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EXPERT SYSTEM IN INTERNAL DISEASES
(ESIRG)

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ABSTRACT:-

In this paper an attempt has been made to design a package for expert system in internal diseases, we named our system (ESIRG). The package is composed of respiratory system and gastrointestinal system, which represent the internal diseases in the human's body.

ESIRG has 7 functions for each system. In gastrointestinal system ESIRG has about (44) diseases and (23) diseases for respiratory system. Also ESIRG can diagnose these diseases and determine treatment according to the signs and symptoms.

In addition to that doctor/user can see what is the causes of that diseases and another functions we will explain them in this paper. Our expert system has been implemented using turbo prolog programming language.

1- INTRODUCTION :-

Expert system is one of the most important field of A.I. because it represent many utilization in various domains like (medicine, mathematics, ...etc.) . To facilitate the implementation of the application, expert system which enable user to enter his application and operate it.

In the medical area we have very large branches such as : nervous system, respiratory system, blood system, gastrointestinal system ...etc., this research focus on the respiratory system and gastrointestinal system because these systems contain a large no. of diseases. We use TURBO PROLOG language in programming this system in MS-DOS by using IBM-PC.

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2-MEDICAL ARTIFICIAL INTELLIGENCE :-

The medical artificial intelligence focus on diagnosis of the diseases to determine the treatment of these diseases . In early of 1960 the researcher began to make the artificial intelligence programs. During years from 1960 we can find 4 important programs which specifies in this area these programs are (3) :

- 1 - PIP (present illness program)
- 2- CASNET .
- 3- INTERNIST .
- 4- MYCIN .

Any medical program stand for medical research because the medical information needs to understand and discuss with a doctor . Some programmers who programmed a medical programs worked with doctors so they could be more understanding for the nature of medicine . During working in the medical area the researchers discovered that the largest problem in this area is the representation of information which taken from the doctors . But after programming the four previous programs this problem has been solved . [3]

3-THE MEDICAL PROBLEMS IN THE EXPERT SYSTEM:

In the medicine science there is no constant base or constant principle about the diagnosis of diseases , for example if person (named a) suffer from a disease and another person (named b) suffer from the same disease , it is not necessary that they have the same signs and symptoms because of several reasons , these reasons are :-

- 1- The natural differences of the body in (A and B) .
- 2- The immunity difference of the body against the diseases in (a and b) .
- 3-Psychological differences in (A and B) .

These reasons were about the patient and now about the doctors, every doctor depend on this information and his experience in diagnosing diseases .

Even in the treatment every doctor gives the patient a treatment depending on the diagnosis the disease and the case of the patient at that time. From that we can understand the medical problems in the expert systems.

4- CHARACTERISTICS OF ESIRG :-

In the ESIRG we will explain two important points, these points are :-

4-1 KNOWLEDGE REPRESENTATION :-

In any expert system we have a large no. of information, for that we must represent these information on a way which give us best results.

The information which have been used in (ESIRG) is represented by diseases, treatment, causes) such as :- dis(name of diseases, part of disease, [list of signs & symptoms], [list of treatment], [list of causes]).

All argument was written as a string except list of signs & symptoms which was written as a list of real no. so that we can represent the grades of the causes, now we will explain how it would be done. Any real no. consist of no. on the left side of point and no. on the right side of point. The left side No. represents the case and the right side No. represents the grades of this case, now we will take representation of "temperature", we represented the "temperature" by No.(16) but the "temperature" can be normal temperature (fever) or decrease in temperature.

We represented these cases such that :

Normal temperature ----- 16.0

Fever ----- 16.1

Decrease in temperature ----- 16.2

We can see the constant No. (16) which is referring to the case "temperature" and the variable No. (0,1,2) which are referring to (normal,high,decrease) of "temperature" now after we explain the way that represent the important part of our

information we will remember the important characteristics of this way :-

1- we represent list of signs and symptoms by real no. not by a trying because it takes smaller size of memory .

