Pediatr Gastroenterol Hepatol Nutr. 2024 Jul;27(4):258-265
https://doi.org/10.5223/pghn.2024.27.4.258
pISSN 2234-8646·eISSN 2234-8840

Pediatric Gastroenterology, Hepatology & Nutrition
pghn

Original Article

Current Pediatric Endoscopy Training Situation in the Asia-Pacific Region: A Collaborative Survey by the Asian Pan-Pacific Society for Pediatric Gastroenterology, Hepatology and Nutrition Endoscopy Scientific Subcommittee

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Received: Apr 11, 2024
Revised: May 7, 2024
Accepted: May 29, 2024
Published online: Jul 8, 2024

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ABSTRACT

Purpose: To date, there is no region-specific guideline for pediatric endoscopy training. This study aimed to illustrate the current status of pediatric endoscopy training in Asia-Pacific region and identify opportunities for improvement.
Methods: A cross-sectional survey, using a standardized electronic questionnaire, was conducted among medical schools in the Asia-Pacific region in January 2024.
Results: A total of 57 medical centers in 12 countries offering formal Pediatric Gastroenterology training programs participated in this regional survey. More than 75% of the centers had an average case load of <10 cases per week for both diagnostic and

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Funding
None.

Conflict of Interest
The authors have no financial conflicts of interest.

therapeutic endoscopies. Only 36% of the study programs employed competency-based outcomes for program development, whereas nearly half (48%) used volume-based curricula. Foreign body retrieval, polypectomy, percutaneous endoscopic gastrostomy, and esophageal variceal hemostasis, that is, sclerotherapy or band ligation (endoscopic variceal sclerotherapy and endoscopic variceal ligation), comprised the top four priorities that the trainees should acquire in the autonomous stage (unconscious) of competence. Regarding the learning environment, only 31.5% provided formal hands-on workshops/simulation training. The direct observation of procedural skills was the most commonly used assessment method. The application of a quality assurance (QA) system in both educational and patient care (Pediatric Endoscopy Quality Improvement Network) aspects was present in only 28% and 17% of the centers, respectively.

Conclusion: Compared with Western academic societies, the limited availability of cases remains a major concern. To close this gap, simulation and adult endoscopy training are essential. The implementation of reliable and valid assessment tools and QA systems can lead to significant development in future programs.

Keywords: Pediatrics; Endoscopy; Education; Asia

INTRODUCTION

With the advent of advanced technology and current management paradigms in the field of pediatric gastroenterology, pediatric endoscopy has become increasingly important over the past few decades for both diagnostic and therapeutic purposes. It also provides comprehensive disease monitoring in pediatric inflammatory bowel disease, influencing decision-making, particularly in the biological era, which requires deeper remission to improve quality of life and reduce surgery-related complications [1,2]. Moreover, advances in therapeutic endoscopy have enhanced life-saving patient care and avoided unnecessary major surgical interventions, such as endoscopic hemostasis of both variceal and non-variceal bleeding, foreign body removal, endoscopic dilatation, polypectomy, endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous endoscopic gastrostomy (PEG) for long-term nutritional support [3]. In compliance with the educational quality assurance (QA) system, curriculum design with realistic intended educational outcomes that are accountable for the requirements of health systems and communities should be carefully determined. Although the North America Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) has proposed recommendations for the Pediatric Gastroenterology and Endoscopy curriculum, there is no consensus regarding the Pediatric Endoscopy Training Program in the Asia-Pacific region [4]. On behalf of the Asian Pan-Pacific Society for Pediatric Gastroenterology, Hepatology, and Nutrition (APPSPGHAN), the endoscopy subcommittee conducted research that primarily aimed to study the current situation of pediatric endoscopy training in this region and identify opportunities for the improvement of the training programs guided by the NASPGHAN and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) benchmarks, as well as to obtain actionable information that could lead to future program developments and APPSPGHAN recommendations.

