

# Implementation Plan for Prescription Recommendation System

## OVERVIEW:

The Prescription Recommendation System is designed to assist physicians in prescribing the most appropriate medication based on a patient's symptoms, age, and sex. This system leverages a weighted scoring algorithm to analyze patient data and identify the best medication. The algorithm takes into account symptom severity, patient age group (these provided by the patient), medication accessibility, and cost (based on research), to provide a comprehensive recommendation.

## PROBLEM STATEMENT:

Physicians need a reliable and efficient method to recommend medications based on patient symptoms, considering variations due to age. The challenge is to develop an algorithm that can accurately predict the best medication from a predefined list of common medications.

## WORKFLOW:

### 1. Data Preparation

A. Define Common Symptoms and Medications:

- Symptoms :

['Fever', 'Cough', 'Headache', 'Diarrhea', 'Body Pain']

- Medications (each has its own accessibility score 1-5):

Paracetamol: [4, 1, 5, 0, 4]

Amoxicillin: [0, 5, 0, 5, 1]

Ciprofloxacin: [0, 5, 0, 4, 1]

Ibuprofen: [3, 1, 4, 0, 5]

Metronidazole: [0, 0, 0, 5, 0]

Artemether/Lumefantrine: [5, 4, 0, 3, 1]

\*Lisinopril: [0, 0, 0, 0, 0]

\*Glibenclamide: [0, 0, 0, 0, 0]

Vitamin C: [1, 2, 1, 1, 1]

Diclofenac: [3, 0, 3, 0, 5]

## B. Create Age group weight vectors

Based on research, the weights for symptom importance across different age groups are:

- **Children** (Aged <12 years):

- Fever: 4
- Cough: 4
- Headache: 3
- Diarrhea: 3
- Body Pain: 2

ie [4, 4, 3, 3, 2]

- **Teenagers** (Aged 13-19 years):

- Fever: 3
- Cough: 3
- Headache: 4
- Diarrhea: 2
- Body Pain: 2

- **Adults** (Aged 20-59 years):

- Fever: 3
- Cough: 3
- Headache: 4
- Diarrhea: 2
- Body Pain: 4

- **Elderly** (Aged  $\geq 60$  years):
  - Fever: 2
  - Cough: 4
  - Headache: 2
  - Diarrhea: 3
  - Body Pain: 5

## 2. Weighted Scoring Algorithm

### A. Scale Symptoms by Patient Priority and Age Group Weights:

Given patient priorities for symptoms and age group, scale the symptoms by multiplying with the age group weights. Let's take Praise

#### Example:

- Praise's priorities: [2, 3, 5, 1, 4]
- Praise's age group weights (Teenager): [3, 3, 4, 2, 2]
- Scaled symptoms based on age:  $[2*3, 3*3, 5*4, 1*2, 4*2] = [6, 9, 20, 2, 8]$

### B. Scale Medication Weights by Accessibility Score

Multiply the medication weights by their accessibility scores.

#### Example:

- **Paracetamol**:  $[4, 1, 5, 0, 4] * 5 = [20, 5, 25, 0, 20]$
- **Amoxicillin**:  $[0, 5, 0, 5, 1] * 4 = [0, 20, 0, 20, 4]$

### C. Calculate Compatibility Score for each medication:

Multiply the scaled symptoms vector with the scaled medication weights vector and sum the results.

#### Example:

For Paracetamol:

- Praise's Scaled symptoms: [6, 9, 20, 2, 8]
- **Paracetamol** weights: [20, 5, 25, 0, 20]

- Praise's Compatibility score with **Paracetamol**:  $(6*20) + (9*5) + (20*25) + (2*0) + (8*20) = 120 + 45 + 500 + 0 + 160 = 825$

For Amoxicillin:

To normalize, divide through by maximum of compatibility scores for all calculated medications.

D. Include Price Factor:

Normalize the prices(divide by max) and combine with compatibility score using a weighted sum. Assuming the ratio between Compatibility and Price is 6:4.

**Example:**

For Paracetamol:

- Compatibility score: 825
- Paracetamol Price: \$30
- Normalized price:  $3/\text{max} = //$  Final score:  $(825 * 0.6) + (0.033333 * 0.4) = 495 + 0.0133332 = 495.0133332$

For Amoxicillin:

### 3. Implementation in JavaScript

A. Implement the Algorithm

(Brainstorm page)

Patient:

Ekomobong Ekanem : [1, 0, 3, 5, 0] = [2, 0, 0, 25, 0]

Age: 19 yrs [2, 1, 0, 5, 2]

Paracetamol(5) = [3, 5, 5, 0, 1] = [15, 25, 25, 0, 5]  $\Rightarrow$  [6, 0, 0, 0, 0]  $\Rightarrow 6 \cdot 0.6$ ,  
 $1/\$30 \cdot 0.4 \Rightarrow 3.6 + //1.2 = 4.8$

Amoxicillin(2) = [0, 2, 4, 4, 1] = [] : [0, 0, 0, 100, 0]  $\Rightarrow 100$ ,  $1/\$1000 \Rightarrow 60 + //400$   
 $= 460$

Compatibility to Price ratio = 6:4

Invert the prices:  $1/\text{price}$