Thorac Res Pract. DOI: 10.4274/ThoracResPract.2025.2025-3-1

Review

Assessment of Worldwide Bronchoscopy Practices and Training Methods: A WABIP Survey

Silvia Quadrelli[1], Agustin Buero[2], Stefano Gasparini[3]

[1]Sanatorio Güemes University Hospital, Executive Committee WABIP, Buenos Aires, Argentina
[2]Buenos Aires British Hospital, WABIP Regent Argentinean Group of Interventional Bronchoscopy, Buenos Aires, Argentina
[3]San Raffaele Hospital, Operative Unit of Thoracic Surgery, Executive Committee WABIP, Milan, Italy

Cite this article as: Quadrelli S, Buero A, Gasparini S. Assessment of worldwide bronchoscopy practices and training methods: a WABIP survey. *Thorac Res Pract.* [Epub Ahead of Print]

Abstract

The practice of bronchoscopy is not standardized. Regional and global variations in bronchoscopy practice are exacerbated by the paucity of recommendations regarding technical aspects in major bronchoscopy guidelines. The aim of this survey was to examine the prevalent practices, adherence to guidelines, and training requirements of bronchoscopy in different countries. The Membership Committee and the Education Committee of the World Association for Bronchology and Interventional Pulmonology designed an online survey that was sent to 1,300 consultant physicians in adult respiratory medicine from 64 countries across five continents. The questionnaire included questions regarding bronchoscopy practice. We obtained 879 responses (67.0%). In 81.2% of cases, the practice occurred in cities with over 200,000 inhabitants. The median number of years in practice was 14 (range 1-50). Only 11% of respondents perform routine bronchoscopy without anesthesia. Spirometry was always performed before bronchoscopy by only 106 physicians (12.4%), blood coagulation tests were always required by 533 (60.6%) and an electrocardiography was always required by 339 (38.5%). The main indications for performing a bronchoscopy were suspicion of cancer (78.6%), suspicion of non tuberculosis (TB) infection (10.6%), and suspicion of TB (6.7%). 39.3% of responders received formal training for at least 6 months with a formal certificate. Despite the wide availability of bronchoscopy guidelines, the way to do them in terms of preparation, anesthesia, technical aspects, etc., varies greatly in each country and physician.

KEYWORDS: Bronchoscopy, interventional pulmonology, global survey

Received: 08.03.2025 ***Revision Requested:*** 29.05.2025 ***Last Revision Received:*** 10.06.2025
Accepted: 26.06.2025 ***Epub:*** 11.08.2025

INTRODUCTION

The practice of bronchoscopy is not standardized. Regional and global variations in bronchoscopy practice are exacerbated by the paucity of recommendations regarding technical aspects of bronchoscopy in major guidelines. Therefore, the practice of bronchoscopy varies based on the physician's preferences and the availability of resources. The practice relies heavily on the transmission of skills from preceptor to trainee because structured teaching or learning methodologies are not routinely implemented. The diagnostic and therapeutic utility of bronchoscopy for pulmonologists has been substantially improved by the incorporation of cutting-edge techniques. To date, a handful of investigations on the use of new technologies have revealed the heterogeneity of individual operator procedures,[1,2] and the frequent disregard for guidelines.[3,4]

The World Association for Bronchology and Interventional Pulmonology (WABIP) is a non-profit organization consisting of over 10,500 medical professionals representing over 60 regional and national societies. Not all countries have their own society; therefore, in some cases, multiple countries share a single society. As the primary objective of WABIP is to meet the educational demands of its member societies, the aim of this survey was to examine the prevalent practices, adherence to guidelines, and training requirements of flexible and interventional bronchoscopy in different countries.

