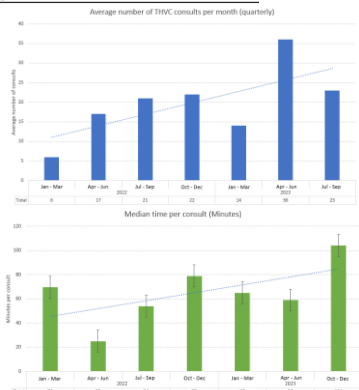


# Incredible Care QIX Award (Process Excellence)

Project Title 1 : Travel Faster (EQUIP-R)		
Department: Division of Infectious Diseases, DOM	Period: Jan – Jun 24	Facilitators/Author: Dr Jeremy Tey
Sponsors (HODs): Prof Sophia Archuleta	Team Leader/s: Dr Matthew Koh	
Team Members: Dr Matthew Koh, Dr Nicholas Ngiam, Dr Wilson Goh, Dr Nicholas Chan, Sun Weimin, Hafizah Binte Dolmad, Dr Brenda Mae Salada, Dr Jolene Oon		

## A. Define the Problem (PLAN)

- With lifting of COVID related restrictions, overseas travel is on the rise. Travel clinics are seeing increased numbers of consultations.
- The pre-travel consultation requires a comprehensive evaluation of travellers' comorbidities, overseas itinerary, previous vaccination history to make appropriate recommendations.
- The large amount of information gathering and counselling required for each consultation is challenging for ID physicians and patients to complete in an efficient manner.
- The average number of consultations at the NUH Traveller's Health and Vaccination Clinic (THVC) per month is increasing and the baseline median amount of time per travel clinic consult is **65 minutes**.

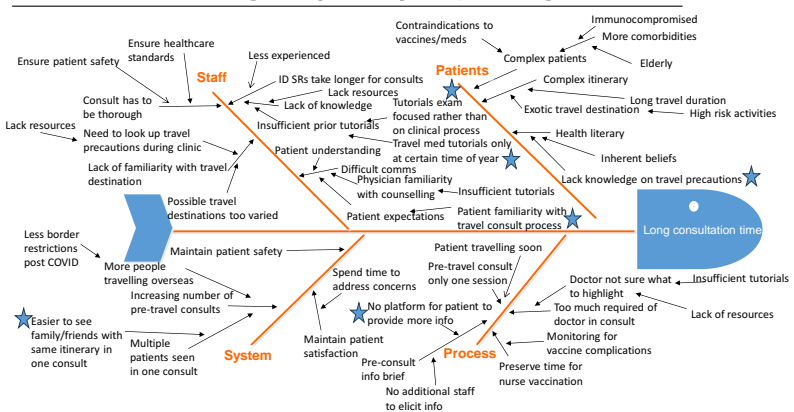


## B. Goal (PLAN) Set SMART goals | Specific, Measurable, Achievable, Relevant, Time-based |

To reduce the amount of consultation time taken for travel health and vaccination consults at the NUH Traveller's Health and Vaccination Clinic (THVC) from median of 65 minutes to less than 48 minutes (at least 25%) within 6 months.



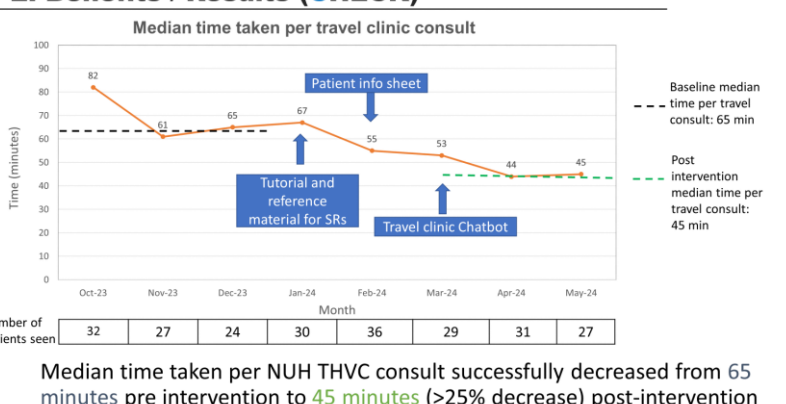
## C. Problem Analysis (PLAN) Gap Analysis



