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ORIGINAL ARTICLE

Paediatric endoscopy in Spain: current situation and recent developments☆

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KEYWORDS
Gastrointestinal endoscopy;
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Abstract
Introduction: Paediatric gastrointestinal endoscopy (pGIE) has advanced significantly over the last decade, with increased diagnostic and therapeutic applications.
Objectives: This study examines the current state of pGIE in Spain, changes in the field over 5 years, and the involvement of paediatric gastroenterologists (pGEs).
Materials and methods: A structured self-administered questionnaire was distributed by the Endoscopy Working Group of the Spanish Society of Paediatric Gastroenterology, Hepatology, and Nutrition (SEGHNP) through the REDCap platform. The questionnaire included questions concerning techniques, sedation, indications, and organizational barriers. We compared the results with data from 2015.
Results: Eighty-one of the 103 invited hospitals participated (66.4%). Paediatric gastroenterologists performed 71% of scheduled pGIEs and 24% of emergency pGIEs. Therapeutic endoscopies accounted for 72% of procedures, including foreign body removal (50%) and polypectomy (36%),

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and were performed by pGEs in 61% and 63% of cases, respectively. When it came to other procedures, pGEs performed 24% in the case of hydrostatic dilation, 20% in the case of variceal sclerotherapy and of haemoclip placement, and 18% in the case of endoscopic coagulation. None of the endoscopic ultrasound, endoscopic retrograde cholangiopancreatography or enteroscopy procedures were performed by pGEs. Sedation was administered by anaesthesiologists in 70% of cases. Compared to 2015, there was an increase in the scheduled endoscopies performed by pGEs (71% vs 54%), the performance of gastroscopies (>180 per year in 61% vs 24%) and colonoscopies (60—120 per year in 31% vs 12%) and the use of picosulfate for colonoscopy preparation (44% vs 10%).
Conclusions: There has been a significant increase in the involvement of pGEs in pGIE in Spain, although of lesser magnitude in emergency and therapeutic endoscopy procedures.

PALABRAS CLAVE
Endoscopia gastrointestinal;
Sedación profunda;
Anestesia pediátrica;
Pediatría

Endoscopia pediátrica en España. Situación actual y evolución en los últimos años

Resumen
Introducción: La endoscopia digestiva pediátrica (EDP) ha avanzado en la última década, con más aplicaciones diagnósticas y terapéuticas. Objetivos: Este estudio analiza la situación actual de la EDP en España, su evolución en cinco años y la participación del pediatra gastroenterólogo (PG).
Material y métodos: Se distribuyó una encuesta estructurada para ser auto-completada a través de la plataforma REDCap enviada por el Grupo de Trabajo de endoscopia de la Sociedad Española de Gastroenterología, Hepatología y Nutrición Pediátrica (SEGHNP). Los resultados se compararon con los datos recabados en el año 2015.
Resultados: Participaron 81 de los 103 hospitales invitados (66,4%). El PG realizó el 71% de las EDP programadas y el 24% de las urgentes. Un 72% de los procedimientos incluyeron endoscopias terapéuticas, como extracción de cuerpo extraño (50%) y polipectomía (36%), realizadas por el PG en el 61% y 63% de los casos. Otros procedimientos, como dilatación hidroneumática, fueron realizados por el PG en el 24%, y técnicas como esclerosis de varices, hemoclips y coagulación en 20%, 20% y 18%. Ningún PG realizó ecoendoscopias, CPRE ni enteroscopias. La sedación fue administrada por anestesiólogos en el 70% de los casos. Comparado con 2015, aumentaron las endoscopias programadas por el PG (71% vs 54%), gastroscopias (>180 al año en 61% vs 24%) y colonoscopias (60—120 al año en 31% vs 12%), y el uso de picosulfato (44% vs 10%) para preparación de colonoscopia.
Conclusiones: Ha aumentado la participación del PG en la EDP en España, aunque menos en la endoscopia urgente y terapéutica.