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MATERIALS AND METHODS

This cross-sectional survey study was endorsed by the APPSPGHAN. An electronic questionnaire was developed by the APPSPGHAN Endoscopy Sub-committee and distributed to representative members. Educational data on pediatric endoscopy training requirements, including general information, curriculum design, minimum case requirements to attain a level of competence, academic content, learning environments, assessment methods, QA, and patient safety issues, were collected in the electronic case record form from each medical center providing a formal Pediatric Gastroenterology training program. The participants were asked to prioritize the level of competence in eight therapeutic endoscopic procedures, including hemostatic control of esophageal variceal bleeding (endoscopic variceal sclerotherapy [EVS] and endoscopic variceal ligation [EVL]), glue injection, hemostatic control of non-variceal bleeding (adrenaline injection, electrocautery, clips, argon plasma coagulation, or hemospray), foreign body removal, esophageal dilatation, PEG, polypectomy, and endoscopic mucosal resection, right after the end of the training program. This information will help identify essential therapeutic procedures for future region-specific training guidance. The levels of competence were adapted and divided into four categories: 1) unconscious incompetence (the learner is not aware that a skill or knowledge gap exists); 2) conscious incompetence in the cognitive stage (the learner is aware of a skill or knowledge gap and understands the importance of acquiring new skill. It is at this stage that the learner can begin); 3) conscious competence or associative stage (the learner knows how to use the skill or perform the task, but doing so requires practice, conscious thought, hard work, and needs direct supervision); and 4) unconscious competence or autonomous state (the individual has enough experience with the skill that he or she can perform easily, they do it unconsciously, and do not need direct supervision) [5]. The top four priorities were further analyzed to determine the minimum number of cases required.

Qualitative data are descriptively presented as frequency, proportion, or percentage, whereas quantitative data are summarized as median (interquartile range) or mean (standard deviation). Further comparative analyses with either chi-square or an appropriate non-parametric test (p<0.05) were performed to determine any feasible associated factors that could influence the training program.

This study was approved by the Research Ethics Committee of the Faculty of Medicine, Chiang Mai University, under the study code PED-2566-0621.

RESULTS

A total of 57 medical centers providing formal Pediatric Gastroenterology training program in 12 countries participated in this regional survey. The top six participating centers were enrolled from Taiwan (n=17), Japan (n=12), South Korea (n=6), New Zealand (n=6), Malaysia (n=3), and the Philippines (n=3). The remaining data were collected from Australia (n=2), India (n=2), Indonesia (n=2), Thailand (n=2), Singapore (n=1), and Cambodia (n=1). Regarding the endoscopic training program, 48.2% and 35.7% of the participating centers provided 2- and 3-year training programs, respectively, and most (78.6%) formally contained details concerning endoscopic training protocols in their Pediatric Gastroenterology curriculum. Although a competency-based curriculum has become academically preferable, only 36% of the study programs applied this curricular design, and nearly half of the respondents (48%) still taught a volume-based curriculum in a traditional way.

https://doi.org/10.5223/pghn.2024.27.4.258

Regarding caseload, >75% of the centers had an average number of <10 endoscopic procedures per week for both diagnostic and therapeutic endoscopies (**Fig. 1**). Among diagnostic endoscopy, most of the respondents required at least 50–99 and 20–49 cases to ensure competence in esophagogastroduodenoscopy (EGD) and ileocolonoscopy, respectively. However, therapeutic endoscopic procedures were performed less frequently (<5 cases/week at most participating centers). This may explain why 20.4% of the centers could not determine the minimal requirement for these procedures, although 35.2% and 31.5% of them required minimum cases of <20 and 20–49, respectively, to entrust their trainees to be consciously competent. Given the very low volumes of more sophisticated procedures, such as ERCP, endoscopic ultrasound, balloon-assisted enteroscopy, and wireless capsule endoscopy, in pediatric practice, they were not included as part of most Pediatric Endoscopy training programs.

Focusing on therapeutic procedures, foreign body retrieval, polypectomy, PEG, and esophageal variceal homeostasis (EVS and EVL) were the top four priorities for trainees to acquire an autonomous stage (unconscious) of competence. Most respondents determined the minimal case requirement to ensure attainment of the mentioned competence level of <5–10 cases during their training experience (**Fig. 2**). Details of the minimal case requirements for each therapeutic procedure are shown in **Table 1**. Most respondents (78.2%) agreed that adult endoscopic rotation experience would enhance the pediatric endoscopy experience in resource-limited circumstances. Nonetheless, 16.4% believed that this solution could not be counted as the minimum case requirement in a Pediatric Endoscopy training program.

