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Application of a Flexible Bronchoscopy Program in Critically Ill Patients in the Emergency Department

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ABSTRACT

Background: Flexible bronchoscopy is an excellent and relatively safe diagnostic and therapeutic tool. It is widely performed by non-pulmonologist physicians in controlled areas such as intensive care units. Due to the high volume of workload in emergency departments, flexible bronchoscopy programs are difficult to implement in critically ill patients.

Objectives: To determine the indications, complications, operational effectiveness, and feasibility of a flexible bronchoscopy program in critically ill patients performed by non-pulmonologist physicians (emergency medicine specialists) in the emergency department of an urban general hospital.

Methods: This is a retrospective, descriptive cohort study of flexible bronchoscopies performed by emergency medicine specialists over a 2-year period in the emergency department in 53 critically ill patients, both intubated and non-intubated. Demographic data, including age, gender, indications, comorbidities, pre- and post-bronchoscopy hemodynamic and ventilatory parameters, pre and post bronchoscopy chest imaging, and complications were recorded. Results were analyzed using descriptive statistics.

Results: During the study period, 53 patients underwent flexible bronchoscopy. 64.8% of the patients were intubated and undergoing mechanical ventilation, and 30.2% underwent flexible bronchoscopy while the patient was awake. The main indication for bronchoscopy was severe pneumonia in 43.3% of the patients, followed by hemoptysis in 18.9%. Bronchoalveolar lavage (BAL) was the most frequently performed bronchoscopic procedure (81.1%). Radiological improvement was achieved in 84.9% of patients, with a complication rate of 1.9%.

Conclusions: The results show that the use of a flexible bronchoscopy program by emergency medicine specialists is effective and safe for the diagnosis and treatment of severe respiratory illnesses in general hospitals.

Keywords: Flexible bronchoscopy, Emergency medicine, Critically ill patient

Abbreviations: CVD: Cerebrovascular Disease; SP Post: Post-Bronchoscopy Systolic Blood Pressure; DP: Post-Bronchoscopy Diastolic Arterial Pressure; HR: Heart Rate Post-Bronchoscopy; RR: Post-Bronchoscopy Respiratory Rate; O_2 Sat: Post-Bronchoscopy Oxygen Saturation; FiO_2: Inspired Fraction of Oxygen; ID: Internal Diameter; DE: Outside Diameter; HBP: Systemic Arterial Hypertension; DM: Diabetes Mellitus; COPD: Chronic Obstructive Pulmonary Disease; CVD: Cerebrovascular Disease; HIV: Human Immunodeficiency Virus; ARDS: Acute Respiratory Failure Syndrome; BAL: Bronchoalveolar Lavage; RR: Respiratory Rate; Sat O_2: Oxygen Saturation; mmHG: Millimeters of Mercury; bpm: Beats Per Minute; rpm: Breaths Per Minute; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure

INTRODUCTION

Flexible bronchoscopy is an excellent diagnostic-therapeutic tool that is relatively safe when applied appropriately to the right patient with the correct indications by trained medical personnel [1]. The increasing availability of single-use bronchoscopes has allowed its use to extend beyond the field of pulmonology (Critical Care, Emergency Medicine, Anesthesiology) [2]. These devices allow bronchoscopy to be performed at the patient's bedside regardless of the area where the patient is located, "bringing care to the patient" [2]. The indications are multiple; however, few studies and programs have explored its application beyond airway management or percutaneous tracheostomies outside of controlled areas such as intensive care units (ICU) [3]. In

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areas such as emergency services, there are few formal training and application programs for flexible bronchoscopy. Factors such as the low availability of bronchoscopy equipment, lack of a specific area for bronchoscopies, and lack of training make the implementation of mobile flexible bronchoscopy programs complex [4]. However, since the development of more accessible single-use flexible bronchoscopes, as well as trained personnel, the application of this technique can be made possible in areas as dynamic as emergency services [5].

RELEVANCE

The use of bronchoscopy in critically ill patients requires timely intervention for conditions such as early management of atelectasis, removal of abundant secretions, management of severe pneumonia (culture collection), hemoptysis, and management of airway obstruction (foreign bodies). These, when managed promptly and effectively, can directly influence the patient's prognosis. However, the availability of early bronchoscopy is limited in the public health system.