Introduction

Paediatric gastrointestinal endoscopy (pGIE) has evolved exponentially in recent years. This technique is essential in the diagnosis of many paediatric gastrointestinal disorders and plays an increasingly important role as a therapeutic tool. The development of new indications and new techniques and the widespread availability of pGIE in most hospitals demands adequate training and skills in paediatric gastroenterologists.[1]

Although there are no technical differences between paediatric and adult endoscopy, there are differences in other respects, such as procedural indications, sedation practices, pre-procedure preparation, size of the equipment, the appropriateness of routine tissue sampling despite of normal macroscopic appearance and routine terminal ileum intubation and the interpersonal skills required to interact with paediatric patients and their families.[2] In this regard, the guidelines developed by the American Society for Gastrointestinal Endoscopy (ASGE) and the North American Society For Pediatric Gastroenterology, Hepatology & Nutrition (NASPGHAN) recommend, preferentially, that paediatric endoscopy procedures be performed by a paediatric endoscopist, in collaboration with adult endoscopists in special situations. In countries such as the United States, paediatric endoscopy procedures are usually performed by paediatric endoscopists trained in accredited fellowship programmes, with the collaboration of paediatric surgeons and/or adult gastroenterologists for specific therapeutic procedures.[3] In Spain, at present, there are no

specific training programmes in paediatric endoscopy, and few case series or reports have been published to date.[4,5] The aim of our study was to evaluate current practices in paediatric endoscopy in Spain, the involvement of paediatric gastroenterologists in this technique and the changes that have taken place in a 5-year period through 2 surveys conducted in 2015[6] and 2020.

Material and methods

We conducted a cross-sectional descriptive study using a structured self-administered questionnaire (Appendix B of the supplementary material). The questionnaire included closed-ended and ordinal questions regarding the performance of the procedures, the need for sedation, indications and perceived needs as well as organizational barriers perceived by clinicians. It consisted of 22 questions through which collected data on the following variables: type of centre (public or private), type of procedure (planned or urgent; diagnostic or therapeutic), most frequent indications, types of therapeutic procedures, monthly volume of tests, specialist who performed the procedure, space/setting where the test was performed, type of sedation used during the procedure and specialist in charge of its performance, type of bowel preparation and setting where preparation was carried out.

We distributed the questionnaire through the Working Group on Endoscopy of the Sociedad Española de Gastroenterología, Hepatología y Nutrición Pediátrica (SEGHNP, Spanish Society of Paediatric Gastroenterology, Hepatology and Nutrition; www.seghnp.org). To mail the questionnaire, we used the Survey Distribution Tools application of the REDCap platform.[7] We developed a cleaned mailing list including 183 recipients that the authors knew practiced paediatric gastroenterology part-time or full-time, although it was not known from the outset whether or not they performed endoscopies. The instructions submitted in the mailing specified that a single response be sent per centre, a requirement that was subsequently guaranteed by screening the responses prior to the analysis of the data. We compared the results of the survey with those of the survey conducted in 2015.[6]

The data were collected and managed through the REDCap[7] electronic data collection software application hosted by the SEGHNP with the help of the AEGREDCap support unit, which is shared with the Asociación Española de Gastroenterología (AEG, Spanish Association of Gastroenterology).

In the descriptive analysis, we summarised categorical variables as proportions. We assessed the association between these variables by means of the Pearson χ^2 test. The statistical analysis was performed with the software SPSS, version 27. The charts were generated with the software GraphPad Prism, version 8.1.0.

Results

We received responses from 81 of the 103 hospitals initially invited (66.4%), distributed across 42 provinces, of which 87% of these were public, 8% private and 5% publicly funded and privately managed. Based on the results of the survey, 92.6% of the hospitals (n = 75) performed pGIE procedures. Of the hospitals that performed planned endoscopies, 71% reported that these procedures were carried out by paediatric gastroenterologists. Fig. 1A and B offer a graphical representation of these findings. With respect to the setting where pGIE procedures were performed, it was most frequently the adult endoscopy unit (35%), followed by a space specifically set up for paediatric endoscopy (24%), the paediatric intensive care unit (21%), and the operating room (20%).

