

A Multi-Country Survey on the Availability of Intraoperative Use of Echocardiography for Noncardiac Surgery

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Abstract

Background: This survey aimed to explore the availability and accessibility of echocardiography during noncardiac surgery worldwide.

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Methods: An internet-based 45-item survey was sent, followed by reminders from August 30, 2021, to August 20, 2022.

Results: 1189 responses were received from 62 countries. Nearly seventy-one percent of respondents had intraoperatively used transesophageal or transthoracic echocardiography (TEE and TTE, respectively) for monitoring or examination. The unavailability of echocardiography machines (30.3%), lack of trained personnel (30.2%), and absence of clinical indications (22.6%) were the top 3 reasons for not using intraoperative echocardiography in noncardiac surgery. About 61.5% of participants had access to at least one echocardiography machine. About 41% had access to at least 1 TEE probe, and 62.2% had access to at least 1 TTE probe. Seventy-four percent of centers had a procedure to request intraoperative echocardiography if needed for noncardiac cases. Intraoperative echocardiography service was immediately available in 58% of centers.

Conclusions: Echocardiography machines and skilled echocardiographers are still unavailable at many centers worldwide. National societies should aim to train a critical mass of certified TEE/TTE anesthesiologists and provide all anesthesiologists access to perioperative TEE/TTE machines in anesthesiology departments, considering the increasing number of older and sicker surgical patients scheduled for noncardiac surgery.

Keywords

echocardiography, transesophageal echocardiography, transthoracic, survey, intraoperative, perioperative echocardiography, transesophageal echocardiography, transthoracic, survey, intraoperative, perioperative

Introduction

Different societies and practice guidelines have acknowledged a comprehensive intraoperative transesophageal echocardiography (TEE) examination as a useful diagnostic and monitoring tool for patients undergoing cardiac surgery.¹⁻³ Perioperative use of TEE or transthoracic echocardiography (TTE) during noncardiac surgery has increased over the last two decades because of its ability to guide hemodynamic management, particularly in patients with significant hypovolemia, ventricular dysfunction, myocardial ischemia, shock, circulatory collapse, or cardiac arrest.⁴⁻⁶ Additionally, TEE has essential roles during solid organ transplantation and trauma surgery that allows intraoperative diagnosis and management of fat, air, and tumor emboli and intravascular tumor extension.⁴⁻⁶

Currently, there is no current consensus on the intraoperative use of TEE and TTE for noncardiac surgery by general anesthesiologists because of several limitations.^{6,7} Firstly, certification in TEE requires adequate levels of dedicated training including basic and advanced knowledge, skills, and competency.^{2,8} In the USA, point of care for ultrasound skills, including basic TEE, is part of the core

training in Accreditation Council for Graduate Medical Education (ACGME) accredited anesthesiology residency programs. The European Association of Cardiovascular Imaging, the European Association of Cardiothoracic Anaesthesiology and Intensive Care (EACTAIC), the Cardiovascular Section of the Canadian Anesthesiologists' Society, the Canadian Society of Echocardiography, Society of Cardiovascular Anesthesiologists (SCA), and the National Board of Echocardiography (NBE) certifications in advanced perioperative TEEs include passing an examination and completion of a minimum of 125 to 150 of personally performed TEE examinations. Additionally, maintenance of competency in perioperative TEE is required through periodic recertification.^{2,8,9} A TEE-certified physician should supervise the hands-on TEE training in the operating rooms, which is time and resource-consuming.¹⁰ However, the advancements in current technologies, including simulation-based training, have improved access to training for noncardiac anesthesiologists interested in utilizing echocardiography.^{4,10} Secondly, the routine use of TEE and TTE for noncardiac surgery is limited by the availability and accessibility of TEE and TTE machines/probes in the operating rooms in some regions/countries, the relatively high

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cost of the machines and probes, and maintenance fees.^{11,12} However, intraoperative TEE and TTE might lower overall costs and long-term complications, including stroke, cardiac complications, and death after cardiac and noncardiac surgery.¹³ This survey explored the availability of echocardiography machines and TEE-certified physicians in noncardiac cases needing intraoperative echocardiography worldwide.

Methods

The study was determined to be “exempt” by the Institutional Review Board at the University of Louisville. We performed an internet-based global survey on the availability and accessibility of echocardiography machines, probes, TEE-skilled physicians, and alternative solutions in case of unavailability of the equipment or trained staff in the perioperative settings between August 30, 2021 and August 20, 2022. The survey questionnaire is listed in [Appendix 1](#).