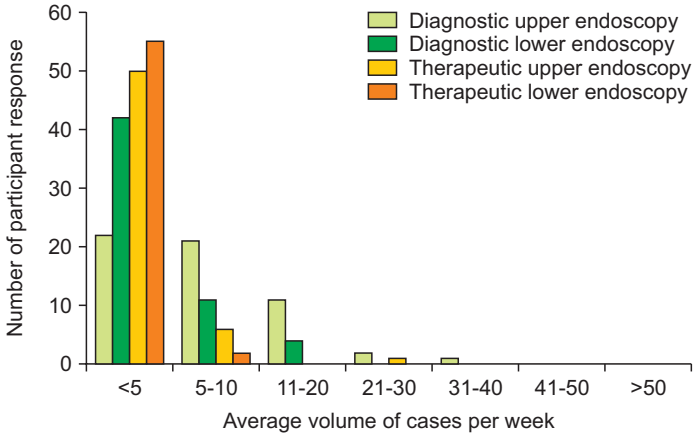

Fig. 1. Average service load of diagnostic and therapeutic endoscopies on a weekly basis.

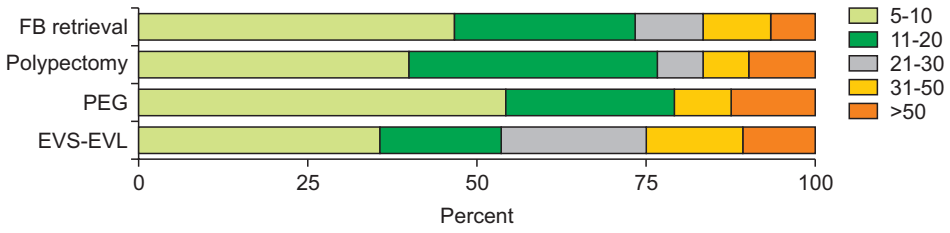

Fig. 2. Minimum requirements to attain autonomous competence stage among the top four priorities of pediatric therapeutic endoscopy at the end of the training program.
FB: foreign body, PEG: percutaneous endoscopic gastrostomy, EVS: endoscopic variceal sclerotherapy, EVL: endoscopic variceal ligation.

https://doi.org/10.5223/pghn.2024.27.4.258

Table 1. Percentage of minimum numbers of cases required for each therapeutic procedures to attain autonomous level of competence, according to participant's opinions

Therapeutic endoscopic procedures	Minimum numbers of case required (%)				
	5–10	11–20	21–30	31–50	>50
Foreign body retrieval	46.7	26.6	10.0	10.0	6.7
Polypectomy	40.0	36.6	6.7	6.7	10.0
PEG	54.2	25.0	0.0	8.3	12.5
EVS-EVL	35.7	17.9	21.4	14.3	10.7
Non-variceal bleeding hemostasis	40.0	20.0	20.0	12.0	8.0
Endoscopic mucosal resection	31.8	36.4	9.1	9.1	13.6
Esophageal dilatation	31.6	42.1	5.3	10.5	10.5
Glue injection	40.0	28.0	12.0	12.0	8.0

Non-variceal bleeding hemostasis included adrenaline injection, electrocautery, clips, argon plasma coagulation, or hemospray.
PEG: percutaneous endoscopic gastrostomy, EVS-EVL: endoscopic variceal sclerotherapy/ligation.