This was a worldwide retrospective survey of bronchoscopic procedures. The Membership Committee and the Education Committee of the WABIP conceptualized and designed the online survey. The survey included queries

Corresponding author: Silvia Quadrelli, MD, PhD, e-mail: silvia.quadrelli@gmail.com

that were written in English. No names or other personal information, including email addresses, was requested from respondents. The questionnaire included general information, patient preparation and monitoring, sedation, and topical anesthesia, procedural/technical aspects, and bronchoscope disinfection/staff protection. The questions required either descriptive or multiple-choice responses. Some questions asked about the availability of different bronchoscopic technologies. The authors conducted a trial run in which they responded to the survey themselves and identified areas for improvement. A final section inquiring into received training and evaluation of training requirements was included. Neither second questionnaires nor reminders were sent. Comparisons were made using Student's t-test or Fisher's exact test, where appropriate.

WABIP is a federation of societies, each of which is represented by a Regent as its local society's official representative (potentially more than one for the same country). Each of the sixty-five active Regents was instructed to disseminate the survey to a minimum of five or ten and a maximum of ten or thirty members of their society, based on the number of active members in that society, in order to ensure broad participation from various countries. There were 1,300 surveys available for distribution.

The type of income of each country is classified according to the strata defined by the World Bank Group: low, lower-middle, upper-middle, and high income. For this purpose, they use gross national income per capita data in U.S. dollars, converted from local currency using the World Bank Atlas method, which is applied to smooth exchange rate fluctuations.

A few months after the survey distribution began, the outbreak of Coronavirus disease-2019 (COVID-19) significantly changed the practice of bronchoscopy. Participants were instructed to respond regarding their resources and working conditions before the modifications imposed by the pandemic. The survey was run from November 2019 to March 2021. A total of 1,300 surveys were distributed by Regents after excluding early respondents from China whose working conditions were affected by the COVID-19 outbreak.

We obtained 879 responses (67.0%). Respondents (73.6% male, age 56.2, ranging 34-70 years old) represented 64 countries across 5 continents (Table 1). 89.4% of respondents identified as pulmonologists, 4.9% as thoracic surgeons, and 1% as interventional pulmonologists. The majority of them perform bronchoscopy exclusively (55.3%) or partially (24.7%) in the public sector, referring to government-funded healthcare facilities, as opposed to privately funded institutions. In 81.2% of cases, their practice occurred in cities with over 200,000 inhabitants. The median number of years in practice was 14 (range 1-50), with 328 (37.3%) having 20 or more years and 364 (41.4%) having 10 or fewer years. Four hundred and forty-three physicians (50.3%) had performed 200 or more bronchoscopies in the previous year, compared to 278 physicians (31.6%) who reported that they did not manage to perform as many procedures.

The most prevalent method (n = 729, 82.9%) for nasal lignocaine administration was lignocaine jelly. Five hundred and nine physicians (57.9%) utilized nebulized lidocaine for topical anesthesia either routinely or intermittently. The concentration of lignocaine used most frequently (534, or 60.9%) for nebulization was 2%. A substantial number (n = 744, 84.7%) used 10% lignocaine spray for pharyngeal anaesthesia either routinely or occasionally.

Only 11% of respondents perform routine bronchoscopy without anaesthesia. For sedation, only 2.7% of physicians used opiates alone, 14.3% used benzodiazepines alone, and 44.3% used a combination of benzodiazepines and opiates. 51% of respondents routinely administered propofol, and 7% administered fentanyl. 13.3% of physicians preferred general anaesthesia, while 12.5% completed more than 50% of procedures without sedation. Only 1% of bronchoscopists deferred to the anesthesiologist for sedation protocol decisions. The majority of respondents added that they chose the mode