The most frequent indications for gastroscopy included suspicion or follow-up of eosinophilic oesophagitis (45%) and of coeliac disease (32%). Other frequent reasons were suspected gastritis, ulcer or *Helicobacter pylori* infection (12%), as well as suspected gastro-oesophageal reflux disease (11%). When it came to the indications for colonoscopy, the predominant one was suspicion and/or followup of inflammatory bowel disease, which accounted for 78% of the cases. This was followed by suspected juvenile polyps and suspected colitis (eosinophilic, infectious, graft-versus-host disease and other, each of which accounted for 8% of cases), and finally, suspicion or followup of polyposis syndrome (6%).

All procedures were performed under sedation. Sedation was predominantly performed by anaesthesiologists (77% of the cases, while paediatric intensivists performed sedation in 35% of the procedures. In some centres, depending on the type of endoscopy, sedation was delivered by both anaesthesiologists and paediatric intensivists. Only 2 respondents reported delivery of sedation by a paediatric gastroenterologist and 1 its delivery by an adult intensivist. In some centres, sedation was delivered by more than one type of clinician, depending on the type of procedure or the care setting where it is performed.

As for the type of sedation/anaesthesia used preferentially, responses overlapped due to the use of combination drugs. Propofol was used in 96% of the centres, sevoflurane in 28%, midazolam in 28%, fentanyl in 20%, ketamine in 9% and remifentanil in 5%.

When it came to intubation for the procedure, in 71% of centres it was only performed if there was a known risk (foreign body removal or dilation procedures or underlying disease), in 33% based on the judgment of the anaesthesiologist independently of risk, in 5% in patients aged less than 18 months and in 6% for colonoscopies.

In the 56 centres (75%) that offered therapeutic endoscopy, foreign body removal and polypectomy were the most frequent types of therapeutic procedures. Figs. 2 and 3 show the percentage distribution of the type of professional performing these procedures, taking into account that in some centres the same technique is practiced by more than one type of specialist. None of the paediatric gastroenterologists that submitted responses reported performance of endoscopic sonography or endoscopic retrograde cholangiopancreatography (ERCP), techniques practiced by adult gastroenterologists in 55% and 51% of participating centres, respectively.

In the group of 49 centres that practiced gastrostomies, the most frequent technique was the classic ''pull-through'' approach (51%) followed by the triangle fixation approach (28%). Nineteen percent practiced surgical gastrostomies and only one centre performed image-guided percutaneous gastrostomies.

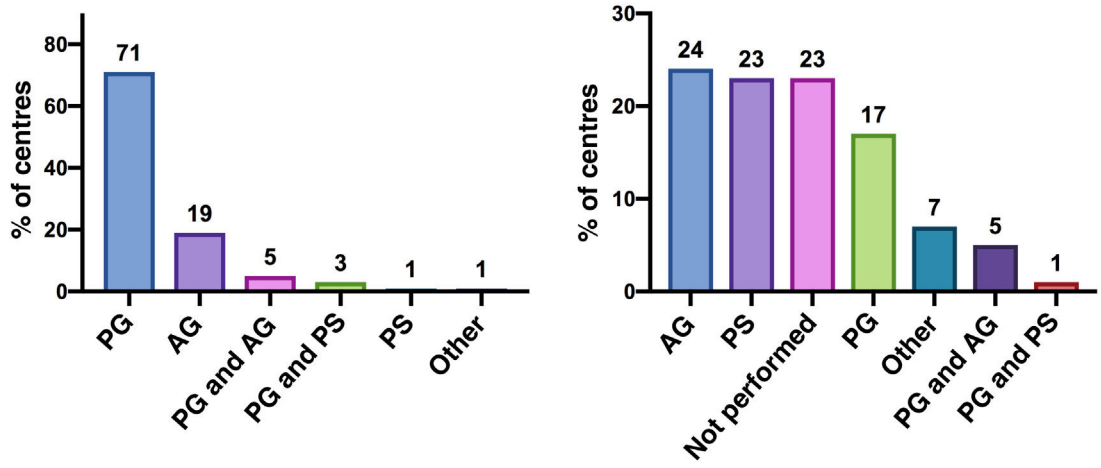

Fig. 1 (A) Professional most frequently performing planned pGIE. (B) Professional most frequently performing emergency pGIE. AG, adult gastroenterologist; PG, paediatric gastroenterologist; PS, paediatric surgeon.