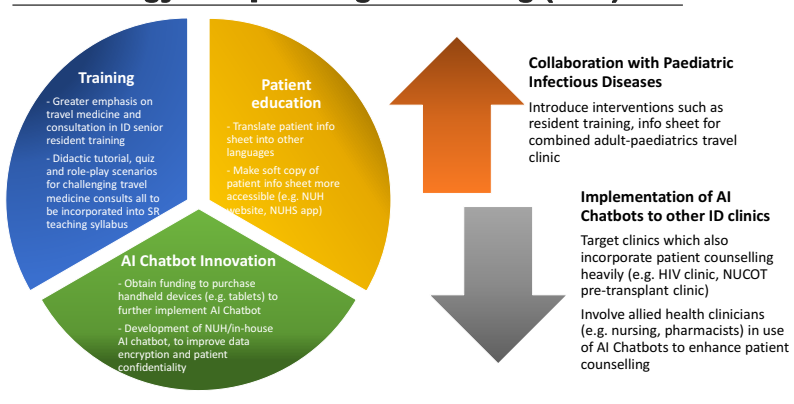
## D. Interventions & Action Plan (DO)

SN	Description	People responsible	Date of implementation
1.1	Creation of tutorial sessions and teaching material on pre-travel consultations for Infectious Diseases Senior Residents	Dr Matthew Koh, Dr Nicholas Ngiam, Dr Wilson Goh, Dr Nicholas Chan, Dr Jolene Oon	9/1/24
1.2	Convert teaching material used during travel medicine tutorial to reference material for easy look up of information during clinic sessions. (Appendix A)	Dr Matthew Koh, Dr Nicholas Ngiam, Dr Wilson Goh, Dr Nicholas Chan, Dr Jolene Oon	16/1/24
2.1	Create information sheet for patients. Provides info on what to expect during travel consultation and also important travel precautions to take. (Appendix B)	Dr Matthew Koh, Dr Brenda Mae Salada, Dr Jolene Oon, Sun Weimin, Hafizah Binte Dolmad	30/1/24
2.2	Patient info sheet implemented into travel clinic workflow. Provided before physical consult in hard and soft copy forms.	Dr Matthew Koh, Dr Brenda Mae Salada, Dr Jolene Oon, Sun Weimin, Hafizah Binte Dolmad	7/2/24
3	Design and implement an artificial intelligence large language model (AI LLM) based chatbot, provided to patients before travel consultation. (Appendix C) Aims: a) Allow patients to input travel info and have frequently asked questions (FAQs) already answered before consult. b) Physicians able to read patient travel details, queries and AI chatbot answers on same device. Saves time answering FAQs and helps physicians focus consult on specific concerns that traveller input into chatbot.	Dr Matthew Koh, Dr Nicholas Ngiam, Dr Wilson Goh, Dr Nicholas Chan, Dr Brenda Mae Salada, Dr Jolene Oon, Sun Weimin, Hafizah Binte Dolmad	27/3/24

