



# Minimally invasive approach to incisional hernia in elective and emergency surgery: a SICE (Italian Society of Endoscopic Surgery and new technologies) and ISHAWS (Italian Society of Hernia and Abdominal Wall Surgery) online survey

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Received: 31 December 2022 / Accepted: 22 March 2023  
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## Abstract

Minimally invasive abdominal wall surgery is growing worldwide, with a constant and fast improvement of surgical techniques and surgeons' confidence in treating both primary and incisional hernias (IH). The Italian Society of Endoscopic Surgery and new technologies (SICE) and the ISHAWS (Italian Society of Hernia and Abdominal Wall Surgery) worked together to investigate state of the art in IH treatment in elective and emergency settings in Italy. An online open survey was designed, and Italian surgeons interested in abdominal wall surgery were invited to fill out a 20-point questionnaire on IH surgical procedures performed in their departments. Surgeons were asked to express their points of view on specific questions about technical and clinical variables in IH treatment. Preferred approach in elective IH surgery was minimally invasive (59.7%). Open surgery was the preferred approach in 40.3% of the responses. In emergency settings, open surgery was the preferred approach (65.4%); however, 34.5% of the involved surgeons declare to prefer the laparoscopic/endoscopic approach. Most respondents opted for conversion to open surgery in case of relevant surgical field contamination, with a non-mesh repair of abdominal wall defects. Among those that used the laparoscopic approach in the emergent setting, the majority (74%) used the size of the defect of 5 cm as a decisional cut-off. The spread of minimally invasive approaches to IH repair in emergency surgery in Italy is gaining relevance. Code-sharing through scientific societies can improve clinical practice in different departments and promote a tailored approach to IH surgery.

**Keywords** Survey · Incisional hernia · Emergency · Laparoscopy · Mesh

## Introduction

Everyday thousands of abdominal surgical procedures are performed worldwide, and for each procedure, an abdominal wall weakness is created.

Though indeed, the increasing adoption of minimally invasive surgery in every surgical field allows for lowering

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The authors and their affiliation of SICE/ISHAWS collaborative group are in Acknowledgements.

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the incidence of incisional hernias, among other well-recognized benefits, they still constitute an economic and social burden [1, 2].

The complexity of abdominal wall surgery is increasingly demanding considering the technological evolution that even this type of surgery, as many other surgical fields, has encountered, with the introduction of the laparoscopic and, more recently, of the robotic approaches and sometimes the indications to one or another approach is blurred and not unanimously defined [1, 3, 4].

Minimally invasive surgery is gaining relevance in abdominal wall surgery, both in primary and incisional defects elective repair [5, 6], with encouraging results comparable with an open approach within certain conditions [7, 8].

Given these considerations, two surgical and scientific Italian societies (SICE—Italian Society of Endoscopic Surgery and new technologies and ISHAWS—Italian Society of Hernia and Abdominal Wall Surgery) decided to analyze the national state of the art in elective, urgent, and emergent repair of IH by investigating through an online survey surgeon belonging to high volumes centers.

## Materials and methods

An online open survey (<https://forms.gle/y3UwnEaHWiMEnxzaA>) was created to investigate the preferred approach of individual surgeons to the elective and emergent treatment of IH.

The survey and the questions were the results of a specific remote brainstorming among the members of the SICE study group on abdominal wall surgery. The group comprises six surgeons experts in this specific surgical area, in collaboration with ISHAWS members.

All the questions were subsequently subjected to validation from the SICE board of directors; after recommended changes from the board, a definitive version was created and used for the online version.

Results were collected after the given deadline for completing the survey.

The paper is written according to the CHERRIES checklist [9].

The survey, created via Google Forms (Google LLC, Mountain View, California US), was explicitly directed to members of SICE, ISHAWS, and unaffiliated surgeons, with a particular interest in minimally invasive abdominal wall repair.

