

Baymax: Personal Healthcare Chabot

A Chatbot Documentation
For the course on
Introduction to Intelligent Systems
(INTESYS)

Submitted by

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I. Introduction

The Philippines, still burdened with a huge national debt and widespread poverty, its population growth rate presents serious challenges to the delivery and accessibility of health services. In rural areas, the people's health is affected by difficult access to health services and the presence of locally endemic diseases such as dengue and malaria.

In this section, the researchers will be talking about 15 different domains/diseases that they think are prevalent among the poor and rural communities in the Philippines. Healthcare in the Philippines suffers from a shortage of human medical resources, especially doctors. This makes the system run slower and less efficiently. With these in mind, the researchers will use the said domains to automate in their chatbot with the objective to develop a small medical diagnostic expert system that is suitable for poor and rural communities.

Acute Tonsillopharyngitis

(Tonsillitis; Pharyngitis)

Overview

According to Sasaki (2018), tonsillopharyngitis is an infection of the throat and/or tonsils and is more common among children than adults. It is usually caused by a virus. Most often, it is one of the viruses that cause the common cold, such as rhinovirus, adenovirus, influenza virus, or respiratory syncytial virus.

Symptoms

The symptoms of tonsillitis are very easy to spot. But do note that not all of the symptoms may show up on the patients.

Common symptoms are:

- A sore throat that is worse when you swallow or talk
- A red throat and tonsils
- Swollen and tender lymph nodes in the neck

Sometimes, may include:

- Difficulty swallowing
- Fever
- White patches on your tonsils
- Bad breath
- Unusual fussiness
- Refusal to eat

Diagnosis

Doctors recognize tonsillopharyngitis by viewing the throat. Typically, doctors test most children but test adults only if they meet certain criteria, such as having white patches on the tonsils (tonsillar exudates), swollen and tender lymph nodes in the neck, fever, and an absence of cough.

Treatment

- Pain relievers (analgesics)
- For strep throat, antibiotics
- Sometimes surgical removal of the tonsils

Villanueva (n.d.) mentioned that mild cases of tonsillitis can be taken care of at home. The patient will be required to take antibiotics to combat the infection and medicine for fever to combat the fever. Hydration and rest are the keys to getting better. The patient can also gargle a solution of warm water with salt three to five times a day. The last resort will be a tonsillectomy or the removal of the tonsils. This will only be recommended for severe cases such as tonsillitis causes infection, numerous cases of tonsillitis in a year, breathing difficulty, or tonsillitis that isn't reacting to treatment.

Influenza

(Flu)

Overview

Tesini (2018) defined influenza as a viral infection of the lungs and airways with one of the influenza viruses. It causes a fever, runny nose, sore throat, cough, headache, muscle aches, and a general feeling of illness (malaise). Among the top "cold weather diseases," most common in the Philippines are those that affect the respiratory tract such as influenza and pneumonia.

Symptoms

Common symptoms are:

- High Fever
- Lethargic
- Aches and pains throughout the body, particularly in the back and legs
- Severe headache
- Watery eyes
- Warm and flushed face

May include:

- Scratchy sore throat
- Burning sensation in the chest
- Dry cough (may become severe and bring up phlegm)
- Runny nose
- Nausea
- Vomiting

Diagnosis

- A doctor's evaluation.
- Sometimes tests on samples of blood or respiratory secretions

Because most people are familiar with the symptoms of influenza and because influenza occurs in epidemics, it is often correctly diagnosed by the person who has it or by family members. The severity of symptoms and the presence of a high fever and body aches help distinguish influenza from a common cold, especially when the illness occurs during an influenza outbreak.

Tests on samples of respiratory secretions can be used to identify the influenza virus. Blood tests may help determine how sick a person is with the infection. Such tests are done mainly when people appear very ill or when a doctor suspects another cause for the symptoms. Some tests can be done in the doctor's office.

Treatment

- Annual influenza vaccination
- Rest
- Drinking plenty of fluids
- Pain reliever
- Decongestants
- Antibiotics (If bacterial infection develops)
- Sometimes antiviral drug

The main treatment for influenza is to rest adequately, drink plenty of fluids, and avoid exertion. Normal activities may resume 24 to 48 hours after the body temperature returns to normal, but most people take several more days to recover.

Chickenpox

(*Varicella*)

Overview

According to Kaye (2018), chickenpox is a highly contagious viral infection with the varicella-zoster virus that causes a characteristic itchy rash, consisting of small, raised, blistered, or crusted spots.

Symptoms

The itchy blister rash caused by chickenpox infection appears 10 to 21 days after exposure to the virus and usually lasts about five to 10 days. Other signs and symptoms, which may appear one to two days before the rash, include:

- Fever
- Loss of appetite
- Headache
- Lethargy

Once rash appears:

- Rash and red spots
- Blisters



Diagnosis

- A doctor's evaluation

A doctor is usually certain of the diagnosis of chickenpox because the rash and other symptoms are so typical.

Treatment

To relieve the itch:

- Antihistamines
- Calamine lotion
- Hands kept clean
- Wash body everyday with soap and water
- Clipped nails to minimize scratching
- Rest
- Avoid contact with others
- Vaccine (Varivax)

According to Brennan (2019), the chickenpox vaccine isn't approved for:

- Pregnant women
- People who have weakened immune systems
- People who are allergic to gelatin or the antibiotic neomycin
- Feeding, usually by mouth
- [Eating several small, nutritious meals each day is the best way.]
- Sometimes tube or intravenous feeding
- For severe undernutrition, sometimes drugs to increase appetite (dronabinol or megestrol)
- Multivitamin supplements are also given to make sure people are getting all the nutrients they need.

Undernutrition

Overview

Morely (2018) defined undernutrition as a type of malnutrition which is a deficiency of calories or of one or more essential nutrients. It is often obvious: People are underweight, bones often protrude, their skin is dry and inelastic, and their hair is dry and falls out easily.

People may lack access to food because they cannot afford it, have no way to get to a store, or are physically unable to shop. In some parts of the world, food supplies are inadequate because of war, drought, flooding, or other factors. According to a recent study by the Food and Nutrition Research Institute (FNRI), the current chronic malnutrition rate among Filipino children aged 0 to 2 is at 26.2 percent, the highest in 10 years.

Symptoms

The most obvious sign of a calorie deficiency is loss of body fat (adipose tissue). Common symptoms are:

- Loss of body fat
- Very low body weight
- Thin, dry, inelastic pale and cold skin
- Hollow cheeks
- Sunken eyes
- Dry, sparse hair

May include:

- Loss of appetite
- Irritability
- Apathy
- Irregular or no menstrual periods (For women)

Diagnosis

- A doctor's evaluation
- Sometimes blood tests

Doctors can usually diagnose undernutrition by asking questions about diet and weight loss and by doing a physical examination. Severe, long-standing undernutrition can usually be diagnosed based on the person's appearance and history.

Treatment

- Feeding, usually by mouth
- [Eating several small, nutritious meals each day is the best way.]
- Sometimes tube or intravenous feeding
- For severe undernutrition, sometimes drugs to increase appetite
- Multivitamin supplements are also given to make sure people are getting all the nutrients they need.