Main Points

- The practice of bronchoscopy is not standardized worldwide, with significant regional variations influenced by physician preferences, resource availability, and the lack of specific technical recommendations in major guidelines.
- Most bronchoscopists prefer to perform procedures with intravenous sedation, often using a combination of benzodiazepines and opiates. Despite limited supporting evidence, routine pre-bronchoscopy tests such as coagulation studies and electrocardiography are frequently requested.
- Advanced bronchoscopic technologies, such as EBUS and cryobiopsy, are available in many centers regardless of a country's income level, yet access remains uneven. Formal bronchoscopy training is inconsistent, with a significant proportion of practitioners learning through mentorship or self-training rather than structured certification programs.
- While most bronchoscopists follow protective measures, adherence varies. For example, fewer than half of the staff work in bronchoscopy suites with high-efficiency particulate air filters for tuberculosis cases, and close-fitting eyewear is used less consistently than gowns.
- The presence of specialized support staff, the role of anesthesiologists in sedation, and the availability of equipment vary significantly across institutions and economic settings. High-income countries are more likely to have structured training programs and anesthesia-administered sedation, whereas lower-income settings often rely on bronchoscopist-led sedation and informal training methods.

Table 1. Regional distribution of participants

North America	120	14%
South America	149	17%
Europe	269	31%
Asia	279	32%
Oceania	39	4%
Africa	23	3%

of sedation based on the type of procedure. Anesthesiologists administered sedation in 37.1% of cases, bronchoscopists in 34.5%, and nurses in 19% of cases. In countries with high income, anesthesiologists were in charge of sedation significantly less frequently (24.3%, $P < 0.001$) compared to countries with middle income (41.5%) or upper middle income (53.8%).

Spirometry was always performed before bronchoscopy only by 106 physicians (12.4%), blood coagulation tests were always required by 533 (60.6%) and an electrocardiography (ECG) was always required by 339 (38.5%) and frequently by 167 (19%).

The support measures implemented during the procedure are outlined in Table 2. The vast majority of bronchoscopists routinely give oxygen supplementation during bronchoscopy; 86% maintain intravenous (IV) access throughout the procedure. All respondents reported having resuscitation equipment immediately available in the event of complications. Details of protective equipment worn by physicians are shown in Table 3. Nearly half of the responders (n = 413, 46.9%) have access to high-efficiency particulate air (HEPA) filters in the bronchoscopy suite during procedures with a suspected or known diagnosis of tuberculosis, but 254 (28.9%) never have access to that protection. Even when 73.8% of responders always wore gowns, only 30% routinely wore close-fitting eyeglasses. Seven hundred ninety-seven physicians, (90.7%) had received vaccination against hepatitis.

The main indications for performing a bronchoscopy were suspicion of cancer, (n = 691, 78.6%), non-tuberculous infection (n = 94, 10.6%), tuberculosis (n = 59, 6.7%).

All participants said that their bronchoscopy department offered bronchial biopsies, with 819 (93.1%) offering conventional transbronchial biopsies and 447 (50.8%) offering transbronchial needle aspiration. A total of 388 respondents, accounting for 44.1% of the sample, reported working in a unit where EBUS was utilised. Laser utilization was reported by 200 respondents, representing 22.7% of the sample, while electrocautery was used by 319 respondents, accounting for 36.2%. Three hundred thirty-nine responders (38.5%) informed that airway stents were placed at their unit, and 268 (30.4%) included cryotherapy in the practice of their center. Three hundred and twenty-six endoscopists (37.1%) had access to cryobiopsy, and 188 (21.3%) also placed valves or coils as part of their clinical practice.

Table 4 shows that physicians in countries with a high or upper middle income were overrepresented in this sample. In countries with a lower middle income, cryobiopsy was significantly less available ($P < 0.05$). Intriguingly, the proportion of respondents working in centres with access to other more costly technologies was independent of the average national income (Table 5).

Only 37 respondents (4.2%) reported not having access to a videobronchoscope, independent of the general income of their country. Less than half of the respondents used fluoroscopy when performing a transbronchial biopsy, in all cases (n = 231, 26.2%) or frequently (n = 127, 14.4%). Only 3 respondents reported performing the procedures without any help from ancillary personnel; the remaining had the support of 1-4 nurses or technicians. The average number of ancillary personnel was 2.09±0.7 with no significant difference between public and private facilities. Even when 347 responders (39.3%) received a formal training for at least 6 months with a formal certificate of training (post residency courses, masters, diplomas, fellowships, etc.), 337 bronchoscopists (37.2%) did not received any sort of training and learned by working with a mentor, practicing during pulmonary residence, or simply self-training. Among the 347 physicians who had received formal training of at

