

ORIGINAL RESEARCH PAPER

The role of paediatric point-of-care ultrasound in Spain: Present status and future perspectives

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ABSTRACT

Introduction: Point-of-care ultrasound (POCUS) is an increasingly used tool among pediatricians in Spain. This study analyses the actual implementation of POCUS based on a national survey of professionals who have received specific training, in order to identify its level of use, barriers and current training needs.

Methodology: A descriptive, cross-sectional observational study was conducted, involving a survey of physicians (mostly pediatricians) who had attended a training course in POCUS organized by different scientific societies. The aim was to obtain feedback from the pediatricians on the use, usefulness, barriers and training in ultrasound.

Results: A total of 126 physicians were interviewed, most of whom declared having access to ultrasound. However, less than half of them made use of such devices, due to considerable difficulties, including lack of time and training. A total of 96.8% of those surveyed considered that ultrasound should be part of the training protocol of physicians specializing in pediatrics. The vast majority believed ultrasound training to be very important but considered their level of experience with the technique to be basic.

Discussion: The implementation of POCUS in pediatrics is still limited in Spain, though the professionals agree on highlighting its relevance in daily practice. Among the most prominent benefits are resource optimization and shortening of the time to diagnosis. The participants agree that competence in the technique should be incorporated in a structured manner to the training of physicians specializing in pediatrics.

Key words: pediatrics, diagnostic ultrasound, point of care ultrasound, Spain, survey



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Introduction

Clinical ultrasound, bedside ultrasound or point-of-care ultrasound (POCUS), is a diagnostic tool complementary to the physical examination that allows real-time images of body structures to be generated using ultrasound (1,2). Its use has progressively spread beyond radiodiagnostics departments and has been adopted by multiple medical specialities such as cardiology, gynaecology, emergency care, and recently also family medicine and paediatrics (1). Its main advantages include its high safety profile, non-invasiveness, and the absence of ionising radiation. Although ultrasound may produce minor physical effects, such as tissue warming and mechanical vibrations, the diagnostic equipment used in clinical practice operates at very low intensities and within the safety margins established by international agencies. Consequently, no clinically relevant adverse effects have been reported, even in the paediatric population (2). However, the diagnostic performance of the technique is highly operator-dependent, requiring specific training and involving a long learning curve. In the paediatric setting, the use of ultrasound has grown in response to the need to optimise resources, reduce diagnostic times, and improve clinical decision-making. Despite this growth, the integration of POCUS remains limited and disparate in Spain, partly due to lack of definition by the medical training programmes. Neither the official paediatric speciality programme (3) nor the White Paper on Paediatric Specialities (4) establish clear criteria for ultrasound training. Order SND/454/2025, of 9 May 2025, contains the update of the diagnostic procedures included in the common portfolio of primary care (PC) services of the Spanish National Health System (5). It includes ultrasound as one of the diagnostic procedures with access from this level of care. If this Order is effectively implemented, together with the incorporation of other diagnostic tests, it would represent a genuine transformation of public PC in Spain, increasing decision-making capacity and improving satisfaction among both the professionals and patients (6). Over the last decade, different paediatric scientific societies in Spain (SEPEAP, AEPap, SEUP, among others) have promoted the creation of working groups focused on the diffusion, teaching and

research of ultrasound (7). However, the management and interpretation of POCUS is not easy to acquire. A study conducted in 2019 among emergency room residents showed that those who had performed more than 300 ultrasound examinations had greater diagnostic reliability than those who had performed fewer explorations (8). Nevertheless, the minimum number of examinations required to achieve an adequate level of competence has not been clearly established (9,10). On the other hand, a meta-analysis published in 2017 concluded that ultrasound can be integrated into the training of young physicians, though further research is needed to assess its efficacy and relevance (11). To date, the existing studies (12–18) have provided a partial view of the use of ultrasound in paediatrics, without elaborating on the real obstacles faced by professionals for its clinical implementation. This study seeks to fill this gap by performing, in real time, the first large-scale multi-course survey in Spain aimed at physicians with a preferential dedication to paediatric care who have participated in training courses in ultrasound, in face-to-face format, organized by different scientific societies. The primary objective was to describe the degree of current use of ultrasound in paediatrics; to identify the main training, organisational and institutional barriers that make it difficult to incorporate the technique into clinical practice; and to provide relevant evidence to guide future decisions in education and healthcare, especially in the context of recent regulatory changes.