Invitations to answer the survey (Appendix 1) were circulated through the institutional links of the SICE and ISHAWS websites, newsletters, and multiple social media sites, with an official reminder sent during the opening of the questionnaire.

In addition, the survey link was always available on the SICE website (<https://siceitalia.com/survey-laparoceli/>).

All participants agreed to the publication of the survey results with their provided answers, personal data, and affiliations; personal data and affiliations were openly requested at the beginning of the online survey to be part of potential future studies on this subject.

Data collection was carried out for two months, from the 5th of May 2022 to the 12th of July 2022.

The survey comprised twenty items (Appendix 2), of which sixteen were mandatory. No adaptive questioning was applied in this survey, and almost all the questions were mandatory to collect an adequate amount of comparable data.

The questions were not automatically randomized or alternated, maintaining the same sequence for each participant.

Most questions allowed the possibility of a single answer, and where possible, an "open" answer was permitted, thus enabling the expression of a personal point of view on specific queries. Individual answers were grouped to find out prevalent replies to specific questions. In addition, open answers were grouped if they represented facets of the same concept, reaching more analyzable and comparable responses to the individual questions.

The survey structure did not allow subsequent modifications to the given answers, and a preset check for completeness of the mandatory answers was automatically performed by Google Forms.

The questionnaire included 20 queries, divided into four sections (Table 1).

The first section aimed to collect data about individual surgeons participating in the questionnaire, their respective affiliations, and the extent of their surgical activity in the field of abdominal wall surgery.

Subsequently, the core of the survey was divided into three sections: the first, based on the actual entity and the approach to the urgent/emergent treatment of IH in each center; the second, composed of questions about surgical strategies when facing specific cases in emergent/urgent settings; and the third, dedicated to personal opinions about the preferred approach to minimally invasive surgery in IH.

Access tracking to the survey was impossible, as viewing, participation, and completion rates could not be calculated using Google Forms.

A steering committee member (LC) downloaded the survey results and shared them with the SICE dedicated study group and with part of the Executive Board of SICE.

**Table 1** List of questions proposed in the survey

| <b>0) Introduction</b>   |   |
|--|---|
| 0.1 PI name, surname *   | <i>Open answer</i>  |
| 0.2 PI E-mail *  | <i>Open answer</i>  |
| 0.3 Co-investigator (name and surname)   | <i>Open answer</i>  |
| 0.4 Co-investigator E-mail   | <i>Open answer</i>  |
| 0.5 In which hospital do you work? *   | <i>Open answer</i>  |
| 0.6 In which department do you work? *   | <i>Open answer</i>  |
| <b>1) First Section</b>  |   |
| 1.1 What is the most relevant surgical activity in your department? *                              | <ul style="list-style-type: none"> <li>- <i>Mainly elective surgery</i></li> <li>- <i>Elective surgery &gt; Urgent surgery</i></li> <li>- <i>Urgent surgery &gt; Elective surgery</i> <ul style="list-style-type: none"> <li>- <i>Mainly urgent surgery</i></li> </ul> </li> </ul>  |
| 1.2 What is the average of cases of ELECTIVE treatment of IH per year in your department? *        | <ul style="list-style-type: none"> <li>- <i>0-10 cases/year</i></li> <li>- <i>10- 30 cases/year</i></li> <li>- <i>30-50 cases/year</i></li> <li>- <i>&gt; 50 cases/year</i></li> </ul>  |
| 1.3 What is the most frequently chosen approach for the ELECTIVE treatment of IH? *                | <ul style="list-style-type: none"> <li>- <i>Open approach</i></li> <li>- <i>Laparoscopic/endoscopic approach</i></li> <li>- <i>Robotic approach</i></li> </ul>  |
| 1.4 What is the average of cases of URGENT/EMERGENT treatment of IH per year in your department? * | <ul style="list-style-type: none"> <li>- <i>0-10 cases/year</i></li> <li>- <i>10-30 cases/year</i></li> <li>- <i>30-50 cases/year</i></li> <li>- <i>&gt; 50 cases/year</i></li> </ul>   |
| 1.5 Which diagnostic method is often used in your unit for the URGENT study of complicated IH? *   | <ul style="list-style-type: none"> <li>- <i>Mainly clinical and anamnestic evaluation</i> <ul style="list-style-type: none"> <li>- <i>Mainly abdominal US</i></li> </ul> </li> <li>- <i>Mainly CT (with and without contrast)</i> <ul style="list-style-type: none"> <li>- <i>Mainly abdominal MRI</i> <ul style="list-style-type: none"> <li>- <i>Other</i></li> </ul> </li> </ul> </li> </ul> |

