection and analysis occurred simultaneously, allowing minor adaptations to the interview guide when necessary.

Data analysis

Quantitative data from the online survey were analyzed using SPSS Statistics version 26. Differences between gastroenterologists' responses from university and general teaching hospitals were analyzed using Pearson's χ^2 tests and T-tests. All P-values were two-sided, with $p < 0.05$ considered statistically significant.

Interview data were analyzed using Braun and Clarke's approach to thematic analysis [17]. After familiarizing themselves with the data, two authors (RM and AD) inductively coded the first three interview transcripts independently and compared all codes. Inconsistencies were discussed until consensus was reached. Once finalized, each subsequent interview was inductively coded by RM and a random selection of all coded transcripts was critically examined by AD. After reaching consensus on code inconsistencies, RM recoded all transcripts using the finalized code tree, and consecutively

RM and AD sorted the identified codes into initial themes. These were reviewed and discussed by the research team until consensus was reached on main- and subthemes. The qualitative data analysis was assisted using ATLAS.ti version 23 [18].

Ethical approval

The study was reviewed and approved by the Medical Ethical Committee of Isala Hospital, Zwolle, the Netherlands (study number: 210117).

Results

Background characteristics

A total of 158 endoscopy trainers completed the online survey (52% response rate). After excluding four respondents who did not disclose their hospital type, our study sample comprised 154 respondents: 115 (75%) from general teaching hospitals and 39 (25%) from university hospitals. All 26 teaching hospitals were represented. We performed in-depth interviews with 11 gastroenterology residency PD's and four associate PD's. The background characteristics for both the survey and interview participants are summarized in Table 1.

Online survey

Endoscopy supervision practices in university hospitals and general teaching hospitals differed considerably (Table 2). University hospital gastroenterologists reported more endoscopy supervision programs but fewer residents supervised at the same time than those in general teaching hospitals. Gastroenterologists in general teaching hospitals were more likely to have their own endoscopy program during indirect supervision of more experienced residents (EPA level 3/4) than those in university hospitals. Almost all respondents (96%) perceived themselves competent in training residents in GI endoscopy (Table 3). Forty-nine percent (19/39) of the university hospital gastroenterologists had participated in an endoscopy teaching course, compared to 25 percent (29/115) of the gastroenterologists from general teaching hospitals ($P=.006$). Most respondents (71%) (strongly) agreed that participation in an endoscopy teaching course should be mandatory for endoscopy trainers. Fifty-five percent (83/154) reported uniformity in endoscopy teaching methods between different trainers in their teaching hospital. Criteria used to determine the level of supervision

differed between teaching hospitals. The transition from direct (EPA level 2) to indirect supervision (EPA level 3) was based on competence assessment according to 89 respondents (58%) and on a predefined time period according to 37 respondents (24%). The predefined direct supervision period varied between teaching hospitals (median 12 weeks; interquartile range 8 to 16 weeks). Seven respondents (4%) reported that the direct supervision period was based on threshold numbers (median 65 procedures; interquartile range 50 to 170 procedures). 21 respondents (14%) did not know the criteria used for determining the level of supervision.

Interviews

The interviewed PDs considered future endoscopy training as a dynamic task that demands specific skills and shared commitment from supervisors and residents, embedded in an effective learning environment (Figure 1). Each of the identified main themes (supervisor, resident, context) is described in more detail, with corresponding subthemes and representative participants' quotes.

Supervisor

PDs reported various effective teaching strategies to train residents in endoscopy. These included a discussion between supervisor and resident before and after an endoscopy training program to set and evaluate learning objectives, determination of earlier acquired endoscopy experience, using consistent terminology, providing verbal instruction without taking over the endoscope, and avoiding cognitive overload. However, due to contextual factors, such as lack of time and heavy workload, participants experienced a gap between ideal and actual supervision practices. PDs expressed a shared responsibility between supervisor and resident to improve this.

'I repeatedly emphasize the importance of setting learning objectives to supervisors and residents. They should discuss in advance: what are the learning objectives today?' (P9)

Most PDs proposed that endoscopy competence of residents is developed with direct supervision and extensive feedback, rather than by performing many procedures. Deconstructing endoscopic procedures into discrete component steps was considered highly effective, to provide supervisors with

a structured framework for training endoscopy, analyzing endoscopy competence, and giving constructive feedback.

