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Met Bot

Development of an Artificial Intelligence (AI) driven interactive calculator chatbot app (Met Bot) for caregivers of children with inborn errors of metabolism (IEM) requiring protein restriction

As Artificial Intelligence (AI) technology becomes more ubiquitous, we hypothesized that caregivers can be empowered to be self-reliant in monitoring and adjusting their child's diets. Hence, we developed an AI-driven interactive calculator chatbot app (Met Bot), for trial on caregivers of children with Inborn Errors of Metabolism (IEM) requiring protein and amino acid restrictions.

The study team searched for Apps specifically designed for patients with IEM, as well as popular Apps for monitoring nutrition intake in general to identify key features to include in the Met Bot.

The Met Bot Development encompassed the following 3 phases :

Phase 1 (Designing Met Bot & trial within study team)

Met Bot comprises of
(1) Nutrition Calculator with
- Customized standard database using United States Department of Agriculture (USDA) nutrient database, Singapore Food Composition database & commercial supermarket foods
- Personalized dashboard and management plan for patients based on their metabolic condition
- **(2) Interactive chatbot "Lynn" providing informing on**

(i) nutrient content per 100g of a specified food
(ii) weight of a specified food to eat for a particular amount of nutrient and
(iii) suggestions on what to eat for a specified amount of nutrient.

Prototype Met Bot (for trial by study team before piloting in phase 2

Phase 2 (Pilot Trial of Met Bot with 3 experienced caregivers)

- **Recruitment of 3 caregivers (Oct 2019)**
- **Pilot Trial (Dec19 – Mar20)**

(i) 1 face to face session Dec 2019 (take consent and demonstration on use of Met Bot, caregivers record their child's food intake for 2 weeks and ask the chatbot 3 questions
(ii) 1st group feedback session Jan 2020 (caregivers gave feedback on improving the App, and caregivers instructed to record their child's intake for 3 days and ask the chatbot 3 questions
(ii) 2nd group feedback session planned for Mar 2020 but conducted *Oct 2020 (caregivers gave feedback on improving the App via zoom)

Met Bot (for rollout to all patients in phase 3)
*** Delay due to Covid 19 and also technical issues in development**

Phase 3 (Rollout of Met Bot to 28 patients)

- **Recruitment of caregivers (Nov 2020-Jan 2021)**
- English speaking, with smartphone/PC and data plans
- 16 caergivers consented to participate
- **Rollout Study (27 Feb – 27 Aug 2021)**
- 1 face to face session (take consent and demonstrate on use of Met Bot)
- Caregivers to use Met Bot for 6 months

(i) Record food intake
(ii) Ask the chatbot questions
(iii) Rate usefulness of MetBot
(iv) Complete post-study survey

Study Outcomes
1. Caregivers' confidence in adjusting their child's diets
2. Usefulness of App

The prototype Met Bot consists of :

(A) a nutrition calculator with information on eight nutrients (energy, carbohydrate, protein, metabolic product protein, leucine, lysine, methionine and phenylalanine). The database uses the USDA (United States Department of Agriculture) nutrient database as the main source of information, supplemented with data on local foods from the Singapore Food Composition tables and commercial supermarket foods. Each patient also has a personalized dashboard and prescription depending on their metabolic condition

(B) an interactive chatbot "Lynn" which provides information on (i) nutrient content per 100g of a specified food, (ii) weight of a specified food to eat for a particular amount of nutrient and (iii) suggestions on what to eat for a specified amount of nutrient.

The prototype Met Bot was fine-tuned by three experienced caregivers in a pilot trial, and rolled-out for trial by fourteen caregivers from March to September 2021. Outcome measures include caregivers' level of confidence in adjusting their child's diet and their assessment of the calculator and chatbot components of the Met Bot