Table 2. Frequency of use of monitoring and support during bronchoscopy

	Always	Frequently	Occasionally	Never
Pulse oximetry	867 (98.5%)	10 (1.1%)	3 (0.3%)	0 (0%)
Use of supplemental oxygen	765 (86.9%)	70 (8%)	45 (5.1%)	0 (0%)
ECG monitoring	610 (69.3)	117 (13.3%)	130 (14.8%)	23 (2.6%)
Venous cannula	758 (86.1%)	60 (6.8%)	37 (4.2%)	25 (2.8%)
Blood pressure monitoring	730 (83%)	78 (8.9%)	64 (7.3%)	8 (0.9%)
Wearing gloves	872 (99.1%)	5 (0.6%)	3 (0.3%)	0 (0%)
Wearing face masks	737 (83.2%)	60 (6.8%)	65 (7.4%)	18 (2%)
Wearing close fitting eye glasses	269 (30%)	174 (19.8%)	341 (38.8%)	96 (10.9%)

ECG: electrocardiography

Table 3. Frequency of adherence to safety practices measures before or after the procedure

	Always	Frequently	Occasionally	Never
Minimum 20 min of disinfection	801 (91%)	49 (5.6%)	8 (0.9%)	22 (2.5%)
Minimum of 60 min of disinfection when suspicion of tuberculosis	628 (71.4%)	118 (13.4%)	81 (9.2%)	53 (6%)
Rinsing with sterile or filtered water	689 (77.2%)	80 (9.1%)	59 (6.7%)	53 (6%)

least 6 months with certification, 173 (49.8%) practiced in a high-income country, 127 (36.5%) in an upper-middle-income country, and 45 (13%) in a lower-middle-income country. Only 45 physicians (28%) practicing in lower-middle-income countries had a formal certification of training vs 174 (40.6%) in high-income countries ($P \leq 0.05$) (Table 6).

DISCUSSION

This survey is a comprehensive representation of bronchoscopy practices around the world. Despite the diverse origins of the participants (65 countries from 6 regions on 5 continents), there are remarkable similarities in certain aspects of the practice.

Table 4. Type of training received by the participants

	n	%
Formal training for at least 6 months with a formal certificate of training (post residency courses, masters, diplomas, fellowships, etc.)	347	39.3
Formal training for at least 6 months without a formal certificate of training (post residency courses, masters, diplomas, fellowships, etc.)	140	15.9
Formal training shorter than 6 months	54	6.1
Informal training (practice with an experienced bronchoscopist)	157	17.8
Practice during residence	160	18.2
Self-training	20	2.3

Table 5. Frequency of availability of different procedures according to the general income of the country of the responders

Practice	High income (n = 428)	Upper middle income (n = 290)	Lower middle income (n = 159)
Conventional TBB	412 (96%)	290 (100%)	129 (81%)
TBNA	183 (43%)	165 (57%)	98 (62%)
EBUS	140 (33%)	157 (54%)	90 (57%)
Laser	37 (9%)	63 (22%)	50 (31%)
Electrocautery	109 (25%)	125 (43%)	84 (53%)
Stents placement	128 (30%)	129 (40%)	81 (51%)
Cryotherapy	102 (24%)	103 (36%)	63 (40%)
Valves or coils placement	53 (12%)	90 (31%)	35 (22%)
Cryobiopsy	211 (49%)	89 (31%)	26 (16%)

TBB: transbronchial needle aspiration

Table 6. Distribution of national income of the country of the responders (World Bank)

Income	n	%
High	428	48.6%
Upper middle	290	32.9%
Lower middle	159	19.1%
Lower	1	0.1%

Greater adherence to safety practices recommendations than previously reported, the frequent requirement of pre-bronchoscopy tests without solid evidence of their utility, the widespread use of sedation, and the greater availability of complex technology compared to the formal training required to manage it appeared to be fairly consistent across countries.