If undernutrition is severe, people may need to be hospitalized.

Allergic Conjunctivitis

(Sore Eyes)

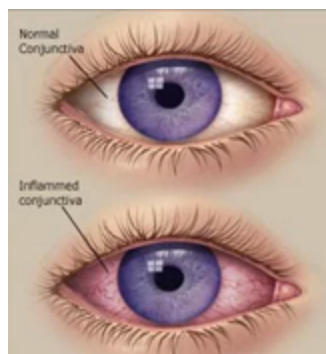
Overview

Sore eyes or Conjunctivitis is defined by the Department of Health (DOH) as a redness and inflammation of the membranes (conjunctiva) covering the whites of the eyes and the inner parts of the eyelids. It has many causes, but in most cases, it results from viral infection, but can also be from bacteria or allergen. There have been epidemics in the Philippines, the most recent big one being in September 2015.

Symptoms

Common symptoms are:

- Redness in white of the eye
- Teary, itchy, burning eyes
- Blurred vision
- Puffy appearance of eyes



Diagnosis

- A doctor's evaluation of the symptoms and appearance of the eye

Doctors recognize allergic conjunctivitis by its typical appearance and symptoms. Tests are rarely needed or useful.

Treatment

- Eye drops
- Use water to wash eyes
- Rest
- Tear supplements
- Cold compresses
- Antihistamines (such as olopatadine)

Acute Diarrhea

Overview

Acute diarrhea is an increase in the volume, wateriness, or frequency of bowel movements (Greenberger, 2018). Sometimes diarrhea contains blood or mucus. It is a very common problem in children, which is usually caused by:

- Infectious gastroenteritis
- Food poisoning
- Use of antibiotics
- Food allergies

Symptoms

Common symptoms are:

- Watery stools for more than 24 hours
- dehydration, such as decreased urination, lethargy or listlessness, crying without tears, extreme thirst, and a dry mouth
- Ill appearance
- High fever
- Blood or pus in stool
- Pain in the abdomen and, when touched, extreme tenderness
- Bleeding in the skin (seen as tiny reddish-purple dots [petechiae] or splotches [purpura])

May include:

- Weight loss
- Frequency and timing of bowel movements

Diagnosis

- A doctor's evaluation.
- Sometimes tests on samples of blood

Not every episode of diarrhea requires immediate evaluation by a doctor. The following information can help people decide whether a doctor's evaluation is needed and help them know what to expect during the evaluation.

Doctors first ask questions about the person's symptoms and medical history. Doctors then do a physical examination. What they find during the history and physical examination often suggests a cause of the diarrhea and the tests that may need to be done. Doctors do blood tests to detect blood and electrolyte abnormalities and stool tests to detect blood, white blood cells, and the presence of infectious organisms.

Treatment

- Extra fluids containing a balance of water, sugars, and salts are needed for people who are dehydrated
- Age-appropriate diet
- Antidiarrheal drugs
- Over-the-counter drugs include adsorbents (for example, kaolin-pectin), which adhere to chemicals, toxins, and infectious organisms.

Scabies

Overview

Scabies is a mite infestation of the skin that causes tiny reddish bumps and severe itching. (Dinulos, 2018). Scabies usually spreads from person to person through physical contact. People with scabies have severe itching, even though there are typically few mites on the body.

Symptoms

Common symptoms are:

- Rash and intense itching (worse at night)
- red bumps around elbow, armpit, wrist, waist, buttocks (do not appear on the face in adults)
- burrows of the mites are often visible as very thin lines up to a ½ inch

People who may develop a severe infestation include:

- Those with a weakened immune system
- Those with severe physical disabilities or intellectual disability
- Australian Aborigines

Diagnosis

- A doctor's evaluation
- Burrow scrapings



Usually, itching and the appearance of bumps and burrows are all that are needed to make a diagnosis of scabies. Sometimes doctors use a lens to magnify the skin and make the burrows visible. However, doctors often confirm the presence of mites, eggs, or mite feces by taking a scraping from the bumps or burrows and looking at it under a microscope.

Treatment

- The treatments used for scabies are mainly applied topically such as sulfur ointments, benzyl benzoate, permethrin cream or lindane lotion
- Antihistamines (Benadryl)

For older children and adults, scabies can be cured by applying a cream containing permethrin or a lotion containing lindane to the entire body from the neck down and washing it off after 8 to 14 hours. This treatment is repeated a week later.

For infants and young children, permethrin is applied to the head and neck, avoiding the skin around the eyes and mouth, and over the entire body. The skinfolds, fingernails, toenails, and the navel should be thoroughly treated. Mittens can be put on infants.

Hypertension

Overview

According Barkis (2019), hypertension is persistently high pressure in the arteries. Often no cause for high blood pressure can be identified, but sometimes it occurs as a result of an underlying disorder of the kidneys or a hormonal disorder.

According to Food Nutrition Research Institute (FNRI), the National prevalence of hypertension among Filipino adults (20 years old and over), had significantly increased after a decline in 2013 from 22.3% to 23.9% in 2015. DOH also revealed that hypertension remains to be the leading cause of illness and said to be one of the identified precipitating factors of premature death in the Philippines.

Symptoms

Based on the blood pressure of the patient. In most people, high blood pressure causes no symptoms, despite the coincidental occurrence of certain symptoms that are widely, but erroneously, attributed to high blood pressure:

- Headache
- Fatigue
- Dizziness

Diagnosis

- Measuring blood pressure

For the most accurate readings, those that are used to diagnose someone with high blood pressure as opposed to a casual check, blood pressure must be measured following a

specific procedure. Blood pressure is measured after a person sits for 5 minutes. The person must have had no exercise, caffeine, or smoking for at least 30 minutes before the measurement.

Treatment

- Regular exercise
- Multivitamins
- Healthy diet
- Smokers should stop smoking.
- Reducing the intake of alcohol and sodium

Hepatitis A

Overview

Acute hepatitis A is an inflammation of the liver that is caused by the hepatitis A virus and that lasts less than 6 months (Kumar, 2019). Hepatitis A is usually spread when people ingest the virus after touching an object or consuming food or drinks that are contaminated by the stool of an infected person (called the fecal-oral route). Spread usually occurs because of poor hygiene—for example, when an infected person prepares food with unwashed hands.

Symptoms

Most older children and adults with hepatitis A have typical symptoms of acute hepatitis. These symptoms include:

- Jaundice (yellowish discoloration of skin)
- Pain in belly
- Loss of appetite
- Nausea
- Fever
- Fatigue
- Dark urine

Diagnosis

- Blood tests

Doctors suspect hepatitis A in people who have been exposed to the hepatitis A virus and who have typical symptoms, such as jaundice.

Testing usually begins with blood tests to determine how well the liver is functioning and whether it is damaged (liver tests). Liver tests involve measuring the levels of liver enzymes and other substances produced by the liver.

Treatment

- Vaccination
- Practice good hygiene

- Do not drink alcohol

If itching occurs, cholestyramine, taken by mouth, is often effective. Most people can safely return to work after jaundice resolves.

Leptospirosis

Overview

Bush (2019) defines leptospirosis as a potentially serious infection caused by *Leptospira*, which are spiral-shaped bacteria called spirochetes, acquired when an unhealed break in the skin comes in contact with water or soil where animal urine is present.