Methodology

A cross-sectional, descriptive, observational study was conducted based on an anonymous survey of physicians with preferential dedication to paediatric care who participated in any of the four ultrasound courses organised by three scientific societies between March and April 2025: two from the Spanish Society of Non-hospital Paediatrics and Primary Care (SEPEAP); one from the Spanish Society of Primary Care Paediatrics (AEPap); and one from the Spanish Society of Ultrasound (SEECO). The survey was developed by the authors from models used in previous clinical ultrasound studies in primary care and paediatric settings (13–16). The study questionnaire consisted of

30 closed, semi-structured questions designed to explore demographic aspects, level of training, frequency and areas of use of ultrasound, perception of usefulness, barriers to implementation, and attitudes toward training. The questionnaire was administered in digital format (Google Forms®) and was anonymously and voluntarily completed by the participants immediately before the start of each in-person course, in a controlled environment and without external incentives. This procedure allowed for the collection of initial perceptions not influenced by training content, ensuring the spontaneity of the responses and greater validity of the reported perceptions. Data were collected during the development of the courses and then exported to Microsoft Excel® for cleaning and statistical analysis. Descriptive statistics were used, expressing categorical variables as absolute frequencies and percentages, and quantitative variables, where applicable, as the mean and range or standard deviation. No inferential or multivariate analyses were performed, given the exploratory and descriptive nature of the study. Incomplete and duplicate responses were removed. The study was conducted in accordance with the principles of the Declaration of Helsinki and did not require formal ethical approval due to its anonymous, observational, and non-interventional nature.

Results

A total of 126 physicians were interviewed, the characteristics of whom are detailed in Table 1. In general, they were young pediatricians, mostly women, working in urban centers (77.4%). A total of 97.6% were pediatricians, and 2.4% were family doctors. Approximately half of the participants reported having worked as specialists in pediatrics for more than 10 years. The most represented region was Madrid, with 46 participants, followed by Extremadura and Andalusia. The majority (66.4%) worked in PC; 19.2% in hospital care only; and 14.2% in both settings. As seen in Tables 2 and 3, a high percentage of the pediatricians (86.5%) had access to ultrasound at their center, but only half of them regularly made use of the technique, due to the existence of a number of barriers. A total of 55.7% indicated that

Table 1. Participant data. N=126.

Gender, %	Female	80.2%
	Male	19.0%
	Prefer not to say	0.8%
Age, years	≤35	42.1%
	36-45	19.8%
	46-55	20.6%
	≥56	17.5%
Specialty, %	Pediatrics	97.6%
	Family medicine	2.4%
Autonomous Community, n.	Andalusia	14
	Aragón	3
	Asturias	2
	Canary Islands	8
	Castilla-León	15
	Castilla la Mancha	8
	Catalonia	3
	Valencian Community	2
	Extremadura	15
	Galicia	3
	Madrid	46
	Navarre	3
	Basque Country	3
Rioja	2	
Workplace, %	Urban	77.4%
	Semi-urban	17.7%
	Rural	4.9%
Care level, %.	Primary Care	66.4%
	Hospital Care	19.2%
	Both	14.4%

Table 2. Availability and use of ultrasound.

	N	Yes	No	Others
Availability of ultrasound equipment in the work center	126	86.5%	13.5%	-
Use in the workplace	126	44.4%	18.3%	27.8%. Yes, with request in radiology
There are limitations to the use of ultrasound at your center.	124	55.6%	44.4%	-

there were no restrictions in terms of access to the equipment, while 44.3% did report such restrictions. Among those who used ultrasound, almost half did so several times a month and a third did so several times a week. Figure 1 shows the main areas of use, particularly pulmonary ultrasound, followed by abdominal and cervical ultrasound. To a lesser extent, transfontanelle brain ultrasound and musculoskeletal and skin ultrasound were also used. It should be noted that 16.6% of those surveyed performed echocardiography. According to Table 4, a total of 48% of the participants had attended 1 to 3 general ultrasound training programs; 16% had attended 4 to 6; and 36% had not attended any. With regard to specific training in pediatric ultrasound, the percentages were 54.0%, 13.7%, and 26.6%, respectively. The main reasons for attending these trainings were: learning the technique (46.0%), reinforcing knowledge (28.5%), need for clinical practice (16.6%), and achieving healthcare

