



## FACTORS ASSOCIATED WITH INTUBATION IN PATIENTS WITH CENTRAL AIRWAY OBSTRUCTION CAUSED BY TUMORS: A SINGLE-CENTER, RETROSPECTIVE COHORT STUDY

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### ABSTRACT

**Background.** This single-center retrospective cohort study aimed to identify factors associated with intubation among patients with central airway obstruction (CAO) caused by tumors in the Lung Center of the Philippines.

**Objectives.** The primary aim is to identify the key variables contributing to the need for intubation in this patient population, thereby enhancing clinical understanding and potentially improving airway management strategies for individuals with CAO caused by tumors.

**Methodology.** Data from patients admitted to the Lung Center of the Philippines from 2015 to 2023 and with a diagnosis of neck, lung, or intrathoracic tumors causing CAO were retrospectively analyzed. Potential factors including age, sex, type, degree, location, degree, and type of obstruction, tissue diagnosis, and treatment received were assessed.

**Results.** Of 178 CAO patients, 37.08% required intubation during their hospital stay. Delayed intubation (88%) and an armored endotracheal tube (53%) were utilized in intubating these patients. Labored breathing (74%) and desaturation (73%) were prevalent symptoms. Univariable analysis revealed that the type of obstruction was significantly associated with intubation, with extraluminal obstruction and mixed obstruction, showing increased odds (OR 2.07 and OR 7.02, respectively) compared to endoluminal obstruction.

**Conclusion.** This study revealed labored breathing and desaturation as the most common symptoms in intubated CAO subjects. Univariable analysis showed that the type of obstruction was significantly associated with the need for intubation. Compared to those with endoluminal obstruction, patients with extraluminal obstruction had two times higher odds of intubation. In contrast, those with mixed obstruction had seven times higher odds. Multivariable analysis showed that the type of obstruction was the only statistically significant variable associated with the need for intubation.

**Keywords:** central airway obstruction, intubation, tumors, retrospective study, predictors

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## INTRODUCTION

Central airway obstruction (CAO) is a severe condition that can occur due to compression of the airways, such as the trachea, mainstem bronchi, bronchus intermedius, or lobar bronchi. It may be caused by malignant or benign conditions, including lung cancer which is the most identified cause. CAO can lead to decreased airflow, compromised oxygenation, and significant health problems, and may affect both children and adults.<sup>1,2</sup> Prompt and effective management of CAO is critical for optimizing patient outcomes and preventing potentially life-threatening consequences. One crucial part of CAO management is assessing the necessity for intubation which is essential in airway management and stabilization.<sup>3,4</sup> Identifying predictors that can assist physicians in anticipating the need for intubation in CAO patients is critical for timely interventions and improved patient outcomes.<sup>5</sup>

More research is needed on the factors influencing the decision to intubate patients with CAO, mainly when the obstruction is caused by tumor growth. More specifically, more studies are needed on emergency intubation in CAO patients when other means of airway management such as mechanical debulking or laser therapy via rigid bronchoscopy; balloon dilation, cryotherapy, or tumor ablation via flexible bronchoscopy; and airway stent placement are not immediately available, and intubation becomes the only way to secure the airway.

Prior studies such as those from the AQUIRE (American College of Chest Physicians Quality Improvement Registry, Evaluation, and Education) registry have demonstrated increased complication and mortality rates in urgent or emergent bronchoscopic procedures for malignant CAO. However, they do not explicitly examine the clinical or anatomical factors that lead to emergency intubation.<sup>3,4</sup> Moreover, while therapeutic bronchoscopy has shown benefit in symptom relief and functional improvement, the existing literature largely focuses on post-procedural outcomes rather than the decision-making process preceding airway management. Current guidelines endorse multidisciplinary, multimodal approaches but acknowledge a low certainty of evidence for many recommendations. To date, no study has systematically explored which patient-specific or tumor-related characteristics are associated with the need for intubation in patients presenting with malignant CAO. Addressing this gap is critical to inform early triage, optimize outcomes, and guide emergency airway management decisions.

At the Lung Center of the Philippines, clinicians often face situations where CAO patients require emergency intubation due to the lack of immediate access to alternative airway management interventions. In these critical scenarios, deciding to intubate is crucial to ensure patient safety and prevent adverse outcomes related to airway compromise. However, the absence of established protocols or guidelines

tailored to these specific circumstances leads to clinical uncertainty and variability in practice.