Participants were respondents who provided perioperative care for patients undergoing noncardiac or cardiac surgery or interventions. The 45-item questionnaire ([Appendix 1](#)) included participants’ demographic and personal data, infrastructural aspects of their workplace (facilities for echocardiography, logistics, skilled, and certified physicians), and the number of noncardiac procedures performed every year ([Appendix 1](#)). We used some modified questions from the multinational survey of Dobbs et al on patterns of intraoperative use of TEE for cardiac surgery.¹⁴

Topics and question items in the questionnaire were designed through a consensus among the study’s steering committee. A link to a copy of the survey questionnaire programmed on the SurveyMonkey® platform was sent to a selected group of six experts before starting the survey to pilot the survey for readability, practicability, presentation, acceptability, and generalizability, allowing them to add comments. Comments and modifications were addressed, and the questionnaire was finalized before sending the survey link to the participating societies.

Participation in this study was voluntary and anonymous. Physicians working in both operating rooms and non-operating room areas were invited to participate. Participants received written information about the aims and objectives of the survey, as well as data handling, management, and privacy rights. All participants were obliged to provide consent for participation and data analysis. The survey was uploaded in English to the SurveyMonkey® platform. The survey link was distributed by twelve participating societies, including the Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva (SIAARTI), Brazilian Society of Anaesthesiology, Spanish Society of Anaesthesiology, Resuscitation and Therapeutics of Pain (SEDAR), Société Française d’Anesthésiologie et de Réanimation (SFAR), Saudi Anesthesia Society (SAS), Slovenian Society of

Anaesthesiology and Intensive Medicine (SSAIM), Romanian Society of Anaesthesia and Intensive Care (SRATI), Swiss Association of Cardiovascular and Thoracic Anesthesia (SACTA), Russian Federation of Anesthesiologists and Reanimatologists (FAR), Asian Societies of Cardiovascular Anesthesia (ASCA), The Belgian Society of Anaesthesiology, Resuscitation, Perioperative Medicine, and Pain Management (BeSARPP), The Society for the Advancement of Transplant Anesthesia (SATA), and The World Federation of Anesthesiologists (WFSA) to their members through email invitations. SIAARTI translated the survey into Italian and distributed it to its members via the SurveyMonkey® platform. The participating societies were instructed to send weekly reminders, and five follow-up emails during the survey. A “snowballing” sampling technique was adopted by asking the email recipients to assist the investigators in distributing the survey among other potential respondents who might be difficult to reach.¹⁵

All data collected was kept anonymous, secure, and confidential in the archiving system of the center of the principal investigator for five years following the general data protection regulations (accessible at <https://eugdpr.org/>).

The initial survey access period was from August 30, 2021, to December 31, 2021. The English and Italian survey versions were closed on June 17, 2022, and August 20, 2022, respectively. The survey window was subsequently extended because the total number of responses was limited during the 2019 coronavirus pandemic to collect the target of 1200 responses.

Sample Size Calculation

We estimated that the total membership of all participating societies was approximately 24 000. We aimed to collect a minimum of 1200 responses from the 12 contributing societies, of which 5% were expected to respond and complete the questionnaire.

Statistical Analysis

The results of the Italian version of the survey were verified and merged with the results of the English version using Microsoft Excel Spreadsheets (Microsoft Office 365 Business, Microsoft Corporation, United States). Data management and descriptive statistics (number, percentages, and median [interquartile range]) were performed using the IBM SPSS Statistics Premium Faculty Pack version 28 Subscription (Statistical Package for Statistical Analysis, IBM Ireland Product Distribution Limited, IBM House, Shelbourne Road, Ballsbridge, Dublin 4, Ireland). Post-hoc comparisons of the 811 finished non-Italian and Italian responses regarding the intraoperative use of TEE, availability of “skilled” physicians in TTE or TEE, and the process to request intraoperative echocardiography if needed for

noncardiac surgery was performed using X2 test with Yates correction using a Geno-P version 1.10 iOS software. $P < .05$ indicated a statistically significant difference.

Results

A total of 1189 responses were collected. Of those who started the survey, 35.7% of participants did not finish. [Supplement Table 1](#) showed the number of participants for each question. Responses from sixty-two countries were included ([Figure 1](#)), and 41% of the participants worked in Italy. The [Supplemental Table 4](#) showed the available data on the participating societies' membership, collected responses, and responses rates. Participants' type of institution, profession, experiences in clinical anesthesiology practice, noncardiac operating rooms, and the number of procedures performed annually requiring anesthesia are presented in [Supplement Table 2](#) and [Figure 2](#). Among all respondents, 26% were general anesthesiologists with cardiac anesthesia fellowship training but without TTE/TEE trainings and 53.1% were general anesthesiologists without cardiac anesthesia fellowship training. Eighty percent of all respondents had experience longer than five years in anesthesiology practice.

Of those who responded, more than 70% reported using TEE/TTE in noncardiac surgery at their centers. ([Table 1](#)).