STUDY DESIGN

The objective of this retrospective study was to determine the main indications (other than airway management-intubation), outcomes, and complications of flexible bronchoscopy performed in the emergency department by non-pulmonologist physicians in a general hospital.

DESIGN

A retrospective, descriptive cohort study of flexible bronchoscopies performed over a 2-year period in the emergency department of HGR No. 1 "Dr. Carlos MacGregor Sánchez Navarro." The study was conducted in a second-level urban regional general hospital with an approximate annual influx of 70,000 patients, 86% of whom were adults and 14% were pediatric patients.

TRAINING OF MEDICAL PERSONNEL

During the two-year study period, selected members of the attending medical staff and final-year residents specializing in medical-surgical emergencies were trained in flexible bronchoscopy by the department head. Initially, they were informally trained, and later underwent formal training. Bronchoscopies performed by attending physicians and residents were fully supervised by the department head. The average training time was 40 h at the beginning and 60 h at the end of the program. The training consisted of four phases: the initial phase with theoretical sessions on basic flexible bronchoscopy, indications, contraindications, and complications; a second phase with hands-on practice using high-fidelity simulation models; once completed, the third phase involved the physician acting as an assistant during bronchoscopies on real patients in the emergency room; and the fourth phase involved the performance of flexible bronchoscopies by attending physicians and residents.

PROCESS DETAILS

During the study period, different models of single-use flexible bronchoscopes were used, depending on availability (because they were purchased by the same residents and assigned physicians), being the ones used in the study: Ambu ® aScope ™ 3 Broncho , Ambu ® aScope ™ 4 Broncho initially with the Ambu ® aView ™ monitor and later using Ambu ® aView ™ 2 Advanced , in addition, the Vathin Normal / Extra bronchoscope (Vathin Medical Instrument Co., Ltd) connected to its digital video monitor was used , at the end of the study the HugeMed BR-M40 bronchoscope (Shenzhen) was also used Hugemed Medical Technical Development Co., Ltd) connected to a digital video monitor. The external diameters of the bronchoscopes used were 5.0 mm with a 2.2 mm working channel, 5.8 mm with a 2.8 mm working channel, 4.9 mm with a 2.2 mm working channel, 6.2 mm with a 3.2 mm working channel, and 4.0 mm with a 2.0 mm working channel. Bronchoscopies were performed both in intubated patients under general anesthesia and in awake patients under light sedation administered by the bronchoscopy team staff. A swivel adapter was used in all intubated patients to maintain mechanical ventilation during the procedure, and a Williams airway was used in all awake patients to facilitate tracheal access.