## E. Benefits / Results (CHECK)



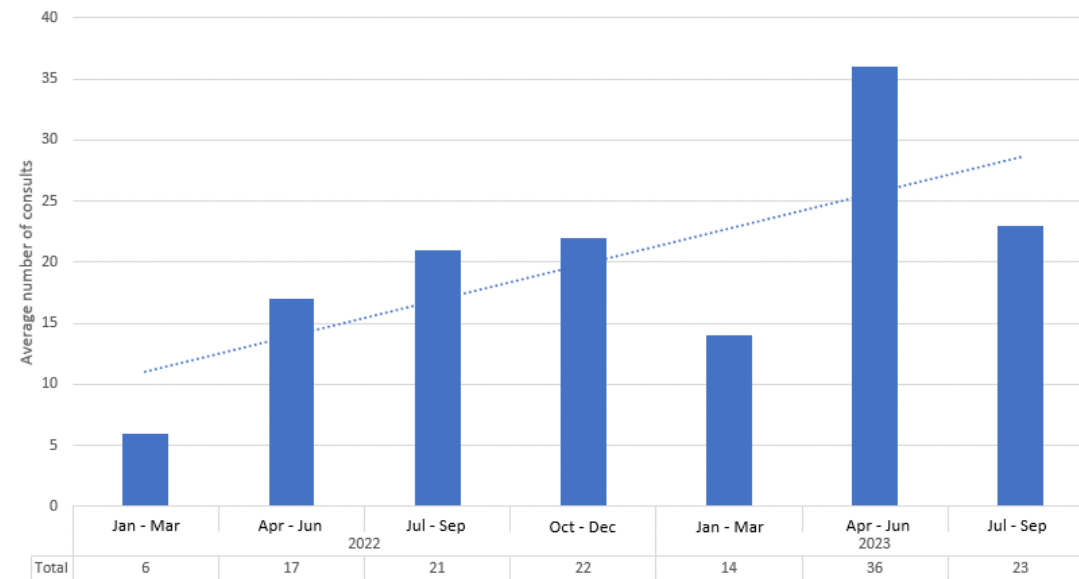
## F. Strategy for Spreading/ Sustaining (ACT)



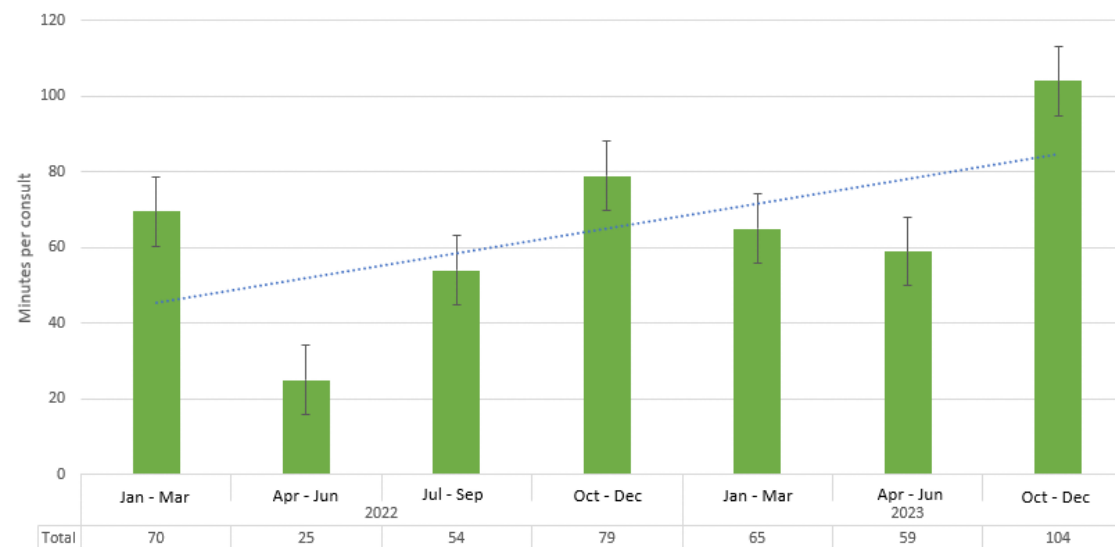
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Average number of THVC consults per month (quarterly)



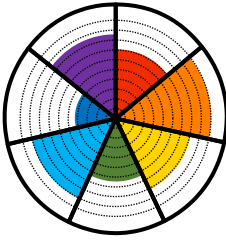
Median time per consult (Minutes)