The unavailability of echocardiography machines (30.3%), lack of trained personnel (30.2%), and absence of clinical indication (22.6%) were the top 3 reasons for not using intraoperative echocardiography in noncardiac surgery ([Table 1](#)).

[Table 2](#) summarized the availability of echocardiography machines. Almost 30% of participants had no echocardiography machine in noncardiac operating rooms at their centers. About 50% ($n = 330$) had no TEE probes, and nearly 30% ($n = 202$) had no TTE probes. Seventy-four percent of centers had a process to request intraoperative echocardiography if needed for noncardiac cases [[Table 2](#)]. Intraoperative echocardiography service was immediately available in 58% of centers.

The top 3 indications for intraoperative TEE or TTE use were to diagnose hypotension (17.8%), to evaluate left ventricular function (12.9%), and to guide drug therapy (10.4%) [[Figure 3](#)] Insertion method of the TEE probe, three-dimensional TEE examination, and availability/ownership of echocardiography machines and probes were presented in [Supplement Tables 2 and 3](#).

Echocardiography was mainly performed, interpreted, and reported by anesthesiologists (44.5%, $n = 133$) and cardiologists (47.5%, $n = 142$) ([Supplement Table 3](#)). Sixty-seven percent of respondents reported the TEE findings in the patient's medical record.

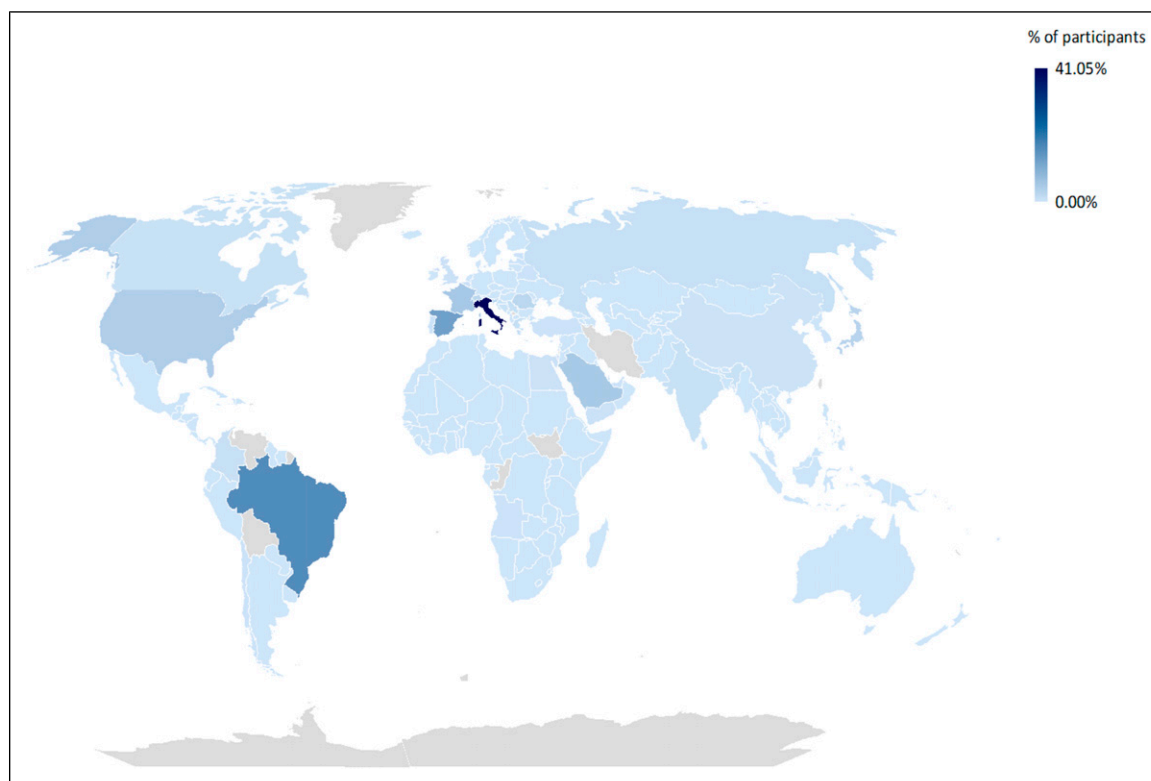


Figure 1. Geographic distribution of the participants' countries of the current practice. Data are presented as percentages from 1033 participants.

