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PROGRAMME

LATVIA-LITHUANIA-BELARUS

## LLB 2-242

**Project: Improvement of the health service by means of IT technology in dermal and lungs cancer diagnostics.**

### **Description of the lung cancer diagnostic algorithm.**

The main task of the lung cancer algorithm is the improvement of early diagnostics of lung cancer by development of decision making system for automatic diagnostics solutions. It should reach mainly two groups of specialists: general practitioners and oncology professionals. Both target groups of specialists should have a possibility to use the algorithm in training purposes as well.

Lung cancer algorithm encompasses different parameters, as well as working system of algorithm principals and regulations. According to the results of selected methods, other diagnostic methods or procedures could be selected till the final diagnosis obtained.

This document presents the algorithm rules as well as the description of diagnostic methods that are used in algorithm.

#### **1. Patient characterists.**

Initial patient characteristics (Table 1) and corresponding values (Table 2) are based on visual inspection and can be got after first visit.

*Table 1. Patient characteristics:*

Code of characteristic	Name of characteristic
C_G	Gender

Code of characteristic	Name of characteristic
C_S	Symptom
C_R	Risk factor

*Table 2. Values of patient characteristics:*

Code of characteristic value	Name of characteristic value
C_G_1	Female
C_G_2	Male
C_S_1	Bone pain
C_S_2	Breathing changes
C_S_3	Change in a cough
C_S_4	Chest pain
C_S_5	Chest sign
C_S_6	Cough
C_S_7	Dyspnoea
C_S_8	Haemoptysis
C_S_9	Hoarseness
C_S_10	Shoulder pain
C_S_11	Weight loss
C_S_12	Enlarged neck lymph nodes
C_R_1	Chronic lung disease
C_R_2	Family history of lung cancer
C_R_3	Other cancer history
C_R_4	Previous radiation therapy

Code of characteristic value	Name of characteristic value
C_R_5	Professional exposure to radon, asbestos, silica or chromium
C_R_6	Age > 74 years
C_R_7	Age 50-54 years
C_R_8	Age 55-74 years
C_R_9	Smoking < 20 pack-year history
C_R_10	Smoking 20-30 pack-year history
C_R_11	Smoking > 30 pack-year history
C_R_12	Quit smoking less than 15 years ago
C_R_13	Second-hand smoking

## 2. Diagnostic methods and results.

Diagnostic methods (Table 3) includes different kind of radiological as well as surgical procedures for disease detection as well as staging procedures. Possible results are presented in Table 4. All descriptions of selected values are described in Table 8.

*Table 3. Diagnostic methods:*

Diagnostic method code	Diagnostic method name
M_BPS	Biopsy or surgical resection
M_BSG	Bone scintigraphy
M_BRC	Bronchoscopy
M_CTG	Computed tomography
M_LCT	Low dose computed tomography
M_EBU	Endobronchial ultrasound
M_EUS	Endoscopic ultrasound

Diagnostic method code	Diagnostic method name
M_MRI	Magnetic resonance imaging
M_NUS	Neck ultrasound
M_PTG	Positron emission tomography (PET/CT)
M_TBA	Transbronchial needle biopsy
M_ULS	Ultrasound
M_XRY	X-ray
M_TTB	Transthoracic percutaneous needle biopsy under CT or other method guidance
M_VMS	Videoassisted mediastinoscopy
M_CMS	Cervical mediastinoscopy
M_VTS	Videoassisted thoracoscopy

*Table 4. Values of diagnostic results:*

Code of result value	Name of result value
R_N	Negative
R_P	Positive
R_1	Neck nodes
R_2	Atelectasis
R_3	Broncheal stenosis
R_4	Hilar enlargement
R_5	Mediastinal lymph nodes enlargement
R_6	Mediastinal widening
R_7	Peribronchial infiltration

Code of result value	Name of result value
R_8	Pleural fluid
R_9	Infiltration of lung parenchyma
R_10	Lung nodules
R_11	Lung mass
R_12	Pleural mass
R_13	Bone lesions
R_14	Pleural nodule
R_BR_1	Brain metastasis
R_BR_2	Meningeal metastasis
R_LSND_1	Ground glass nodule <5 mm
R_LSND_2	Ground glass nodule 5-9 mm
R_LSND_3	Ground glass nodule >9 mm
R_LSND_4	Solid nodule <4 mm
R_LSND_5	Solid nodule 4-6 mm
R_LSND_6	Solid nodule 6-8 mm
R_LSND_7	Solid nodule >8 mm
R_LSND_8	Several nodules <5 mm
R_LSND_9	Several nodules >=5 mm
R_LSND_10	Several solid with ground glass nodule
R_LSND_11	Solid part with ground glass nodule, when solid part <5 mm
R_LSND_12	Solid part with ground glass nodule, when solid part 5-7 mm