Addressing this research gap is essential for improving the standard of care for CAO patients, especially in emergencies where intubation is the only way to secure the airway. By identifying the factors associated with the need for emergency intubation in such cases, clinicians can develop more effective risk assessment strategies and standardized protocols for prompt and appropriate airway management.<sup>5</sup> Thus, this research undertook a single-center, retrospective cohort study that determined the factors associated with the need for intubation in patients with critical airway obstruction (CAO), focusing on tumors as the cause of CAO in patients admitted at the Lung Center of the Philippines.

## METHODOLOGY

### Study Design

The study had a retrospective cohort design that included CAO patients admitted to the Lung Center of the Philippines between January 2015 and November 30, 2023.

### Study Setting

This study was conducted at the Lung Center of the Philippines from December 15, 2023, to February 15, 2024. The authors accessed the patient's data through the Data Management and Analysis System (DMAS) website using the hospital's computer.

### Inclusion and exclusion criteria

This study included patients of all ages, both pay and service patients, who had been diagnosed with airway thoracic tumors causing central airway obstruction (CAO) by a pulmonologist or thoracic and cardiovascular surgeon (TCVS). CAO was diagnosed based on CT scan imaging or bronchoscopic findings from January 2015 to November 30, 2023. Airway obstruction at or above the level of the main bronchi resulting from tumors were taken into consideration. Patients were excluded if their medical records were unavailable or incomplete.

### Sample Size and Sampling Methodology

PASS 2021 software for multiple regression was used to calculate the minimum sample size requirement. Using multiple logistic regression analysis, a minimum of 174 patients achieves 90% statistical power, with at most 15 factors assuming a medium effect size (Cohen's  $f^2=0.15$ ) and alpha set at 0.05.

### Study Procedure

The study began by submitting a protocol to the Technical Review Board of the Lung Center of the Philippines for

approval. Permission was obtained from the Institutional Ethics Review Board of the Lung Center of the Philippines to conduct the study.

Data collection started after obtaining Ethics approval and continued until the required number of subjects was attained. Patient charts were the primary data source, and information such as age, sex, and diagnostic details were recorded in a data collection form. Imaging results provided additional data on obstruction type, degree, and location.

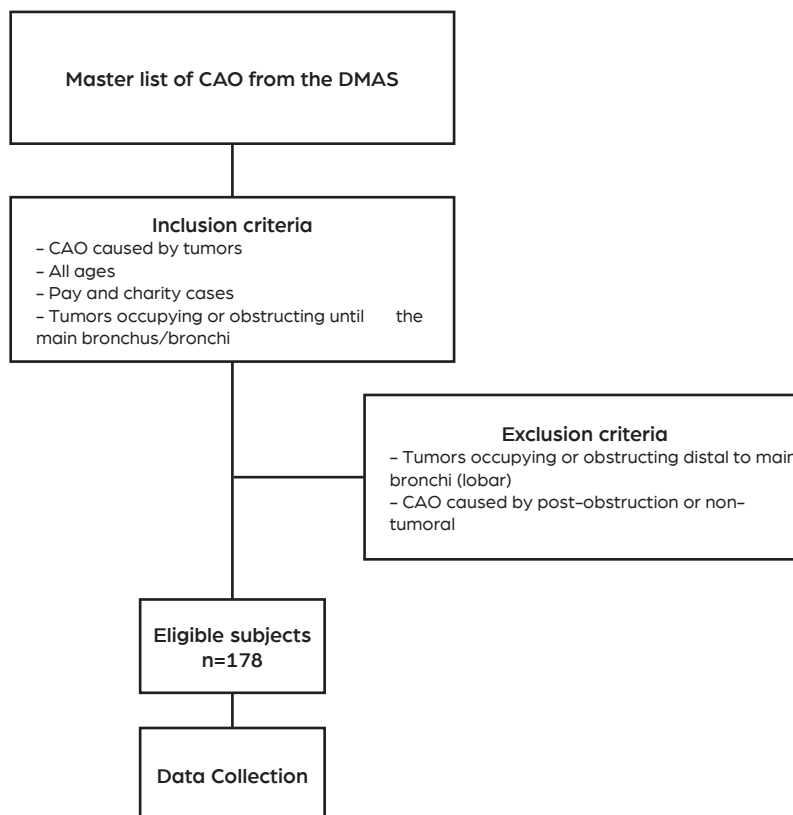
The study enrolled patients admitted to pulmonary, thoracic, and cardiovascular surgery services between January 2015 and November 30, 2023, with diagnoses of neck, lung, or intrathoracic tumors causing central airway obstruction (CAO). The primary data sources were comprehensive medical records in the Data Management and Analysis System (DMAS). We identified eligible patients involved using specific keywords in clinical notes and criteria consistent with the study's inclusion criteria.