Table 1 (continued)

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|                          |  |   |
|--------------------------|--|---|
| 1.6                      | What is the most frequently chosen approach for the URGENT/EMERGENT treatment of IH? *   | <ul style="list-style-type: none"> <li>- <i>Open approach</i></li> <li>- <i>Laparoscopic/endoscopic approach</i></li> <li>- <i>Robotic approach</i></li> </ul>  |
| <b>2) Second Section</b> |  |   |
| 2.1                      | In case of surgical field contamination (e. g. accidental enterotomy) during urgent/emergent laparoscopic IH surgery, what do you think is more appropriate to do? *   | <ul style="list-style-type: none"> <li>- <i>Conversion to laparotomy in any case of abdominal contamination</i></li> <li>- <i>Conversion to laparotomy in case of relevant contamination of the surgical field (e.g., colotomy)</i></li> <li>- <i>Prosecution of the laparoscopic approach</i></li> <li>- <i>Other</i></li> </ul>   |
| 2.2                      | In case of contamination of the surgical field (e.g., accidental enterotomy) during urgent/emergent laparoscopic IH surgery, which is in your opinion the best approach to abdominal wall defect? *                          | <ul style="list-style-type: none"> <li>- <i>Anatomical repair of the defect once the field has been cleared and the enterotomy repaired</i></li> <li>- <i>Prosthetic repair with a biologic mesh of the defect once the field has been cleared and the enterotomy repaired</i></li> <li>- <i>Prosthetic repair with a synthetic mesh of the defect once the field has been cleared and the enterotomy repaired</i></li> <li>- <i>Other</i></li> </ul> |
| 2.3                      | A 45-years-old man arrives at the ER with a strangled IH on a previous right pararectal incision, a defect of 3 cm, and suspected intestinal ischemic suffering. What is, in your opinion, the most appropriate approach? *  | <ul style="list-style-type: none"> <li>- <i>Open approach</i></li> <li>- <i>Laparoscopic approach</i></li> <li>- <i>Endoscopic approach</i></li> <li>- <i>Robotic approach</i></li> <li>- <i>Other</i></li> </ul>   |
| 2.4                      | A 45-years-old man arrives at the ER with a strangled IH on a previous right pararectal incision, a defect of 10 cm, and suspected intestinal ischemic suffering. What is, in your opinion, the most appropriate approach? * | <ul style="list-style-type: none"> <li>- <i>Open approach</i></li> <li>- <i>Laparoscopic approach</i></li> <li>- <i>Endoscopic approach</i></li> <li>- <i>Robotic approach</i></li> <li>- <i>Other</i></li> </ul>   |

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**Table 1** (continued)