Usually common in the Philippines, specifically the ones who walk through flood without boots. The Department of Health (DOH) has recorded 113 deaths due to leptospirosis from January 1 to August 3 this year, from a total of 981 cases all over the country.

Symptoms

In about 90% of infected people, leptospirosis symptoms are not serious. In the rest, the disorder involves many organs. This potentially fatal form of leptospirosis called Weil's syndrome.

Leptospirosis usually occurs in two phases:

First Phase (Mild infection):

- Fever
- Coughing
- Diarrhea
- Muscle pain
- Red eyes
- Rash
- Headache
- Nausea
- Stiff neck
-

Second Phase:

- Jaundice (yellowish discoloration of skin)
- Nosebleed
- Coughing of blood

Diagnosis

- Culture of blood and urine samples or sometimes a sample of cerebrospinal fluid (obtained by spinal tap)
- Blood tests for leptospirosis antibodies or genetic material

Doctors suspect leptospirosis when characteristic symptoms occur in people who have traveled to an area where an outbreak is occurring.

To confirm the diagnosis of leptospirosis, doctors take a sample of blood and urine. These samples are analyzed.

Treatment

- Antibiotics (Penicillin or ampicillin)

If developed into Second Phase:

- Blood transfusions
- Hemodialysis

People with Weil syndrome may need blood transfusions, and if they have kidney failure, they may need hemodialysis.

Cholera

Overview

According to Bush (2018) cholera is an infectious disease that is caused by eating food or drinking water contaminated with *Vibrio cholerae*. A common cause of cholera outbreaks in the Philippines are contaminated water sources. Worldwide, there are an estimated 3–5 million cholera cases and 100,000–120,000 deaths due to cholera every year.

Symptoms

In about 90% of infected people, leptospirosis symptoms are not serious. In the rest, the disorder involves many organs. This potentially fatal form of leptospirosis called Weil's syndrome.

Leptospirosis usually occurs in two phases:

First Phase (Mild infection):

- Fever
- Coughing
- Diarrhea
- Muscle pain
- Red eyes
- Rash
- Headache
- Nausea
- Stiff neck
-

Second Phase:

- Jaundice (yellowish discoloration of skin)
- Nosebleed
- Coughing of blood

Diagnosis

- Culture of a sample of stool

Doctors take a sample of stool or use a swab to obtain a sample from the rectum. It is sent to a laboratory where cholera bacteria, if present, can be grown (cultured). Identifying *Vibrio cholerae* in the sample confirms the diagnosis.

Treatment

- Vaccination
- Fluids that contain salt
- Antibiotics
- Drink boiled water to avoid bacteria
- Rest and drink plenty of fluids
- Maintain clean environment

Rapid replacement of lost body water and salts is lifesaving. Most people can be treated effectively with a solution given by mouth. These solutions are designed to replace the fluids the body has lost. For severely dehydrated people who cannot drink, a salt solution is given intravenously.

Meningococcal meningitis

(Meningitis)

Overview

According to WHO, Meningococcal meningitis is a bacterial form of meningitis, a serious infection of the thin lining that surrounds the brain and spinal cord. According to Dr. Lulu Bravo, professor emeritus at the University of the Philippines-Manila College of Medicine, meningococemia can be so severe as to cause death within 24 hours after initial onset of fever and purpuric rashes (purplish spots caused by bleeding tiny blood vessels beneath the skin's surface).

It is associated with high fatality (up to 50% when untreated) and high frequency (more than 10%) of severe sequelae. If treated early, most people with meningitis recover well. But when treatment is delayed, permanent brain or nerve damage or death is more likely, especially in very young children and people over 60.

Symptoms

Common symptoms are:

- high fever
- headache
- stiff neck
- Reddish purple of tiny dots under skin
- Low blood pressure
- Drowsiness, dizziness
- Seizure
- vomiting
- coughing

- Lethargy

Diagnosis

- Examination and culture of samples of blood or other infected tissues, including cerebrospinal fluid obtained by spinal tap

Doctors suspect meningococcal infection in people who have typical symptoms, particularly if symptoms occur during an outbreak. To confirm the diagnosis, doctors take samples of blood or other infected tissues or do a spinal tap (lumbar puncture) to obtain a sample of the fluid that surrounds the brain and spinal cord (cerebrospinal fluid).

Treatment

- Vaccination
- Antibiotics
- Antiseizure drugs
- Dexamethasone (a corticosteroid)
- Spinal tap (lumbar puncture)
- Cerebrospinal fluid

People are usually admitted to an intensive care unit and given antibiotics and fluids intravenously as soon as possible, before doctors get the culture results identifying the organism causing the infection. If meningococci are confirmed, doctors change the antibiotics to those that are most effective against the bacteria, typically ceftriaxone or penicillin, given intravenously.

Active Tuberculosis

(TB)

Overview

Tuberculosis is a chronic contagious infection caused by the airborne bacteria *Mycobacterium tuberculosis*. It usually affects the lungs. (Tierney, 2018). The bacteria that cause tuberculosis are spread from one person to another through tiny droplets released into the air via coughs and sneezes. In the Philippines, TB is a major health problem.

Symptoms

Signs and symptoms of active TB include:

- Coughing that lasts three or more weeks
- Coughing up blood
- Chest pain, or pain with breathing or coughing
- Unintentional weight loss
- Fatigue
- Fever
- Night sweats
- Chills

- Loss of appetite
- Substance and tobacco use

Diagnosis

Doctors may suspect tuberculosis based on symptoms such as fever, a cough lasting more than 3 weeks, a cough that brings up blood, chest pain, and difficulty breathing.

- Chest x-ray
- Examination, culture, and other tests of a sputum sample
- Tuberculin skin test
- Blood tests for tuberculosis
- Screening tests for people at risk of tuberculosis

Sometimes the first indication of tuberculosis is a positive screening test. Screening tests for tuberculosis are done routinely for people who are at risk of tuberculosis.

Treatment

- Antibiotics
- Vaccinations
- Sometimes surgery or corticosteroids

Most people with active tuberculosis do not need to be hospitalized. However, to help prevent the spread of the disease, they should do the following:

- Stay at home / Isolation
- Avoid visitors (they do not have to avoid family members who have already been exposed)
- Cover their cough with a tissue or cough into their elbow

Pneumonia

Overview

According to Herriman of Outbreak News Today (2018), pneumonia is the 3rd biggest killer in the Philippines, accounting for 10 percent of deaths. Pneumonia is an infection that inflames air sacs in one or both lungs, which may fill with fluid. It is said that infants younger than 2 and people over 65 are at higher risk.

Symptoms

The most common symptom of pneumonia is

- Cough that produces sputum (thick or discolored mucus)

Other common pneumonia symptoms include:

- Chest pain
- Chills
- Fever
- Shortness of breath

Diagnosis

- A doctor's examination
- Usually a chest x-ray, but sometimes a computed tomography (CT) scan of the chest
- Sometimes testing to identify the microorganism causing the pneumonia

A doctor checks for pneumonia by listening to the chest with a stethoscope. Pneumonia usually produces distinctive sounds. These abnormal sounds are caused by narrowing or closing of the airways or filling of the normally air-filled parts of the lungs with inflammatory cells and fluid, a process called consolidation. In most cases, the diagnosis of pneumonia is confirmed with a chest x-ray but sometimes a CT scan of the chest is done. In mild cases doctors may decide to treat based on the symptoms and the results of the examination.