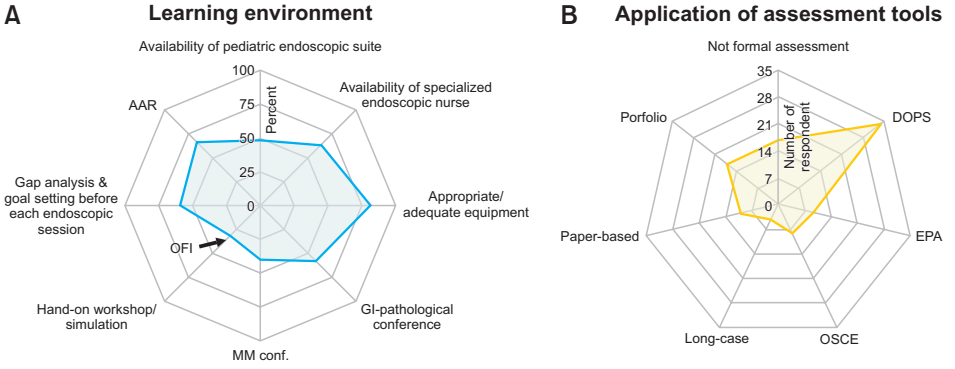

Fig. 3. (A) Implementation of learning environment and (B) application of assessment tools at the participating medical centers.
AAR: after action review, GI: gastrointestinal, MM conf.: morbidity and mortality conference, DOPS: direct observation procedural skills, EPA: entrustable professional activities, OSCE: objective structured clinical examination, OFI: opportunity for improvement.

Although practical skills could be learned through hands-on experience, approximately half of the essential topics, such as indications/contraindications of endoscopy, bowel preparation, basic techniques, and endoscopy-related complications, were formally and systematically provided to the trainees. Regarding the learning environment, 31.5% and 40% of the participating centers provided formal hands-on workshop/simulation training and morbidity/mortality conferences to their trainees, respectively (**Fig. 3A**). This would result in a gap between patient safety and educational risk management. Forty-nine percent of the centers involved anesthesiologists in all endoscopic procedures, whereas 32.7% did so on request and 18.2% on their own.

To assess the level of competence, most of the participating centers (n=30) did not define regular timely evaluations; moreover, only 15 and 23 of the 54 centers developed formal pre-defined assessment criteria and milestone tracking, respectively. Direct observation of procedural skills was the most common assessment method employed among various evaluation tools, including portfolios, objective structured clinical examination (OSCE), paper-based exams, entrustable professional activities, and long-case examination (**Fig. 3B**). QA system in both educational and patient care (PEnQuIN) was applied in only 28% and 17% of the centers, respectively.

In relation to the level of academic maturity by country according to the QS ranking 2024, this study did not demonstrate a positive correlation between countries ranked within the

https://doi.org/10.5223/pghn.2024.27.4.258

Table 2. Comparative analysis of academic performances according to quacquarelli symonds ranking of the participating countries

Application of	QS ranking		*p*-value
	Within top 100	Beyond top 100	
Competency-based curricular design	10/19 (52.63%)	10/27 (37.04%)	0.842
Educational QA system	9/29 (31.03%)	6/25 (24.00%)	0.565
Endoscopic QA indicators (PEnQuIN)	4/28 (14.28%)	5/26 (19.23%)	0.626
Hand-on workshop or simulation training	10/28 (35.71%)	7/26 (26.92%)	0.487

QA: quality assurance, PEnQuIN: Pediatric Endoscopy Quality Improvement Network.

top 100 and selected academic performances, including the application of competency-based curricular design, educational QA systems, endoscopic QA indicators (PEnQuIN), and implementation of hands-on workshops or simulation training models (**Table 2**). Finally, 41.8% of the participating centers reported that their institute/national authority provided systematic training programs for trainers.