PATIENT SELECTION

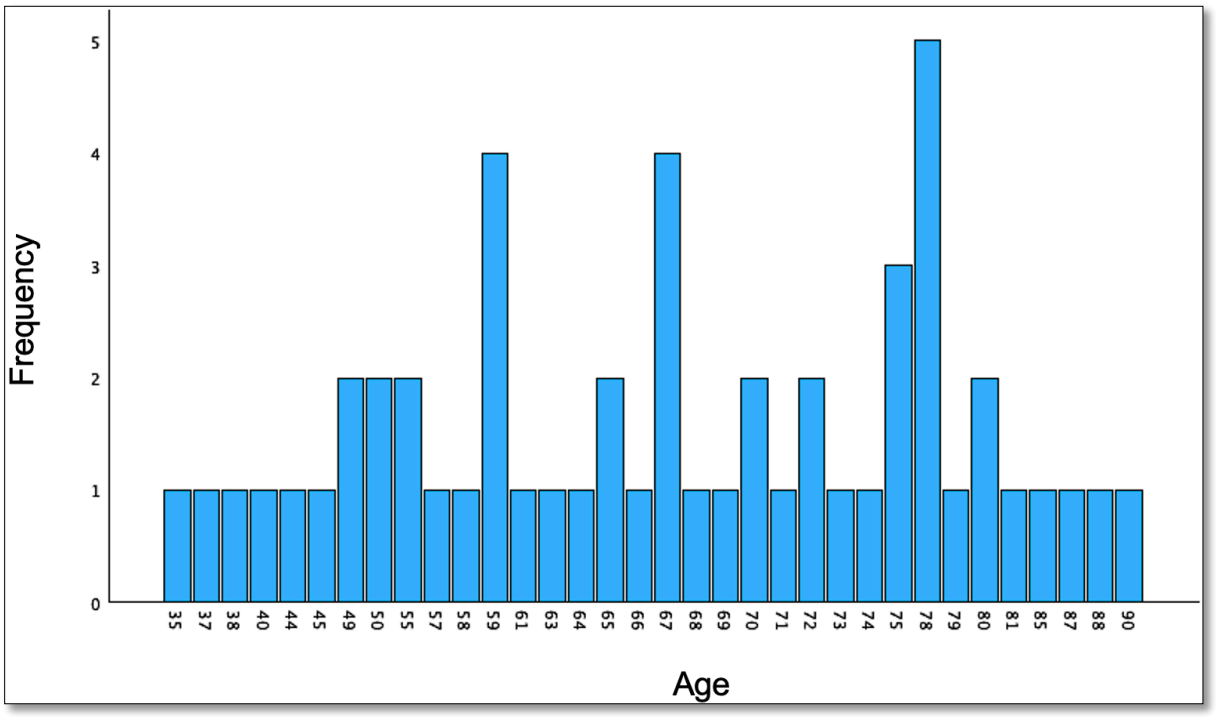
All reported patients were documented based on a bronchoscopy procedure record from May 1, 2023, to May 31, 2025. All bronchoscopies were performed with prior authorization, under the signature of the informed consent authorized by the patient's family, explaining in detail the procedure, indications, risks, potential complications, in the case of awake patients, the entire procedure was also explained to the patient, from sedation and analgesia to the performance of the procedure.

All bronchoscopies were recorded in a video file on the device itself for analysis and subsequent reporting. A post-study patient clinical record was completed and added to the patient's medical record. The procedure was also documented on video using an external camera with a panoramic view of the entire procedure, always safeguarding the patient's identity for subsequent analysis, evaluation, and process improvement. At the end of each procedure, the patient and/or family member were always informed of the bronchoscopy results.

DATA ANALYSIS

A researcher, independent of the hospital and the specialty, analyzed the database obtained from flexible bronchoscopy reports and patient records and performed statistical analysis using SPSS (IBM SPSS Version 27). Patient demographic data, age, **(Graphic 1)** gender, medical history, indications for bronchoscopy, and procedural details were collected **(Table 1).** Pre- and post-procedure vital signs, type of

sedation and analgesia, whether any type of neuromonitoring was used, complications, type of previous imaging study, radiological results, sample collection, etc. were recorded. In addition, the type and brand of bronchoscope, and size of endotracheal tube in intubated patients were documented. The protocol established a safety margin of at least 2 mm between the internal diameter of the endotracheal tube and the external diameter of the bronchoscope in intubated patients. A thorough analysis of the indications for bronchoscopy, sedation and analgesia strategies, and potential risks was performed by the bronchoscopy team in all patients. The critical bronchoscopy teams consisted of four final-year emergency department residents who had previously completed the first three phases of training and were trained to perform various roles within the team (primary bronchoscopist, bronchoscopist's assistant, patient monitoring - patient stabilization physician, and general assistant), as well as an assigned physician and/or supervision of the head of the service. In all procedures, sedation and analgesia were provided by team members.



Graph 1. Age range of patients.

Table 1. Gender of patients.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Female	27	50.9	50.9	50.9
	Male	26	49.1	49.1	100.0
	Total	53	100.0	100.0	

Severe hypoxemia is defined as a patient with an oxygen saturation of less than 80 without improvement despite low-flow, high-flow, or invasive mechanical ventilation strategies.

Hemodynamic instability was defined as patients with systolic BP less than 90 despite management with crystalloids and/or vasoactive amines, tachycardia greater than 120 beats per minute, recent ischemic heart disease within 1 month, and clinical data of acute heart failure.

Minor complications were defined as those patients who, during or after the procedure, presented hypoxemia of 90-80 oxygen saturation, who responded to the removal of the bronchoscope and/or adjustment of the fraction of inspired oxygen (FiO_2) and ventilator parameters VF (ventilatory frequency), TV (Tidal Volume), PEEP (positive end-

expiratory pressure) in the case of patients under mechanical ventilation, transient tachycardia of 120 beats per minute or less, bradycardia 59-50 beats per minute, transient systolic arterial hypotension 89-80 mmHg.