Despite the lack of substantial evidence, certain practices continue to be performed routinely. In patients without coagulopathy, the risk of haemorrhage is <1%, whereas it can reach 7.5% in those with an abnormal coagulation profile.[5] Several retrospective studies in patients undergoing transbronchial lung biopsy (TBLB) showed that routine coagulation testing could not predict the risk of post-TBLB bleeding.[6]

The majority of guidelines[7-9] do not recommend routinely conducting coagulation studies, platelet counts, and haemoglobin levels prior to bronchoscopy. Instead, these tests are reserved for patients with clinical risk factors for bleeding, such as ongoing anticoagulation, bleeding diathesis, and chronic liver and kidney disease. Nonetheless, 60.6% of respondents always request routine blood tests that include coagulation.

There is no consensus on a specific minimum age for patients without specific cardiovascular risk factors, and the majority of recommendations suggest that ECG may be indicated only for patients with known cardiovascular risk factors.[10,11] Despite this, an ECG is always requested 40% of bronchoscopies. The widespread practice of ordering ECGs might be a result of the comorbidities of many patients who are candidates for it, driven by institutional protocols, defensive medicine, or routine habits, rather than individual anesthesiologists' decisions. The indication for routine spirometry was only 12%, which is significantly lower than the prevalence among Australian-New Zealand bronchoscopists,[12] but more comparable to the practice in Italy.[13] Even when it has been cited as a limitation due to the high prevalence of chronic obstructive pulmonary disease in bronchoscopy candidates, there is no evidence that sedation increases the rate of complications.[14,15]

According to the guidelines by the American Institute of Health Architects and the Centers for Disease Control and Prevention in 2003, it is recommended that procedures that induce coughing, such as bronchoscopy, be conducted in rooms equipped with HEPA filters. Additionally, these guidelines suggest that the air should be directly exhausted to the external environment, in accordance with the guidelines and documents.[16-18] Several sources suggest that in cases where the recirculation of air cannot be avoided, the expulsion of exhaust air outdoors should be directed away from patient care areas. Additionally, the utilization of HEPA filters is deemed necessary. Nevertheless, fewer than half of the respondents reported working in a room equipped with a HEPA filter, even when conducting bronchoscopy procedures on patients suspected, or confirmed to have tuberculosis.

The majority of physicians adhere to the guidelines for protective measures. However, it is noteworthy that the use of gowns was more consistently observed compared to the use of close-fitting eyeglasses, which were only regularly worn

by 30% of the participants. The survey specifically requested responses regarding practices before the onset of the COVID-19 pandemic, and it is evident that these practices have inevitably undergone changes both during and in the aftermath of the pandemic.

A considerable proportion of respondents reported being employed in facilities that possess extensive access to state-of-the-art technology, regardless of the welfare status of the nation. The composition of physicians in a global association is likely to exhibit bias, since it attracts individuals who are inclined towards engaging in the practice of contemporary and costlier advanced[19] while a survey in Cairo showed that several bronchoscopists performed electrocautery, cryotherapy, argon plasma coagulation, endobronchial ultrasound, laser therapy, auto-şuorescence bronchoscopy, and balloon dilatation.[20] It is noteworthy that numerous facilities, despite possessing costly equipment like lasers, valves, or coils, lack access to a more affordable and highly cost-effective technology like cryobiopsy. Interestingly, the accessibility of cryobiopsy is contingent upon the income level of the country.