DISCUSSION

To our knowledge, this is the first study to illustrate the current status of pediatric gastroenterology endoscopy training in the Asia-Pacific region. The results of this survey can potentially lead to program refinement in certain areas. Although we could not obtain data from all countries within the study region, the results reflect good representation and diversity among APPSPGHAN members. Compared with adult endoscopy training, one of the biggest obstacles in pediatric programs is the far lower volume of cases, particularly for therapeutic endoscopic procedures. This may be partly due to the lower prevalence of pediatric inflammatory bowel disease in the Asia-Pacific region [6] than in Western countries. Before completing the training program, NASPGHAN [4] recommends the following minimum procedural numbers to achieve a level 1 competence: 100, 120, 10, 10, and 15 cases for diagnostic upper endoscopy, colonoscopy, EGD with foreign body retrieval, polypectomy, and EVS/EVL, respectively, whereas the British Society of Pediatric Gastroenterology, Hepatology, and Nutrition defines the competence threshold for both upper and lower endoscopies as >100 cases. In accordance with their guidelines, our trainers highlighted the top four priorities for therapeutic endoscopy: foreign body retrieval, polypectomy, PEG, and esophageal variceal hemostasis (EVS and EVL). However, our survey showed that only 55.4% and 25% of the centers recommended a minimum number of >100 cases for diagnostic upper endoscopy and colonoscopy, respectively, and most of the respondents (36–47%) proposed only 5–10 cases as the minimum requirement to attain learning outcomes according to the NASPGHAN level 1 therapeutic procedures. This may result from availability bias and could be compensated for by providing hands-on endoscopy workshops or simulation training experiences. These learning experiences not only confidentially improve procedural skills but also ensure patient safety, which is an important in-training academic risk. A systematic review showed consistently beneficial outcomes of simulation training on endoscopic performance, such as shorter scope insertion time, fewer adverse events, and higher rate of procedural completeness [7]. Unfortunately, only 31.5% of the respondents deliberately incorporated simulation-based training into their endoscopy programs. This could result from limited availability and high investment costs. Another approach is to add adult endoscopy experience to pediatric training programs. A study in Japan showed faster acquisition of a cecal intubation rate of over 90% after completing >100 colonoscopies in adult rotation training [8]. Most of the respondents (78.2%) agreed that the

https://doi.org/10.5223/pghn.2024.27.4.258

number of adult endoscopic experiences could help enhance endoscopic performance and should be counted as the minimum requirement in the pediatric endoscopy program.

Although new and modern curricular design tends to transform from volume/case-based to competency-based programs responding to realistic intended educational outcomes that are accountable for the requirements of health systems and communities, only one-third of the participating medical centers have employed this education concept in their programs [9,10]. Several assessment methods have been proposed to objectively evaluate competence levels, including simulation-based assessment, OSCE, entrustable professional activities, and the Gastrointestinal Endoscopy Competency Assessment Tool for Pediatric Colonoscopy [11]. However, subjective supervision evaluations to determine overall competence using direct observation have remained the major assessment tool in our pediatric endoscopy training program, similar to those reported from the other side of the world [12]. Moreover, only 27.8% and 42.6% of the participating centers set formal specific quality-predefined assessment metrics and progress tracking for their trainees, respectively. According to a focus group interview from medical centers in North America, both attending and fellows agreed that a formal course of "teach-the-teacher" on "how to teach endoscopy" would be beneficial to improve training outcomes [13]. Our study demonstrated a 58.2% probability of improvement in this area.

One of the most important opportunities for improvement is the implementation of QA systems in the educational and patient care processes. In 2012, the Canadian Association of Gastroenterology published a consensus statement on the safety and quality indicators in endoscopy, focusing on adult gastrointestinal endoscopy [14]. Ten years later, a joint NASPGHAN/ESPGHAN committee proposed a pediatric quality guideline, PEnQuIN, consisting of indicators of three key standards: facility-, procedure-, and endoscopist-related. From an educational perspective, all training endoscopists should be supervised and assessed for milestone competency achievement using validated assessment tools. Two quality indicators have been proposed in this subdomain: the proportion of training endoscopists who have achieved competence by the end of their training, and the rate at which the competence of training endoscopists is assessed longitudinally [15]. Our survey showed a huge gap in this particular issue, in which >70–80% of the participating centers did not systematically incorporate the QA system into their training programs. Finally, although positive correlations between the levels of academic maturity ranked by the QS system and some relevant selected academic performances, including the application of competency-based curricular design, educational QA system, endoscopic QA indicators (PEnQuIN), and implementation of hands-on workshops or simulation training models, were initially hypothesized, they were not proved in the analysis of the results obtained from this survey. This may reflect a significant gap in the full deployment of educational quality management from academic to postgraduate-professional degrees. However, the major limitations of this study type was the availability and selection bias, because it was not possible to collect data from all eligible medical teaching centers.

Conclusion

Compared to Western academic societies, the limited availability of cases remains a major concern. To close this gap, simulation and adult endoscopy training are essential. More importantly, real-life practices under systematic supervision of properly qualified educators in training centers that comply with quality control standards should be emphasized. The implementation of reliable and valid assessment tools and QA systems can lead to significant development in future programs.

https://doi.org/10.5223/pghn.2024.27.4.258

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