PRIMARY DATA ANALYSIS

Patient characteristics and history, indications for bronchoscopy, vital signs, type of sedation, procedure results, etc. were analyzed using descriptive techniques, frequencies, percentages, medians, and intervals and are represented as appropriate.

RESULTS

During a 2-year period, 53 bronchoscopies were documented, performed in the emergency department of Regional General Hospital No. 1. "Dr. Carlos MacGregor Sánchez Navarro" by specialist physicians and final-year residents in emergency medicine. A sample of n=53 is presented, 50.9% were female and 49.1% male. The mean age was 52.3 years. Of the total bronchoscopies, 69.8% were performed with the patient intubated under mechanical ventilation and 30.2% with the patient awake under light sedation and/or laryngeal-tracheal block. The main diagnoses for performing flexible bronchoscopy were severe pneumonia (43.4%), hemoptysis (18.9%), and right atelectasis (15.1%) **(Table 2).** Among the comorbidities found: Type 2 Diabetes Mellitus (35.8%), COPD (15.1%), HBP-High blood pressure (7.5%), HIV (11.3%) were the most frequent **(Table 3).** All patients who underwent the bronchoscopic procedure were requested a previous chest imaging study; for the procedure are described with pre-bronchoscopy imaging study, 22.6% with chest teleradiography study, and 77.4% with chest tomography prior to bronchoscopy, 54.7% of the cases were under non-invasive neuromonitoring type processed encephalography, the most frequent therapeutic bronchoscopic procedures were: Bronchoalveolar lavage (BAL) in 81.1%, repositioning of the endotracheal tube in 9.4%. **(Table 4)** during its realization propofol was used for sedation (56.6%), followed by sevoflurane (22.6%), (Table **5)** in the analgesia modality fentanyl was used (52.8%) as the main agent, **(Table 6)** in addition to using double distilled water (66%) for bronchial alveolar lavage and tranexamic acid (11.3%) for the management of hemoptysis. The physiological characteristics were recorded prebronchoscopy **(Table 7)** and postbronchoscopy **(Table 8).**

Table 2. Main diagnoses for performing bronchoscopy.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Hemoptysis	10	18.9	18.9	18.9
	Right atelectasis	8	15.1	15.1	34.0
	Severe Pneumonia	23	43.4	43.4	77.4
	Left atelectasis	3	5.7	5.7	83.0
	Aspiration of gastric contents	4	7.5	7.5	90.6
	Hemorrhagic stroke	1	1.9	1.9	92.5
	Ischemic stroke	4	7.5	7.5	100.0
	Total	53	100.0	100.0	

CVD: Cerebrovascular disease

Table 3. Comorbidities.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Bronchogenic Cancer	3	5.7	5.7	5.7
	Liver cirrhosis	2	3.8	3.8	9.4
	SAH	4	7.5	7.5	17.0
	Others (Post-surgical)	1	1.9	1.9	18.9
	None	1	1.9	1.9	20.8
	Tuberculosis	4	7.5	7.5	28.3
	DM type 2	19	35.8	35.8	64.2
	COPD	8	15.1	15.1	79.2
	CVD	1	1.9	1.9	81.1
	HIV	6	11.3	11.3	92.5
	Esophageal varices	2	3.8	3.8	96.2
	Pneumonia	1	1.9	1.9	98.1
	ARDS	1	1.9	1.9	100.0
	Total	53	100.0	100.0	

HBP: Systemic Arterial Hypertension; DM: Diabetes Mellitus; COPD: Chronic Obstructive Pulmonary Disease; CVD: Cerebrovascular Disease; HIV: Human Immunodeficiency Virus; ARDS: Acute Respiratory Failure Syndrome

Table 4. Bronchoscopic procedures.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	BAL	43	81.1	81.1	81.1
	Decontamination	1	1.9	1.9	83.0
	BAL/ Decontamination	4	7.5	7.5	90.6
	Endotracheal tube replacement	5	9.4	9.4	100.0
	Total	53	100.0	100.0	

BAL: Bronchoalveolar Lavage

Table 5. Sedation.