In our research, a majority of bronchoscopists indicated a preference for conducting the procedure with the aid of IV sedation, whereas 12% expressed a preference for utilising solely local anaesthesia. The findings of the Australia and New Zealand survey, indicate a lack of major divergence from the results mentioned, since 94% of respondents reported providing IV sedation, assuming there were no contraindications. Similarly, the UK survey revealed that only 10% did not offer any form of sedative regimen. A survey conducted in India found that the prevailing practice (59.4%) for bronchoscopy involved solely the use of topical anaesthesia, without any accompanying conscious sedation. Despite several concerns regarding the safety of sedation and the potential for severe consequences, multiple studies have demonstrated the following: a notable enhancement in patient tolerance through the utilization of IV sedation;[20,21] a reduced necessity for pausing or cancelling the procedure; and the absence of any further difficulties, except for a more profound though reversible decline in oxygen saturation.[15] Additionally, the Putinati et al.[21] study exhibited a noteworthy decrease in the frequency of abandoned procedures resulting from patient resistance when sedation was administered. A study that conducted a meta-analysis of nine studies to assess the safety and effectiveness of moderate sedation in the context of bronchoscopy revealed that participants who received sedation were more inclined to undergo the procedure again, and the duration of the procedure was shorter compared to those who did not receive sedation. Additionally, the occurrence of hypoxic episodes was found to be similar in both groups.[22]

The requirement for sedation is expected to exhibit variability across patients, possibly influenced by the level of explanation and reassurance provided by healthcare professionals.

The study participants predominantly employ a dual-drug sedation protocol, irrespective of the delivering personnel (i.e., bronchoscopist, anaesthetist, or nurse). There was no statistically significant disparity observed in the sedation usage rate between the private and public healthcare settings. However, it is noteworthy that in less than 40% of cases, the administration of sedation was performed by an anesthesiologist. A Latin American survey showed that sedation performed by a bronchoscopist was deemed “safe” or “quite safe” by approximately two-thirds of respondents, and, one-third believed that the bronchoscopist should “always” or “almost always” be in charge of the sedation.[22,23]

Despite the absence of agreement among other regional surveys, our study revealed that bronchoscopists, across various countries and working in both the public and private sectors, strongly endorse the regular utilisation of sedation. This endorsement is likely a result of advancements in sedation techniques, drugs, and monitoring, as well as the evidence presented by numerous studies.

The majority of societal recommendations, specifically those from India, BTS, and Argentina, propose that the provision of IV sedation be considered as a means to enhance patient tolerance during bronchoscopy. The American College of Chest Physicians strongly recommends the use of topical anaesthesia, analgesia, and sedation in all patients having bronchoscopy, unless there are specific reasons not to do so. This approach is advocated due to its potential to improve patient tolerance and satisfaction throughout the procedure.[24]

The utilization of propofol in the endoscopy suite by non-anesthesiologists is contentious and depends on regional rules. Our design did not facilitate the determination of the frequency with which an anesthesiologist was present during the administration of propofol. Patients who are administered propofol should undergo monitoring and get appropriate care in accordance with the standards for deep sedation. In cases where propofol is provided by non-anesthesia workers, it is essential that these individuals possess the necessary qualifications to effectively manage patients whose level of sedation exceeds the initially anticipated depth. The majority of guidelines[7,9,24] emphasise that the administration of IV sedation using midazolam or fentanyl by the proceduralist is safe. However, it is advised that propofol administration be carried out by an anesthetist or medical staff who have received specialized training. Differences in local protocols, resource availability, and task delegation contribute to the lower involvement of anesthesiologists in sedation practices in high-income countries, where sedation is often managed by pulmonologists or trained nursing staff.

Any additional analysis must acknowledge the significant limitations of the study. The fact that the respondents were all members of the WABIP suggests that they have a special interest in bronchoscopy that may not be shared by the numerous general pulmonologists who perform bronchoscopy in various countries. Second, the proportion of respondents disproportionately represents physicians practicing in upper-middle-and high-income countries, whereas only a negligible proportion of members practice in low-income countries. Even though WABIP membership dues are kept intentionally low (5 U.S. dollars per year) in order to remove membership costs as a barrier to participation, countries with greater unmet health care needs may have distinct priorities, resources, training opportunities, and practice conditions. The third limitation is

that China is absent from this survey. China is home to a sizable proportion of WABIP members who operate in a variety of bronchoscopy facilities. Lastly, as with any survey, those who respond to a questionnaire about bronchoscopy represent a biased population with a particular interest in bronchoscopy practice and/or working in more specialised centres.