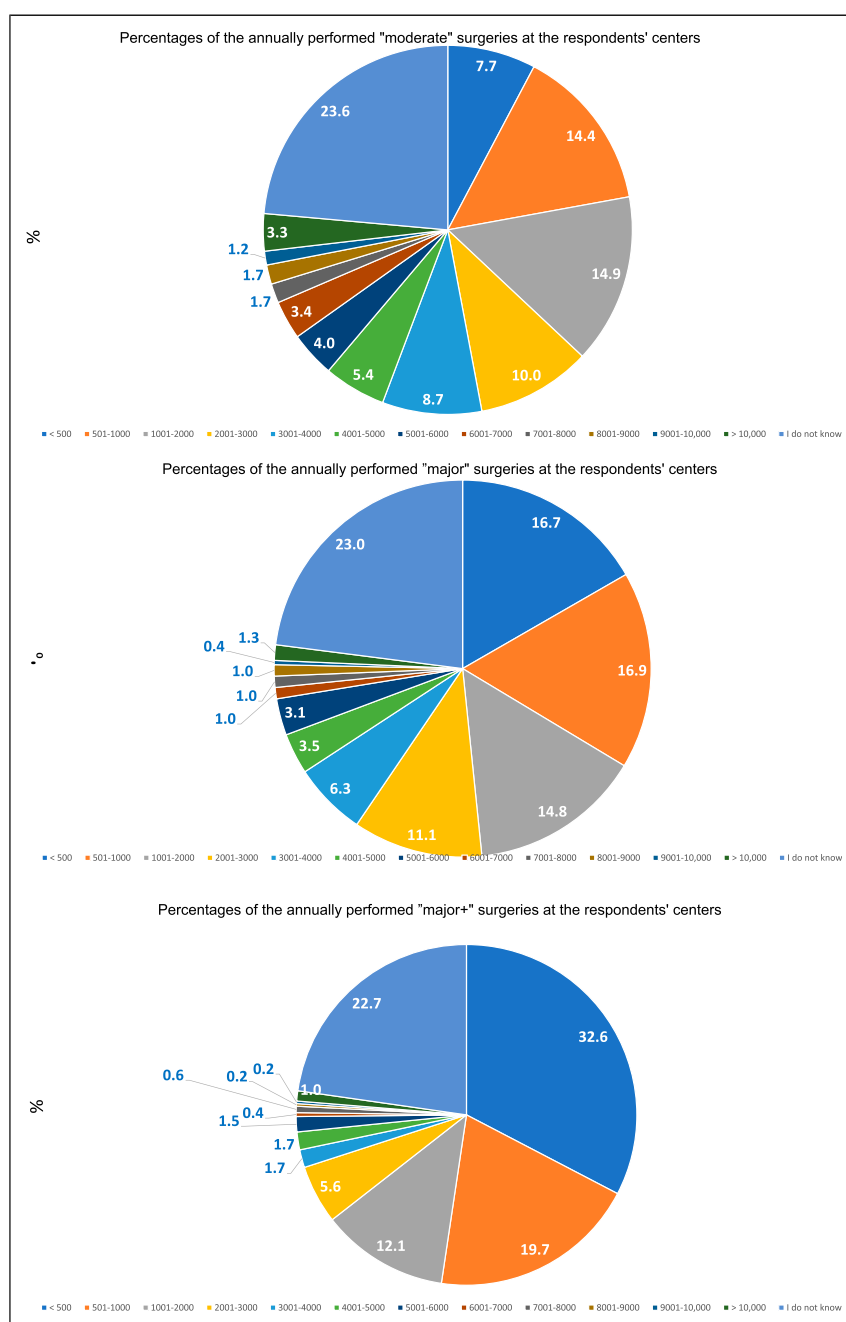


Figure 2. The anticipated annually performed “moderate,” “major,” and “major +” noncardiac surgical procedures at the participants’ centers. Data were presented as percentages from 877 completed responses; 440 participants skipped answering these questions.

Regarding echocardiography expertise, 82.3% had access to at least “one skilled” clinician in TTE or TEE, and 57.4% had access to at least 1 TTE/TEE certified clinician in their centers [Table 2]. Fifty-one percent of respondents were trained and 9% were certified in TEE or TTE. Forty-six percent had the chance to be trained or certified in TTE or TEE; 19% had sufficient time to participate in webinars or other online teaching activities on TTE and TEE regularly. Figure 4 showed the sponsorship sources for the

transesophageal or transthoracic echocardiography training or certification from 388 completed responses. 61% were self-sponsored and 21% were from the current employers. The residency program included training in TEE and TTE at 27% of centers.

Since 41% of the respondents worked in Italy, Table 3 compared Italy vs other countries’ intraoperative use of echocardiography and access to skilled echocardiographic clinicians. There were significantly more clinicians who

Table 1. The Intraoperative Use of Either Transesophageal or Transthoracic Echocardiography for Intraoperative Monitoring or Examination Available at the Respondents' Centers.