	Frequency	Percentage	Valid percentage	Cumulative percentage
Methoxyflurane	2	3.8	3.8	3.8
Propofol	30	56.6	56.6	60.4
Midazolam	1	1.9	1.9	62.3
Sevoflorane	12	22.6	22.6	84.9
None	8	15.1	15.1	100.0
Total	53	100.0	100.0	

Table 6. Analgesia.

	Frequency	Percentage	Valid percentage	Cumulative percentage
Lidocaine	2	3.8	3.8	3.8
Fentanyl	28	52.8	52.8	56.6
Sevoflorane	1	1.9	1.9	58.5
Buprenorphine	9	17.0	17.0	75.5
None	13	24.5	24.5	100.0
Total	53	100.0	100.0	

Table 7. Pre-bronchoscopy physiological characteristics.

Parameter	Average	Median	Standard deviation
PAS	116 mmHg	115	±13.5
PAD	71 mmHg	71	±8.48
HR	87 bpm	89	±9.43
RR	19.8 rpm	20	±1.90
Sat. O_2	90.1%	90	±1.13

RR: Respiratory Rate; Sat O_2: Oxygen Saturation; mmHG: Millimeters of Mercury; bpm: Beats Per Minute; rpm: Breaths Per Minute; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HR: Heart Rate

Table 8. Physiological characteristics after bronchoscopy.

		HR POST	RR POST	PS POST	DP POST	SAT O_2 POST	FiO_2	IMAGE CONTROL	DI TUBE	BRONCHOSCOPE
N	Valid	53	53	53	53	53	53	53	53	53
	Lost	0	0	0	0	0	0	0	0	0
Average		88.68	19.36	112.30	68.25	93.64	76.60			4.977
Standard error of the mean		1.473	.162	1926	1.189	.177	3.866			.0348
Median		90.00	20.00	110.00	68.00	94.00	100.00			5,000
Standard deviation		10.725	1.178	14.020	8.656	1.287	28.144			.2532
Variance		115.030	1.388	196,561	74,919	1.657	792.090			.064
Asymmetry		.018	-1.039	-.117	.296	-.973	-.601			-.932
Standard error of skewness		.327	.327	.327	.327	.327	.327			.327
Kurtosis		.552	.587	-.479	.492	.753	-1.315			11.222
Standard kurtosis error		.644	.644	.644	.644	.644	.644			.644
Percentiles	25	80.00	18:00	101.00	64.00	93.00	50.00			5,000
	50	90.00	20.00	110.00	68.00	94.00	100.00			5,000
	75	95.50	20.00	126.00	70.50	95.00	100.00			5,000

SP Post: Post-bronchoscopy Systolic Blood Pressure; DP: Post-Bronchoscopy Diastolic Arterial Pressure; HR: Heart Rate Post-Bronchoscopy; RR: Post-Bronchoscopy Respiratory Rate; O_2 Sat: Post-Bronchoscopy Oxygen Saturation; FiO_2: Inspired Fraction of Oxygen; ID: Internal Diameter; DE: Outside Diameter

EVALUATION OF THE PHYSIOLOGICAL STATUS POST-BRONCHOSCOPY

Comparative analysis of pre- and post-bronchoscopy physiological constants revealed relevant clinical variations that can be interpreted with academic rigor. Heart rate (HR) showed a slight increase post-procedure, increasing from a mean of 87.43 bpm to 88.68 bpm, although with a similar standard deviation (±9.43 pre vs ±10.72 post), suggesting hemodynamic stability in most cases, but with greater interindividual dispersion. Respiratory rate (RR) remained practically constant (19.79 bpm pre vs 19.36 bpm post), although post-procedure kurtosis was higher (0.587), indicating a higher concentration of patients around the mean value. Systolic blood pressure (SBP) decreased slightly (116.04 mmHg to 112.30 mmHg), which could be attributed to the effect of sedation and ventilatory support, while diastolic blood pressure (DBP) decreased from 71.66 to 68.25 mmHg, reflecting a significant reduction compatible with pharmacological vasodilation. Regarding oxygen saturation (Sat O2), a statistically relevant clinical improvement was observed, increasing from a mean of 90.06% to 93.64% after the intervention, with a decrease in asymmetry (from -0.197 to -0.973), reflecting greater homogeneity in gasometric recovery.