Code of result value	Name of result value
R_LSND_13	Solid part with ground glass nodule, when solid part >7 mm
R_LSND_14	Fat containing
R_LSND_15	Calcified
R_LSND_16	Growing nodule
R_LSND_17	No growing nodule

Relations (Table 5) amongst used diagnostic methods and results includes all possible diagnostic results, as well as different combinations of the results could be possible in the working algorithm. The possibility of patient observation in case of negative result or inadequate result for further diagnostic procedures or diagnosis establishment is provided as well. Diagnosis (Table 6 and Table 7) can be made on the diagnostic results.

Table 5. Relations of methods and results:

Diagnostic method	Diagnostic result	
	Code	Name
M_BPS <i>Biopsy or surgical resection</i>	R_N	<i>Negative</i>
	D_MR	<i>Morphology</i>
M_BSG <i>Bone scintigraphy</i>	R_N	<i>Negative</i>
	D_MT_4	<i>M1b</i>
M_BRC <i>Bronchoscopy</i>	R_N	<i>Negative</i>
	D_MR	<i>Morphology</i>
	D_TN_2	<i>T1</i>

Diagnostic method	Diagnostic result	
	Code	Name
	D_TN_3	<i>T2</i>
	D_TN_4	<i>T3</i>
	D_TN_5	<i>T4</i>
	D_TN_6	<i>Tis</i>
M_CTG <i>Computed tomography</i>	R_N	<i>Negative</i>
	R_LSND_1	<i>Ground glass nodule &lt;5 mm</i>
	R_LSND_2	<i>Ground glass nodule 5-9 mm</i>
	R_LSND_3	<i>Ground glass nodule &gt;9 mm</i>
	R_LSND_4	<i>Solid nodule &lt;4 mm</i>
	R_LSND_5	<i>Solid nodule 4-6 mm</i>
	R_LSND_6	<i>Solid nodule 6-8 mm</i>
	R_LSND_7	<i>Solid nodule &gt;8 mm</i>
	R_LSND_8	<i>Several nodules &lt;5 mm</i>
	R_LSND_9	<i>Several nodules &gt;=5 mm</i>
	R_LSND_10	<i>Several solid with ground glass nodule</i>
	R_LSND_11	<i>Solid part with ground glass nodule, when solid part &lt;5 mm</i>
	R_LSND_12	<i>Solid part with ground glass nodule, when solid part 5-7 mm</i>
	R_LSND_13	<i>Solid part with ground glass nodule, when solid part &gt;7 mm</i>
	R_LSND_14	<i>Fat containing</i>

Diagnostic method	Diagnostic result	
	Code	Name
	R_LSND_15	<i>Calcified</i>
	R_LSND_16	<i>Growing nodule</i>
	R_LSND_17	<i>No growing nodule</i>
	R_11	<i>Lung mass</i>
	R_5	<i>Mediastinal lymph nodes enlargement</i>
	R_8	<i>Pleural fluid</i>
	R_9	<i>Infiltration of lung parenchyma</i>
	R_2	<i>Atelectasis</i>
	R_12	<i>Pleural mass</i>
	R_13	<i>Bone lesions</i>
M_LCT	R_N	<i>Negative</i>
<i>Low dose computed tomography</i>	R_LSND_1	<i>Ground glass nodule &lt;5 mm</i>
	R_LSND_2	<i>Ground glass nodule 5-9 mm</i>
	R_LSND_3	<i>Ground glass nodule &gt;9 mm</i>
	R_LSND_4	<i>Solid nodule &lt;4 mm</i>
	R_LSND_5	<i>Solid nodule 4-6 mm</i>
	R_LSND_6	<i>Solid nodule 6-8 mm</i>
	R_LSND_7	<i>Solid nodule &gt;8 mm</i>
	R_LSND_8	<i>Several nodules &lt;5 mm</i>
	R_LSND_9	<i>Several nodules &gt;=5 mm</i>