## **B. Goal (PLAN)**

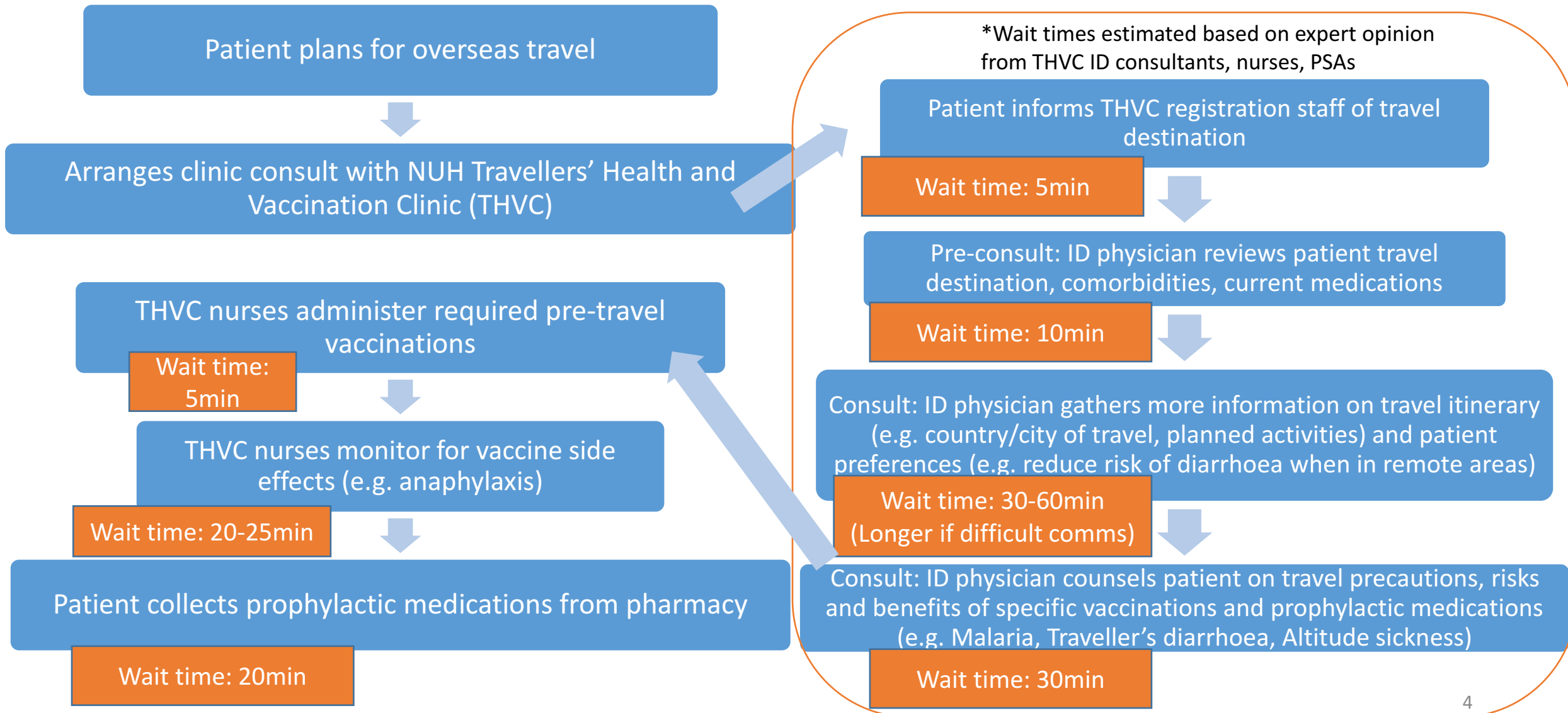
Set SMART goals | Specific, Measurable, Achievable, Relevant, Time-based |