'I love task deconstruction, because in my opinion that is the most effective teaching method. (...) The resident focuses on one learning objective. I save time by performing the procedure partly myself, allowing us to spend more time to the learning objective.' (P23)

Most participants noted that lack of uniformity between different supervisors led to conflicting messages that create confusion to residents, especially in the first phase of endoscopy training. By contrast, some perceived variation in supervisor perspectives and approaches to promote the residents' learning process. One PD proposed that teaching hospitals should have one or two experienced supervisors to train novice residents in endoscopy.

'There are so many changes in supervisors, all having their own focus. That is difficult for novice endoscopists. When they [residents] have experience, it is an advantage because they can learn from the different styles, techniques, points of attention. But at first, it is confusing.' (P8)

Formal education on effective endoscopy teaching was perceived to be very beneficial in becoming a 'consciously competent trainer', and to improve supervisor uniformity within teaching hospitals. The desire for continuous learning through follow-up supervision training was expressed by several PDs who had participated in an endoscopy training course.

'A teach-the-endoscopy-teacher course supports you to become a better teacher. What are your own pitfalls? What are your teaching styles? And how can you improve?' (P20)

Resident

Participants believed that self-regulated learning, the process in which residents take responsibility and initiative in diagnosing their learning needs, formulating learning objectives, and requesting supervisor assistance and procedural feedback is important to optimize endoscopy learning.

'What certainly can be improved is that they [residents] ask for DOPS. Because I think... When they perform endoscopies themselves, they rarely ask for feedback.' (P11)

'An endoscopy supervision program that did not go well. Some residents are not able to set learning objectives. (...) And it irritates me when a resident is not able to self-reflect.' (P20)

In clinical practice, the transition from direct (EPA level 2) to indirect endoscopy supervision (EPA level 3) for novice endoscopists was not solely based on competence assessment. Some teaching hospitals use a predefined period of direct supervision. Depending on the resident's learning curve, the direct supervision period could be shortened or extended. One PD indicated that an extended period of direct supervision was difficult to schedule. Several PDs perceived the DOPS assessment tool, used to assess the endoscopy competence of residents, to be too extensive and time consuming to be useful in endoscopy supervision practice. The decision whether residents can progress to a higher EPA level is usually taken in a formal staff meeting. Some teaching hospitals took the opinion of endoscopy nurses into account regarding this decision.

'We also ask the opinion of the endoscopy nurses [regarding the resident's endoscopy performance]. (...) The feedback [of endoscopy nurses] is valuable, because the resident behaves differently with attendance of the supervisor. For example on patient interactions.' (P5)

Context

PDs acknowledged the tension between endoscopy training and patient care. The main barriers identified to effective endoscopy supervision were a lack of time and heavy workload. In some teaching hospitals, endoscopy supervisors performed multiple tasks in parallel with the supervision of residents, such as an own endoscopy program and supervision of medical students.

'Lack of time is the most important factor. When the patient is delayed, there is less time for supervision. In that case, the resident's training is inferior to the care of the patient. That annoys me.' (P26)

Participants described considerable differences in the structure of endoscopy training programs between teaching hospitals and expressed a desire for more standardization in both the initial and advanced stages of residency. Although PDs universally reported that participation in an endoscopy training course is mandatory before residents start performing endoscopies on patients, access to endoscopy simulator training for further practice after completion of the mandatory course was available only in a few teaching hospitals. One participant proposed to standardize preclinical simulator training.

'We should make agreements about the extent to which a resident practices on an endoscopy simulator under supervision of a gastroenterologist, before performing endoscopic procedures on patients.' (P7)

PDs stated that residents should preferably start their endoscopy training in a general teaching hospital, because of the focus on highly complex healthcare and lack of low complex endoscopies in university hospitals. PDs suggested to limit advanced endoscopy training in the final years of gastroenterology residency to dedicated subspecialty training programs, with exposure in both university and general teaching hospitals. They envisioned a skills-based selection for these programs, aligned to the demand for a particular endoscopic procedure to ensure adequate exposure.

'Residents are very satisfied [about the advanced subspecialty training programs]! (...) For example, the resident in the HPB [hepato-pancreato-biliary] training program performs all elective [esophageal] variceal band ligation procedures. The learning curve is steep.' (P15)

Discussion

This mixed-methods study aimed to deepen our understanding of endoscopy trainers' perspectives on the current status and desired future best practices of GI endoscopy training. Considerable variability

in endoscopy training practices between and within teaching hospitals was found, in line with our previous study among residents [10]. To overcome the challenges faced and improve future endoscopy training, best practices were identified regarding the supervisor, resident and context.