Diagnostic method	Diagnostic result	
	Code	Name
	R_LSND_10	<i>Several solid with ground glass nodule</i>
	R_LSND_11	<i>Solid part with ground glass nodule, when solid part &lt;5 mm</i>
	R_LSND_12	<i>Solid part with ground glass nodule, when solid part 5-7 mm</i>
	R_LSND_13	<i>Solid part with ground glass nodule, when solid part &gt;7 mm</i>
	R_LSND_14	<i>Fat containing</i>
	R_LSND_15	<i>Calcified</i>
	R_LSND_16	<i>Growing nodule</i>
	R_LSND_17	<i>No growing nodule</i>
	R_11	<i>Lung mass</i>
	R_5	<i>Mediastinal lymph nodes enlargement</i>
	R_8	<i>Pleural fluid</i>
	R_9	<i>Infiltration of lung parenchyma</i>
	R_2	<i>Atelectasis</i>
	R_12	<i>Pleural mass</i>
	R_13	<i>Bone lesions</i>
M_EBU	R_N	<i>Negative</i>
<i>Endobronchial ultrasound</i>	D_LN_1	<i>N0</i>
	D_LN_2	<i>N1</i>

Diagnostic method	Diagnostic result	
	Code	Name
	D_LN_3	<i>N2</i>
	D_LN_4	<i>N3</i>
	D_TN_2	<i>T1</i>
	D_TN_3	<i>T2</i>
	D_TN_4	<i>T3</i>
	D_TN_5	<i>T4</i>
M_EUS <i>Endoscopic ultrasound</i>	R_N	<i>Negative</i>
	D_LN_1	<i>N0</i>
	D_LN_2	<i>N1</i>
	D_LN_3	<i>N2</i>
	D_LN_4	<i>N3</i>
M_MRI <i>Magnetic resonance imaging</i>	R_BR_1	<i>Brain metastasis</i>
	R_BR_2	<i>Meningeal metastasis</i>
	R_BR_3	<i>Edema</i>
M_NUS <i>Neck ultrasound</i>	R_N	<i>Negative</i>
	R_P	<i>Positive</i>
M_PTG	R_N	<i>Negative</i>

Diagnostic method	Diagnostic result	
	Code	Name
<i>Positron emission tomography (PET/CT)</i>	R_P	<i>Positive</i>
M_TBA <i>Transbronchial needle aspiration</i>	R_N	<i>Negative</i>
	D_LN_1	<i>N0</i>
	D_LN_2	<i>N1</i>
	D_LN_3	<i>N2</i>
	D_LN_4	<i>N3</i>
	D_MR	<i>Morphology</i>
M_ULS <i>Ultrasound</i>	R_N	<i>Negative</i>
	R_P	<i>Positive</i>
	D_MT_4	<i>M1b</i>
M_XRY <i>X-ray</i>	R_N	<i>Negative</i>
	R_10	<i>Lung nodules</i>
	R_11	<i>Lung mass</i>
	R_5	<i>Mediastinal lymph nodes enlargement</i>
	R_6	<i>Mediastinal widening</i>
	R_8	<i>Pleural fluid</i>
	R_9	<i>Infiltration of lung parenchyma</i>
	R_2	<i>Atelectasis</i>

Diagnostic method	Diagnostic result	
	Code	Name
	R_12	<i>Pleural mass</i>
	R_13	<i>Bone lesions</i>
M_TTB <i>Transthoracic percutaneous fine biopsy under CT guidance</i>	R_N	<i>Negative</i>
	D_TN_1	<i>T0</i>
	D_TN_2	<i>T1</i>
	D_TN_3	<i>T2</i>
	D_TN_4	<i>T3</i>
	D_TN_5	<i>T4</i>
	D_MR	<i>Morphology</i>
M_VMS <i>Videoassisted mediastinoscopy</i>	R_N	<i>Negative</i>
	D_LN_1	<i>N0</i>
	D_LN_2	<i>N1</i>
	D_LN_3	<i>N2</i>
	D_LN_4	<i>N3</i>
	D_MR	<i>Morphology</i>
	D_MT_3	<i>M1a</i>
M_VTS <i>Videoassisted thoracoscopy</i>	D MT 3	<i>M1a</i>
	R_8	<i>Pleural fluid</i>

