STANDARD TREATMENT WORKFLOW (STW)

IMAGE GUIDED MANAGEMENT OF HAEMOPTYSIS

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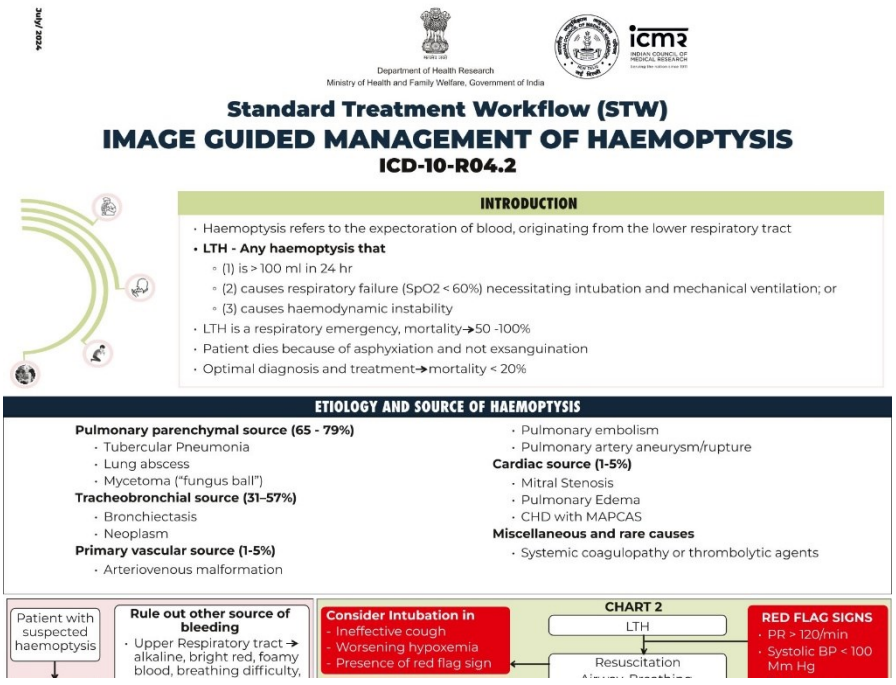