|   |   |
|---|---|
| <p>2.5 A 45-years-old man arrives at the ER with a strangled IH on a previous right pararectal incision, a defect of 20 cm, and suspected intestinal ischemic suffering. What is, in your opinion, the most appropriate approach? *</p> | <ul style="list-style-type: none"> <li>- <i>Open approach</i></li> <li>- <i>Laparoscopic approach</i></li> <li>- <i>Endoscopic approach</i></li> <li>- <i>Robotic approach</i></li> <li>- <i>Other</i></li> </ul> |
| <p><b>3) Third Section</b></p>  |   |
| <p>3.1 In your opinion, minimally invasive surgery is an adequate tool for IH surgery? *</p>  | <ul style="list-style-type: none"> <li>- <i>Yes, but only for elective surgery</i></li> <li>- <i>Mainly for elective surgery</i></li> <li>- <i>Only for elective surgery</i></li> </ul>                           |
| <p>3.2 What are, in your opinion, the possible limitations of minimally invasive surgery in elective IH surgery?</p>  | <p style="text-align: center;"><i>Open answer</i></p>   |
| <p>3.3 In your opinion, which are the possible limitations of minimally invasive surgery in non-elective IH surgery?</p>  | <p style="text-align: center;"><i>Open answer</i></p>   |

*PI* \*: mandatory, Principal Investigator, *IH* Incisional Hernia, *US* UltraSound, *CT* Computerized Tomography, *MRI* Magnetic Resonance Imaging, *ER* Emergency Room

## Results

The online survey, for which invitations and reminders had been sent out during the two months, was filled out by a total of 104 general surgeons affiliated with 82 different surgical units from all over Italy.

All surgeons answered the questions by expressing their points of view, relying on their own experiences and their applications of national and international guidelines in this field.

All the answers maintained independent points of view even when responding surgeons (or a couple of surgeons for each department) are working in the same center because answers to specific questions express the general attitude of their departments and the individual surgeon's specific behaviors and skills.

Analyzing the principal type of surgical activities in each center, 66.3% of the surgeons reported elective surgery as the most prevalent in their departments; only 14.4% reported emergent/urgent surgery as the principal activity in their departments (1.9% reported almost exclusively urgent/emergent surgery, and 17.3% almost exclusively elective surgery).

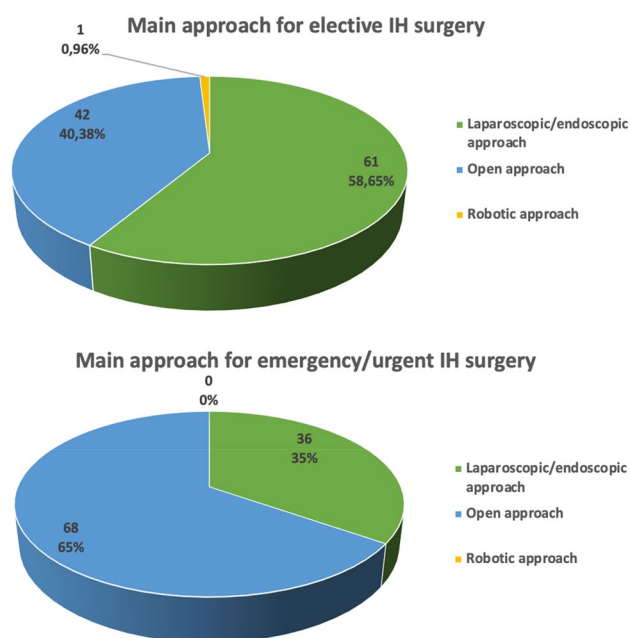
Regarding the total of elective IH surgical repairs per year in each center, 36.5% face a number between 30 and

50 cases/year, while 34.6% report a total of 10–30 cases/year; 24% handle more than fifty cases/year, and only 4.8% of the enrolled centers manage 0–10 cases/year. For elective IH repair, the preferred approach in most departments surveyed was laparoscopic/endoscopic (58.7%), while 40.3% preferred open surgery for elective surgery. In 1% of the cases, the robotic approach was preferred for IH in elective settings.

Forty-eight participants (46.2%) declared to perform between 10 and 30 urgent/emergent cases/year, 45 (43.3%) 0–10 cases/year, and the remaining 11 (10.5%) more than 30 cases/year.

In the emergent/urgent settings open surgery was the preferred approach (65.4%), followed by the minimally invasive approaches (34.6%) (Fig. 1), with a higher prevalence in the centers with a higher abdominal wall surgery volume.