Diagnostic method	Diagnostic result	
	Code	Name
	R_14	<i>Pleural nodule</i>
	R_12	<i>Pleural mass</i>
M_CMS	R_N	<i>Negative</i>
<i>Cervical mediastinoscopy</i>	D_LN_1	<i>N0</i>
	D_LN_2	<i>N1</i>
	D_LN_3	<i>N2</i>
	D_LN_4	<i>N3</i>
	D_MR	<i>Morphology</i>

Table 6. Diagnosis:

Diagnosis code	Diagnosis name
D_NG	Negative
D_LN	Lymph node
D_MT	Metastasis
D_MR	Morphology
D_TN	Tumor

Table 7. Values of diagnosis:

Code of diagnosis value	Name of diagnosis value
D_NG_1	No observation

Code of diagnosis value	Name of diagnosis value
D_NG_2	Observation
D_NG_3	CT after 3 months
D_NG_4	CT after 3-6 months
D_NG_5	CT after 6-12 months
D_NG_6	CT after 12 months
D_NG_7	CT after 12 months for 3 years
D_NG_8	CT after 3, 9, 24 months
D_NG_9	CT after 9-12 and 24 months
D_NG_10	CT after 18-24 months
D_NG_11	CT after 24 and 48 months
D_LN_1	N0
D_LN_2	N1
D_LN_3	N2
D_LN_4	N3
D_LN_5	Nx
D_MT_1	M0
D_MT_2	M1
D_MT_3	M1a
D_MT_4	M1b
D_MT_5	Mx
D_MR_1	G1
D_MR_2	G2

Code of diagnosis value	Name of diagnosis value
D_MR_3	G3
D_MR_4	Non small cell lung cancer
D_MR_5	Small cell
D_MR_6	Undifferentiated
D_TN_1	T0
D_TN_2	T1
D_TN_3	T2
D_TN_4	T3
D_TN_5	T4
D_TN_6	Tis
D_TN_7	Tx

Table 8. Description and translation of codes and values

Code	Value	Description
C_G	Gender	
C_G_1	Female	
C_G_2	Male	
C_S	Symptom	A departure from normal function or feeling which is noticed by a <u>patient</u> , indicating the presence of <u>disease</u> or abnormality
C_S_1	Bone pain	Pain in the bones
C_S_2	Breathing changes	Changes in breathing, strange sounds or other feelings while breathing
C_S_3	Change in a cough	Any changes in a chronic cough, particularly in a smoker. coughing more often, cough has a deeper or hoarse sound, or coughing up blood or more mucus than usual.

Code	Value	Description
C_S_4	Chest pain	Pain in the chest usually not related with heart disease
C_S_5	Chest sign	Any new feelings in the chest, especially in a smoker or together with a cough.
C_S_6	Cough	The symptom of many benign and malignant lung diseases
C_S_7	Dyspnoea	A subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity
C_S_8	Haemoptysis	The main clinical symptom that could indicate lung cancer
C_S_9	Hoarseness	Voice sounds deeper, hoarse, or raspier. Hoarseness can be caused by a simple cold, but this symptom becomes worrisome when it hangs on for more than two weeks. Hoarseness related to lung cancer can occur when the tumor affects the nerve that controls the larynx, or voice box.
C_S_10	Shoulder pain	In case of spread lung cancer it may produce pain in shoulder, back or other bones.
C_S_11	Weight loss	Medical problem when at least 10% of a person's body weight has been lost in six months or 5% in the last month
C_S_12	Enlarged neck lymph nodes	Palpated or patient feels enlarged nodes in the neck region, >10,, in short axis by Ultrasound or CT; points to N3 disease
C_R	Risk factor	A variable, associated with an increased <u>risk of disease</u>
C_R_1	Chronic lung disease	Diagnosis of asthma, bronchopulmonary dysplasia or chronic obstructive pulmonary disease
C_R_2	Family history of lung cancer	Relatives with diagnosed lung cancer
C_R_3	Other cancer history	Other cancer may manifest with lung nodules, turning out to be lung metastases from other cancer
C_R_4	Previous radiation therapy	Previous radiation therapy in chest area increases risk of lung or breast cancer
C_R_5	Professional exposure to radon, asbestos, silica or	Patient had exposure with these risk factors previously