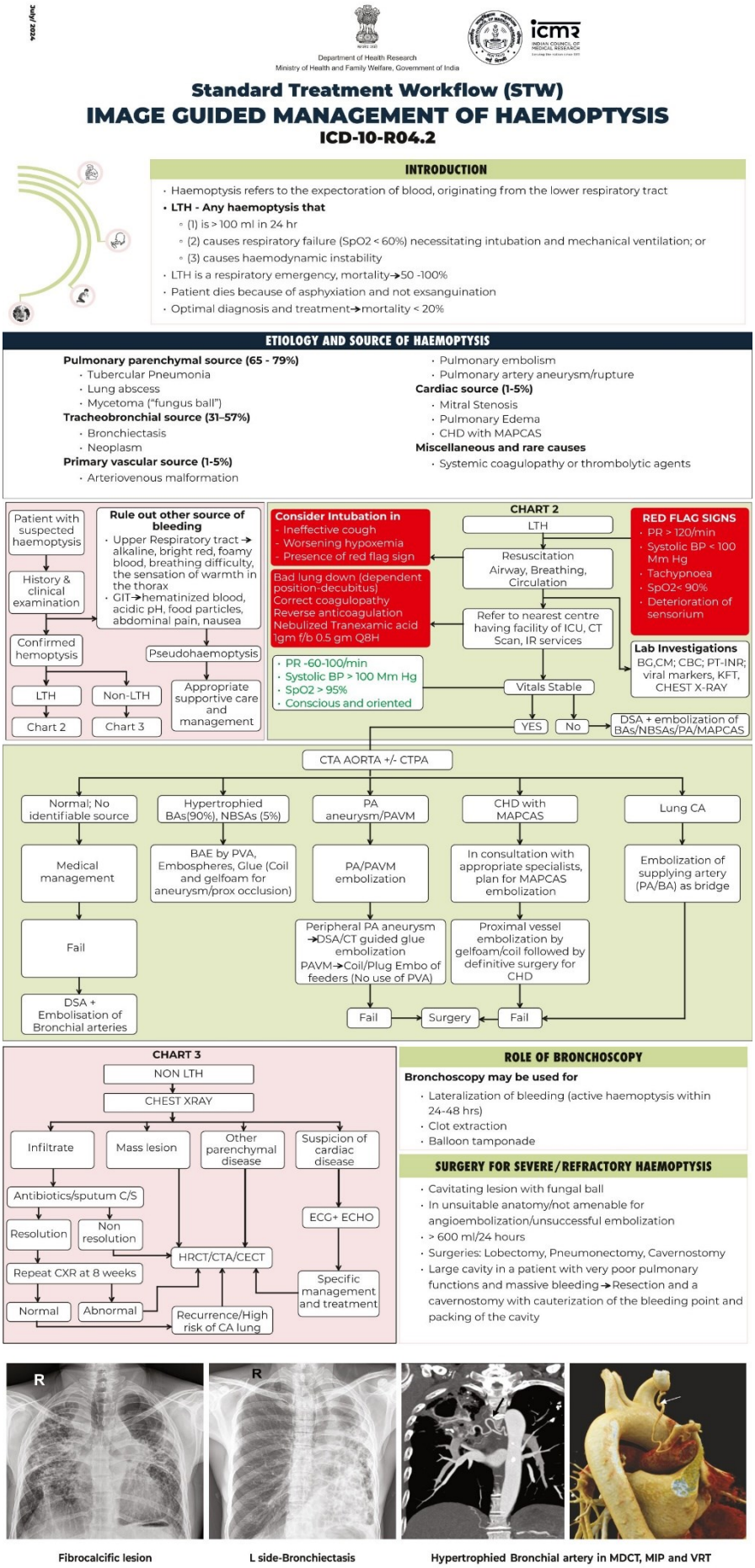
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Department of Health Research
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INDIAN COUNCIL OF MEDICAL RESEARCH
Standard Treatment Workflow (STW)
IMAGE GUIDED MANAGEMENT OF HAEMOPTYSIS
ICD-10-R04.2
INTRODUCTION
· Haemoptysis refers to the expectoration of blood, originating from the lower respiratory tract
· LTH - Any haemoptysis that
◦ (1) is > 100 ml in 24 hr
◦ (2) causes respiratory failure (SpO2 < 60%) necessitating intubation and mechanical ventilation; or
◦ (3) causes haemodynamic instability
· LTH is a respiratory emergency, mortality→50 -100%
· Patient dies because of asphyxiation and not exsanguination
· Optimal diagnosis and treatment→mortality < 20%
ETIOLOGY AND SOURCE OF HAEMOPTYSIS
Pulmonary parenchymal source (65 - 79%)
· Tubercular Pneumonia
· Lung abscess
· Mycetoma ("fungus ball")
Tracheobronchial source (31–57%)
· Bronchiectasis
· Neoplasm
Primary vascular source (1-5%)
· Arteriovenous malformation
· Pulmonary embolism
· Pulmonary artery aneurysm/rupture
Cardiac source (1-5%)
· Mitral Stenosis
· Pulmonary Edema
· CHD with MAPCAS
Miscellaneous and rare causes
· Systemic coagulopathy or thrombolytic agents
Patient with suspected haemoptysis
History & clinical examination
Confirmed hemoptysis
LTH
Non-LTH
Chart 2
Chart 3
Rule out other source of bleeding
· Upper Respiratory tract→ alkaline, bright red, foamy blood, breathing difficulty, the sensation of warmth in the thorax
· GIT→hematinized blood, acidic pH, food particles, abdominal pain, nausea
Pseudohaemoptysis
Appropriate supportive care and management
CHART 2
LTH
Resuscitation Airway, Breathing, Circulation
Refer to nearest centre having facility of ICU, CT Scan, IR services
Consider Intubation in
- Ineffective cough
- Worsening hypoxemia
- Presence of red flag sign
Bad lung down (dependent position-decubitus)
Correct coagulopathy
Reverse anticoagulation
Nebulized Tranexamic acid 1gm f/b 0.5 gm Q8H
· PR -60-100/min
· Systolic BP > 100 Mm Hg
· SpO2 > 95%
· Conscious and oriented
Vitals Stable
YES
No
RED FLAG SIGNS
· PR > 120/min
· Systolic BP < 100 Mm Hg
· Tachypnoea
· SpO2< 90%
· Deterioration of sensorium
Lab Investigations
BG,CM; CBC; PT-INR; viral markers, KFT, CHEST X-RAY
DSA + embolization of BAs/NBSAs/PA/MAPCAS
CTA AORTA +/- CTPA
Normal; No identifiable source
Medical management
Fail
DSA + Embolisation of Bronchial arteries
Hypertrophied BAs(90%), NBSAs (5%)
BAE by PVA, Embospheres, Glue (Coil and gelfoam for aneurysm/prox occlusion)
PA aneurysm/PAVM
PA/PAVM embolization
Peripheral PA aneurysm →DSA/CT guided glue embolization
PAVM→Coil/Plug Embo of feeders (No use of PVA)
CHD with MAPCAS
In consultation with appropriate specialists, plan for MAPCAS embolization
Proximal vessel embolization by gelfoam/coil followed by definitive surgery for CHD
Lung CA
Embolization of supplying artery (PA/BA) as bridge
Fail
Surgery
Fail
CHART 3
NON LTH
CHEST XRAY
Infiltrate
Mass lesion
Other parenchymal disease
Suspicion of cardiac disease
Antibiotics/sputum C/S
Resolution
Non resolution
Repeat CXR at 8 weeks
Normal
Abnormal
HRCT/CTA/CECT
Recurrence/High risk of CA lung
ECG+ ECHO
Specific management and treatment
ROLE OF BRONCHOSCOPY
Bronchoscopy may be used for
· Lateralization of bleeding (active haemoptysis within 24-48 hrs)
· Clot extraction
· Balloon tamponade
SURGERY FOR SEVERE/REFRACTORY HAEMOPTYSIS
· Cavitating lesion with fungal ball
· In unsuitable anatomy/not amenable for angioembolization/unsuccessful embolization
· > 600 ml/24 hours
· Surgeries: Lobectomy, Pneumonectomy, Cavernostomy
· Large cavity in a patient with very poor pulmonary functions and massive bleeding→Resection and a cavernostomy with cauterization of the bleeding point and packing of the cavity
R
R
Fibrocalcific lesion
L side-Bronchiectasis
Hypertrophied Bronchial artery in MDCT, MIP and VRT