In our system we have about [70] diseases , if we suppose the "decrease in temperature" happened in [30] diseases , instead of writing this sentence about [30] times , we write the no. [16.2] about [30] times. also for search operation it takes less time.

2- We represented the cases grades by simplicity and efficiency.

4-2 THE INTERFACE WITH USERS :-

A good representation of information is not enough to make good system but we must present a good interface with the users. Now we will remember the important characteristics of interface with user in ESIRG :-

1- The Esirg covers large no of possibility for user's requirement .

2- We used menus in ESIRG to make it easy .

3- The esirg provides messages to the user , these messages are :

A- Messages indicates the type of user's error .

B- Messages indicates in which part of ESIRG the user is working .

C- Messages appear to the user for selecting from menu or from keyboard or (hit any key) to continue .

4- Using terms serves the the experts and non-experts , but this point not executed in every case because the medical terms are very difficult to convert to common terms.

5- FUNCTIONS OF ESIRG :-

ESIRG has (7) functions for each system (respiratory system and gestrointestinal system), now we will explain each function (see figure 1) :-

5-1 CLASSIFICATION OF DISEASES :-

Each system in human's body consist of several parts, each part suffers from some diseases. This function disply all diseases in a part (we will select it).

For example , if the user want to know the diseases in the "stomach" , he will select "stomach". Moreover ESIRG has a common diseases such as (CHOLERA , WHOOPING COUGH) that does not happen in a specific part, for this reasone these diseases has been put under title " common " diseases {see appendix 1,2}.

5-2 DIAGNOSIS OF DISEASES :-

This function is responsible on the diagnosis of diseases and give the desired treatment to the user (patient) . ESIRG has several questions to the user (patient) , with each question the probability answers are found in menu and the user select the desrible answer and according to that the result will be one of the following :-

- 1- The user suffer from specific disease .
- 2-The user suffer from one of the probable diseases , if these answers are part from these diseases
- 3-The results of user's answers in useless , because the correlation among these answers is missing.

Now we will explain the two important questions " HOW ? " and " WHY ? ".In all questions we have the selections "WHY ?" with other answers , this selections display the importance of that question in diseases. At the end of

questions , and after the ESIRG give the result , it display how it concludes this result. [see the questions in appendix 3].

5-3 INFORMATION ABOUT DISEASES :-

When we enter the name of any disease that present in the ESIRG , the ESIRG will display the causes , treatment , part , signs & symptoms of disease.

5-4 COMMON DISEASES IN (PART, CAUSES, TREATMENT, SIGNS & SYMPTOMS) :-

If we want to know the common diseases in some of information , these information enter by the user , these information including :-

A- Part in human's body (respiratory or gastrointestinal)

B- Treatment .

C- Causes .

D- Signs & Symptoms .

It is very useful function in ESIRG .

5-5 APPEND (CAUSES , TREATMENT) :-

In the ESIRG the user can append a new treatment to any existing disease and can append a new causes for any existing disease , whenever he need that .

5-6 DELETION (DISEASES , TREATMENT , CAUSES) :-

We can remove any disease from ESIRG by using this function . Moreover we can remove any causes from any disease.