CONCLUSION

One noteworthy observation is that nearly 40% of physicians, despite being deeply committed to bronchoscopy and operating in technologically advanced centres, did not undergo any form of formal training. Another limitation of the study is that only 1% of the respondents are interventional pulmonologists. Instead, many acquired their skills through mentorship, practical experience during pulmonary residency, or self-directed learning. There is a significant disparity in the proportion of physicians who received formal training, with a higher frequency observed among those practicing in high-income countries compared to the 28% practicing in lower-middle-income countries. The previously mentioned statement highlights the limited availability of formal training options in certain nationsas well as the lack mandatory certification for individuals in bronchology facilities equipped with costly and intricate technology. The training programmes for respiratory endoscopy exhibit significant heterogeneity across many countries, irrespective of their comparable levels of economic development. Numerous countries and scientific organisations continue to depend on the completion of a specific set of procedures. The prevailing criterion is evidently inadequate; the sufficient quantity of bronchoscopies performed does not guarantee the attainment of adequate competence. The global implementation of comprehensive and standardised training curricula is important. The responsibility for conceptualising and implementing these programmes primarily lies with scientific societies. However, bronchoscopy technology companies should demonstrate responsible behaviour by incorporating, in addition to a successful marketing strategy, training opportunities that enable countries, regardless of their economic resources, to acquire the necessary competence for utilising these technologies effectively. Simultaneously, it is imperative for health care authorities to collaborate with scientific societies to enhance training opportunities, establish regulations for certification in performing intricate procedures, and ensure advantageous incentives for individuals who invest in their bronchoscopy education so they can practice with the utmost proficiency.

Ethics

Acknowledgements

We express our thanks to Michael Mendoza for his logistic support. Furthermore, we acknowledge to all the Regents of the World Bronchology Association for their dedication and coordination in facilitating the surveys across their respective countries.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.Q., A.B., S.G., Concept: S.Q., S.G., Design: S.Q., S.G., Data Collection or Processing: S.Q., A.B., Analysis or Interpretation: S.Q., A.B., Literature Search: S.Q., Writing: S.Q., A.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Niwa H, Tanahashi M, Kondo T, et al. Bronchoscopy in Japan: a survey by the Japan Society for Respiratory Endoscopy in 2006. *Respirology*. 2009;14(2):282-289. [Crossref]
2. Smyth CM, Stead RJ. Survey of flexible fibreoptic bronchoscopy in the United Kingdom. *Eur Respir J*. 2002;19(3):458-463. [Crossref]
3. Honeybourne D, Neumann CS. An audit of bronchoscopy practice in the United Kingdom: a survey of adherence to national guidelines. *Thorax*. 1997;52(8):709-713. [Crossref]
4. Wahidi MM, Rocha AT, Hollingsworth JW, Govert JA, Feller-Kopman D, Ernst A. Contraindications and safety of transbronchial lung biopsy via flexible bronchoscopy. A survey of pulmonologists and review of the literature. *Respiration*. 2005;72(3):285-295. [Crossref]
5. Facciolongo N, Patelli M, Gasparini S, et al. Incidence of complications in bronchoscopy. Multicentre prospective study of 20,986 bronchoscopies. *Monaldi Arch Chest Dis*. 2009;71(1):8-14. [Crossref]
6. Cumulated Index Medicus. 1999;40. [Crossref]
7. Mohan A, Madan K, Hadda V, et al. Guidelines for diagnostic flexible bronchoscopy in adults: Joint Indian Chest Society/National College of chest physicians (I)/Indian association for bronchology recommendations. *Lung India*. 2019;36(Supplement):S37-S89. [Crossref]
8. Du Rand IA, Blaikley J, Booton R, et al. British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults: accredited by NICE. *Thorax*. 2013;68(Suppl 1):i1-i44. [Crossref]
9. Asociación Argentina de Broncoesofagología. Consenso de la Asociación Argentina de Broncoesofagología para la realización de fibrobroncoscopia. *Rev Am Med Resp*. 2009;9:196-209.
10. Correll DJ, Hepner DL, Chang C, Tsen L, Hevelone ND, Bader AM. Preoperative electrocardiograms: patient factors predictive of abnormalities. *Anesthesiology*. 2009;110(6):1217-1222. [Crossref]
11. Committee on Standards and Practice Parameters; Apfelbaum JL, Connis RT, et al. Practice advisory for preanesthesia evaluation: an updated report by the American Society of Anesthesiologists task force on preanesthesia evaluation. *Anesthesiology*. 2012;116(3):522-538. [Crossref]
12. Barnett AM, Jones R, Simpson G. A survey of bronchoscopy practice in Australia and New Zealand. *J Bronchology Interv Pulmonol*. 2016;23(1):22-28. [Crossref]
13. Facciolongo N, Piro R, Menzella F, et al. Training and practice in bronchoscopy a national survey in Italy. *Monaldi Arch Chest Dis*. 2013;79(3-4):128-133. [Crossref]