autonomy (14.2%). The reported level of experience was mostly basic (54.8%), while only 1.5% reported having advanced experience, and 13.5% intermediate-level experience. Ultrasound training was to be considered important by 95% of the respondents, and 100% thought that pediatricians should have access to ultrasound in their workplace. Almost half reported that their goal in training was to incorporate the technique into daily clinical practice; others reported reasons of safety (22.4%) or diagnostic accuracy (20%). Ninety percent were of the opinion that ultrasound contributes to the optimization of healthcare resources, and 78.6% considered that it shortens case-resolution time. Only 0.8% felt that it did not improve the efficiency of the system, and 1.5% considered that it did not reduce the resolution times. According to the respondents, the main benefit of performing ultrasound is that it increases the case-resolution capacity (60.8%), followed at a distance by reducing diagnostic uncertainty (27.2%). Research and publications (1.6%) were mentioned in very few cases. In addition, 68.8% considered that the use of ultrasound improves competitiveness in the labor market, while 28.8% were somewhat in agreement with this opinion, and 2.4% did not agree. A relevant issue is training in ultrasound as a resident intern physician (MIR) in the specialty of pediatrics and

Table 3. Frequency of use of ultrasound, if it has been answered that it is used. N=99.

Daily	11.1%
Several times a week	33.3%
Several times a month	41.4%
Rarely	14.1%

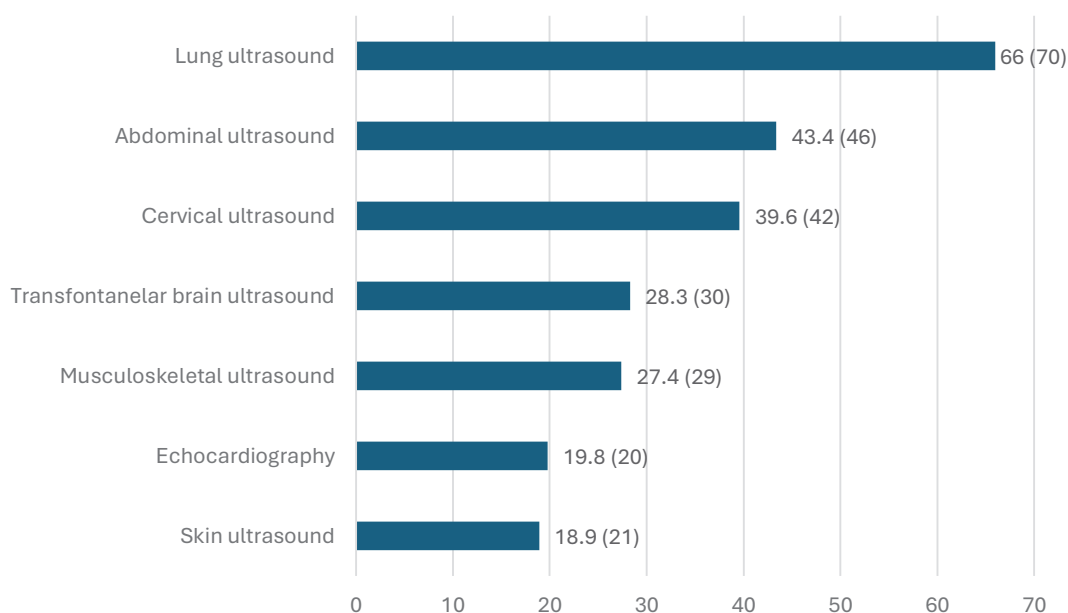


Figure 1. Areas of use of ultrasound. Percentage (N). N=106.

Table 4. Survey on aspects of ultrasound in pediatrics.