Treatment

- Antibiotics
- Sometimes antiviral drugs or antifungal drugs
- Stay home and avoid spreading it

People with pneumonia also need to clear secretions and may benefit from deep-breathing exercises. People with pneumonia who are short of breath or have low levels of oxygen in their blood are given oxygen, usually by a small plastic tube in the nostrils (nasal cannula).

Dengue Fever

Overview

Dengue is a mosquito-borne viral infection that causes fever, generalized body aches, and, if severe, external and internal bleeding (called dengue hemorrhagic fever) (Yuill, 2018). According to the Santos (2019), a total of 271,480 dengue cases were reported from January to August 31 of 2019, prompting the declaration of a national dengue epidemic in the Philippines mentioned by DOH.

Symptoms

Symptoms of dengue typically begin about 3 to 15 days after being bitten by an infected mosquito. Dengue varies in severity. Dengue usually begins suddenly, causing:

- High Fever
- Severe headaches
- Muscle pain
- Fatigue
- Vomiting
- Nausea
- Skin rash

Diagnosis

- Blood tests

Doctors suspect dengue fever when typical symptoms occur in people who live or have traveled in an area where the infection is common. It is usually diagnosed by blood tests for antibodies to the virus.

Treatment

There's no medicine to kill the dengue virus. Doctors will:

- Have you take medicine, such as acetaminophen, to lessen pain and lower your fever
- Give you IV fluids (into your vein), especially if you have dengue hemorrhagic fever
- Don't take aspirin or ibuprofen because they can cause bleeding or make it worse.
- Doctors will keep you under mosquito nets while you're sick so mosquitoes don't pick up the infection from you and spread it to other people.
- Relievers

With the world shifting to a more dynamic and automated way of solving problems, building an expert system requires a lot of experience. To provide an accurate solution is an ability to solve complex problems. In the medical field for example, they use an expert system together with their knowledge to identify a patient's disease and its treatment based from the given input of the patient. If a college student were to implement an expert system and give it to the medical facility, it would be able to detect simple diseases like fever, colds, etc. However when it comes to more complicated diseases that need more structure in the system, the student would not be able to solve these types of situations. On the other hand, if an expert was to design this, it would be able to detect specific and complex diseases. An example would be the PERFEX which was developed by several experts designed to assist in diagnosing coronary artery disease from thallium-201 3D myocardial distributions. This approach has standardized the image interpretation process.

After examining numerous data from the patients with angiographically documented coronary artery disease, heuristic rules were derived that specifically determines the presence and location of perfusion defects on thallium-201 SPECT studies with coronary lesions. These rules operate on data that are input to the expert system from the process, which identifies defects as portions of the myocardium (Garcia, 2004). Being able to program an expert system that determines simple diseases such as fever and an expert system that can determine a coronary artery disease requires a lot of experience on that field and training. A person can develop their own expertise in this domain by further research on a specific disease and generate patterns given data from the patients which will generate a conclusion. As a person grows their expertise on a certain task, for example, the expert system will be fed with more knowledge and information which will lead to an accurate conclusion. Thus, helping and easing the task for people under the medical field.

An expert system has the ability to aid in decision-making and predict future outcomes based on the information and data given by the users. In the business world for example, specifically stocks. Once a stock firm decides to implement an expert system which was

programmed successfully and fed with a lot of data, it can predict once a stock will go up or once it will go down. This will not be accurate though because of unforeseen events but in a hypothetical situation where these unlikely events will not happen, the expert system will be accurate and informative. This will help stockbrokers recommend their clients which stock they would invest in. Thus, creating an advantage over other firms that do not use expert systems in their business. Another significance of an expert system is automation of work. Humans tend to generate more errors compared to computers. By implementing an expert system in their own field, a person may be able to eliminate these errors or casualties which will lead to a more productive and accurate solutions to their problems (Bajpai, 2017).

II. Knowledge Base

Knowledge base (Note: words in bold letters are the major symptoms of the disease):

IF	THEN
symptom(fever), symptom(headache), symptom(watery_eyes), symptom(lethargic)	disease(influenza)
symptom(sore_throat), symptom(bad_breath), symptom(swollen_tonsils), symptom(fever)	disease(acute_tonsillopharyngitis)
symptom(fever), symptom(red_spots), symptom(blister), symptom(itchiness)	disease(chickenpox)
symptom(low_body_weight), symptom(pale_skin), symptom(low_appetite), symptom(sparse_hair)	disease(undernutrition)
symptom(eye_redness), symptom(itchy_eyes), symptom(blurred_vision), symptom(puffy_eyes)	disease(sore_eyes)
symptom(watery_stool), symptom(dehydration), symptom(fever),	disease(acute_diarrhea)

symptom(paleness)	
symptom(rash), symptom(red_bumps), symptom(mite_burrow)	disease(scabies)
symptom(high_blood_pressure), symptom(fatigue), symptom(dizziness)	disease(hypertension)
symptom(nausea), symptom(fever), symptom(dark_urine), symptom(fatigue), symptom(jaundice) (more medical tests are required like blood sample to have a high certainty factor!)	disease(hepatitis_A)
symptom(muscle_pain), symptom(fever), symptom(diarrhea), symptom(jaundice), symptom(nausea)	disease(leptospirosis)
symptom(watery_stools), symptom(dehydration), symptom(muscle_cramps), symptom(low_blood_pressure)	disease(cholera)
symptom(reddish_purple_dots), symptom(high_fever), symptom(dizziness), symptom(vomiting), symptom(lethargy)	disease(meningitis)
symptom(coughing_blood), symptom(fever), symptom(night_sweats), symptom(chest_pain)	disease(tuberculosis)
symptom(thick_mucus), symptom(shortness_of_breath), symptom(fever), symptom(chills)	disease(pneumonia)

(more medical tests are required like x-ray to have a high certainty factor!)	
symptom(high_fever), symptom(fatigue), symptom(vomiting), symptom(nausea), symptom(muscle_pain) (more medical tests are required like blood sample to have a high certainty factor!)	disease(dengue_fever)

The parts of the knowledge base that were the easiest to finalize were the symptoms of each disease. As we have researched on the different diseases, it was easy to convert the statements to logical expressions that would be read by the program itself. An example would be finalizing the symptoms of dengue:

English statement	Logical Expression
High fever is a symptom of dengue	symptom(high_fever)
Fatigue is a symptom of dengue	symptom(fatigue)
Vomiting is a symptom of dengue	symptom(vomiting)
Nausea is a symptom of dengue	symptom(nausea)
Muscle pain is a symptom of dengue	symptom(muscle_pain)

As seen in the figure, the english statements were easily converted predicate logics, as seen with symptom(X), where X is the type of symptom. Also, in order for dengue to be true, it backtracks first to the symptoms that were input by the user as true. Once all symptoms are true, then the patient has dengue. Here is the figure for the backward chain:

Let:

H = Symptom (high-fever)

F = Symptom (Fatigue)

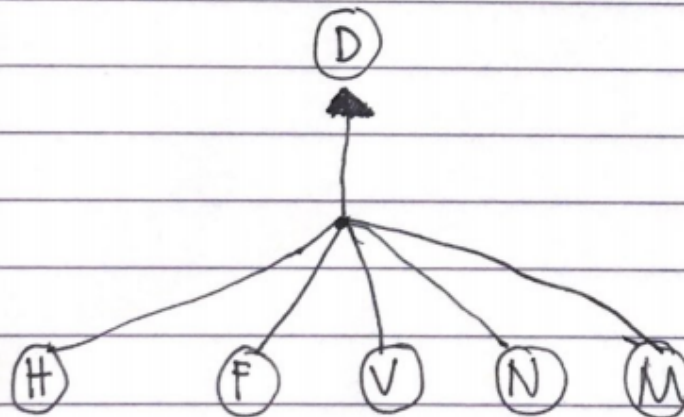
V = Symptom (vomiting)

N = Symptom (nausea)

M = Symptom (muscle-pain)

D = hypothesis (dengue-fever)

Prove: D



The most difficult to finalize in the knowledge base was putting the certainty level for each symptom that was true for a specific disease. Compared to different programming languages like Java and C, the coding format in prolog is very different. As much as it is more focused for AI development and machine learning, it is very strict in how it is typed. Furthermore, assignment statements are very different in Prolog.

As we were creating the chatbot, what we intended as a group is that for every symptom that was marked true by the user, there will be a corresponding certainty percentage which serves as the confidence level of the chatbot in finalizing the type of disease the user has. Furthermore, in each disease, there are major symptoms that, once marked as true, has a big certainty percentage for the user in having that disease. The main dilemma that we faced was storing the certainty value and the truth value of the symptom based on the user input at the same time. Yet, we weren't able to implement it properly.

The alternative that we did was that we predetermined the certainty level of each symptom once marked true, and then displayed the total certainty level for that disease. Note that the total is shown when all of the symptoms for the disease were marked true by the user. The total shown for each disease ranges from 50 - 80%. Reason for this is because of the goal of our chatbot. The chatbot must never have 100% certainty level in any disease since no chatbot design and implementation is perfect. Also, the predetermining of certainty levels is an inaccurate method. Furthermore, the goal of the chatbot is to determine the disease the user currently has based from his user inputs, as well as diagnosis (age, height, weight, blood pressure, etc.) below is some of the code used for the chatbot:

```
pneumonia :-  
    write('certainty level at 0%'), nl,  
    symptomPic(thick_mucus),  
    write('certainty level at 30%'), nl,  
    symptom(shortness_of_breath),  
    write('certainty level at 40%'), nl,  
    symptom(fever),  
    write('certainty level at 50%'), nl,  
    symptom(chills),  
    write('you have pneumonia with certainty level at 60%'), nl,  
    write('more medical tests are needed. suggestion: X-ray'), nl.
```

III. Results and Analysis

SAMPLE CONVERSATIONS

```
Hello!
I am Baymax.
Your personal healthcare companion.
certainty level at 0%
Does the patient have following symptom:lethargic?
yes.

certainty level at 30%
Does the patient have following symptom:watery_eyes?
no.

certainty level at 0%
Does the patient have following symptom:sore_throat?
yes.

certainty level at 30%
Does the patient have following symptom:swollen_tonsils?
yes.

certainty level at 60%
Does the patient have following symptom:bad_breath?
yes.

certainty level at 70%
Does the patient have following symptom:fever?
yes.

you have acute tonsillopharyngitis with certainty level at 80%
Take Care!
true
```

Sample Conversation 1. Code block breaks for checking once a value is falsified.

In the sample conversation above, we can see how the program breaks the current action and moves to the next block of illness. This can be identified by looking at how the certainty level resets back to 0%. This is impressive because this shows the efficiency of using backward chaining. Knowing that one of the truth values required by the illness is falsified, the System stops checking for the illness and moves to the next illness to be diagnosed.

Hello!
 I am Baymax.
 Your personal healthcare companion.
 certainty level at 0%
 Does the patient have following symptom:fever?
 yes.

certainty level at 30%
 Does the patient have following symptom:watery_eyes?
 no.

certainty level at 0%
 Does the patient have following symptom:sore_throat?
 yes.

certainty level at 30%
 Does the patient have following symptom:swollen_tonsils
 yes,
 ?
 yes.

certainty level at 60%
 Does the patient have following symptom:bad_breath?
 yes.

certainty level at 70%
 you have acute tonsillopharyngitis with certainty level at 80%
 Take Care!
 true

Sample Conversation 2. Expert System does not ask the same question again.

It is seen from this screenshot that there was a question skipped. It is expected from the given below that after the certainty level is at 70%, it will ask the user if he/she have a fever symptom. Though, since this statement was asserted beforehand by the other illness (seen as the first question of the sample conversation), the program no longer re-asks the same questions. This is because of the features available in Prolog. It uses a knowledge base to check whether something is true or not, if it doesn't know the answer, it will prompt the user, else it will refer to the data that it already has.

```
acute_tonsillopharyngitis :-
    write('certainty level at 0%'), nl,
    symptom(sore_throat),
    write('certainty level at 30%'),nl,
    symptom(swollen_tonsils),
    write('certainty level at 60%'),nl,
    symptom(bad_breath),
    write('certainty level at 70%'),nl,
    symptom(fever),
```


write('you have acute tonsillopharyngitis with certainty level at 80%'), nl.

Code Snippet 1. Expert System is expected to ask fever symptoms as last inquiry but due to previous assertions, did not.

```
Hello!
I am Baymax.
Your personal healthcare companion.
certainty level at 0%
Does the patient have following symptom:lethargic?
yes.

certainty level at 30%
Does the patient have following symptom:watery_eyes?
yes.

certainty level at 50%
Does the patient have following symptom:headache?
yes.

certainty level at 60%
Does the patient have following symptom:fever?
yes.

you have influenza with certainty level of 70%
Treatment for Influenza:
Annual Influenza vaccination:
Rehydrate
Antibiotics
Take Care!
true
```

Sample Conversation 3. Treatment is given after proper diagnosis is done.

In the Expert System, when an illness is properly identified, it's treatments are displayed on the program. Regardless if the certainty level is not 100%, as long as all the truth cases have been met, the system considers it as such and displays the treatment for that illness.