During the procedure, it is noteworthy that 60.4% of the patients required aminergic support, only 1 case (1.9%) presented cardiorespiratory arrest, however, it is worth mentioning that within the primary complications during the procedure were: Severe or transient hypoxemia: 5.7%, pneumothorax: 1.9%.

DISCUSSION

The use of flexible bronchoscopy in emergency departments worldwide is very limited; there are few records of the use of bronchoscopy beyond endotracheal intubation in emergency departments. The largest published record of bronchoscopies performed by emergency physicians is that of Lee [6] with 146 procedures over a period of 10.5 years. In our hospital, over a period of 2 years, 53 bronchoscopies were performed, equivalent to 36% of all bronchoscopies in 20% of the time

period of the Lee study [6]. Of the bronchoscopies performed in the service, a radiological improvement was obtained in 84.3%, compared to Lee's record where an improvement of 83% was obtained, in addition the indications for bronchoscopy in our study were directly related to bronchoscopic resolution, such as severe pneumonia, resolution of atelectasis, management of hemoptysis, aspiration of gastric contents, unlike Lee's study [6] in our study bronchoscopies were performed in intubated and non-intubated (awake) patients in 16 patients (30.2%) in these patients laryngotracheal block was used in 8 patients, there are no reports of studies on the application of laryngeal tracheal block for bronchoscopies in emergencies. This study was not designed to establish causality between bronchoscopies performed in the emergency department and their clinical improvement or medium-term follow-up; however, some of the physiological parameters measured, specifically pulse oximetry, revealed statistically significant clinical improvement, as well as the radiographic improvement. Regarding the type of bronchoscopes used, due to the variability in the availability of bronchoscopy equipment, the most used single-use bronchoscope was the Ambu ® Scope TM 4 Broncho in 33 procedures (62.2%), followed by the Ambu ® Scope TM 3 Broncho in 9 procedures (17%). The guidelines on sedation-analgesia in bronchoscopy recommend that the most used drugs for performing bronchoscopies are propofol, midazolam, lidocaine as an adjuvant and opioids (fentanyl) for analgesic management [7]. In comparison with the study by Lee where the type of sedoanalgesia is not described [6], we recorded sedoanalgesia in each case of bronchoscopy, the selection of pharmacological agents being individualized according to each patient as well as the experience of the bronchoscopy team, being in intubated patients Propofol the most used pharmacological agent 56% (n30) followed by sevoflurane in 22% (n12). It should be noted that propofol was not only used in intubated patients but as light sedation in awake patients (n6). In two patients methoxyflurane was used as a sedative agent, which has had a resurgence as analgesic drug in certain procedures such as colonoscopies [8], as noted 50% of awake bronchoscopies were performed under laryngeal-tracheal block, the procedure being effective in 100% of cases, in all bronchoscopies under this modality nebulized or spray lidocaine was used as an adjuvant. Hemoptysis is a clinical entity whose presentation percentage varies from 8 to 15% [9,10], being an entity with high risk of morbidity and mortality considering complications secondary to bleeding, in emergency services the presentation is uncertain. In Lee's study pulmonary hemorrhage or hemoptysis was found in 11% of bronchoscopies. Lee [6] in our study we found 18.9% (n10) of these patients, tuberculosis being the most frequent directly related cause followed by bronchogenic cancer. For the management of hemoptysis, double distilled water was used most frequently 66% only in 6 patients (11.3%) was the use of tranexamic acid required as a second line for the control of hemoptysis. An important point in critically ill intubated patients is the correct placement of the endotracheal tube, the malposition of the endotracheal tube can vary from 5-25% depending on whether the intubation was in a hospital or outpatient setting [11]. Different scenarios can condition a higher risk of complications during or after orotracheal intubation. For example, during cardiopulmonary resuscitation, malposition of the endotracheal tube can vary from 3% to 25% [12,13]. The displacement of the endotracheal tube is due to passive movements of the head. Neck flexion can displace the endotracheal tube (ET) downwards up to 2 cm and extension can cause upward displacement, away from the carina. Neck flexion without control of the ET generates a bad position of up to 11.7%, and upward displacement can result in injury to the recurrent laryngeal nerve or vocal cords due to compression by the cuff [14]. In our study by flexible bronchoscopic visualization we found a frequency of bad placement of the endotracheal tube in 58.5% of intubated patients (n31), in 5 of which the initial bronchoscopy was for repositioning of the endotracheal tube as an indication, in all patients the endotracheal tube was repositioned leaving the tip 3 cm from the main carina (MC), these findings provide an important area of opportunity for analysis of the factors by which we find a high percentage of poorly positioned endotracheal tubes, with selective right intubation being the most frequent 90% of cases. Regarding complications of flexible bronchoscopy, each patient must be individually assessed for the use of bronchoscopy as a diagnostic method, considering the risk-benefit of the procedure prior to performing it.