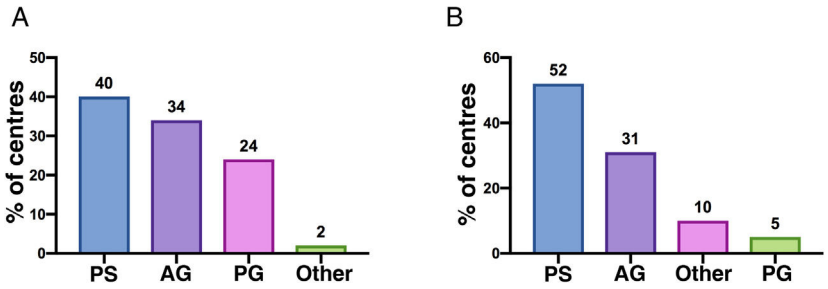

Fig. 2 Professional most frequently performing endoscopic dilations. (A) Balloon dilation. (B) Bougie dilation. AG, adult gastroenterologist; PG, paediatric gastroenterologist; PS, paediatric surgeon.

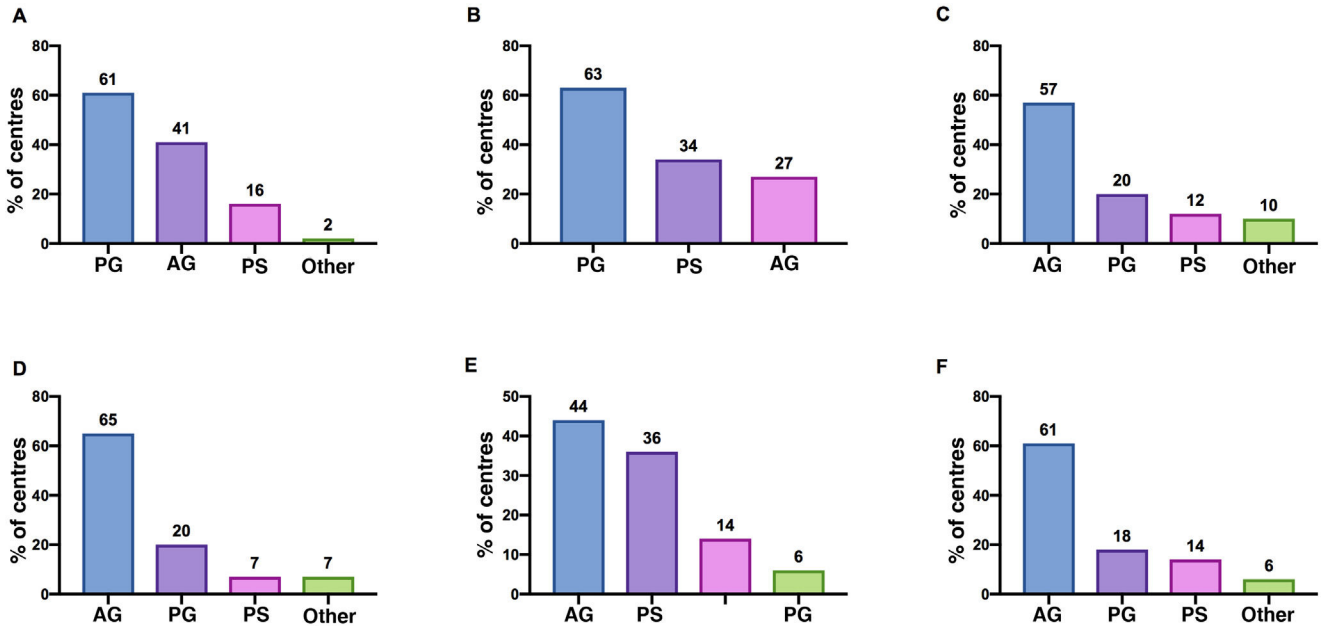

Fig. 3 Professional most frequently performing other endoscopic procedures. (A) Polypectomy. (B) Foreign body removal. (C) Varicose vein ligation/ablation. (D) Haemoclip placement. (E) Prosthesis placement. (F) Argon plasma coagulation/bipolar electrocoagulation. AG, adult gastroenterologist; PG, paediatric gastroenterologist; PS, paediatric surgeon.