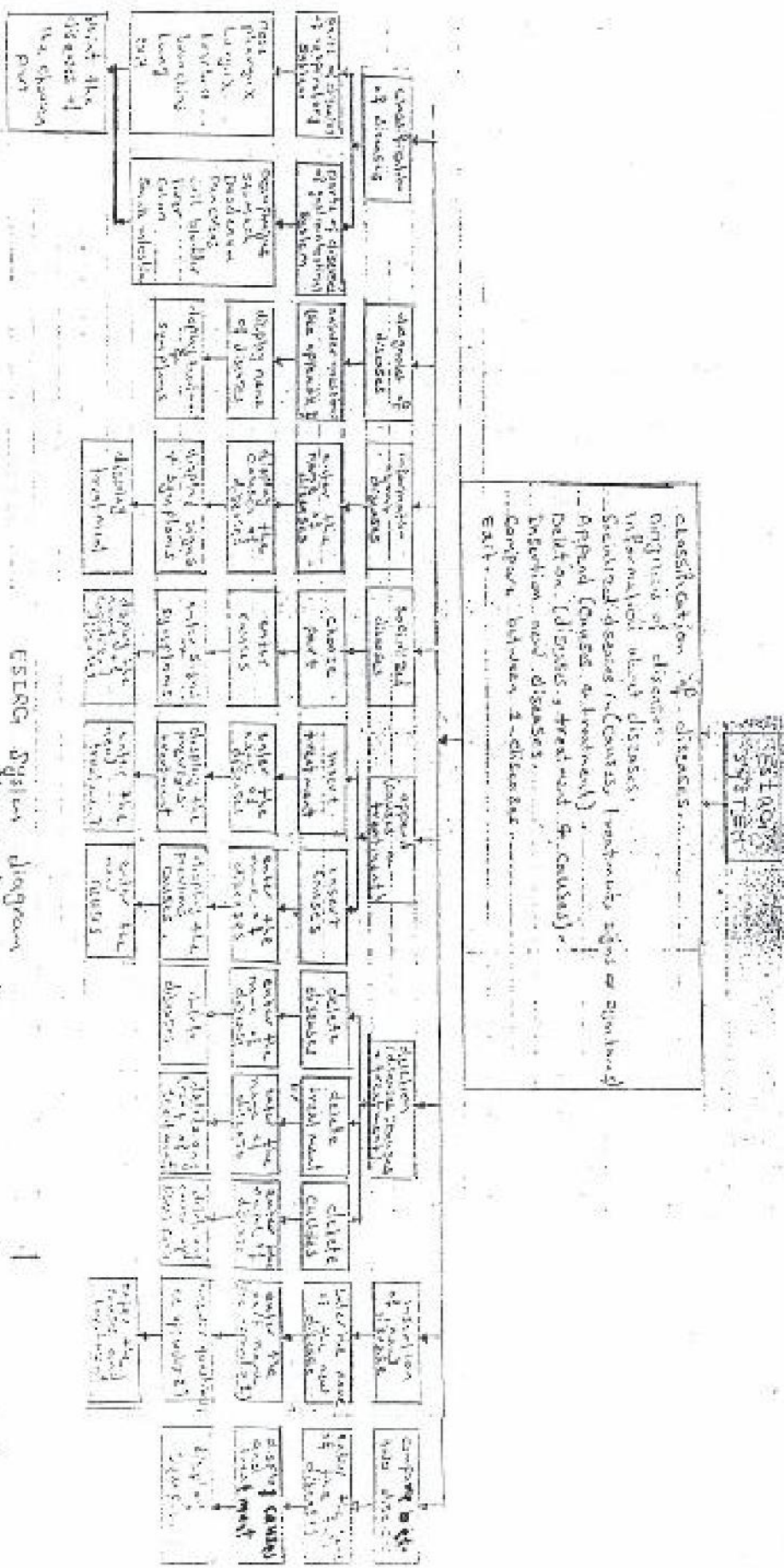
The important point in this function whenever any treatment became not active to avoid the disease or at least to decrease the danger of that disease , in this case we can delete this treatment from ESIRG.

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5-7 INSERTION NEW DISEASES :-

If a new disease discovered we can add it to ESIRG with all the information (part , causes , treatment , signs , & symptoms).

6- CONCLUSION :-

We introduced the (ESIRG) which is related with two systems in human's body (respiratory systems & gastrointestinal system). The doctor /user can make use of (7) functions provided by ESIRG for each of (respiratory system & gastrointestinal system).