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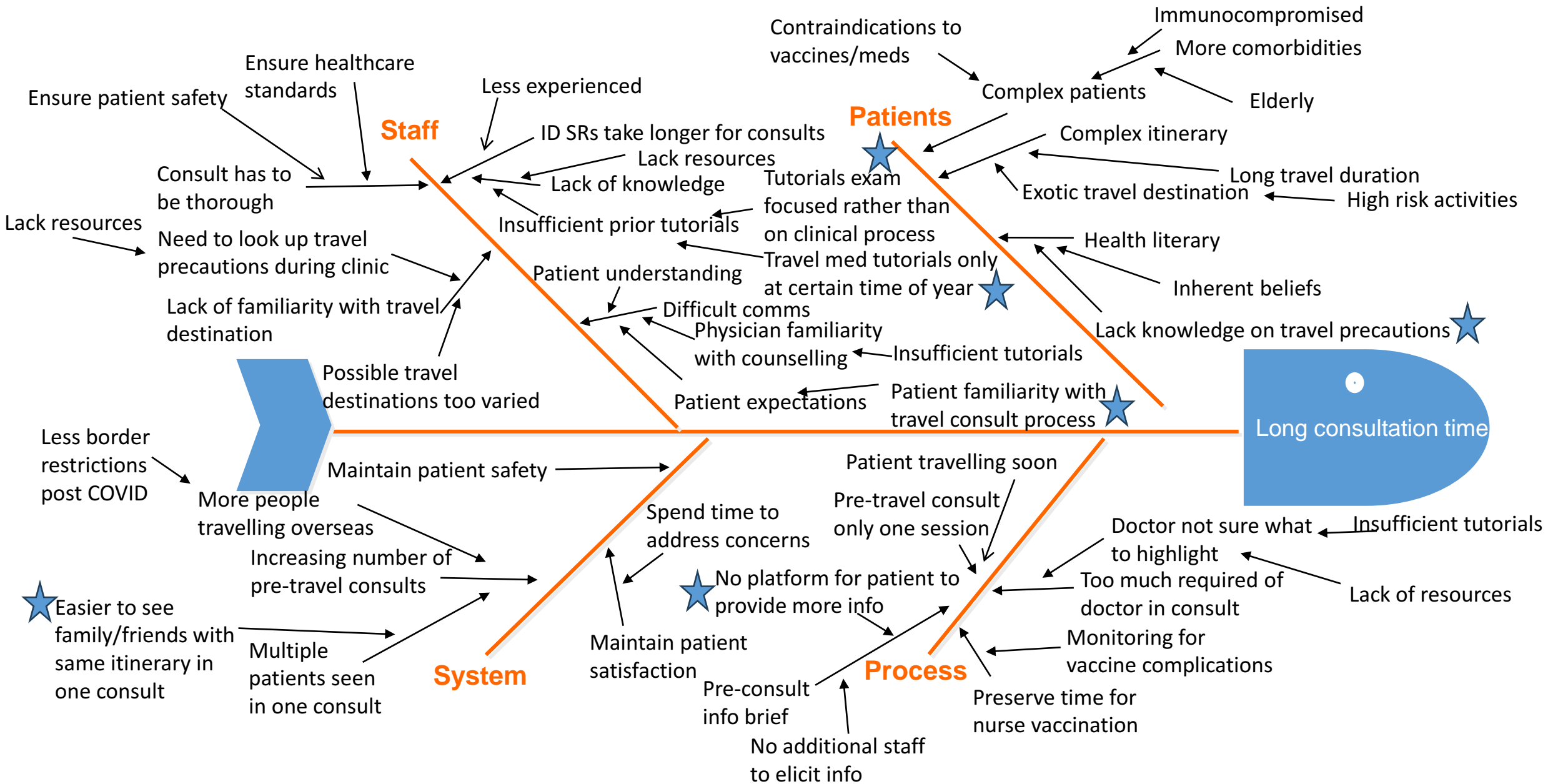