Table 1 Differences in gastrointestinal endoscopy practices between the two periods under study.

	2015	2020	*P*
Number of centres	72	81	NA
Performed endoscopies, n (%)	70 (97.2%)	75 (92.6%)	.28
Performed emergency endoscopies, n (%)	54 (77.1%)	53 (70.6%)	.37
Performed gastrostomies, n (%)	24 (34.2%)	49 (65.3%)	*.0002*
Planned endoscopies performed by PG, n (%)	35 (50%)	53 (71%)	*.0004*
Gastroscopy volume >180 procedures/year	17 (24%)	46 (61%)	*.01*
Colonoscopy volume, 60—120 procedures/year	9 (12%)	23 (31%)	*.0009*
Performance of endoscopy in paediatric endoscopy suite, n (%)	13 (19%)	18 (24%)	.54
Sedation by paediatric anaesthesiologist, n (%)	48 (69%)	58 (77%)	.26
Use of propofol for sedation, n (%)	65 (93%)	72 (96%)	.48
Use of picosulphate for bowel preparation	7 (10%)	32 (43%)	*.01*
Therapeutic endoscopies performed by PG			
Oesophageal prosthesis, n (%)	1 (1.4%)	6 (8%)	.06
Bougie dilation, n (%)	1 (1.4%)	5 (6.1%)	.21
Varicose vein ligation/ablation, n (%)	9 (12.8%)	15 (20%)	.27
Balloon dilation, n (%)	14 (20%)	2 (2.6%)	*.0009*
Foreign body removal, n (%)	28 (40%)	47 (63%)	*.007*
Polypectomy, n (%)	31 (44.2%)	45 (61%)	*.04*
Endoscopic ultrasound, n (%)	0 (0%)	0 (0%)	NA
ERCP, n (%)	0 (0%)	0 (0%)	NA

ERCP, endoscopic retrograde cholangiopancreatography; PG, paediatric gastroenterologist.

Bowel preparation for colonoscopy was carried out at the outpatient level in 54% centres, with polyethylene glycol in 51% and sodium picosulphate in 43%.

Fifty-three centres (70.6% of the total) reported having the capability for emergency endoscopy. Paediatric gastroenterologists performed these procedures in only 24% of these centres, requiring assistance from an adult gastroenterologist in 5%. The performance of emergency endoscopies was limited in 5 centres (6.2%) due to the limited availability of paediatric gastroenterologists and/or restrictions related to the age of the patient. The reason is that few of the surveyed centres had paediatric gastroenterologists on call 24 h a day and 7 days a week. As a result, emergency endoscopies are usually performed only in the morning. Patients who require care after hours are usually referred to other centres. In other hospitals, where adult gastroenterologists perform emergency endoscopies, the possibility of performing these procedures may be restricted based on the age and/or weight of the patient.

With respect to the experience of the surveyed clinicians, 68% performed fewer than 20 gastroscopies per month and 8% performed more than 40. As regards colonoscopies, 65% performed fewer than 5 per month and only 8% performed more than 10 colonoscopies per month. The waiting time was less than 4 weeks in 66% of cases.

Table 1 presents these data in comparison to the corresponding information for year 2015.