ESIRG the ability to display about (44) diseases in gastrointestinal system and about (23) diseases in respiratory system . Also ESIRG can diagnose these diseases and determine the treatment according to the signs and symptoms . In addition to that the doctor / user can see what is the causes of that diseases . Any specialist doctor can update on ESIRG data base by insert , delete and append any information . In ESIRG the doctor can see the common diseases in cause , treatment , part , signs & symptoms. In the appendix 4 of this of this paper we can see some of the output model from ESIRG.

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Appendix no. 1

1- Respiratory System's

1. Nose 2. Pharynx 3. Larynx 4. Trachea 5. Bronchias 6. lungs

2- Gastroenteritis System Parts

1. Oesophaguse 2. Stomach 3. Duomenum 4. Pncreas 5. Liver
6. Colon 7. Small Intestine

Appendix No.2

1- Respiratory System Diseases :-

- 1- Common cold 2- Influenza 3-Whooping cough 4- Asthma
5- Diphtheria 6- Allergic rhinitis 7- Pneumonia
8- Acutebronchiolitis 9- Bronchiolitis 10- Emphysema
11- Bronchectesis 12- Laryngitis 13- Pharyngitis 14- T.B.
15- Bronchogenic Carcinoma 16- Pulmonary Infraction
17- Pulmonary hydratid cyst (Bronchias) 18- pulmonary
hydratid (trachea) 19- Pneumothroax 20- Croup of Trachea
21- Croup of Bronchias 22- pulmonary Carcinoma
23- Carcinoma of Trachea.

2- Gastroenteritis System's Diseases :-

- 1-Oesophagitis Ulcer 2- Carcinoma of Oesophaguse 3- Acute
Gastritis 4- Gastric Ulcer 5- Gastric Carcinoma 6- Infection
Hepatitis 7-Cirrhosis of Liver 8- Liver Pyogenic Abscess 9-Liver
Amoebic Abscess 10-Hydatid in the Liver 11- Acute Pancreatites
12- Chronic Pancreatites 13- Pancreaticcyst 14- Carcinoma of the
Pancreas 15-Acute Cholecystitis 16- Chronic Cholecystitis
17- Duodenal Ulceration 18- Malabsorption 19- Crohns Disease
20- Diverticulitis 21- Intscinal Amoebiasis 22- Tuberculosis of
the Intestine 23- Acute Appendieitis 24- Acute Intestinal

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Abstraction 25- Bacillary Dysentery 26- Irritable Bowel
 Syndrome 27- Ulcerative Colitis 28- Carcinoma of the Colon
 29- Acute Peritonitis 30- Haemorrhoids 31- Typhoid
 32- procellosis 33- Measles 34- Mumps 35- Cholera
 36- German Measles 37- Rickets 38- Diabetes Insipidus
 39- Diabetes Mellitus 40- Food Poisoning 41- Aspirin Poisoning
 42- Barbipurate Poisoning 43- Hypothyroidism
 44- Hyperthyroidism

APPENDIX 3

Common questions between both RESPIRATORY SYSTEM'S DISEASES & GASTROENTRITIS SYSTEM'S DISEASES :-

- 1- Determine the age group of the patient ?
 1-10 years 11-20 years 20-90 years
- 2- Determine the sex of the patient ?
 Male Female
- 3- Marital status ?
 Single Married
- 4- Does the patient smoke ? (No \ Yes)
- 5- Does the patient have alcoholic ? (No \ Yes)
- 6- Does the patient have general weakness ?
 No general weakness General weakness
- 7- Does the patient have headache ?
 Sever headache Light headache
- 8- The appetits .
 Normal appetits Loss of appetits
- 9- Weight of the body ?
 Normal Increase in weight Decrease in weight
- 10- Does the patient have chest pain ? (No \ Yes)
 Determine side of the pain ?
 Pain in the middle of the chest
 Pain in the right side of chest
 Pain in the left side of the chest