Surgeons working in departments with an estimated number of 30–50 cases/year preferred the laparoscopic/endoscopic approach for IH for urgent/emergent surgery in 70% of the cases, while this percentage goes down to 39.5% for departments with a total amount of 10–30 urgent/emergent cases/year, getting to 22% of the total for departments facing 0–10 cases/years.



**Fig. 1** Different approach for elective and emergency/urgent IH surgery

The rest of the cases in urgent/emergent settings are dealt with traditional open surgery, as open surgery guarantees a broader approach to the surgical field and better control of possible intestinal strangulation and iatrogenic lesions.

Regarding the diagnostic approach to IH in urgent/emergent settings, most surgeons (99 out of 104, 95.2%) prefer a radiological confirmation of the clinical presentation using urgent CT with contrast. In elective surgery for incisional hernias, the preoperative study of the defect is usually obtained through ultrasound and/or dynamic CT, before and after the Valsalva maneuver, to improve and adapt the surgical approach to abdominal wall repair.

In case of intra-operative contamination of the surgical field due to the spillage of bowel content consequent of iatrogenic or pre-existent perforation, conversion to laparotomy was the preferred option for the 54% of the participants if a concomitant resection as needed, 20 surgeons (19.2%) did not consider appropriate to convert in any case, while 23 surgeons (22.1%) considered conversion as the only viable option in case of contamination.

Regarding the type of repair of IH, only a minority of the participants (34.6%) considered primary repair as the most appropriate; 65.4% of the participating surgeons considered the positioning of a mesh adequate. If a mesh is used, the meshes considered as the most adequate by the participants were the biological ones (30.8%), over synthetic (16.3%) and biosynthetic meshes (5%). A considerable part of the participants (13%) underlined that the criteria of the approach to

abdominal wall defect, in this case, must be the most fitting for the patient, based on a case-by-case strategy.

In the third part of the survey, a clinical case was given to the participants: a 45-year-old man getting to the ER for an IH on a previous pararectal incision with suspected strangulation to the contents of the hernial sac and a variable size of the defect. As the size of the defect increased the number of surgeons recommending a laparoscopic approach decreased and 6.7% of the participants individuated the laparoscopic technique as the preferred approach in abdominal defects of 20 cm. 21.2% of the participating surgeons indicated the open approach as the preferred one if the defect measured 3 cm (Fig. 2).

The last couple of questions of the survey was asking the opinion of the participating surgeons about the feasibility and safety of the adoption of a minimally invasive approach for IH, repair and 63.5% of the responding surgeons indicated it as a viable option in both elective and emergent settings, 3.8% of the participants considered minimally invasive surgery for IH as a valid approach only for elective procedures.