Discussion

The 81 hospitals that participated in the survey included the 35 centres that, according to the White Book of Paediatric Specialities, can fully offer the services described as differentiating elements that define the scope of the given speciality. Thus, the distribution of the survey was such that it not only documented the activity of centres with the capability to offer the established scope-defining services, but also of centres that were smaller or had more limited resources. The White Book of Paediatric Specialities, published in 2022 by the la Asociación Española de Pediatría (Spanish Association of Pediatrics), lists 156 centres (chiefly in the public system) that offer paediatric gastroenterology, hepatology and nutrition services that are delivered by full-time or part-time paediatric gastroenterologists.[8] These figures are greater compared to those published by the Sociedad Española de Pediatría Hospitalaria (SEPHO, Spanish Society of Inpatient Paediatric Care) in 2011.[9] These discrepancies may be due to both differences in methodology and the growth of the speciality in recent years. Of the 156 centres, the White Paper highlights that only 20 have the capacity to offer the full range of speciality-defining services, with an additional 15 having the potential to offer the full range if they established the necessary collaborations. The survey was sent to 183 paediatric gastroenterologists from 103 Spanish hospitals, all of which were included in the list of centres published in the White Paper.

Our survey shows an increase in paediatric endoscopy services performed by paediatric gastroenterologists. However, there is still debate as to which specialist should deliver these services. In 2007, a survey of 24 Spanish centres conducted by Pollina et al.[4] found that paediatric surgeons performed 44% of paediatric endoscopy procedures and 89% of interventional endoscopy procedures such as dilations and percutaneous endoscopic gastrostomy procedures. On the other hand, the survey we conducted in 2020 showed that paediatric gastroenterologists were the professionals most frequently involved in the performance of planned paediatric endoscopy procedures in Spain (71%), followed by adult gastroenterologists (19%). Furthermore, paediatric surgeons

were involved in 23% of emergency and 40% of interventional endoscopy procedures. A possible explanation for these differences in the 13 years elapsed between both studies is that the training in endoscopy of paediatric gastroenterologists has improved, so they are now able to play a more important role in these techniques.

The 2017 joint guideline of the European Society of Gastrointestinal Endoscopy (ESGE) and the European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) recommends that both paediatric gastroscopy and paediatric colonoscopy procedures be performed by endoscopists specialised in paediatric gastroenterology. If these procedures are performed by adult endoscopists, collaboration with paediatric specialists is a must.[10] Julián-Gómez et al. concluded that adult endoscopists, in collaboration with paediatric care specialists, can conduct paediatric endoscopy procedures quickly, safely and effectively. When it comes to ERCP and endoscopic sonography in children, the guideline recommends performance by experienced endoscopists (such as the adult gastroenterologists in our survey), in tertiary care hospitals managing a high volume of these procedures and with participation of paediatric care specialists.[5]

Regarding gastrostomy tube placement, the ESPGHAN recommends that it be performed by an experienced team and that a paediatric surgeon be available to manage potential complications.[11] Our results show that in 2020, compared to 2015, more centres performed gastrostomies (34.2 % vs 65.3 %; $P = .0002$), gastroenterologists performed more planned endoscopies (71% vs 54%; $P = .0004$), the total annual volume of gastroscopies per centre had increased (61% vs 24% performing more than 180 a year; $P = .01$), as did the volume of colonoscopies (31% vs 12% performing 60—120 a year; $P = .0009$), more procedures were performed in adult endoscopy units (35% vs 21%; $P = .07$) and the use of picosulphate for bowel preparation had increased (43% vs 10%; $P < .01$). We did not find significant differences in any of the other aspects analysed.

The increase in the number of endoscopies performed by paediatric gastroenterologists could be due to an improving trend in endoscopy training in these providers.

Another aspect under debate in the field of paediatric endoscopy is which professional that should be in charge of sedation during the procedure. When it comes to sedation and analgesia, paediatric patients pose challenges that differ from those of adults, as they tend to require deeper levels of sedation and the possible problems range from ventilatory problems to cardiovascular events, especially in infants aged less than 1 year.[12] In consequence, the provider in charge of sedation must have considerable skills in advanced life support. In the past 2 decades, there has been a growing number of publications on the administration by non-anaesthesiologist providers of agents like propofol or ketamine for induction of anaesthesia in adult patients for sedation during endoscopy procedures,[13] but the data in paediatric care are scarce.[14,15] The guideline published in 2010 by scientific societies related to endoscopy spurred a debate about the delivery of sedation with propofol by non-anaesthesiologists.[16] These discussions led to the suggestion of different levels of skill and experience and scopes of practice, prompting debate among paediatric anaesthesiologists and paediatric endoscopists with experienced in these procedures.[17,18] These is consensus that general anaesthesia is needed under certain circumstances: complex therapeutic procedures, patients with high risk of cardiopulmonary complications and non-cooperative patients in which intravenous sedation has failed.[19] In our 2020 survey, anaesthesiologists were the professional in charge of sedation in most centres (70%), which may explain why propofol was the most frequently used agent (96%). Notwithstanding, we found that a variety of agents were used, which was consistent with previous studies that concluded that further evaluation of sedation practices during paediatric endoscopic procedures and their standardization are required to reduce the rate of complications.[20]