Patients diagnosed with neck, lung, or intrathoracic tumors, focusing on those with CAO, were identified. Parameters such as the type, location, and degree of obstruction were recorded, with the degree categorized based on CT scan results or bronchoscopic findings.

## Study Procedures

This study enrolled patients admitted to the pulmonary, thoracic, or cardiovascular surgery services between January 2015 and November 30, 2023, who were diagnosed with central airway obstruction (CAO) secondary to neck, lung, or intrathoracic tumors. Eligible patients were identified through a retrospective review of comprehensive electronic medical records in the Data Management and Analysis System (DMAS), using keyword searches and criteria aligned with the study's inclusion parameters.

CAO was diagnosed based on clinical assessments supported by CT scan findings and/or bronchoscopic evidence of obstruction at the level of the trachea or main bronchi. Patients were included if CT scan or bronchoscopic findings indicated central airway obstruction, as documented in clinical records. There must be evidence of at least 50% luminal narrowing of the trachea or main bronchi, as interpreted by radiologic or bronchoscopic assessment, and confirmed by the attending physician's clinical judgment. Either modality was accepted as diagnostic confirmation, consistent with standard clinical practice.



**Figure 1.** Selection of study participants.

The study outcome was intubation defined as intubation that was requested after CAO diagnosis by the attending physician, with or without referral to the anesthesiology department, based on medical charts.

The "need" for intubation is based solely on information available within the medical records at the time of CAO diagnosis, such as clinical symptoms, imaging reports, respiratory distress documentation, main service referral, and orders for intubation.

## DATA MANAGEMENT AND STATISTICAL ANALYSIS

Data were encoded in MS Excel. Stata MP version 17 software was used for data processing and analysis. Shapiro Wilk's test was used to assess the normality of data. Continuous variables (i.e., age, degree of obstruction) were presented as median (interquartile range/IQR) due to the non-normal data distribution. Categorical variables (i.e., age category, sex, classification, type of obstruction, location of obstruction, tissue diagnosis, and treatment received) were expressed as frequencies and percentages. Comparison of variables between patients who needed and did not need intubation was performed using the Whitney U test for continuous variables and the Chi-Square or Fisher's Exact test for categorical variables.

Logistic regression analysis with Fifth's bias correction was conducted to determine the factors associated with the need for intubation. Simple logistic regression was performed, and variables with  $p < 0.20$  were included in the model. Model building was done using multiple logistic regression analysis with a backward elimination technique. P values  $\leq 0.05$  were considered statistically significant. Missing data were neither replaced nor estimated.

## ETHICAL CONSIDERATIONS

This study was approved by the Institutional Ethics Review Board of the Lung Center of the Philippines. Informed consent was waived due to its retrospective design. All data were de-identified, securely stored, and accessed only by authorized personnel. Procedures adhered to the Declaration of Helsinki and applicable ethical standards.

A total of 178 patients met the inclusion criteria. Of these, 66 patients (37.08%; 95% CI: 29.97–44.62%) required intubation. Among intubated patients, 88% (n=58) underwent delayed intubation, while 12% (n=8) underwent preemptive intubation. Armored endotracheal tubes were used in 53% (n=35) of cases. Preemptive intubation was performed based on clinician judgment due to progressive orthopnea, imaging findings, or anticipated airway compromise for procedures under sedation.

Symptoms commonly noted immediately prior to intubation included labored breathing (74.24%), desaturation (72.73%), orthopnea (31.82%), decreased sensorium (27.27%), speaking in phrases or sentences (24.24%), stridor (21.21%), hoarseness (7.58%), and hemoptysis (4.55%). Most symptoms were cited as key reasons for proceeding with intubation. Symptom documentation among non-intubated patients was limited, which restricts direct comparison and represents a limitation.