Variable	Completed Responses (n (%))	Skipped Answers (n)
Intraoperative use of either transesophageal or transthoracic echocardiography for intraoperative monitoring or examination	811	456
Regularly	119 (14.7%)	
Occasionally	259 (31.9%)	
Rarely	197 (24.3%)	
Never	115 (14.2%)	
Not accessible	118 (14.5%)	
Others (non-anesthesiologists or do not provide care in the operating room)	3 (.4%)	
Percentage of cases to total cases performed using intraoperative transesophageal or transthoracic echocardiography during the last 12 months	489	778
None	68 (13.9%)	
<1%	145 (29.7%)	
1%–5%	124 (25.4%)	
6%–10%	47 (9.6%)	
11%–20%	43 (8.8%)	
21%–50%	29 (5.9%)	
51%–100%	31 (6.3%)	
Others (non-anesthesiologists or do not provide care in the operating room)	2 (.4%)	
Rating the importance of reasons for non-routine intraoperative using TEE in noncardiac surgery cases if needed at the participants' centers (1; most important, 5; least important reason)		779

Likert Scale	1	2	3	4	5	Completed Responses
Not enough machines available	138 (30.3%)	122 (26.8%)	78 (17.1%)	79 (17.3%)	39 (8.6%)	456
Not enough trained personnel	138 (30.2%)	146 (31.9%)	89 (19.5%)	51 (11.2%)	33 (7.2%)	457
Not requested by anesthesiologists/anesthetists if needed	63 (13.4%)	100 (21.2%)	186 (39.5%)	74 (15.7%)	48 (10.2%)	471
TEE is not indicated in all cases	106 (22.6%)	59 (12.6%)	62 (13.2%)	188 (40.2%)	53 (11.3%)	468
The risk of injury outweighs the benefit of routine use	32 (6.8%)	40 (8.4%)	49 (10.3%)	63 (13.3%)	290 (61.2%)	474

Abbreviations: TEE, transesophageal echocardiography.

never used intraoperative TEE and TTE and substantially less skilled echocardiographic clinicians available in Italy when compared to non-Italian countries (Table 3).

Discussion

This multi-country survey aims to assess the status of intraoperative echocardiography use in noncardiac surgeries/procedures. Almost half of the anesthesiologists who responded to our survey used TEE regularly or occasionally in noncardiac cases. In addition, more than half of the respondents stated they were trained in echocardiography. However, perioperative training was not standardized and was only included in the residency program of a minority of centers.

TEE has been well established in cardiac surgery with advanced cardiac and valvular function assessment. In recent

years, intraoperative use of TEE has become common in high-risk noncardiac surgeries. However, there is a lack of high-quality evidence for the benefits and risks of intraoperative TEE in the management of noncardiac surgeries. A 2018 systemic review investigated intraoperative TEE's comparative effectiveness and harms in noncardiac surgery. The incidence of TEE complications ranged from 0% to 1.7% in patients undergoing various procedures. No serious adverse events were observed. Changes in surgical or medical management attributable to the use of TEE were noted in 17% to 81% of patients. The only randomized trial of intraoperative TEE was grossly underpowered to detect meaningful differences in 30-day postoperative outcomes.¹⁶ Most studies focused on high-risk noncardiac surgeries, such as posterior fossa neurosurgical procedures in the sitting position, orthotopic liver transplantation, or patients experiencing intraoperative cardiac arrest, which limited generalizability of

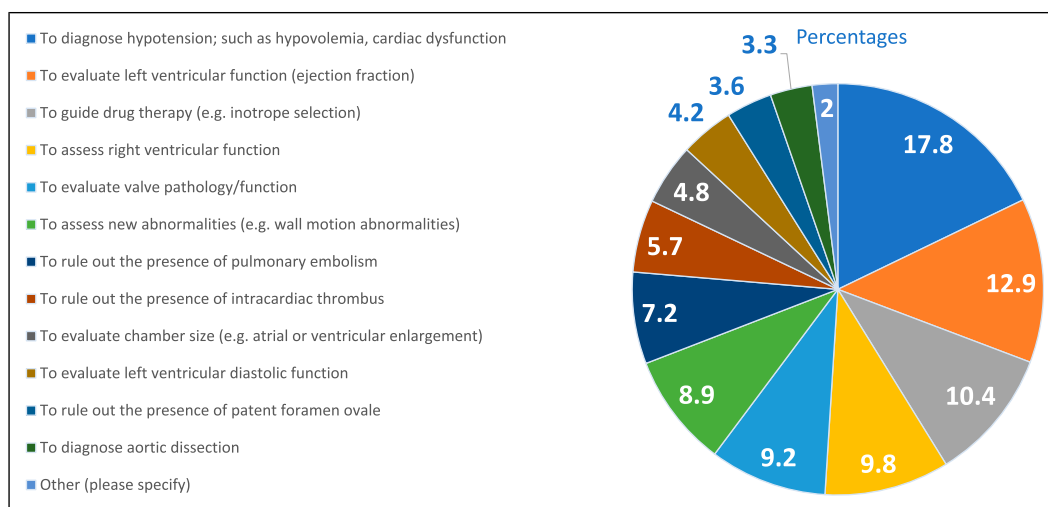
Table 2. The Availability of Transesophageal (TEE) or Transthoracic (TTE) Echocardiography Equipment and Trained Staff at the Participants' Centers.