Last of all, in most centres, bowel preparation for paediatric colonoscopy was performed at the outpatient level, and the most widely used agent, both in 2015 and 2020, was polyethylene glycol, which has been found to be effective, safe and well tolerated in the paediatric population.[21–23] However, the use of sodium picosulphate for bowel preparation in children has increased in the span of 5 years.[10]

Our findings evince greater involvement of paediatric gastroenterologists in the performance of endoscopies and an increased frequency of these procedures in children in recent years. Therefore, there is a real need to implement continuing education courses in endoscopy for paediatric gastroenterologists in Spain. An article published in the United Kingdom in 2018 bluntly stated that ''there is no excuse for mortality due to lack of competency and training of paediatric endoscopists in gastrointestinal bleeding therapy''.[24] Its authors bring up the necessity of seeking solutions for the management of GI bleeding that would also be applicable to other types of paediatric therapeutic endoscopy procedures: routine delivery of hands-on training on therapeutic procedures in animal models, *e-learning*, one-on-one training in live cases, immersion of paediatric endoscopists in adult GI endoscopy emergency bleeding cases, training of paediatric surgeons in the field so they can provide support in the management of these cases and centralization of this type of service to centres with greater experience.

At the same time, validated assessment tools would be needed to support competency-based training in paediatric endoscopy, such as the GIETCATKIDS tool developed by experts in North America, which has exhibited a high reliability and validity.[25] Later on, the same research team found that endoscopic experience was positively associated with self-assessment accuracy among paediatric endoscopists.[26] Another study that assessed provider variation in diagnostic yield in a paediatric endoscopy centre concluded that goals for paediatric endoscopy could include ileal intubation rates greater than 90% (in adherence to the ESGE and ESPGHAN guidelines) and provider diagnostic yields greater than 40%.[27]

One of the strengths of our study is that we collected data from the same centres included in the 2015 survey, so we were able to assess the evolution over the intervening years and, in addition, it included all the centres that, according to the White Book of Paediatric Specialities, can offer the full range of activities established as differential elements. There are several limitations to this study. Firstly, the data were self-reported, which may be a source of bias,

since participants may not recall accurately or may tend to give socially desirable answers. Furthermore, data collection depended on the availability and willingness of survey participants, which may have limited the diversity of the responses.

Conclusion

Comparing the current findings with those of the 2015 survey, we can conclude that there has been a significant increase in the involvement of paediatric gastroenterologists in the practice of paediatric endoscopy, with an increase in the annual volume of endoscopies and colonoscopies performed by these clinicians, although their role in the performance of emergency and therapeutic endoscopic procedures continues to be limited. Collaboration with adult gastroenterologists continues to be key in emergency endoscopy and most therapeutic endoscopy procedures.

In future studies, it would be interesting to evaluate not only the performance of paediatric endoscopy procedures in Spanish centres, as we did in our survey, but also aspects that would allow us to understand the knowledge and skills of the professionals who practice this technique in Spain, and, based on the results, to propose strategies for improving the continuous education of paediatric endoscopists. Lastly, further evaluation and standardization of sedation practices in paediatric patients during endoscopy procedures are needed in order to reduce the rate of complications.

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Declaration of competing interest

The authors have no conflicts of interest to declare.

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This work is dedicated to the memory of Dr Vicente Varea Calderón.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.anpedi.2024.08.009.

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