In the interviews, PDs reported various effective teaching strategies to train residents in endoscopy, including discussing learning objectives with the resident before and after an endoscopy training program, providing direct supervision and feedback, and task deconstruction. These strategies reflect the deliberate practice theory of acquiring competence in complex skills [19], and have been identified as essential tools for endoscopy trainers [3, 4, 6, 7, 8, 20, 21]. However, survey results from this study and our previous study among residents, indicate that these strategies are rarely applied in the current endoscopy supervision practice [10]. This might be due to contextual factors, such as lack of time and heavy workload, lack of (shared) understanding of supervisors and residents on the purpose and relevance of supervision, or lack of teaching skills [22]. Multiple studies suggested that formal education on endoscopy teaching and standardization of teaching methods may improve the quality of endoscopy training [2, 4, 6, 7, 21]. Although comparative studies are lacking, it is plausible that there is more variability in teaching methods in the Netherlands, where only a minority of trainers received formal training on endoscopy teaching, compared to countries, such as the UK, where most trainers have been trained. A recent survey study in the UK revealed that endoscopy trainers who completed a train-the-trainer (TTT) course more commonly reported setting learning objectives and completing DOPS compared to untrained trainers [8]. Survey respondents in our study perceived an endoscopy teaching course to be so useful that it should be mandatory for endoscopy trainers. In laparoscopic colorectal surgery, implementation of a TTT course improved both teaching performances of trainers and learning curves of residents [23]. We are currently evaluating whether a train-the-colonoscopy-trainer course has similar effects on endoscopy trainers and residents.

PDs believed that residents' self-regulated learning (SRL) strategies, such as diagnosing own learning needs, formulating learning objectives and requesting procedural feedback, can improve endoscopy learning, in line with the deliberate practice theory [19]. SRL refers to the modulation of 'self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals' [24]. Elements of SRL have demonstrated to be effective in GI endoscopy training, such as colorectal polyp classification [25] and endoscopy simulator performance [26]. SRL also appeared to be feasible in patient-based colonoscopy training and was highly valued by residents

[27]. Although SRL can improve complex psychomotor skills, it demands specific training and guidance [28]. Due to the Dunning-Kruger effect, incompetent learners, including novice endoscopists, have a tendency to overestimate their abilities [29, 30]. Therefore, implementation and development of SRL in the endoscopy training practice requires interventions to improve the residents' goal setting and reflection skills. Further, the learning environment should offer opportunities for residents to employ their SRL skills, including supportive trainers and sufficient time for supervision [31]. In spite of the paradigm shift in medical education from the use of threshold numbers towards a competency-based approach [1], our study results indicated that the level of supervision of novice endoscopists is both time- and competency-based. These findings resonate with the earlier mentioned residents' experiences [10]. Important barriers to the use of competence assessment were scheduling difficulties and logistical concerns regarding the DOPS assessment tool, in agreement with the literature [6]. Future research is required to develop strategies to overcome these barriers.

Endoscopy supervision practices varied considerably between university and general teaching hospitals. Participants expressed a desire for more standardization in both the initial and advanced stages of endoscopy training. To overcome disparities in the development of basic endoscopic skills of novice endoscopists, PDs suggested integrating simulator training into the national gastroenterology training curriculum. This has been shown to significantly improve novice endoscopists' skills [32, 33]. The suggestions to optimize advanced endoscopy training in dedicated subspecialty training programs, requiring a skills-based selection, were in line with previous research [34]. Main barriers to effective endoscopy supervision were a lack of time and heavy workload, which is in line with a previous survey study in the UK [8]. Supervisors frequently had to perform other tasks during the endoscopy supervision of residents, which may restrict supervisor availability, flexibility and quality of supervision. Organizational commitment and support, having a set place and a regular time slot for supervision may help to overcome these barriers [8, 23]. We propose that supervision should be seen as an organizational priority, enabling supervisors to focus on teaching. In addition, standardization of supervision practices is recommended, including sufficient time for supervision before and after an endoscopy training session.