The demographic and clinical profile of patients with central airway obstruction (CAO) is shown in Table 1, comparing those who required intubation and those who did not. A total of 178 patients met the inclusion criteria. Of these, 66 patients required intubation. The median age of CAO patients was 57 years, ranging from 2 to 92 years, with more than half falling between 18 and 60 years. There was no significant difference in age distribution between the two groups. Additionally, most CAO patients were male, with no significant gender disparity observed between those who required intubation and those who did not. As to the type of obstruction, mixed obstruction was observed in only 6% of cases, but a higher proportion of intubated patients had mixed and extraluminal obstruction in intubated subjects compared to non-intubated patients.

Regarding the degree of obstruction, the median measurement based on CT scans was 1.2 mm, ranging from 0 to 8 mm, with no significant difference observed between intubated and non-intubated groups. Similarly, the median degree of obstruction based on bronchoscopy was 90%, ranging from 0 to 100%, with no significant variation between the two groups.

Bronchial obstruction was the most common location of obstruction among CAO patients, with the proportion of patients with carinal obstruction being significantly different between intubated and non-intubated patients. A higher proportion of intubated patients had carinal obstruction compared to those who did not require intubation.

**Table 1.** Demographic, tumor, and treatment profile of participants

	ALL PATIENTS (n=178)	NEED FOR INTUBATION		P VALUE
		YES (n=66)	NO (n=112)	
Age (in years), median (IQR)	57 [IQR: 37-67]	58 [IQR: 37-68]	56 [IQR: 35-66]	0.5809 <sup>a</sup>
<18 (n, %)	6 (3)	2 (3)	4 (4)	1.000 <sup>b</sup>
18- 60 (n, %)	100 (56)	37 (56)	63 (56)	
>60 (n, %)	72 (41)	27 (41)	45 (40)	
Sex (n, %)				
Male	123 (69)	48 (73)	75 (67)	0.422 <sup>c</sup>
Female	55 (31)	18 (27)	37 (33)	
Type of obstruction (n, %)				
Endoluminal	71 (40)	18 (27)	53 (47)	0.004* <sup>c</sup>
Extraluminal	96 (54)	40 (61)	56 (50)	
Mixed	11 (6)	8 (12)	3 (3)	
Degree of obstruction, median (IQR)				
Based on CT (in mm)	1.2 [IQR: 0-4.2]	2 [IQR: 0-4.6]	1 [IQR: 0-4]	0.4222 <sup>a</sup>
Based on bronchoscopy (in %) [n=28]	90 [IQR: 80-96.5]	90 [IQR: 80-95]	90 [IQR: 90-98]	0.2192 <sup>a</sup>
Location of obstruction, (n, %)				
Tracheal	1 (1)	0	1 (1)	1.000 <sup>b</sup>
Proximal	9 (5)	2 (3)	7 (6)	0.488 <sup>b</sup>
Distal	32 (18)	16 (24)	16 (14)	0.095 <sup>c</sup>
Middle third	12 (7)	3 (5)	9 (8)	0.539 <sup>b</sup>
Carinal	28 (16)	15 (23)	13 (12)	0.049* <sup>c</sup>
Bronchial	144 (81)	56 (85)	88 (79)	0.303 <sup>c</sup>
Tissue diagnosis (n, %)				
Benign	7 (4)	2 (3)	5 (4)	1.000 <sup>b</sup>
Malignant	171 (96)	64 (97)	107 (96)	
Treatment received (n, %)				
Radiotherapy	20 (11)	6 (9)	14 (13)	0.487 <sup>b</sup>
Surgical intervention	0	0	0	-
Interventional Bronchoscopy	28 (16)	12 (18)	16 (14)	0.490 <sup>b</sup>

<sup>a</sup>Mann Whitney U test; <sup>b</sup>Fisher's Exact test; <sup>c</sup>Chi Square test  
\*Statistically significant

Table 2 summarizes the timing of intubation, and the prevalence of key symptoms observed in patients who required intubation. A substantial majority (88%) underwent delayed intubation, typically after the onset of overt respiratory symptoms. Only a small proportion (12%) received preemptive intubation, often based on imaging findings or progressive clinical deterioration. Labored breathing and desaturation were the most frequently observed symptoms, affecting over 70% of intubated patients. Orthopnea, altered mental status (decreased sensorium), and stridor were also notable but less common.