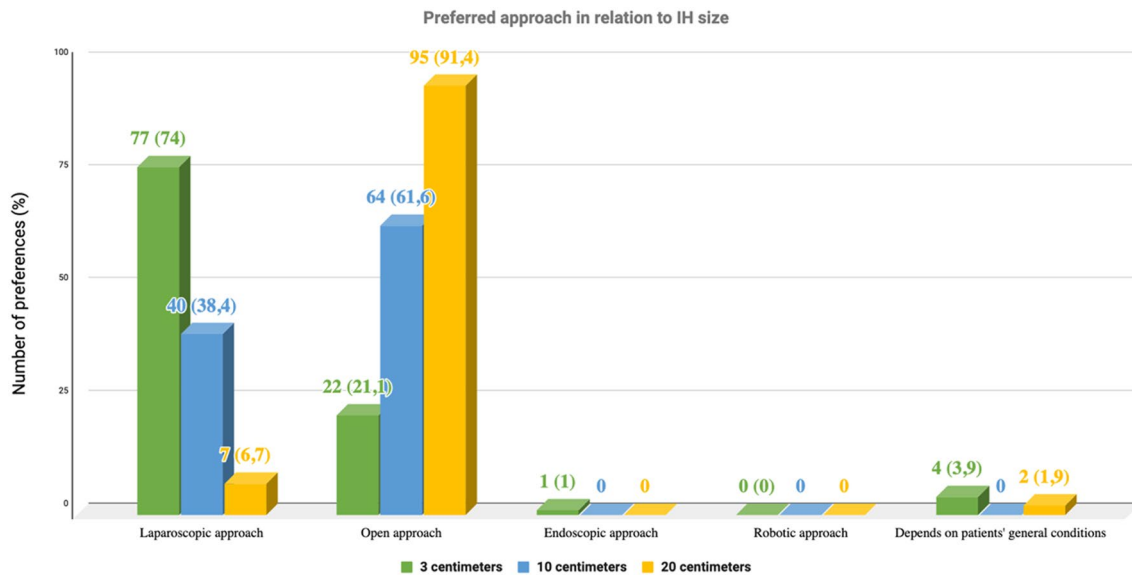
## Discussion

The present study stems from the widespread interest within SICE and ISHAWS in minimally invasive surgery and its possible application to abdominal wall surgery in routine clinical practice.

This first step, through the creation of the online survey, aims at generating a surgical network through different Italian realities, facilitating the sharing of scientific knowledge on abdominal wall surgery, with a particular focus on incisional hernias. Furthermore, the intention is to share the knowledge and casuistry of different and distant surgical units to participate in building new scientific evidence with future studies.

What resulted from the analysis of the present data, supports a gradual growth in minimally invasive surgery to manage elective and emergent/urgent IH repair. This is in line with the published literature [10]. Limitations to a minimally invasive approach for IH repair are related mainly to ongoing contaminations of the surgical site and the definition of the wall defect based on the EHS classification [11]. On the other hand, the gain in terms of reducing postoperative complications, the length of hospitalization, and recurrences are solid support for these changes.

All clinicians are conscious of the possible distance between guidelines and the clinical reality due to the specific needs at the hospital where they work, but also (and maybe even more) related to surgeons' and surgical teams' specificity and skills. For example, minimally invasive techniques are still a rarity in many elective surgical interventions



**Fig. 2** The preferred approach in relation to IH size

because of the high technical ability necessary to carry out a safe and "time-acceptable" procedure.

In urgent/emergent surgery, standardized treatments are difficult to be defined because of the patient and surgeon-related factors, depending on the acute setting definition itself.

The patient's general conditions, bowel obstruction, contamination of the surgical site, and previous surgical procedures are only a part of the "unstandardized" treatment of the abdominal hernia. Individual surgeon/surgical team skills and background, equipment availability, and the individual center's organization are influential in surgical treatment in emergent/urgent settings and even more in a technical field like abdominal wall repair.

In this perspective, the scientific analysis and the actual comprehension of the role of minimally invasive surgery in emergent/urgent surgery for primary and incisional hernias is a flourishing and dynamic field of surgical research today, with some difficulties linked to the scarcity of randomized controlled trials and adequate studies. Nevertheless, despite this technical and technological complexity, minimally invasive surgery is gaining relevance and becoming more extensively known and affirmed in Italy, especially in fields like colorectal surgery [12].

Minimally invasive techniques in abdominal wall surgery already have a thirty-year experience [13], with many complex techniques affirmed today, and encouraging results in terms of shorter hospitalization, postoperative pain, return to normal activities, and hernia recurrence [14–16].

Results from this survey show that in the clinical practice in many Italian centers, many surgeons are confident with minimally invasive techniques in IH repair. Moreover, the

percentages of minimally invasive approaches are in line with indications from international guidelines [10, 17], preferring a minimally invasive approach for wall defects under 5 cm.

The percentage of minimally invasive approaches for IH in emergent/urgent settings (Fig. 2) shows certain confidence despite possible tricky situations deriving from intestinal distention and/or vascular intestinal ischemia. These results testify to the wide spreading of laparoscopic/endoscopic techniques in abdominal wall surgery, both in scheduled and urgent procedures [18, 19].