Code	Value	Description
	chromium	
C_R_6	Age > 74 years	
C_R_7	Age 50-54 years	
C_R_8	Age 55-74 years	The highest probability of lung cancer in this group
C_R_9	Smoking < 20 pack-year history  (1 pack-year – 20 cigarettes per day every day per year)	
C_R_10	Smoking 20-30 pack-year history	pack-year – 20 cigarettes per day every day per year
C_R_11	Smoking > 30 pack-year history	1 pack-year – 20 cigarettes per day every day per year
C_R_12	Quit smoking less than 15 years ago	
C_R_13	Second-hand smoke	Smoking cohabitant
R_N	Negative	
R_P	Positive	
R_1	Neck nodes	Lymph nodes in the neck
R_2	Atelectasis	Defined as the collapse or closure of the lung resulting in reduced or absent gas exchange. It may affect part or all of one lung. Usually appears when tumor growing inside the bronchus (central growth type). Diagnosed with X-ray, CT or bronchoscopy.

Code	Value	Description
R_3	Broncheal stenosis	Abnormal narrowing of the bronchus, may be the result of intrabroncheal tumor growth, peribroncheal tumor growth, compression with tumor growing in the lung parenchyma or stenosis from enlarged lymph node. Diagnosed with bronchoscopy, CT or X-ray.
R_4	Hilar enlargement	The hilum is the area on the central portion of each lung where the <a href="#">bronchi</a> , arteries, veins, and nerves enter and exit the lungs. Usually is "enlarged" because of enlarged lymph nodes (inflammatory or tumor) or because of the tumor growing in the hilar region. Diagnosed on X-ray, CT
R_5	Mediastinal lymph nodes enlargement	Lymph nodes are enlarged if >10mm in short axis on CT
R_6	Mediastinal widening	On X-ray image widening of usual mediastinal contours
R_7	Peribronchial infiltration	Peribronchial thickening or bronchial wall thickening, sometimes with tissues thickening around bronchial wall. Detected on X-ray or CT.
R_8	Pleural fluid	Pleural effusion is excess fluid that accumulates between the two <a href="#">pleural layers</a> , the fluid-filled space that surrounds the lungs. Detected on X-ray or CT.
R_9	Infiltration of lung parenchyma	Lung infiltration can occur for a variety of reasons: When your lung tissue contains an abnormal presence of granulomas, when your airspaces fill with fluid inflammatory cells or exudates, or malignant cancer cells. Diagnosed with X-ray or CT.
R_10	Lung nodules	A spot (or spots) in the lung less than 3 cm in diameter. Detected on X-ray or CT.
R_11	Lung mass	A "lung mass" is defined as an abnormal spot in the lungs that is more than 3 cm in size. If a spot (or spots) is less than 3 cm in diameter, it is called a "lung nodule." Detected on X-ray or CT.
R_12	Pleural mass	A mass in pleura less than 1cm

Code	Value	Description
R_13	Bone lesions	Metastatic bone lesions, pathological fractures
R_14	Pleural nodule	Nodule, growing in pleura, <1cm
R_BR	Brain analysis result	If patient has brain symptoms, brain MRI could be used.
R_BR_1	Brain metastasis	Lung cancer metastases (nodules) in the brain tissue.
R_BR_2	Meningeal metastasis	Lung cancer metastases in brain surrounding tissues (meninges)
R_LSND	Lesion analysis result: Nodule density	A feature of lung nodule on CT image, that describes the tissue roentgen sensity in Hounsfield units
R_LSND_1	Ground glass nodule <5 mm	Low density and not clare margins module ; CT follow up in 12 months
R_LSND_2	Ground glass nodule 5-9 mm	Low density and not clare margins module ; CT in 6 months
R_LSND_3	Ground glass nodule >9 mm	Low density and not clare margins module ; CT in 3-6 months
R_LSND_4	Solid nodule <4 mm	Soft tissue density nodule in the lungs; Usually too small for proper differentiation and follow-up is needed
R_LSND_5	Solid nodule 4-6 mm	Low dose CT in 12 months. If low risk patient and no nodule dynamics – no further CT.  If high risk patient – CT in 18-24 months
R_LSND_6	Solid nodule 6-8 mm	If low risk – low dose CT in 6-12 months, then in 18-24 months. If high risk – CT in 3-6 months, then in 9-12 and 24 months.
R_LSND_7	Solid nodule >8 mm	If low or high risk – low dose CT in 3,6, and 24 months or biopsy or PET-CT.
R_LSND_8	Several nodules <5 mm	