How many general ultrasound trainings have you completed?	N=125	None 1-3 4-6	36% 48% 16%
How many pediatric ultrasound trainings have you completed?	N=124	None 1-3 4-6 More than 6	26.6% 54.0% 13.7% 5.7%
Level of experience in ultrasound.	N=126	None Basic Intermediate Advanced	30.2% 54.8% 13.5% 1.5%
Do you consider ultrasound training to be important for pediatricians?	N=125	Strongly agree Somewhat agree Somewhat disagree Disagree	95.2% 4.8% - -
Do you think pediatricians should have access to ultrasound in their workplace?	N=126	Yes No	100% 0%
What do you expect to achieve at the end of training?	N=125	Incorporate it into my daily clinical practice. Improve diagnostic accuracy. Safety. Others	49.6% 20% 22.4% 8%
Does ultrasound contribute to the optimization of healthcare resources?	N=125	Yes No	90.4% 9.6%
Does it reduce case resolution time?	N=126	Strongly agree Somewhat agree Somewhat disagree	78.6% 19.8% 1.6%
What is the most important benefit of training and using ultrasound?	N=125	Becoming more autonomous Becoming more resolute Reducing diagnostic uncertainty Other (research, cost-effectiveness)	10.4% 60.8% 27.2% 1.6%
Does it make you more competitive in the job market?	N=125	Strongly agree Somewhat agree Disagree	68.8% 28.8% 2.4%
Do you think ultrasound should be included in resident training?	N=125	Strongly agree Somewhat agree Disagree	96.8% 3.2% -
How much time should be dedicated to ultrasound training in residents?	N=125	0-1 month 2-4 months >4 months Depends on the subspecialties	12% 32% 12% 44%
How would you rate the importance of ultrasound for the future?	N=126	Essential Important but not essential Not relevant	76.2% 23.8% -
Do you think that ultrasound in pediatrics should be supervised by radiology?	N=125	Always Only in complex cases Never Not sure	8.8% 86.4% 0.8% 4%
What emerging ultrasound-related technology do you find most promising?	N=124	Portable ultrasound Artificial intelligence applied to ultrasound Tele-ultrasound All	58.5% 35.7% 4.8% 0.8%

its specific areas: A total of 96.8% of the participants considered that it should be included in the training program, while 3.2% were somewhat in agreement with this opinion, and none disagreed. With regard to the ideal duration of training, 32% considered 2–4 months to be adequate, 44% considered that it should vary depending on the subspecialty, and 12% favored both a duration of 0–1 month and a duration of over four months. As regards the future of ultrasound in pediatrics, 76.2% considered that it will be an essential tool, while 23.8% reported that it will be important, but not essential. With regard to the role of radiologists, the vast majority (86.4%) considered that radiological supervision is only required in complex cases; 8.8% thought that supervision should be constant; and 4% did not know. Among the emerging technologies of greatest interest, portable ultrasound was the most widely mentioned tool (58.5%), followed by artificial intelligence (35.7%) and, to a lesser extent, tele-ultrasound (4.8%). Finally, the main barriers faced by pediatricians wishing to incorporate ultrasound into their clinical practice (Figure 2) were a lack of time (75.4%) and a lack of training (71.4%). Other reported difficulties were a shortage of equipment (47.3%), lack of protocols (23.8%), lack of institutional support (22.2%), the presence of other specialists in charge (9.5%), associated costs (7.9%) and, to a lesser extent, professional demotivation (0.8%).

Discussion

Ultrasound is a valuable and increasingly used tool for supporting clinical diagnoses in pediatrics, particularly because of its safety, the absence of ionising radiation, and its usefulness in examining uncooperative patients (crying, irritability, etc.) (12). Moreover, in children it affords excellent resolution, thanks to their smaller body size and the low amount of subcutaneous fat (12). The use of ultrasound in PC is justified because, together with the patient history and physical examination, it increases the case resolution capacity, improves reliability and diagnostic performance, helps guide the therapeutic approach, and optimizes healthcare system resource utilization by reducing the waiting lists. Ultrasound also has a favorable cost-effectiveness ratio, as it prevents unnecessary consultations with other specialists and reduces delays for pediatric patients and their families (1). The present study aims to offer a view of the use of ultrasound by physicians caring for the pediatric population. Although most of the respondents reported having access to ultrasound equipment, less than half of them used the technique, due to the existence of various barriers, including lack of time and lack of specific training. Only 1.5% reported an advanced level of experience with ultrasound. However, more than 95% considered training in this field to be a very important aspect for pediatricians. This and other studies have shown the

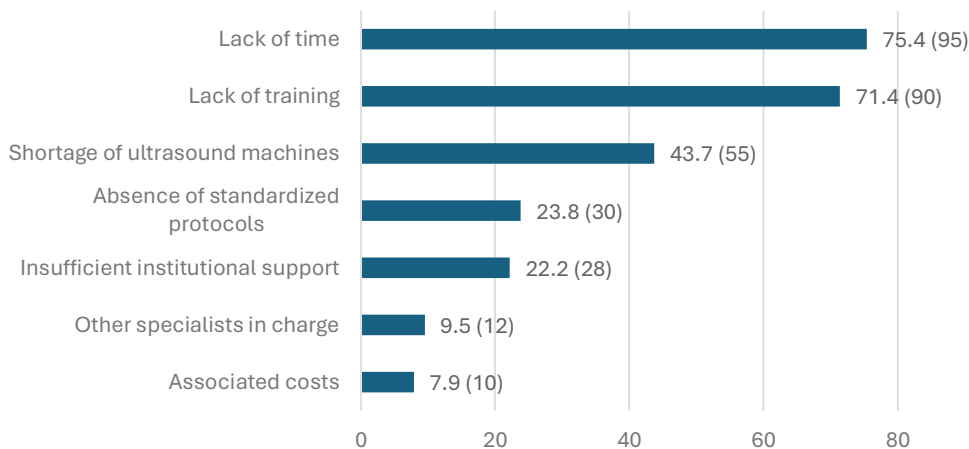


Figure 2. Main barriers to the implementation of ultrasound in clinical practice. Percentage (N). N=126.