<p>Hello! I am Baymax. Your personal healthcare companion. certainty level at 0% Does the patient have following symptom:lethargic? <input type="text" value="yes."/></p> <p>certainty level at 30% Does the patient have following symptom:watery_eyes? <input type="text" value="yes."/></p> <p>certainty level at 50% Does the patient have following symptom:headache? <input type="text" value="yes."/></p> <p>certainty level at 60% Does the patient have following symptom:fever? <input type="text" value="yes."/></p> <p>you have influenza with certainty level of 70% Treatment for Influenza: Annual Influenza vaccination: Rehydrate Antibiotics Take Care! true</p>	<p>I am Baymax. Your personal healthcare companion. certainty level at 0% Does the patient have following symptom:lethargic? <input type="text" value="no."/></p> <p>certainty level at 0% Does the patient have following symptom:sore_throat? <input type="text" value="yes."/></p> <p>certainty level at 30% Does the patient have following symptom:swollen_tonsils <input type="text" value="yes."/></p> <p>? certainty level at 60% Does the patient have following symptom:bad_breath? <input type="text" value="yes."/></p> <p>certainty level at 70% Does the patient have following symptom:fever? <input type="text" value="yes."/></p> <p>you have acute tonsillopharyngitis with certainty level at 80% Treatment for Acute tonsillopharyngitis: Antibiotics Penicillin V: 250mg 2 times a day for 10 days for kg < 27 and 500 mg for kg>27 Rest Take Care! true</p>
---	--

Sample Conversation 4. Each symptom has a different weight therefore each illness has different resulting certainty levels.

In the system, each symptom has a different weight in terms of severity. The more severe the symptoms, the more reserve its weights are. This is a safety precaution made by the system to avoid delivery of false information to the user. Though, with severe symptoms, we recommend that the user consult medical personnel as soon as possible.

Hello!
I am Baymax.
Your personal healthcare companion.
certainty level at 0%
Does the patient have following symptom:lethargic?

certainty level at 30%
Does the patient have following symptom:watery_eyes?

certainty level at 50%
Does the patient have following symptom:headache?

certainty level at 60%
Does the patient have following symptom:fever?

you have influenza with certainty level of 70%
Treatment for Influenza:
Annual Influenza vaccination:
Rehydrate
Antibiotics
Take Care!
true

Sample Conversation 5. Sample conversation using the dynamic inquiry.

The Expert System is highly scalable because of its dynamic methods such as the code snippet seen below. Scalable meaning the knowledge base is easily expandable. In the code snippet, the function simply asserts a certain symptom to the knowledge base if the user returns yes, and otherwise if no. Therefore, all the designer needs to add is the illness structure where the symptoms and treatments are defined.

```
ask(Question) :-
    write('Does the patient have following symptom:'),
    write(Question),
    write('? '),
    read(Response),
    nl,
    ( (Response == yes ; Response == y)
    ->
    assert(yes(Question)) ;
    assert(no(Question)), fail).
```

Code Snippet 2. Expert System uses this dynamic inquiry which makes it easily scalable when designers want to add more illnesses.

```
Does the patient have following symptom:muscle_pain
no

?
certainty level at 0%
Does the patient have following symptom:low_blood_pressure?
no

certainty level at 0%
Does the patient have reddish_purple_dots as seen on the pic?
no

certainty level at 0%
Does the patient have following symptom:coughing_blood?
no

certainty level at 0%
Does the patient have thick_mucus as seen on the pic?
no

certainty level at 0%
Does the patient have following symptom:high_fever?
no

Unable to diagnose your disease due to lack of data
Sorry! Try again.Take Care!
true
```

Sample Conversation 6. Worse case scenario when there is not enough data to conclude a disease, the system returns this.

One of the incapacabilities of the system is that if none of the illness return all its symptoms as true, it will not be able to diagnose the user even if the user has inputted true symptoms to the system. To put it simply, the system will only accept the diagnosis if for example 5 out of 5 symptoms are true. The system does not accept 4 out of 5 symptoms or anything other than a complete set.

The expert system is specialized, scalable, and efficient. It is specialized because the Expert System was developed using a rule-based programming language. In a rule-based programming language like Prolog, rules are stored in a knowledge base and are used for predicate calculations. One of Prolog's features is that no two exact truths can exist at the same time in the knowledge base therefore there will be no duplicates. This feature affected the program positively because when the same symptom is consulted, if the truth value exists within the knowledge base then the question is no longer inquired. It saves time for the user and space for the program. The group developed the system such that it is modular to achieve scalability. A certain format is needed to add a new illness to the system. Upon insertion to the program, all other methods and blocks are expected to be compatible with the newly inserted data. There is no need for modification. The expert system is efficient because it uses a Backward Chaining approach. In a backward chaining approach, the system views the root most value or the result first before traversing down to its subnodes. If one of its subnodes is false, then the entire statement is false. This concept makes the program efficient as first, it does not need to further continue in the same block if a no is passed because, either way, it will return a false regardless. This makes the diagnosis less of a burden.

IV. Recommendations

Using the Backward Chaining approach, our group was able to create an Expert System Chatbot that specializes in diagnosing common diseases in rural and poor communities. This Chatbot was developed using the Prolog rule-based programming language.

Strengths

PROGRAMMING LANGUAGE. In creating the Expert System Shell, we used the programming language Prolog. This language is a rule-based language whose primary and common usage is for artificial intelligence and machine learning. In utilizing the specialized language, we were able to take advantage of its unique features and apply it to the Expert System.

SCALABLE. Given the unique syntax of the programming language, adding another illness to test in the system is easy. By just simply copying a block format of code and replacing placeholders, the expert system can successfully diagnose the patient of the newly added illness without the programmer having to add or replace anything else.

EFFICIENT. After extensive research, it is seen that it is recommended that a Backward Chaining approach is used in Diagnosis-natured Expert Systems because of its low in

time complexity and reduction in the number of actions to be done . We applied this approach to our own diagnosis Expert System.

Weaknesses

The group found that the source of the weaknesses of our program could be the result of the restrictions of a highly specialized language like Prolog.

DURATION OF DIAGNOSIS. The group found that the best way for users to input their symptoms is through boolean questions. The user is prompted with a question only answer by either yes or no. This method will have to traverse all the possible symptoms within the knowledge base and results to the user having to deny more symptoms than required.

CONFIDENCE LEVEL. There seems to be no way to calculate for the confidence level through a formula. If a formula is used, there must be dynamically-changing variables that differs from illness to illness, but the language does not simply permit these.

USER INTERFACE. With only a standard GUI library available in the system, the programmer only have a few features available in the creation of the Graphical User Interface for the Expert System. Also, with the lack of time to study how the GUI works with Prolog, the group decided to leave as it is, a text-based user interface.

Recommendations

RESORT TO A MORE COMMON AND VERSATILE PROGRAMMING LANGUAGE. Prolog is a highly specialized language that has a unique syntax and because of this, the language is also very limited in terms of features. It is advised that future programmers use a different language that is common, and versatile in usage such as Python. The programming language Python is in the common syntax therefore it will be easy for programmers to adapt to. The language is also highly feature and expandable with the many libraries available in the language. Also, Python is being used in artificial intelligence and machine learning aspects as well, therefore, it is possible to replicate this Expert System in Python.

OPTIMIZE DIAGNOSIS. Rather than resorting to boolean questions, it is more optimized if the Expert System uses a selection based diagnosis where the user, given possible choices, is able to pick which of the choices are his/her symptoms. This way, there is no time wasted on questions that are irrelevant to the user at the moment.

EXPAND DOMAIN. On the restrictions of the requirements, we were only able to add a single domain of illnesses to be diagnosed. It is advice to add more domains of illnesses in order to create a more reliable and smarter Expert System.