A strength of this study is the mixed-methods design, allowing both an overview of the current endoscopy training practice and an in-depth exploration of desired best practices. The nationwide

design and high response rate of the survey, with respondents from all teaching hospitals, is another strength. We acknowledge the following limitations. Firstly, all interviews were conducted by a gastroenterology resident. Although being an insider had logistical advantages and helped to understand the participants' views, this may also have affected the collection and interpretation of the interview data [35]. Therefore, we built a research team with team members from within (AL, RM, WV) and outside (AD, JP, PB) the researched context. Secondly, for the semi-structured interviews, we purposefully invited (associate) PDs, whose views on endoscopy supervision may differ from other endoscopy supervisors. Finally, our study was limited to GI endoscopy training in the Netherlands, potentially limiting its international generalizability.

In conclusion, this mixed-methods study found considerable variability in endoscopy training practices between teaching hospitals. Best practices were identified with respect to the supervisor, resident and context. Formal education on endoscopy teaching, promotion of the resident's SRL, and standardization of endoscopy training programs and supervision practices has the potential to improve future endoscopy training. Future studies should be conducted to evaluate the impact of formal education on, and standardization of endoscopy teaching in the endoscopy training practice.

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Supplementary materials

Appendix 1

Survey questions for endoscopy trainers

Demographic variables

1. Gender (m/f)
2. Age, ... years (free text)
3. Name of the current teaching hospital (dropdown list)

Endoscopy training program in the teaching hospital

4. In my teaching hospital, the initial period under direct supervision (EPA level 2) is predefined and independent of the skills development of residents (yes/no/don't know).
5. If applicable: In my teaching hospital, the initial period under direct supervision (EPA level 2) is predefined in (time/number of performed procedures/other).
6. If applicable: The predefined period under direct supervision (EPA level 2) is approximately ... weeks (free text).
7. If applicable: The number of performed procedures during the period under direct supervision (EPA level 2) is approximately ... (free text).
8. If applicable: Specify other (free text).
9. If applicable: Which criteria are used to determine the transition from direct supervision (EPA level 2) to indirect supervision (EPA level 3) in your teaching hospital? (free text).
10. I am satisfied with the way the endoscopy training program is organized in my teaching hospital (5-point Likert scale).

Endoscopy supervision in the teaching hospital

11. In my teaching hospital, I supervise residents in the endoscopy room (yes/no).
12. If applicable: The number of years I supervise residents in the endoscopy room is approximately ... (free text).
13. If applicable: The number of half-days a week I supervise residents in the endoscopy room is approximately ... (free text).

14. If applicable: The number of residents I supervise at the same time is approximately ... (free text).
15. If applicable: In my teaching hospital, I supervise novice residents who perform endoscopic procedures under direct supervision (EPA level 2) (yes/no).
16. If applicable: In my teaching hospital, I supervise more experienced endoscopists who perform endoscopic procedures under indirect supervision (EPA level 3 or 4) (yes/no).
17. If applicable: The supervision of novice residents (EPA level 2) differs from the supervision of more experienced residents (EPA level 3 or 4) (yes/no).
18. If applicable: Explain the main differences in endoscopy supervision of novice and more experienced residents (free text).
19. If applicable: I have my own endoscopy program in parallel with the endoscopy supervision of more experienced residents (EPA level 3 or 4) (yes/no).
20. If applicable: I feel sufficiently competent in my role as endoscopy supervisor (5-point Likert scale).
21. If applicable: Endoscopy trainers in my teaching hospital provide uniform endoscopy supervision (5-point Likert scale).
22. If applicable: Before the start of an endoscopy supervision program under direct supervision (EPA level 2), I discuss the patients on the list with the resident (5-point Likert scale).
23. If applicable: Before the start of an endoscopy supervision program under indirect supervision (EPA level 3 or 4), I discuss the patients on the list with the resident (5-point Likert scale).
24. If applicable: After an endoscopy supervision program, I debrief the patients on the list with the resident (5-point Likert scale).
25. If applicable: Before the start of an endoscopy supervision program, I set learning objectives together with the resident (5-point Likert scale).

Training-the-endoscopy-trainer

26. I have received formal training on endoscopy teaching (yes/no).
27. If applicable: Specify the type of training and where this training took place (free text).
28. If applicable: The formal training on endoscopy teaching was useful and helped me to become a better endoscopy supervisor (5-point Likert scale).