use of ultrasound by pediatricians to remain a minority practice. According to a survey conducted in 2018, involving 273 participants, although 47% had received training in ultrasound, only 18% used the technique in their daily practice (13). In another study conducted in 2023 and based on 182 questionnaires on pulmonary ultrasound, 67.6% of the professionals stated that they had ultrasound available at their center, but 53.7% did not use it (14). Similar results have been observed in studies conducted in Canada (15). Thus, despite its usefulness, ultrasound remains a tool of limited use in pediatrics (16), except in specific centers - particularly in the United States (17,18). Training in this area is considered essential, including the online modality, which has been shown to be of interest and cost-effective (19,20). Regarding the relevant aspects of our study, the survey was anonymous and was completed in person immediately before the start of each course. This allowed us to collect the perceptions of the participants with no influence of the training content. In addition, the study included a large sample of paediatricians attending sessions of different scientific societies. Common barriers for the implementation of ultrasound were identified, mainly a lack of time and training. In addition to the training and organisational barriers noted by respondents, it is important to consider other institutional factors that may hinder the expansion of POCUS use in paediatrics. These include the possible perception of professional intrusion by radiology departments, who could view ultrasound performed by non-radiologists as an invasion of competence (21). The perception of overlapping competence, the lack of shared protocols, and the absence of formal collaboration mechanisms can lead to tensions that hinder access to equipment or professional autonomy in the use of this tool. Although in our survey most paediatricians (84.6%) felt that supervision by the radiology department is only necessary in complex cases, and only 8% considered that such supervision should be constant, it is important to recognise that beyond individual obstacles such as time or training, there are also structural barriers that need to be addressed to ensure effective and safe integration of POCUS in paediatric practice. This study has some limitations that should be considered when interpreting the results. First, there is a potential selection bias,

since the participants attended a point-of-care paediatric ultrasound course, which may overestimate both the interest and the degree of actual use of the technique in paediatric practice. However, the questions asked focused on the status of ultrasound use in their workplace rather than on personal perceptions or motivations. Second, the sample is not completely representative of all paediatricians in Spain, and the findings therefore cannot be generalised to the entire professional population. Finally, the cross-sectional design of the study prevents establishing causal relationships between variables. Despite the limitations of the study, the results provide an updated view of the use of POCUS in paediatrics in Spain. Although most respondents have the necessary equipment in their centres, less than half of them use it regularly. The main barriers mentioned are lack of time, practical training, institutional support and organisational support. However, almost all the professionals recognise the usefulness of this technique in paediatric care and consider that it should be incorporated into specialised training, although their reported level of experience was mostly basic (22, 23). In this scenario, the recent Order SND/454/2025, which incorporates ultrasound as an accessible procedure in PC, represents a key regulatory opportunity to drive its implementation (6). In order for the implementation of POCUS to have a real impact on the paediatric setting, structured training measures and a clear institutional commitment will be necessary. This study may help guide future decisions in the areas of education, health care and professional policy.

Conclusions

The implementation of paediatric clinical ultrasound in Spain remains limited, despite widespread recognition of its diagnostic and training value. Most of the surveyed paediatricians consider it essential to include ultrasound training in the specialisation curriculum. Overcoming current barriers, mainly lack of time, training, and institutional support, will require coordinated strategies among scientific societies, universities, and health authorities. The recent inclusion of ultrasound in the primary care services portfolio

represents an opportunity to promote its real integration into daily paediatric practice.

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Ethics Approval and Consent to Participate: Ethical approval was not required for this study according to national regulations, as it consisted of an anonymous, voluntary survey without intervention or collection of identifiable personal data. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Consent for Publication: Participation in the anonymous survey was voluntary, and completion of the survey implied informed consent for participation and for the publication of the aggregated data.

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Declaration on the Use of AI: No artificial intelligence tools were used in the preparation of this manuscript.

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