Variable	Responses (n (%))	Skipped Answers (n)
The perceived number of echocardiography machines available in noncardiac operating rooms at the participants' centers	676	591
None	200 (29.6%)	
1	221 (32.7%)	
2–5	170 (25.1%)	
6–10	18 (2.7%)	
>10	7 (1.0%)	
I have no idea	57 (8.4%)	
Others (there is no such workplace or brought from the intensive care unit)	3 (.4%)	
The perceived number of TEE probes available in the noncardiac operating rooms at the participants' centers	676	591
None	330 (48.8%)	
1	164 (24.3%)	
2–5	89 (13.2%)	
6–10	19 (2.8%)	
>10	4 (.6%)	
I have no idea	69 (10.2%)	
Others (there is no such workplace)	1 (.1%)	
The perceived number of TTE probes available in noncardiac operating rooms at the participants' centers	676	591
None	202 (29.9%)	
1	207 (30.6%)	
2–5	170 (25.1%)	
6–10	29 (4.3%)	
>10	15 (2.2%)	
I have no idea	51 (7.5%)	
Others (there is no such workplace)	2 (.3%)	
The number of "skilled" physicians in transthoracic or transesophageal echocardiography for adult and/or pediatric patients are available in the participants' centers	651	616
None	58 (8.9%)	
1	73 (11.2%)	
2–5	258 (39.6%)	
6–10	94 (14.4%)	
>10	111 (17.1%)	
I have no idea	56 (8.6%)	
Others (only cardiologists)	1 (.2%)	
The number of "skilled" physicians in transthoracic or transesophageal echocardiography for adult and/or pediatric patients are available if needed in the noncardiac operating room or interventional non-surgical rooms in the participants' centers	651	616
None	111 (17.1%)	
1	115 (17.7%)	
2–5	248 (38.1%)	
6–10	53 (8.1%)	
>10	55 (8.4%)	
I have no idea	66 (10.1%)	
Others (it depends on the availability of skilled physicians)	3 (.5%)	
The number of "certified" physicians in transthoracic or transesophageal echocardiography for adult and/or pediatric patients are available if needed in the noncardiac operating room or interventional non-surgical rooms in the participants' centers	651	616
None	170 (26.1%)	
1	107 (16.4%)	
2–5	203 (31.2%)	

(continued)

Table 2. (continued)

Variable	Responses (n (%))	Skipped Answers (n)
6–10	39 (6.0%)	
>10	25 (3.8%)	
I have no idea	106 (16.3%)	
Others (there is no national certification in echocardiography)	1 (.2%)	
The participants' centers have a procedure to request intraoperative echocardiography if needed for noncardiac surgery cases	651	616
Yes	306 (47%)	

**Figure 3.** The indications for intraoperative use of the transesophageal or transthoracic echocardiography. Data were presented as percentages from 489 completed responses; 778 participants skipped answering this question.

these findings. Current guidelines recommend limiting the use of TEE to high-risk noncardiac surgeries and patients with intraoperative hemodynamic instability.¹⁶

This survey found that nearly 71% of participants used intraoperative echocardiography in noncardiac surgery. The unavailability of echocardiographic machines, lack of TEE and TTE probes, and absence of clinical indication were among the top 3 reasons for not using intraoperative echocardiography. The common practice for anesthesiologists is to only use TEE and TTE for selective cases based on clinical situations and patient risk factors. There were significant variations in echocardiography equipment availability among different hospitals and regions, urging healthcare systems to supply echocardiography technology when needed for life-threatening conditions refractory to therapy. Furthermore, this survey confirmed that practitioners reported and archived perioperative TEE and TTE findings. Reimbursement could facilitate the availability of echocardiographic equipment in noncardiac operating rooms when needed.¹⁴

The most common reason to use perioperative echocardiography in noncardiac surgeries is hypotension.¹⁷ In

this survey, 18% used TTE or TEE to diagnose causes of hypotension, 13% to evaluate ventricular dysfunction, and 10% to guide inotropic therapy. TEE and TTE in this setting provide a fast and minimally invasive method to rescue hemodynamics and change the perioperative course of surgical patients. A systemic review analyzed preoperative echocardiography in high-risk patients and intraoperative exams during hemodynamic compromise/cardiac arrest. The most common diagnoses in the preoperative exam group were low ejection fraction, aortic valve disease, mitral valve disease, right ventricular failure, and hypovolemia. In the intraoperative exam group, the most common diagnoses were hypovolemia, low ejection fraction, right ventricular failure, regional wall motion abnormalities, and pulmonary embolism.¹⁸

Interestingly, 48% of respondents' hospitals relied on cardiologists to perform intraoperative TTE/TEE when needed. This raises the need to explore whether formal mandatory training for general anesthesiologists on TTE/TEE should be required.