However, despite the fact that the population with clear indications that would benefit from this procedure is adequately selected [15,16], there are complications that can be related to various factors [17]. Complications can be related to the procedure itself, as well as to factors involved in the procedure, such as individual characteristics of each patient, related to sedation/anesthesia, and the taking of biopsies if applicable. An example of this is patients under mechanical ventilation, taking biopsies during flexible bronchoscopy can generate tension pneumothorax, however, contrary to this, a randomized controlled study found that there was no significant difference in mortality or respiratory deterioration in immunocompromised patients who undergo bronchoalveolar lavage vs. those who only undergo diagnostic bronchoscopy [18].

In retrospective studies where 20,986 patients were considered, severe complications occurred in 1.08% of the total procedures, presenting a mortality rate of 0.02% [19]. Hehn [20] reported 4.3% of complications related to flexible bronchoscopy in a total of 1358 procedures, and 2.8% of the complications were related to non-respiratory factors, presenting a mortality rate of 0.1% [20]. In our study, complications occurred in 1.9% of cases, the most significant being a case with pneumothorax, and a patient

with cardiorespiratory arrest secondary to hypoxia due to obstruction of the endotracheal tube with massive secretions during aspiration with the bronchoscope, the patient was reintubated and came out of cardiorespiratory arrest at the first cycle of resuscitation. Complications such as pneumothorax occur during flexible bronchoscopy in approximately 0.1%, being higher in transbronchial biopsy with 0.4% [18]. Focciolongo [19], in a review of 20,986 flexible and rigid bronchoscopies, found a percentage of 1.08% of overall complications, the 4 main ones being hemorrhage in 41%, followed by desaturation in 21%, pneumothorax was found in 9.77% of cases and pulmonary edema in 6.22% [19]. Our sample is very small but only a small percentage of complications were documented during bronchoscopies, the percentage being very similar to the results of studies such as that of Focciolongo [19]. This study demonstrates significant results in diagnostic and therapeutic efficacy, with radiological improvement documented in 84.9% of cases by post-procedure chest X-ray. Thirty-four percent had a positive culture, which helped optimize antibiotic management. We can therefore conclude that bronchoscopy showed a high rate of diagnostic and therapeutic effectiveness, especially in patients with severe pneumonia. The radiological improvement and physiological stability post-procedure reinforce its clinical utility. The safety profile was acceptable, with a low complication rate.

LIMITATIONS

The main limitations of this study are the number of patients who underwent flexible bronchoscopy, as it is not a competency commonly included in the core training of the emergency specialty; not all physicians had the necessary training; they were only re-analyzed during one shift and only from Monday to Friday. The average number of bronchoscopies performed during the 24 months of the study was approximately 2 per month, which was higher compared to Lee's study. No follow-up was established for patients who underwent flexible bronchoscopy. A clinical correlation between bronchoscopy and patient prognosis was not established.

CONCLUSIONS

The implementation of a flexible bronchoscopy program in critically ill patients appears to be feasible and safe. According to our results, flexible bronchoscopy performed by non-pulmonologists has a high rate of effectiveness and safety compared with reports from previous studies by other authors. It is true that the purpose of the study did not measure the clinical impact of bronchoscopies performed in the emergency department. However, all of them provided information either leading to treatment changes or, where appropriate, were therapeutic, resolving the pathology immediately after detection (control of hemoptysis, resolution of atelectasis, removal of foreign bodies). A bedside bronchoscopy program for critically ill patients is feasible and practical in secondary care hospitals and can serve as a reference for scheduling a secondary bronchoscopy.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interests in the creation of this study.

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