July 2024

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IMAGE GUIDED MANAGEMENT OF HAEMOPTYSIS

(Continued)

ANGIOGRAPHIC AND CT APPEARANCE OF ABNORMAL BRONCHIAL ARTERIES-INDICATIONS FOR BAE

1. Hypervascularity of lung parenchyma (most common)
2. Hypertrophic tortuous bronchial or non-bronchial arteries (common)
3. Neovascularisation (common) or peri-bronchial hypervascularity
4. Enlarged main bronchial artery (diameter > 2.0 mm)
5. Contrast extravasation (variable)
6. Bronchial artery aneurysm, pseudoaneurysm (rare)
7. Bronchial-to-pulmonary vein-shunts
8. Pleural thickening > 3 mm adjacent to a parenchymal abnormality
9. Extrapleural fat hypertrophy including enlarged vascular structures
10. 10% of BA may arise from Brachiocephalic, SCA, IMA or abdominal aorta branches

CONTRAINDICATIONS FOR BRONCHIAL ARTERY EMBOLIZATION

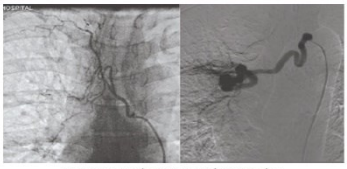
- Documented severe iodinated contrast allergy
- Careful to exclude branches supplying the heart, spinal cord or brain arising from bronchial, intercostal or other non-bronchial vessels
- Congenital PA stenosis (bronchial collateral vessels may provide an essential role in pulmonary parenchymal perfusion)

PROCEDURE DETAILS OF BAE

Pre op CTA/Flush DTA and B/L SCA Aortogram
↓
Locate Hypertrophied BAs, search and hook with diagnostic cobra/simmons catheter
↓
Selective hand-injection angiogram→verification of absence of any branches supplying to critical structures
↓
Advance coaxial microcatheter in target vessel distally and access flow dynamics by angiogram through 2CC luer lock syringe
↓
Embolization by pulsatile injection through 1 cc syringe under active fluoroscopy
↓
When resistance/reflux develops, new manual contrast angiogram to be done after flushing residual embolic materials
↓
Locate other BAs and NBSAs and embolise all pathological arteries