Code	Value	Description
R_LSND_9	Several nodules >=5 mm	
R_LSND_10	Several solid with ground glass nodule	
R_LSND_11	Solid part with ground glass nodule, when solid part <5 mm	CT in 3 months, later 3 years once in 12 months; if growing – PET/CT
R_LSND_12	Solid part with ground glass nodule, when solid part 5-7 mm	CT in 3 months, if growing – biopsy or surgery
R_LSND_13	Solid part with ground glass nodule, when solid part >7 mm	PET/CT; if growing or suspicious on PET/CT – biopsy or surgery
R_LSND_14	Fat containing	Fat containing nodule is usually benign, e.g. hamartoma.
R_LSND_15	Calcified	Calcifications seen in nodule, usually in benign disease (e.g. Tuberculosis)
R_LSND_16	Growing nodule	If diagnostic method was repeated
R_LSND_17	Not growing nodule	If diagnostic method was repeated
M_BPS	Biopsy or surgical resection	Method for tissue removal for pathology diagnosis
M_BSG	Bone scintigraphy	Radiological method for metastases in bones detecion (in case of lung cancer + bone pain)
M_BRC	Bronchoscopy	The main endoscopic diagnostic method for central growth type lung cancer lesions detection and biopsy
M_CTG	Computed tomography (CT)	The main radiological diagnostic method for lung tumor, nodes and whole body assessment
M_LCT	Low dose computed	Low dose CT protocol, with lower quality, but with lower dose; usually used in screening high risk

<b>Code</b>	<b>Value</b>	<b>Description</b>
	tomography	persons
M_EBU	Endobronchial ultrasound	An endobronchial ultrasound is a procedure that may be performed during a bronchoscopy to provide further information to diagnose or determine the stage of lung cancer.
M_EUS	Endoscopic ultrasound	Uses the esophagus to access mediastinal lymph nodes, excellent for station 5, 7, 8 lymph nodes. Useful for station 2L and 4L
M_MRI	Magnetic resonance imaging	MRI has the modestly higher detection rate for brain metastases
M_NUS	Neck ultrasound	Ultrasound of neck lymph nodes
M_PTG	Positron emission tomography (PET)	<p>Could be useful for &gt;8 mm solid nodules on CT differentiation (benign or malignant).</p> <p>PET has a limited role in T-staging because of its lack of resolution. PET however is of great value in N- and M-staging.</p>
M_TBA	Transbronchial biopsy	Lymph nodes or other lesion biopsy during bronchoscopy
M_ULS	Ultrasound	For neck lymph nodes, for inner organs metastases
M_XRY	X-ray	The initial radiological diagnostic method for the patient with symptoms or high risk patient. The diagnostic method lacks good resolution, so usually the CT is needed.
M_TTB	Transthoracic percutaneous fine biopsy under CT or other method guidance (fluoroscopy or ultrasound) (TTB)	Useful for peripheral lung nodules or masses pathological diagnosis assessment

<b>Code</b>	<b>Value</b>	<b>Description</b>
M_VMS	Videoassisted mediastinoscopy	Good for inferior mediastinum, station 5 and 6 lymph nodes
M_VTS	Videoassisted thoracoscopy	Pleural nodules, masses, pleural fluid evaluations; sometimes for lung lesions or nodes characteristics
M_CMS	Cervical mediastinoscopy	Still considered the gold standard (usual comparator) by many, excellent for 2RL 4RL
D_NG	Negative	
D_NG_1	No observation	
D_NG_2	Observation	Follow up of the patient if the disease is not clear; the observation time depends on individual factors, symptoms and diagnostic tests results
D_NG_3	CT after 3 months	
D_NG_4	CT after 3-6 months	
D_NG_5	CT after 6-12 months	
D_NG_6	CT after 12 months	
D_NG_7	CT after 12 months for 3 years	
D_NG_8	CT, PET/CT or biopsy after 3, 9, 24 months	
D_NG_9	CT after 9-12 and 24 months	
D_NG_10	CT after 18-24 months	
D_NG_11	CT after 24 and 48 months	