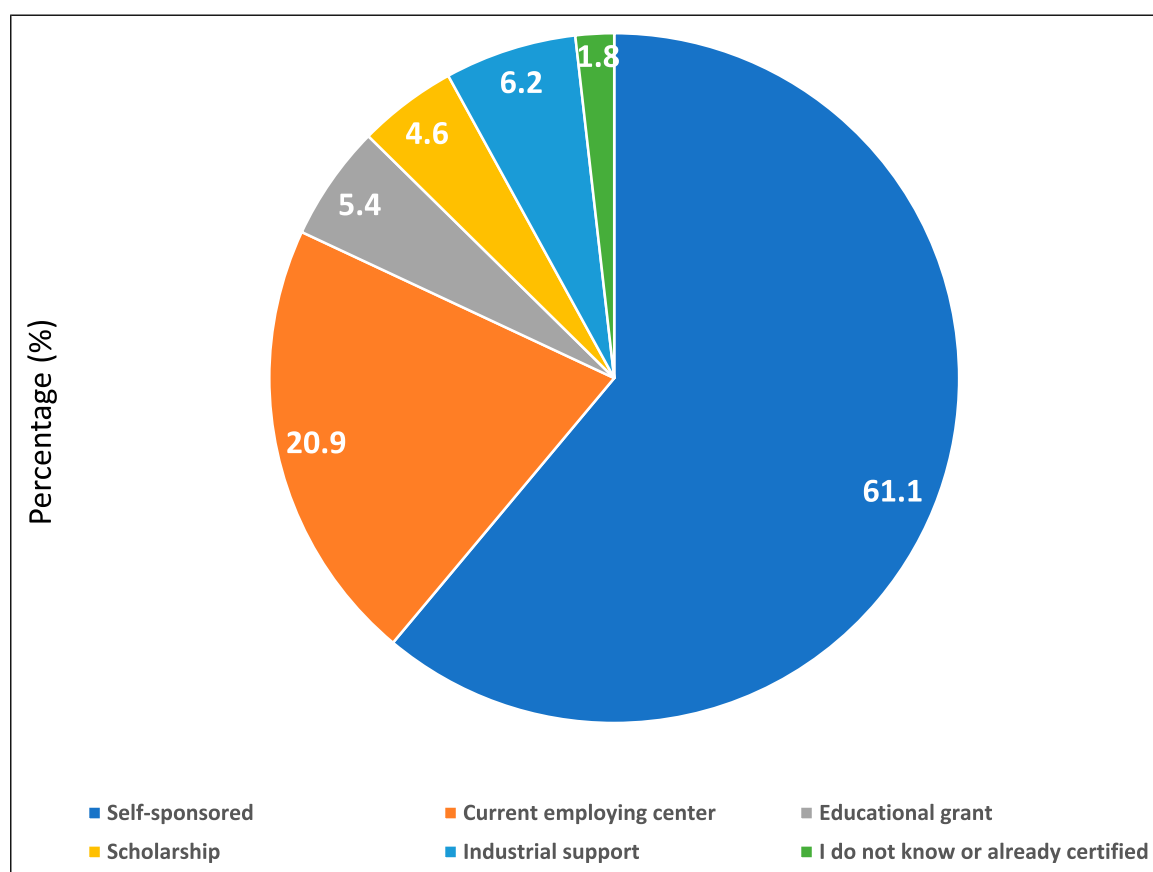


Figure 4. Sponsorship sources for the transestophageal or transthoracic echocardiography training or certification from 388 completed responses.

The present survey demonstrated that despite high interest in echocardiography training, only 19% were certified in TTE or TEE. Unfortunately, we cannot balance the different training styles among different regions, particularly regarding training and certifications in point-of-the-care-ultrasound (POCUS) and Basic TEE certification, as this is beyond the scope of the present survey. Operating room environments and pathologies are distinctly different from other settings, such as clinics, emergency rooms, and intensive care units, and a specific perioperative echocardiography curriculum should be developed. Most training in echocardiography is self-funded in this survey, and in-person hands-on courses might be costly. To develop consensus across multiple societies regarding the intraoperative use of TTE/TEE and ensure adequate training and standardization, the authors believe that the different societies should draw attention to (1) providing affordable and accessible training courses for general anesthesiologists on POCUS and basic TTE/TEE, which can be an obligatory part of the residency training, (2) working with hospitals and healthcare systems to ensure the availability of the necessary equipment in the operating rooms, and (3) developing formal certification processes and encouraging anesthesiologists to obtain such certifications to

promote patient safety.¹⁹⁻²¹ Furthermore, innovative simulation training in online and offline echocardiography modalities could produce promising results.²² In academic centers with cardiac anesthesia programs, providing non-cardiac anesthesiologists with basic TEE and TTE trainings by cardiac anesthesiologists might be invaluable and cost-efficient.