- 11- Does the patient have difficulty in swallowing ? (No\Yes)
- 12- Does the patient have cough ? (Yes\No)
Determine type of cough
Dry cough
Cough with sputum , light , white is color
= = = = ,yellow = =
= = = = ,heavy,green, = =
- 13- Does the patient have chronic cough ? (No\Yes)
Determine the severity of the cough ?
Sever cough light cough
- 14- Does the patient have sweating ? (No\Yes)
Where the sweating is happen ?
Sweat at all the time sweat at night
- 15- Does the patient have hoarseness of voice ? (No\Yes)
- 16- Temperature ?
Normal
Fever
Decrease in temperature
- 17- Does the patient have vomitus ? (No\Yes)
Nature of the vomitus ?
Bloody vomitus
No blood with vomitus
- 18- Does the patient have dehydration ? (No\Yes)
- 19- Does the patient have dry mouth ? (No\Yes)
- 20- Does the patient have nausea ? (No\Yes)
- 21- Nature of pulse rate ?
Normal pulse rate
Rapid pulse rate
Slow pulse rate
Irregular pulse rate
- 22- Blood pressure
Normal blood pressure
Increase in blood pressure
Decrease in blood pressure

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- 23- The amount of haemoglobin in blood ?
 Normal in Hb
 Increase in Hb
 Decrease in Hb
- 24- E S R rate
 Normal E S R
 Increase in E S R
- 25- Percentage of bile pigments in blood ?
 Normal bile pigments
 Increase in bile pigments in blood

Questions for RESPIRATORY SYSTEM'S diseases :-

- 26- Does the patient have abdominal pain ? (No\Yes)
 Determine the side of the pain ?
 Pain in the middle of upper part of the abdomen
 = = = right side of upper part of the abdomen
 = = = left = = = = =
 = = = middle of lower part of the abdomen
 = = = right side of lower part of the abdomen
 = = = left = = = = =
- 27- Does the patient has gases ? (No\Yes)
- 28- Does the patient feel any acidity at the upper part of the abdomen ? (No\Yes)
- 29- The nature of faeces ?
 Normal faeces
 Diarrhoea
 Constipation
 - The nature of diarrhoea ?
 Diarrhoea normal
 Diarrhoea with blood
 = with mucus
- 30- Does the patient have bloody faeces? (no/yes)

31-Does the patient have skin rash?(no / yes)

32-The amount of urine ?

normal amount of urine

Increase in amount of urine

Decrease in amount of urine

33-Color of the skin?

Normal color

Pal discoloration of the skin

Yellow = = = =

Blue = = = =

34- The nature of the shape of the abdomen?

Normal abdomen shape

Distention in upper right side of the abdomen

= = = left = = = =

= = = lower right side of the abdomen

= = = left = = = =

Fluid in the abdomen

General distention

35- Does the patient have swelling?(no/yes)

Determine the side of the swelling?

Swelling in the liver

= = = spleen

= = = colon

Swelling in the middle of upper part of the abdomen

Swelling in the right side of upper part of abdomen

Swelling in the middle of lower part of the abdomen

Swelling in the right of lower part of abdomen

Swelling in the left of lower part of the abdomen

36- Does the patient have tenderness? (no/yes)

Determine the side of the tenderness?

Tenderness in the middle of upper part abdomen

= = = Right side of = = = =

= = = Left = = = =

= = = Middle of lower part abdomen

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= = = Right side of the lower part abdomen
= = = left side of lower part abdomen

General tenderness

- 37- Does the patient have sugar in urine?(no/yes)
No sugar in urine
Sugar in urine
- 38- Does the patient have blood in urine?
No blood in urine
Blood in urine
- 39- Does the patient have micro-organisms in urine?(no/yes)
Determine the type of micro-organisms?cocci, bacilli, cocci and bacilli
- 40- does the patient have micro-organisms in faeces?(no/yes)
Determine the type of micro-organisms?
Cocci, bacilli, cocci and bacilli
- 41- The amount of sugar in blood?
Normal sugar
Increase in sugar amount in blood
Decrease = = = = =
- 42- Percentage of sodium in blood?
Normal sodium
Increase of sodium percentage in blood
Decrease = = = = =
- 43- Percentage of potassium in blood?
Normal potassium
Increase of potassium percentage in blood
Decrease = = = = =
- 44- Percentage of calcium in blood?
Normal calcium
Increase in Calcium
Decrease in calcium