**Table 2.** Timing and Symptoms in Intubated Patients (n=66)

Variable	Frequency (n, %)
Preemptive Intubation	8 (12.12)
Delayed Intubation	58 (87.88)
Labored Breathing	49 (74.24)
Desaturation	48 (72.73)
Orthopnea	21 (31.82)
Decreased Sensorium	18 (27.27)
Stridor	14 (21.21)

**Table 3.** Factors associated with the need for intubation among CAO patients (n=178)

	CRUDE OR (95% CI)	P VALUE	ADJUSTED OR (95% CI)	P VALUE
Age (in years)				
<18	Ref	Ref	-	-
18- 60	1.06 (0.22-5.25)	0.940	-	-
>60	1.09 (0.22-5.48)	0.919	-	-
Sex				
Female	Ref	Ref	-	-
Male	1.30 (0.67-2.53)	0.435	-	-
Type of obstruction				
Endoluminal	Ref	Ref	Ref	Ref
Extraluminal	2.07 (1.07-4.03)	0.032*	2.07 (1.07-4.03)	0.032*
Mixed	7.02 (1.82-27.16)	0.005*	7.02 (1.82-27.16)	0.005*
Degree of obstruction (in mm)	1.03 (0.91-1.17)	0.609	-	-
Location of obstruction, %yes (Ref: No)				
Tracheal	0.56 (0.02-13.92)	0.723	-	-
Proximal	0.55 (0.13-2.36)	0.417	-	-
Distal	1.91 (0.89-4.10)	0.096	-	-
Middle third	0.60 (0.17-2.13)	0.429	-	-
Carinal	2.22 (0.99-4.95)	0.052	-	-
Bronchial	1.49 (0.67-3.30)	0.327	-	-
Tissue diagnosis				
Benign	Ref	Ref	-	-
Malignant	1.32 (0.29-6.07)	0.721	-	-
Treatment received (Ref: No)				
Radiotherapy	0.73 (0.27-1.94)	0.528	-	-
Interventional Bronchoscopy	1.34 (0.60-3.00)	0.475	-	-

<sup>a</sup>Mann Whitney U test; <sup>b</sup>Fisher's Exact test; <sup>c</sup>Chi Square test  
\*Statistically significant

As seen in Table 3, univariable analysis showed that the type of obstruction was significantly associated with the need for intubation. Compared to those with intraluminal obstruction, patients with extraluminal obstruction had two times higher odds of intubation. In contrast, those with mixed

obstruction had seven times higher odds. Multivariable analysis showed that the type of obstruction was the only statistically significant variable associated with the need for intubation.

## DISCUSSION

This study examined 178 patients with central airway obstruction (CAO) caused by tumors and found that 37.08% required intubation. The need for intubation was significantly associated with mixed-type and extraluminal obstruction as well as carinal involvement. Labored breathing and desaturation were the most observed symptoms among intubated patients and the majority underwent delayed intubation defined as occurring after the onset of respiratory distress. These findings contribute to the limited body of evidence identifying early predictors of airway compromise in malignant CAO.

The results are consistent with previous studies highlighting respiratory distress as a common presentation in CAO. Daneshvar et al. reported breathlessness in 61% of patients with lung cancer-related CAO while Giovacchini et al. found dyspnea present in 98.4% of CAO patients, although neither study linked these symptoms with intubation events.<sup>5,6</sup> This study adds to current literature by specifically correlating symptom patterns with actual airway intervention. Labored breathing and desaturation in this cohort were not only prevalent but also temporally associated with intubation, emphasizing their role as critical warning signs.

Mixed-type and extraluminal obstructions were significantly more likely to require intubation compared to endoluminal masses. These findings are supported by prior observations in cases of bulky thoracic tumors and anterior mediastinal masses where external compression on the airway has been shown to increase the risk of positional airway collapse and dynamic obstruction, particularly during sedation or anesthesia induction.<sup>8,9</sup> Extraluminal obstruction may compress multiple airway levels, limiting compensatory ventilation and increasing the need for urgent airway stabilization. In contrast, endoluminal lesions may be more distal or focal allowing for temporary preservation of airflow especially when affecting non-critical areas such as the lobar bronchi.

Obstruction at the carina was notably more frequent in intubated patients. The carina is a critical anatomical junction that bifurcates airflow to both lungs and its involvement implies extensive central airway disease with higher physiological burden. This observation supports prior imaging studies which found that distal airway patency, when preserved, was associated with a lower need for intervention.<sup>7</sup> When the carina is compromised, airflow to both lungs may be severely reduced, resulting in rapid desaturation and necessitating immediate airway management.