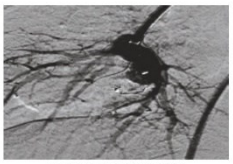
EXPECTED OUTCOMES

- **Technical success: 90-100%**
- **Clinical success**
  - Within 24 hr- 82-100%; within 30 days-70-92%;
  - 1-yr clinical success- 64-92 %
  - Recurrence: upto 47% [Repeat Embolization to be performed]
- **Predictors of recurrent Haemoptysis are as follows:**
  - Recruitment of non-bronchial systemic collaterals
  - Diabetes
  - Presence of an aspergilloma
  - Feeding vessels from internal mammary artery
  - Multidrug-resistant tuberculosis, co-existent pulmonary interstitial lung disease, patients with malignant diseases
  - Unstable haemodynamics and prolonged coagulation
- **Associated adverse events/complications**
  - Post embolization syndrome-1.7-31%
  - Spinal cord Infarction, bronchial infarction,stroke <1%
- **After care**
  - Pain management: NSAIDS and if required intravenous Narcotics
- **Follow up**:
  - After 1 week; 1, 3, 6, and 12months post-BAE and yearly thereafter
  - Hb
  - Chest Xray



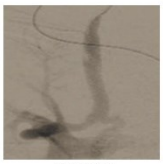
Hypertrophied Bronchial arteries

Non bronchial Systemic Artery



Plug Deploy in PAVM

Hypertrophied Bronchial artery in MDCT, MIP and VRT



MAPCAS

ABBREVIATIONS

BA:	Bronchial Artery	**FB:**	Flexible Bronchoscopy	**NBSA:**	Non Bronchial Systemic Artery
BG:	Blood Grouping	**GA:**	General Anaesthesia	**OT:**	Operation Theatre
CBC:	Complete Blood Count	**HB:**	Hemoglobin	**PA:**	Pulmonary Artery
CE:	Clinical Examination	**ICU:**	Intensive Care Unit	**PAVM:**	Pulmonary Arteriovenous Malformation
CHD:	Congenital Heart Disease	**IMA:**	Internal Mammary Artery		
CM:	Cross Matching	**IR:**	Interventional Radiology	**PT:**	Prothrombin Time
CTA:	Computed Tomogram Angio	**LTH:**	Life threatening Haemoptysis	**PVA:**	Poly vinyl Alcohol
CTPA:	CT Pulmonary Angio	**MAPCAS:**	Major Aorto-Pul Collaterals	**KFT:**	Kidney Function Test
DSA:	Digital Subtraction Angio	**MDCT:**	Multi Detector CT	**SCA:**	Subclavian Artery
ECG:	Electrocardiogram	**MIP:**	Maximum Intensity Projection	**VRT:**	Virtual Reality Technology
ECHO:	Echocardiography	**MS:**	Mitral Stenosis		

REFERENCES

1. Singhal R, K B SB, Naranje P, Kazimi J, Garg PK, Chandra D, Popat BA, Shetty NS, Gorsi U, Vimala LR, Khera PS, Irodi A, Kulkarni S, Keshava SN, Bhalla AS. Society of Chest Imaging and Interventions Consensus Guidelines for the Interventional Radiology Management of HAEMOPTYSIS. Indian J Radiol Imaging. 2023 Apr 10;33(3):361-372. doi: 10.1055/s-0043-1762552. PMID: 37362365; PMCID: PMC10289864.
2. Parrot A, Tavolaro S, Voiriot G, Canellas A, Assouad J, Cadranel J, Fartoukh M. Management of severe hemoptysis. Expert Rev Respir Med. 2018 Oct;12(10):817-829. doi: 10.1080/17476348.2018.1507737. Epub 2018 Sep 10. PMID: 30198807.
3. Bhalla A, Kandasamy D, Veedu P, Mohan A, Gamanagatti S. A retrospective analysis of 334 cases of hemoptysis treated by bronchial artery embolization. Oman Med J. 2015 Mar;30(2):119-28. doi: 10.5001/omj.2015.26. PMID: 25960838; PMCID: PMC4412455.
4. Kettenbach J, Ittrich H, Gaubert JY, Gebauer B, Vos JA. CIRSE Standards of Practice on Bronchial Artery Embolization. Cardiovasc Intervent Radiol. 2022 Jun;45(6):721-732. doi: 10.1007/s00270-022-03127-w. Epub 2022 Apr 8. PMID: 35396612; PMCID: PMC9117352

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