There are several limitations to this study. This survey was distributed through email invitations and social media using the “snowballing” sampling technique.¹⁵ It was not possible to precisely identify the number of invited participants to calculate the survey’s response rate. The authors did not consider an a priori sample size calculation because the use of the “snowballing” sampling technique, unknown survey outcomes, and the lack of available data for some society’s membership sizes (the available membership numbers in the participating societies are presented in the [Supplemental Table 4](#)). Some participating international societies, like the Asian Societies of Cardiovascular Anesthesia (ASCA) and The World Federation of Anesthesiologists (WFSA), included several sub-societies with unknown total membership or the number of people who received the survey reminders.

Table 3. Comparisons of the Main Outcomes From 811 Completed Responses From Non-Italian Countries and Italy.

Variable	Completed Responses (n (%))		Skipped Answers (n)		P value
	Non-Italian Countries	Italy	Non-Italian Countries	Italy	
Intraoperative use of either transesophageal or transthoracic echocardiography for intraoperative monitoring or examination	542	222	269	234	
Regularly	83 (15.3%)	36 (16.2%)			.121
Occasionally	159 (29.3%)	100 (45%)			4.493
Rarely	146 (27%)	51 (23%)			.295
Never	71 (13.1%)	44 (19.8%)			.025
Not accessible	83 (15.3%)	35 (15.8%)			.962
Others (non-anesthesiologists or do not provide care in the operating room)	0 (0%)	3 (1.4%)			.040
The number of “skilled” physicians in transthoracic or transesophageal echocardiography for adult and/or pediatric patients are available in the participants’ centers	430	334	221	282	
None	54 (12.6%)	57 (17.1%)			.099
1	75 (17.4%)	40 (12.1%)			.052
2–5	168 (39.1%)	80 (24.1%)			1.368
6–10	39 (9.1%)	14 (4.2%)			.013
>10	42 (9.8%)	13 (3.9%)			.002
I have no idea	50 (11.6%)	16 (4.8%)			.001
Others (only cardiologists)	2 (.5%)	1 (.3%)			.830
The participants’ centers have a procedure to request intraoperative echocardiography if needed for noncardiac surgery cases	430	334	221	282	
Yes	217 (50.5%)	89 (27%)			4.400

Data are presented as numbers (%). $P < .05$ significant compared with the Italian responses.

Despite having a large sample size of 1189 participants from many countries, most of the survey was carried out in 6 countries, with 41% respondents from Italy. Therefore, there may be selection bias that limits the generalizability of the data. There were statistically significant differences between the Italian and non-Italian responses regarding the intraoperative use of TEE and the availability of “skilled” physicians in TTE or TEE. Another fact to be considered is that countries with a long-standing tradition in perioperative echocardiography, such as the USA and France, had a low participation rate. Our results should be carefully interpreted because university hospitals represented 53% of overall and 43% Italian respondents, whereas 21.5% and 40.3% of the overall and Italian responses were from public non-university hospitals. These biases from respondents might skew the conclusion one way or the other. Although the survey asked participants not to skip questions, the program allowed skipping, and the results of

each question had different numbers of respondents. Although the proportion of anesthesiologists with at least five years of specialty practice was over 80%, this survey included anesthesiology residents, fellows, and nurse anesthetists potentially with limited echocardiography expertise and technical skills. Lastly, the initial examination of choice (TTE or TEE) in noncardiac surgeries was not explicitly identified, nor was the physician’s expertise limited to one or both modalities.

Conclusion

Most respondents in this survey had already used echocardiography intraoperatively for monitoring or examination. Echocardiography machines and skilled echocardiographers were still unavailable at many centers worldwide. National societies should aim to train a critical mass of certified TEE and TTE anesthesiologists and provide all anesthesiologists

access to perioperative TEE and TTE machines in anesthesiology departments, considering the increasing number of older and sicker surgical patients scheduled for noncardiac surgery. The results of the present survey can help the participating societies develop recommendations for the required availability and accessibility of equipment, as well as the indications and training requirements for the intraoperative use of echocardiography for noncardiac surgery.

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Declaration of Conflicting Interests

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Ethical Statement

Ethical Approval

Ethical approval for this study was exempted by the University of Louisville Institutional Review Board, University of Louisville, Louisville, KY, United States, dated June 11, 2021. The survey questionnaire is listed in [Appendix 1](#).

Informed Consent

Informed Consent is waived as determined by the Institutional Review Board.

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Supplemental Material

Supplemental material for this article is available online.

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