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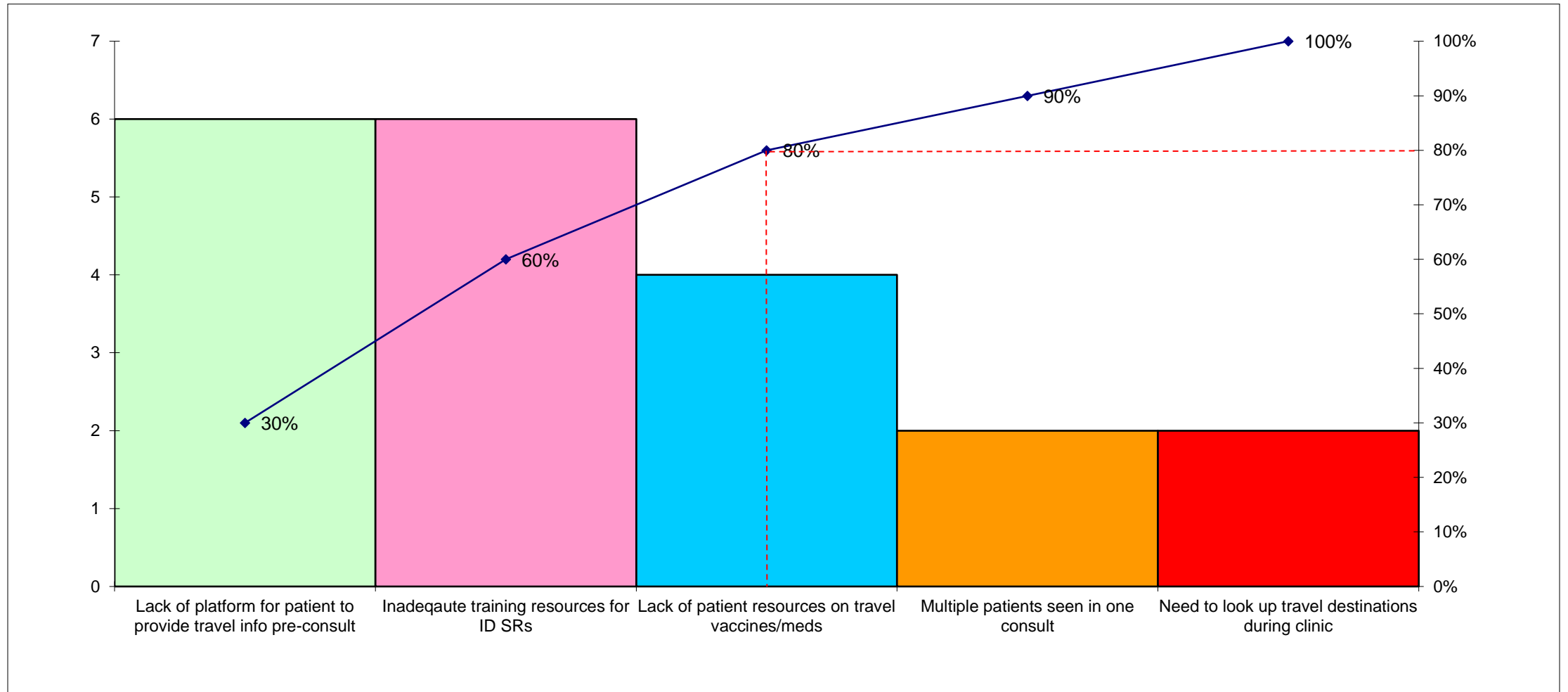
# C. Problem Analysis (PLAN) Value Stream Map



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# D. Interventions & Action Plan (DO)

Improved process mapping

Patient plans for overseas travel



Registers with NUH Travellers' Health and Vaccination Clinic (THVC). Provided patient info sheet on travel precautions

THVC nurses administer required pre-travel vaccinations

Time: 5min



Time: 20 - 25min



Patient collects prophylactic medications from pharmacy

Time: 20min

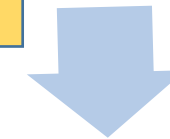
Pre-consult: Patient provided device with AI LLM chatbot to input travel info and answer FAQs