Code	Value	Description
D_LN	Lymph node	
D_LN_1	N0	No metastases in regional lymph nodes
D_LN_2	N1	Metastases in N1-nodes: ipsilateral nodes within the lung up to hilar nodes. N1 alters the prognosis but not the management. A T1-tumor without positive nodes within the lung has a 5-y survival of 61%. The same T1-tumor with N1-nodes has a 5-y survival of only 34%.
D_LN_3	N2	Metastases in mediastinal lymph nodes in the ipsilateral side of the tumor
D_LN_4	N3	Metastases in contralateral mediastinal or contralateral hilar nodes <i>or</i> any scalene or supraclavicular nodes. N3-nodes are clearly unresectable.
D_LN_5	Nx	Evaluation of lymph nodes status is not performed
D_MT	Metastasis	Spread of the disease
D_MT_1	M0	No distant metastasis
D_MT_2	M1	Distant metastasis
D_MT_3	M1a	Separate tumour nodule(s) in a contralateral lobe or tumour with pleural nodules or malignant pleural or pericardial effusion.
D_MT_4	M1b	Distant metastasis in other organs (eg. Brain, bones, adrenals, etc) or in other lung
D_MT_5	Mx	Evaluation of distant disease spread is not performed
D_MR	Morphology (or histology or pathological assessment)	Pathology evaluation results of biopsies or surgical resection pathological assessment; final diagnosis of the disease or disease confirmation
D_MR_T	Grade of the tumor	Tumor grade is an indicator of how quickly the tumor is likely to grow and spread.

Code	Value	Description
D_MR_1	G1	Good differentiated tumor, better prognosis
D_MR_2	G2	Medium differentiated tumor
D_MR_3	G3	Poorly differentiated tumor, bad prognosis
D_MR_H	Histology type	Type of the cancer cells. Treatment and prognosis depend on the cells type
D_MR_4	Non small cell lung cancer	NSCLC can be divided into adenocarcinoma, squamous cancer, other types
D_MR_5	Small cell lung cancer	SCLC has different staging system and treated usually by chemotherapy.
D_TN	Tumor	Primary tumor assessment cT – clinical assessment, pT – pathological assessment after operation.
D_TN_1	T0	No primary tumor
D_TN_2	T1	Diameter of 3 cm or smaller and surrounded by lung or visceral pleura or  endobronchial tumor distal to the lobar bronchus
D_TN_3	T2	Greater than 3 and smaller than 7 cm  T2a= 3 cm - 5 cm  T2b= 5 cm - 7 cm  Invasion of the visceral pleura, atelectasis or obstructive pneumopathy, involving less than the whole lung.  Tumor involving the main bronchus 2 cm or more distal to the carina.
D_TN_4	T3	Tumor with atelectasis or obstructive pneumonitis of the entire lung.  Tumor in the main bronchus within 2 cm of the carina but not invading it.



Code	Value	Description
		Tumor of any size with invasion of non-vital structures such as the chest wall, mediastinal pleura, diaphragm, pericardium.  Separate tumour nodules in the same lobe as the primary tumor.
D_TN_5	T4	Invasion of vital mediastinal structures: heart, trachea, esophagus, great vessels, recurrent laryngeal nerve, carina.  Invasion of vertebral body.  Separate tumour nodule(s) in a different ipsilateral lobe to that of the primary tumor.
D_TN_7	Tx	Evaluation of primary tumor cannot be performed

### 3. Algorithm rules.

Algorithm working rules are stated bellow.

1. If C\_R\_11 and (C\_R\_7 or C\_R\_8) and no C\_S, then next method is M\_LCT
2. If C\_R\_6-C\_R\_8 and (C\_S\_6 or C\_S\_8) and C\_S\_2-C\_S\_12, then next method is M\_XRY
3. If C\_R\_1-C\_R\_5 and (C\_S\_6 or C\_S\_8) and C\_S\_2-C\_S\_12, then next method is M\_XRY
4. If C\_R\_9-C\_R\_13 and (C\_S\_6 or C\_S\_8) and C\_S\_2-C\_S\_12, then next method is M\_XRY
5. If C\_S\_12, then next method is M\_NUS
6. If M\_NUS is R\_P, then next method is M\_CTG and diagnosis is D\_LN\_4
7. If M\_XRY is (R\_6 or R\_8 or R\_10 or R\_11 or R\_12 or R\_13), then next method is M\_CTG
8. If (M\_CTG or M\_LCT) is R\_LSND\_1, then D\_NG\_1
9. If (M\_CTG or M\_LCT) is R\_LSND\_2, then D\_NG\_3
10. If (M\_CTG or M\_LCT) is R\_LSND\_3, then next method is (M\_PTG or M\_BPS)
11. If (M\_CTG or M\_LCT) is R\_LSND\_2 and R\_LSND\_17, then D\_NG\_7
12. If (M\_CTG or M\_LCT) is R\_LSND\_2 and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
13. If (M\_CTG or M\_LCT) is R\_LSND\_11, then D\_NG\_3