29. Formal training on endoscopy teaching should be mandatory for endoscopy supervisors (5-point Likert scale).

Open-ended questions

30. Positive aspects of the endoscopy training program in my teaching hospital are ... (free text).

31. Areas for improvement of the endoscopy training program in my teaching hospital are ... (free text).

32. Empty field to enter additional remarks: ... (free text).



Appendix 2

Semi-structured interview guide

- Describe the current endoscopy training program of residents in your teaching hospital.
- Describe future best practices regarding the endoscopy training program of residents.
- Describe the current endoscopy supervision practice of residents in your teaching hospital.
- Describe future best practices regarding the endoscopy supervision of residents.
- Are you satisfied with the endoscopy training of residents in your teaching hospital? Specify why you are (not) satisfied.
- Describe an endoscopy supervision program when you were satisfied with your role as endoscopy supervisor.
- Describe an endoscopy supervision program when you were less satisfied with your role as endoscopy supervisor.
- Our survey results indicated lack of uniformity in endoscopy teaching methods between different gastroenterologists in the same teaching hospital. What is your opinion on this lack of uniformity?

Tables

Table 1
Characteristics of survey respondents and interview participants

	All survey respondents (N=154)	General teaching hospital survey respondents (N=115)	University hospital survey respondents (N=39)	Interview participants (N=15)
Mean age, years (SD)	47.1 (8.5)	47.2 (8.2)	46.9 (9.3)	49.1 (7.0)
Female, N (%)	64 (42) *	46 (40) *	18 (46)	7 (47)
Mean endoscopy trainer experience, years (SD)	10.5 (6.5)	10.4 (6.1)	10.8 (7.7)	13.1 (5.7)
Role				
Program director, N (%)				11 (73)
Associate program director, N (%)				4 (27)

N = number of participants; SD = standard deviation; * = missing data

Table 2
Comparison of endoscopy training characteristics between respondents in university hospitals and general teaching hospitals

	All survey respondents (N=154)	General teaching hospital survey respondents (N=115)	University hospital survey respondents (N=39)	P-value
Number of supervision programs, half days a week (SD)	2.1 (1.2)	1.8 (0.9)	3.0 (1.4)	<.001
Number of residents per supervision program (SD)	1.7 (1.0)	1.8 (1.1)	1.4 (0.6)	.028
I supervise residents under direct supervision, N (%)	137 (90) *	112 (98) *	25 (64)	<.001
I supervise residents under indirect supervision, N (%)	151 (99) *	113 (99) *	38 (97)	.423
I have my own endoscopy program during indirect supervision, N (%)	69 (46) *	62 (55) *	7 (18) *	<.001
Having participated in an endoscopy teaching course, N (%)	48 (31)	29 (25)	19 (49)	.006

Statistics: T-test and χ^2 -test; SD = standard deviation; * = missing data

Table 3
Proportion of trainer responses to Likert score questions regarding endoscopy supervision

I feel sufficiently competent in my role as endoscopy supervisor (%)



Formal training on endoscopy teaching should be mandatory for endoscopy trainers (%)



Endoscopy trainers in my teaching hospital provide uniform endoscopy supervision (%)



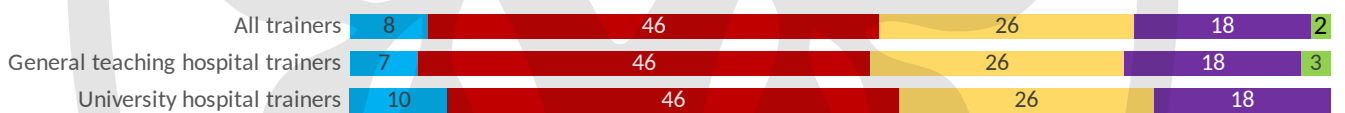
Before the start of an endoscopy supervision program under direct supervision (EPA level 2), I discuss the patients on the list with the resident (%)



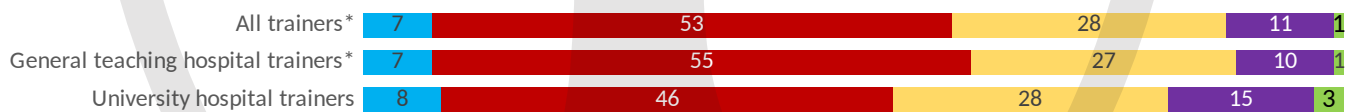
Before the start of an endoscopy supervision program under indirect supervision (EPA level 3-4), I discuss the patients on the list with the resident (%)



Before the start of an endoscopy supervision program, I set learning objectives together with the resident (%)



After an endoscopy supervision program, I debrief the patients on the list with the resident (%)



Likert scale 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree 6. Don't know / not applicable

* Missing data

Figure 1

Thematic map of participants' views on the current status and future best practices regarding endoscopy training