Time: 10min



Consult: ID physician reviews chatbot inputs and responses. Takes further history on travel itinerary structured with assistance of tutorial and reference material

Time: 10 - 20min



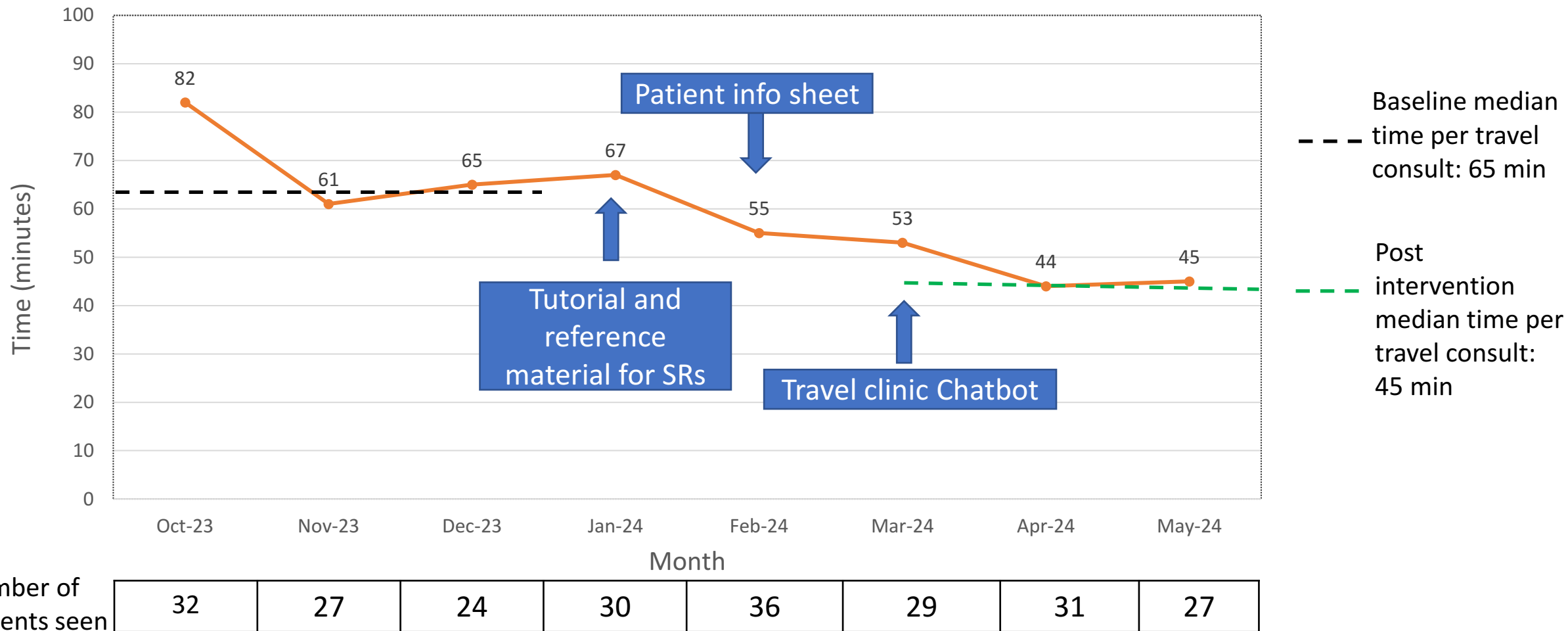
Consult: ID physician does patient counselling on travel precautions, vaccinations and prophylactic medications with assistance of reference teaching material

Time: 10 - 20min

Note: Points of QI Interventions indicated in green boxes, with improved estimated wait times in yellow boxes

# E. Benefits / Results (CHECK)

## Median time taken per travel clinic consult



Median time taken per NUH THVC consult successfully decreased from 65 minutes pre intervention to 45 minutes (>25% decrease) post-intervention