The finding that 88% of intubated patients underwent delayed rather than preemptive intubation suggests a clinical gap in recognizing early airway risk. Although intubation is often considered a last resort due to concerns over technical difficulty or loss of spontaneous ventilation,

the high incidence of late intubation in this cohort indicates missed opportunities for earlier intervention. Ost et al. through the AQUIRE registry reported significantly increased complication rates when therapeutic bronchoscopy or airway intervention was performed under emergency conditions.<sup>3</sup> These outcomes highlight the importance of timely decision-making before airway collapse occurs.

Clinical implications of these findings include the need for heightened vigilance in CAO patients presenting with mixed or carinal obstruction. In such cases, the presence of desaturation or increased work of breathing should prompt consideration for early ICU transfer, preparation for intubation or the standby presence of a bronchoscopy team. Current guidelines encourage multidisciplinary airway planning in CAO but acknowledge the low certainty of supporting evidence.<sup>2</sup> The present findings contribute objective criteria such as anatomical location and obstruction type that may inform structured protocols for triage and airway management.

This study offers a focused analysis on tumor-related CAO and introduces measurable predictors for intubation, a factor largely absent in previous retrospective studies. However, the study has limitations. The retrospective design relied heavily on chart documentation which may have introduced variability in symptom recording. Furthermore, the study did not evaluate inter-modality agreement between CT and bronchoscopy findings, nor did it standardize imaging interpretation across reviewers. These limitations suggest that prospective validation is needed.

Future research should aim to develop and validate a risk stratification tool incorporating obstruction type, carinal involvement and clinical symptoms. Such a tool could support early triage and reduce emergency interventions. Additionally, prospective trials comparing early versus delayed intubation in high-risk CAO populations may provide further insight into optimizing outcomes.

## CONCLUSION

This study aimed to identify factors associated with the need for intubation in patients with central airway obstruction (CAO) caused by tumors. Our findings revealed that carinal obstruction was more frequent in intubated patients and that mixed type and extraluminal obstructions were significantly more likely to require intubation compared to endoluminal masses. The study had limitations in terms of its retrospective design, reliance on a review of records, and the absence of tests for inter-modality agreement in diagnosing CAO. Prospective validation is needed to provide more robust evidence and ultimately improve outcomes.

## AUTHORSHIP

All authors have certified fulfillment of authorship criteria.

## DISCLOSURE

All authors have no conflicts of interest to disclose.