- 45- Percentage of uric acid in blood?
 - Normal uric acid in blood
 - Increase uric acid in blood
 - Decrease = = = =
- 46- Percentage of enzymes of liver?
 - Normal enzymes of liver
 - Increase enzymes of liver
- 47- Percentage of urea in blood?
 - Normal uria
 - Increase in uria in blood
- 48- Percentage of alkailine ph osphates?
 - Normal alkailine
 - Increase in alkailine
- 49- Percentage of mylase?
 - Normal mylase
 - Increase a mylase
- 50- Percentage of protien in blood?
 - Normal protien
 - Decrease proTien
- 51- Specific grevity of urine?
 - Normal grevity of urien
 - Increase in grevity of urine
 - Decrease = = = =
- 52- Percentage of WBC ?
 - Normal wbc
 - Increase in wbc
 - Decrease in wbc

QUESTIONS FOR GASTROENTRITIS SYSTEM'S DISEASES:

- 26- Does the patient have running nose?
 - No running nose
 - Running nose
- 27- Dose the patient have sneezing?
 - No sneezing, sneezing

- 28- Does t
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APPENDI

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- 28- Does the patient have tridness on exeration?
 No tridnesson exeration
 Tridness on exeration
- 29- Does the patient have wheezes during the breathing?
 No whèezes during the breathing
 Wheezes during the breathing
- 30- Nature of breathing?
 Normal breathing
 Increase in breathing
 Decrease in breathing
- 31- Does the patient have micro-organisms in sputum?(no/yes)
 Is tuber clous bacelli?
 No tuber clous bacelli
 Tuber clous bacelli in sputum
- 32- Does the patient have suffocation?
 No suffocation
 Suffocation

APPENDIX -4-

EXPERT SYSTEM IN INTERNAL DISEASES
 THE RESPIRATORY SYSTEM
 MAIN MENU

select your choice

classification of diseases
 diagnosis of diseases
 information about diseases
 socialized diseases in (causes , treatment , sign & symptoms)
 append (causes & treatment)
 deletion (diseases , treatment , & causes)
 insertion new diseases
 compare between 2 - diseases
 exit

USES:

for up or for down and return to select

EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
CLASSIFICATION OF DISEASES

parts of diseases of respiratory system are :-

nose
pharynx
larynx
trachea
bronchea
bronchias
lung
common
exit

EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
CALSSIFICATION OF DISEASES

lung

pneumonia
tuberculosis
pulmonary carcinoma
pulmonary infraction
pneumo thorax
emphysema

*** No other disease ***

HIT ANY KEY

EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
INFORMATION ABOUT DISEASES

HIT ANY KEY
EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
INFORMATION ABOUT DISEASES

enter name of the diseases :- asthma

the causes are :- air pollution

dust

the signs & symptoms :-

- * dry cough
- * cough with sputum , light , yellow is color
- * cough with sputum , heavy green is color
- * sever cough
- * light cough
- * wheezes during the breathing
- * flushing face

EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
DIAGNOSIS OF DISEASES

determin the type of cough?

-
- * dry cough
 - * cough with sputum , light , white is color
 - * cough with sputum , light , yellow is color
 - * cough with sputum , heavy , green is color
 - * why?
-

24

EXPERT SYSTEM IN INTERNAL DISEASES
THE RESPIRATORY SYSTEM
(CAUSES & TREATMENT)

treatment of 'asthma'

- * gave oxygen
- * corticosteroid
- * aminophellin
- * bronchodileter

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