14. If (M\_CTG or M\_LCT) is R\_LSND\_12, then next method is M\_PTG
15. If (M\_CTG or M\_LCT) is R\_LSND\_12 and R\_LSND\_17, then D\_NG\_7
16. If (M\_CTG or M\_LCT) is R\_LSND\_12 and R\_LSND\_16, then next method is M\_BPS
17. If (M\_CTG or M\_LCT) is R\_LSND\_13, then next method is M\_BPS
18. If (M\_CTG or M\_LCT) is R\_LSND\_8, then D\_NG\_11
19. If (M\_CTG or M\_LCT) is R\_LSND\_9, then D\_NG\_3
20. If (M\_CTG or M\_LCT) is R\_LSND\_9 and R\_LSND\_17, then D\_NG\_7
21. If (M\_CTG or M\_LCT) is R\_LSND\_10, then D\_NG\_3
22. If (M\_CTG or M\_LCT) is R\_LSND\_10 and R\_LSND\_16, then next method is M\_BPS
23. If (M\_CTG or M\_LCT) is R\_LSND\_4 and no C\_R, then D\_NG
24. If (M\_CTG or M\_LCT) is R\_LSND\_4 and (C\_R\_7 or C\_R\_8) and C\_R\_11, then D\_NG\_6
25. If (M\_CTG or M\_LCT) is R\_LSND\_4 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_17, then D\_NG
26. If (M\_CTG or M\_LCT) is R\_LSND\_4 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
27. If (M\_CTG or M\_LCT) is R\_LSND\_5 and no C\_R, then D\_NG\_6
28. If (M\_CTG or M\_LCT) is R\_LSND\_5 and no C\_R and R\_LSND\_17, then D\_NG
29. If (M\_CTG or M\_LCT) is R\_LSND\_5 and no C\_R and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
30. If (M\_CTG or M\_LCT) is R\_LSND\_5 and (C\_R\_7 or C\_R\_8) and C\_R\_11, then D\_NG\_5
31. If (M\_CTG or M\_LCT) is R\_LSND\_5 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_17, then D\_NG\_10
32. If (M\_CTG or M\_LCT) is R\_LSND\_5 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
33. If (M\_CTG or M\_LCT) is R\_LSND\_6 and no C\_R, then D\_NG\_5
34. If (M\_CTG or M\_LCT) is R\_LSND\_6 and no C\_R and R\_LSND\_17, then D\_NG\_10
35. If (M\_CTG or M\_LCT) is R\_LSND\_6 and no C\_R and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
36. If (M\_CTG or M\_LCT) is R\_LSND\_6 and (C\_R\_7 or C\_R\_8) and C\_R\_11, then D\_NG\_4
37. If (M\_CTG or M\_LCT) is R\_LSND\_6 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_17, then D\_NG\_9
38. If (M\_CTG or M\_LCT) is R\_LSND\_6 and (C\_R\_7 or C\_R\_8) and C\_R\_11 and R\_LSND\_16, then next method is (M\_PTG or M\_BPS)
39. If (M\_CTG or M\_LCT) is R\_LSND\_7 and no C\_R, then D\_NG\_8

40. If (M\_CTG or M\_LCT) is R\_LSND\_7 and (C\_R\_7 or C\_R\_8) and C\_R\_11, then D\_NG\_8
41. If (M\_CTG or M\_LCT) is R\_11, then next method M\_BRC, M\_TBB, M\_BPS
42. If (M\_CTG or M\_LCT) is R\_2, then next method M\_BRC and M\_BPS
43. If (M\_CTG or M\_LCT) is R\_9, then next method M\_BRC and M\_BPS
44. If (M\_CTG or M\_LCT) is R\_5, then next method M\_EBU, M\_EUS, M\_CMS, M\_VMS
45. If (M\_CTG or M\_LCT) is R\_8, then next method M\_VTS,
46. If (M\_CTG or M\_LCT) is R\_12, then next method M\_VTS, M\_TTB, M\_BPS
47. If (M\_CTG or M\_LCT) is R\_13, then next method M\_BS.