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## REFERENCES

1. Ernst A, Feller-Kopman D, Becker HD, Mehta AC. Central airway obstruction. *Am J Respir Crit Care Med*. 2004 Jun 15;169(12):1278-97. doi:10.1164/rccm.200210-1181SO. PMID: 15187010.
2. Mudambi L, Miller R, Eapen GA. Malignant central airway obstruction. *J Thorac Dis*. 2017 Sep;9(Suppl 10):S1087-110. doi:10.21037/jtd.2017.07.27. PMID: 29214067; PMCID: PMC5696549.
3. Ost DE, Ernst A, Grosu HB, Lei X, Diaz-Mendoza J, Slade M, et al. Complications following therapeutic bronchoscopy for malignant central airway obstruction: results of the AQuIRE registry. *Chest*. 2015 Aug;148(2):450-71. doi:10.1378/chest.14-2539. PMID: 25644902.
4. Ost DE, Ernst A, Grosu HB, Lei X, Diaz-Mendoza J, Slade M, et al. Therapeutic bronchoscopy for malignant central airway obstruction: success rates and impact on dyspnea and quality of life. *Chest*. 2015 May;147(5):1282-98. doi:10.1378/chest.14-1933. PMID: 25485563.
5. Daneshvar C, Falconer WE, Ahmed M, Sibly A, Hindle M, Nicholson TW, et al. Prevalence and outcome of central airway obstruction in patients with lung cancer. *BMJ Open Respir Res*. 2019 Sep 24;6(1):e000429. doi:10.1136/bmjresp-2019-000429. PMID: 31673363; PMCID: PMC6797367.
6. Giovacchini CX, Kessler ER, Merrick CM, et al. Clinical and radiographic predictors of successful therapeutic bronchoscopy for relieving malignant central airway obstruction. *BMC Pulm Med*. 2019 Nov 18;19(1):219. doi:10.1186/s12890-019-0987-3. PMID: 31739764; PMCID: PMC6852060.
7. Powers RE, Schwalk AJ. Overview of malignant central airway obstruction. McGovern Medical School, The University of Texas Health Sciences Center at Houston; The University of Texas Southwestern Medical Center, Dallas, TX.
8. Slinger P, Campos JH. Anesthesia for thoracic surgery. In: Miller RD, editor. *Miller's Anesthesia*. 8th ed. Philadelphia: Elsevier; 2015. p. 1942-85.
9. Usuda K, Iwai S, Yamagata A, Ishikawa M, Kato M, Murakami J, et al. Clinical outcomes and survival following placement of self-expandable metallic stents for central airway stenosis and fistula. *Thorac Cancer*. 2021 Jan;12(1):48-56. doi:10.1111/1759-7714.13707. PMID: 33179865; PMCID: PMC7779193.
10. Barach AL. The use of helium in the treatment of asthma and obstructive lesions in the larynx and trachea. *Ann Intern Med*. 1935;9:739-65.
11. Brewer LA, Bai AF, Little JN, et al. Carcinoma of the lung: practical classification for early diagnosis and surgical treatment. *JAMA*. 1958;166:1149-55.
12. Brewer LA. Patterns of survival in lung cancer. *Chest*. 1977;71:644-50.
13. Line DH, Deeley TJ. The necropsy findings in carcinoma of the bronchus. *Br J Dis Chest*. 1971;65:238-42.
14. Guedes F, Branquinho MV, Sousa AC, et al. Central airway obstruction: is it time to move forward? *BMC Pulm Med*. 2022;22(1):68. doi:10.1186/s12890-022-01862-x. PMID: 35139857; PMCID: PMC8824825.
15. Cavaliere S, Venuta F, Foccoli P, Toninelli C, La Face B. Endoscopic treatment of malignant airway obstructions in 2,008 patients. *Chest*. 1996 Dec;110(6):1536-42. doi:10.1378/chest.110.6.1536. PMID: 8989073.



This is a program that caters to adult afflicted with TB since early 2000 and children with TB in 2007. The Lung Center of the Philippines DOTS clinic is the first public health facility engaged implementing Programmatic Management for Drug resistant TB in 2005 as a satellite treatment center under the Green Light Committee. In 2008, it became one of the ten (10) treatment centers implementing the DOH guidelines on PMDT as issued by DOH Administrative Order 2008-0018.



An infographic titled "SERVICES OFFERED" and "OTHER SERVICES PROVIDED" with icons and photos illustrating various services. The "SERVICES OFFERED" section includes: CONTACT TRACING (photo of a person on a phone), DSTB/DRTB SCREENING (GENEXPERT) (photo of a person at a computer), HIV COUNSELING AND TESTING FOR ENROLLED TB PATIENTS (15 YEARS OLD AND ABOVE) (photo of a person at a desk), and DIRECT SPUTUM SMEAR MICROSCOPY TEST FOR ENROLLED PATIENTS (photo of a person with a sputum cup). The "OTHER SERVICES PROVIDED" section includes: CONDUCTS TB EDUCATION, REFERRING AND PROVIDING CENTER FOR PRESUMPTIVE DSTB/DRTB PATIENTS, ACT AS TREATMENT PARTNER, FOLLOW UP CASES WHO FAILED TO REPORT FOR TREATMENT, and SUBMITS ACCOMPLISHMENT REPORTS TO LCP/NTP/QCHD (photo of a person at a computer).

An infographic titled "OUR OBJECTIVES" and "CONTACT INFORMATION AND SCHEDULE". The "OUR OBJECTIVES" section includes: TB-FREE PHILIPPINES, ENSURE THAT TB DOTS SERVICES ARE AVAILABLE, ACCESSIBLE, AND AFFORDABLE IN COLLABORATION WITH THE LGUS AND OTHER PARTNERS, and TO REDUCE PREVALENCE AND MORTALITY FROM TB. The "CONTACT INFORMATION AND SCHEDULE" section includes: SCHEDULE: MONDAY TO FRIDAY, 8AM-5PM, CONTACT US AT: 8924-6101 LOC 1856-57, and EMAIL US AT: PHDD@lcp.gov.ph.