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VI. Appendix A: Interview Transcripts

Legend:

Yellow - Acute

Red - Fatal (Emergency situation)

Disease	Symptoms/ History	Treatment
Acute Tonsillopharyngitis <i>(Tonsillitis; Pharyngitis)</i> <ul style="list-style-type: none"> is usually caused by a virus. Most often, it is one of the viruses that cause the common cold, such as rhinovirus, adenovirus, influenza virus, or respiratory syncytial virus. is an infection of the throat and/or tonsils and is more common among children than adults. 	<p>Common symptoms are:</p> <ul style="list-style-type: none"> A sore throat that is worse when you swallow or talk A red throat and tonsils Swollen and tender lymph nodes in the neck <p>Sometimes, you may also get:</p> <ul style="list-style-type: none"> Difficulty swallowing Fever White patches on your tonsils Bad breath Unusual fussiness Refusal to eat 	<ul style="list-style-type: none"> Antibiotics Hydration Rest Analgesic (spray) Penicillin V: 250mg 2 times a day for 10 days for kg < 27 and 500 mg for kg>27 Sometimes surgical removal of the tonsils
Influenza/Colds <i>(Flu)</i> <ul style="list-style-type: none"> is a viral infection of the lungs and airways with one of the influenza viruses. It causes a fever, runny nose, sore throat, cough, headache, muscle aches (myalgias), and a general feeling of illness (malaise). 	<p>Common symptoms are:</p> <ul style="list-style-type: none"> High Fever Lethargic Aches and pains throughout the body, particularly in the back and legs Severe headache Watery eyes Warm and flushed face <p>May include:</p> <ul style="list-style-type: none"> Scratchy sore throat burning sensation in the chest Dry cough (may become severe and bring up phlegm) Runny nose Nausea Vomiting 	<ul style="list-style-type: none"> Annual influenza vaccination Rest Drinking plenty of fluids Pain reliever Decongestants Antibiotics (If bacterial infection develops) Sometimes antiviral drugs
Chickenpox <i>(Varicella)</i> <ul style="list-style-type: none"> is a highly contagious viral infection with the varicella-zoster virus that causes a characteristic itchy rash, consisting of small, raised, blistered, or crusted spots. 	<p style="text-align: right;"><i>USE PICTURES</i></p> <p>Common symptoms are:</p> <ul style="list-style-type: none"> Fever Headache Loss of appetite Lethargy <p>Once rash appears:</p> <ul style="list-style-type: none"> Rash and red spots Blisters 	<p><u>To relieve the itch:</u></p> <ul style="list-style-type: none"> Antihistamines Calamine lotion Hands kept clean Wash body everyday with soap and water Clipped nails to minimize scratching <ul style="list-style-type: none"> Rest Avoid contact with others Vaccine (Varivax) <p>The chickenpox vaccine isn't approved for:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pregnant women <input type="checkbox"/> People who have weakened immune systems <input type="checkbox"/> People who are allergic to gelatin or the antibiotic neomycin

<p>Undernutrition (Type of Malnutrition)</p> <ul style="list-style-type: none"> • is a deficiency of calories or of one or more essential nutrients. • is often obvious: People are underweight, bones often protrude, their skin is dry and inelastic, and their hair is dry and falls out easily. 	<p>Common symptoms are:</p> <ul style="list-style-type: none"> • Loss of body fat • Very low body weight • Thin, dry, inelastic pale and cold skin • Hollow cheeks • Sunken Yes • Dry, sparse hair <p>May include:</p> <ul style="list-style-type: none"> • Loss of appetite • Irritability • Apathy • Irregular or no menstrual periods (For women) <p>“refer to a large medical facility”</p>	<ul style="list-style-type: none"> • Feeding, usually by mouth [Eating several small, nutritious meals each day is the best way.] • Sometimes tube or intravenous feeding • For severe undernutrition, sometimes drugs to increase appetite (dronabinol or megestrol) • Multivitamin supplements are also given to make sure people are getting all the nutrients they need.
<p>Allergic Conjunctivitis (Sore Eyes)</p> <ul style="list-style-type: none"> • is inflammation of the conjunctiva (the membrane that lines the eyelids and covers the white of the eye) caused by an allergic reaction. 	<p style="text-align: center;"><i>USE PICTURES</i></p> <p>Common symptoms are:</p> <ul style="list-style-type: none"> • Redness in white of the eye • Teary, itchy, burning eyes • Blurred vision • Puffy appearance of eyes 	<ul style="list-style-type: none"> • Eye drops • Use water to wash eyes • Rest • Tear supplements • Cold compresses • Antihistamines (such as olopatadine)
<p>Acute Diarrhea</p> <ul style="list-style-type: none"> • is an increase in the volume, wateriness, or frequency of bowel movements. Sometimes diarrhea contains blood or mucus. • is a very common problem in children (see also Diarrhea in adults). • is usually caused by: <ul style="list-style-type: none"> <input type="checkbox"/> Infectious gastroenteritis <input type="checkbox"/> Food poisoning <input type="checkbox"/> Use of antibiotics <input type="checkbox"/> Food allergies 	<p>Common symptoms are:</p> <ul style="list-style-type: none"> • Watery stools for more than 24 hours • dehydration, such as decreased urination, lethargy or listlessness, crying without tears, extreme thirst, and a dry mouth • Ill appearance • High fever • Blood or pus in stool • Pain in the abdomen and, when touched, extreme tenderness • Bleeding in the skin (seen as tiny reddish purple dots [petechiae] or splotches [purpura]) <p>May include:</p> <ul style="list-style-type: none"> • Weight loss • Frequency and timing of bowel movements 	<ul style="list-style-type: none"> • <i>Extra fluids containing a balance of water, sugars, and salts are needed for people who are dehydrated</i> • <i>Age-appropriate diet</i> • <i>Antidiarrheal drugs</i> • <i>Over-the-counter drugs include adsorbents (for example, kaolin-pectin), which adhere to chemicals, toxins, and infectious organisms.</i>
<p>Scabies</p> <ul style="list-style-type: none"> • is a mite infestation of the skin that causes tiny reddish bumps and severe itching. • Scabies usually spreads from person to person through physical contact. • People with scabies have severe itching, even though there are typically few mites on the body. 	<p style="text-align: center;"><i>USE PICTURES</i></p> <p>Common symptoms are:</p> <ul style="list-style-type: none"> • Rash and intense itching (worse at night) • red bumps around elbow, armpit, wrist, waist, buttocks (do not appear on the face in adults) • burrows of the mites are often visible as very thin lines up to a ½ inch <p>People who may develop a <u>severe infestation</u> include:</p> <ul style="list-style-type: none"> • Those with a weakened immune system • Those with severe physical disabilities or intellectual disability • Australian Aborigines 	<ul style="list-style-type: none"> • The treatments used for scabies are mainly applied topically such as sulfur ointments, benzyl benzoate, permethrin cream or lindane lotion • Antihistamines (Benadryl) <p>For older children and adults, scabies can be cured by applying a cream containing permethrin or a lotion containing lindane to the entire body from the neck down and washing it off after 8 to 14 hours. This treatment is repeated a week later.</p> <p>For infants and young children, permethrin is applied to the head and neck, avoiding the skin around the eyes and mouth, and over the entire body. The skinfolds, fingernails, toenails, and the</p>