14. Grendelmeier P, Tamm M, Jahn K, Pflimlin E, Stolz D. Flexible bronchoscopy with moderate sedation in COPD: a case-control study. *Int J Chron Obstruct Pulmon Dis*. 2017;12:177-187. **[Crossref]**
15. Solis M, Hernandez M, Duran C, Dure R, Quadrelli S. A prospective study of the safety of flexible bronchoscopy under propofol sedation in patients with and without chronic obstructive pulmonary disease. *J Pulm Respir Med*. 2017;7(6). **[Crossref]**
16. Madan K, Mohan A, Agarwal R, Hadda V, Khilnani GC, Guleria R. A survey of flexible bronchoscopy practices in India: the Indian bronchoscopy survey (2017). *Lung India*. 2018;35(2):98-107. **[Crossref]**
17. Jensen PA, Lambert LA, Iademarco MF, Ridzon R; CDC. Guidelines for preventing the transmission of Mycobacterium tuberculosis in health-care settings, 2005. *MMWR Recomm Rep*. 2005;54(RR-17):1-141. **[Crossref]**
18. Lee JY. Tuberculosis infection control in health-care facilities: environmental control and personal protection. *Tuberc Respir Dis (Seoul)*. 2016;79(4):234-240. **[Crossref]**
19. Issaka A, Adjeso T, Yabasin IB. Flexible bronchoscopy in Ghana: initial experience in a tertiary hospital. *Pan Afr Med J*. 2021;38:298. **[Crossref]**
20. Madkour A, Al Halfawy A, Sharkawy S, Zakzouk Z. Survey of adult flexible bronchoscopy practice in Cairo. *J Bronchology Interv Pulmonol*. 2008;15(1):27-32. **[Crossref]**
21. Putinati S, Ballerin L, Corbetta L, Trevisani L, Potena A. Patient satisfaction with conscious sedation for bronchoscopy. *Chest*. 1999;115(5):1437-1440. **[Crossref]**
22. Hong KS, Choi EY, Park DA, Park J. Safety and efficacy of the moderate sedation during flexible bronchoscopic procedure: a systematic review and meta-analysis of randomized controlled trials. *Medicine (Baltimore)*. 2015;94(40):e1459. **[Crossref]**
23. Rubinstein-Aguñín P, García-Choque MA, López-Araoz A, Fernández-Bussy S; Latin American Thoracic Association. Sedation for bronchoscopy: current practices in Latin America. *J Bras Pneumol*. 2020;46(1):e20180240. **[Crossref]**
24. Wahidi MM, Jain P, Jantz M, et al. American College of Chest Physicians consensus statement on the use of topical anesthesia, analgesia, and sedation during flexible bronchoscopy in adult patients. *Chest*. 2011;140(5):1342-1350. **[Crossref]**