Concerning prosthetic repair of IH in contaminated surgical fields, the most used mesh in this survey is the biological one, as in daily routine practice in many centers worldwide. The use of biological mesh in a contaminated surgical field is at the center of the storm in international scientific debate, with a relevant reduction of the direct indications for this kind of equipment [20–22]. However, the recent evidence still contrasts with actual practice, outlining the physiological time gap between a scientific finding and its application in clinical reality.

The choice of the most indicated mesh for the individual procedure is strongly influenced by the experience of the operating surgeon, the availability at the individual center, and the evaluation of the contaminating source (e.g., large vs small bowel). However, the next few years will surely see a change in this practice through an objective evaluation in the field of biosynthetic meshes and their comparison with synthetic ones.

The last section of the survey was dedicated to personal opinions on the limitations of a minimally invasive approach to IH in elective and urgent surgery.

In the first case, most of the participating surgeons outlined that limitations are mainly correlated to the extension of the defect, its location (e.g., to the borders of the abdomen), and the surgeon's skills and confidence with the minimally invasive technique.

Instead, in urgent sets, limitations to a minimally invasive approach are related to what has been mentioned above, while adding the increased total surgical procedure time, equipment availability, confidence in using all the different meshes, and need to safely handle many different techniques of IH repair, adapting them to different situations. The type of procedure the surgeon is confident with is determined mainly by the level of possible intestinal contamination of the surgical site.

Limitations of the present study are strongly related to the concept of the open survey itself: personal points of view are expressed freely in this survey, and this certainly gives space to opinions and interpretations of international and national guidelines and scientific evidence about these pathological entities. Answers are therefore more linked to personal experiences, developed in clinical practice, and based on institutional/surgical settings of different departments. This could lead to a relevant distance between answers to this survey and scientific literature.

A further bias could arise from participants' provenance: most of the responding surgeons are members of SICE and/or ISHAWs. These scientific societies have a strong calling for minimally invasive surgery. So, high confidence in laparoscopic/endoscopic or robotic approaches to IH could represent a deviation from the Italian clinical reality.

Nevertheless, a growing number of surgical departments in Italy are increasing their experience with a minimally invasive approach to abdominal wall surgery, with the desirable possibility of the future creation of dedicated specialized centers with an adequate standard in treating primitive ventral and incisional hernias.

## Conclusions

This online survey represents the desire of two Italian scientific surgical associations to stimulate a constructive debate on IH surgery and to evaluate the actual application of a minimally invasive approach for IH in different circumstances through a code-sharing modality.

The distance between the feasibility of a surgical procedure in a specific surgical unit and the national/international guidelines is the measure of actual application in clinical practice, within all the surgical variability, equipment availability, hospital needs, and indications.

Standardization is not the valid answer we are looking for, reaching a single, uniform way to approach these situations.

Instead, we aim at sailing towards a tailored surgery, fitting the specific patient with a specific procedure.

For this reason, sharing information is one of the goals of scientific associations to give clinicians the most considerable amount of verified and precise tools available to face different situations.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s13304-023-01505-8>.

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**Author contributions** Lorenzo Crepez, Alberto Sartori and Stefano Olmi contributed to the study conception and design. Lorenzo Crepez, Alberto Sartori, and Stefano Olmi performed material preparation, data collection. The first draft of the manuscript was written by Lorenzo Crepez and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Funding** The authors received no financial support for this article's research, authorship, and/or publication.

**Data availability** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request

## Declarations

**Conflict of interest** Lorenzo Crepez, Alberto Sartori, Mauro Podda, Monica Ortenzi, Alberto Di Leo, Cesare Stabilini, Michele Carlucci, and Stefano Olmi declare that they have no conflict of interest.

**Ethical approval** No ethical approval was needed for this paper.

**Informed consent** No informed consent was needed for this paper.

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