		navel should be thoroughly treated. Mittens can be put on infants.
Hypertension <ul style="list-style-type: none"> Another name for high blood pressure 	<p>Based on the blood pressure of the patient.</p> <p>In most people, high blood pressure causes no symptoms</p> <ul style="list-style-type: none"> Headache Fatigue Dizziness 	<ul style="list-style-type: none"> Regular exercise Multivitamins Healthy diet Smokers should stop smoking. Reducing the intake of alcohol and sodium
Hepatitis A <ul style="list-style-type: none"> Highly contagious liver disease caused by the Hepatitis A virus but is rarely dangerous. Caused by eating or drinking something that is contaminated 	<ul style="list-style-type: none"> Jaundice (yellowish discoloration of skin) Pain in belly Loss of appetite Nausea Fever Fatigue Dark urine <p><u>Doctors diagnose hepatitis A based on blood tests</u></p> <p>FOR DEFINITE DIAGNOSIS: "refer to a large medical facility" FOR BLOOD TESTS</p>	<ul style="list-style-type: none"> Vaccination Practice good hygiene Do not drink alcohol <p>If itching occurs, <u>cholestyramine</u>, taken by mouth, is often effective.</p> <p>Most people can safely return to work after jaundice resolves.</p>
Leptospirosis <ul style="list-style-type: none"> is a potentially serious infection caused by <i>Leptospira</i>, which are spiral-shaped bacteria called spirochetes, acquired when an unhealed break in the skin comes in contact with water or soil where animal urine is present Usually common in the Philippines, specifically the ones who walk through flood without boots. 	<p>First Phase (Mild infection):</p> <ul style="list-style-type: none"> Fever Coughing Diarrhea Muscle pain Red eyes Rash Headache Nausea Stiff neck <p>CAN BE FATAL</p> <p>Second Phase:</p> <ul style="list-style-type: none"> Jaundice (yellowish discoloration of skin) Nosebleed Coughing of blood <p>FOR DEFINITE DIAGNOSIS: "refer to a large medical facility" FOR BLOOD AND URINE TESTS</p>	<ul style="list-style-type: none"> Antibiotics(Penicillin or ampicillin) <p>If developed into 2nd Phase:</p> <ul style="list-style-type: none"> Blood transfusions Hemodialysis <p><i>People with Weil syndrome may need blood transfusions, and if they have kidney failure, they may need hemodialysis.</i></p>
Cholera <ul style="list-style-type: none"> Infectious disease that is caused by eating food or drinking water contaminated with <i>Vibrio cholerae</i>. 	<ul style="list-style-type: none"> Watery stools Vomiting Dehydration Low blood pressure Muscle cramps <p>FOR DEFINITE DIAGNOSIS: "refer to a large medical facility" FOR Culture of a sample of stool</p>	<ul style="list-style-type: none"> Vaccination Fluids that contain salt Antibiotics Drink boiled water to avoid bacteria Rest and drink plenty of fluids Maintain clean environment

<p>Meningococcal meningitis (Meningitis)</p> <ul style="list-style-type: none"> • is a bacterial form of meningitis, a serious infection of the thin lining that surrounds the brain and spinal cord. • is associated with high fatality (up to 50% when untreated) and high frequency (more than 10%) of severe sequelae. • If treated early, most people with meningitis recover well. But when treatment is delayed, permanent brain or nerve damage or death is more likely, especially in very young children and people over 60. 	<p>Common symptoms are:</p> <ul style="list-style-type: none"> • high fever • headache • stiff neck • <u>Reddish purple of tiny dots under skin</u> • Low blood pressure • Drowsiness, dizziness • Seizure • vomiting • coughing • Lethargy <p><i>Certainty factor is needed!</i></p> <p>FOR DEFINITE DIAGNOSIS: <i>"refer to a large medical facility" FOR BLOOD TESTS and CT</i></p>	<ul style="list-style-type: none"> • Vaccination • Antibiotics • Antiseizure drugs • Dexamethasone (a corticosteroid) • Spinal tap (lumbar puncture) • Cerebrospinal fluid
<p>Active Tuberculosis (TB)</p> <ul style="list-style-type: none"> • is a potentially serious infectious disease that mainly affects your lungs. The bacteria that cause tuberculosis are spread from one person to another through tiny droplets released into the air via coughs and sneezes. • In the Philippines, TB is a major health problem. 	<p>Signs and symptoms of active TB include:</p> <ul style="list-style-type: none"> • Coughing that lasts three or more weeks • <u>Coughing up blood</u> • Chest pain, or pain with breathing or coughing • Unintentional weight loss • Fatigue • Fever • Night sweats • Chills • Loss of appetite • Substance and tobacco use <p><i>Certainty factor is needed!</i></p>	<p>Most people with active tuberculosis do not need to be hospitalized. However, to help prevent the spread of the disease, they should do the following:</p> <ul style="list-style-type: none"> • Stay at home • Avoid visitors (they do not have to avoid family members who have already been exposed) • Cover their cough with a tissue or cough into their elbow <p>-Vaccination</p>
<p>Pneumonia</p> <ul style="list-style-type: none"> • Lung infection that may lead you to the hospital • It occurs when an infection causes the air sacs of the lungs to fill with fluids or pus. • Infants younger than 2 and people over 65 are at higher risk. 	<ul style="list-style-type: none"> • Cough • Shortness of breath • Fever • Chills • Chest pain • Thick or discolored mucus <p><i>Certainty factor is needed!</i></p>	<ul style="list-style-type: none"> • Antibiotics • Sometimes antiviral drugs or antifungal drugs • Stay home and avoid spreading it
<p>Dengue Fever</p> <ul style="list-style-type: none"> • A mosquito-borne disease caused by dengue viruses • Most cases occur in tropical areas, so it is common here in the Philippines 	<ul style="list-style-type: none"> • High Fever • Severe headaches • Muscle pain • Fatigue • Vomiting • Nausea • Skin rash <p><i>Doctors suspect dengue based on your symptoms and if you've been in an area where mosquitoes carry the infection. To know for sure, they'll do blood tests.</i></p> <p><i>Certainty factor is needed!</i></p>	<ul style="list-style-type: none"> • There's no medicine to kill the dengue virus. Doctors will: • Have you take medicine, such as acetaminophen, to lessen pain and lower your fever • Give you IV fluids (into your vein), especially if you have dengue hemorrhagic fever • Don't take aspirin or ibuprofen because they can cause bleeding or make it worse. • Doctors will keep you under mosquito nets while you're sick so mosquitoes don't pick up the infection from you and spread it to other people. • Relievers

CERTIFICATION

This is to certify that all the information above is true and correct.



Dr. Hazel Joy H. Jamalul /
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VII. Appendix B: Contributions of Members

Name	Contributions
Cansana, Jose Lorenzo M.	Source Code, Documentation, Algorithm
Jamalul, Gabriel Rasheed H.	Source Code, Documentation, Algorithm
Loyola, Leanne Marie C.	Source Code, Documentation, Algorithm
Marasigan, Giann Jericho Mari F.	Source Code, Documentation, Algorithm