# F. Strategy for Spreading/ Sustaining (ACT)

## Training

- Greater emphasis on travel medicine and consultation in ID senior resident training
- Didactic tutorial, quiz and role-play scenarios for challenging travel medicine consults all to be incorporated into SR teaching syllabus

## Patient education

- Translate patient info sheet into other languages
- Make soft copy of patient info sheet more accessible (e.g. NUH website, NUHS app)

## AI Chatbot Innovation

- Obtain funding to purchase handheld devices (e.g. tablets) to further implement AI Chatbot
- Development of NUH/in-house AI chatbot, to improve data encryption and patient confidentiality

## Collaboration with Paediatric Infectious Diseases

Introduce interventions such as resident training, info sheet for combined adult-paediatrics travel clinic

## Implementation of AI Chatbots to other ID clinics

Target clinics which also incorporate patient counselling heavily (e.g. HIV clinic, NUCOT pre-transplant clinic)

Involve allied health clinicians (e.g. nursing, pharmacists) in use of AI Chatbots to enhance patient counselling

# Appendix A: Tutorial slides/reference material example

## Approach to the pretravel consultation

Patient associated risks

Travel associated risks

Risk Assessment	Standard In-Office Interventions	Focused Education before the Trip
<p><b>Medical history</b>, including medications, disabilities, immune status, immunizations, surgeries, allergies, and pregnancy or breast-feeding</p> <p><b>Prior travel experience</b></p> <p><b>Specific itinerary</b>, including regions, season, and dates</p> <p><b>Activities</b> (e.g., adventure travel and events involving mass gatherings)</p> <p><b>Type of accommodations</b></p> <p><b>Travelers' risk tolerance</b></p> <p><b>Financial challenges</b></p>	<p><b>Administration of immunizations</b></p> <p>Updating of routine vaccines — MMR, Tdap, pneumococcal, varicella, influenza</p> <p>Routine travel vaccines — hepatitis A, typhoid, hepatitis B</p> <p>Special travel vaccines — yellow fever, rabies, polio, meningococcal, Japanese encephalitis, cholera, tickborne encephalitis</p> <p><b>Malaria chemoprophylaxis (if risk)</b> Individualize to itinerary and patient</p> <p><b>Travelers' diarrhea</b></p> <p>Food and water precautions</p> <p>Oral rehydration and use of loperamide and bismuth</p> <p>Antibiotic self-treatment options for severe diarrhea</p> <p>Prophylaxis with bismuth or antibiotic (only if high risk)</p>	<p><b>Vectorborne diseases (if risk)</b></p> <p>Personal protection measures for malaria, dengue, chikungunya, Zika virus infection, leishmaniasis, rickettsial disease, sleeping sickness</p> <p><b>Other travel-related illnesses (as applicable)</b></p> <p>Altitude illness</p> <p>Travelers' thrombosis</p> <p>Motor vehicle injury</p> <p>Bloodborne and sexually transmitted infections</p> <p>Swimming, water exposure, and marine hazards</p> <p>Transportation-associated illnesses</p> <p>Respiratory infection and tuberculosis</p> <p>Rabies and animal-associated illness</p> <p>Skin conditions and wounds</p> <p><b>Medical kit and medical care abroad</b></p> <p>Personal health kit</p> <p>Available medical facilities</p> <p>Evacuation insurance; supplemental health insurance</p>

Best time for travel consult: At least 4 – 8 weeks before planned travel

## Malaria prevention Chemoprophylaxis

Drug	Frequency	Initiation	Discontinuation	Pregnancy	Notes
<b>Atovaquone-proguanil (Malarone)</b>	Daily	1 – 2 days	7 days	No	CrCl $\geq 30$ mL/min Nausea/vomiting (Most develop tolerance after 1-2 dose) Cost: SGD 8 per tablet (expensive)
<b>Doxycycline</b>	Daily	1 – 2 days	4 weeks	No	GI upset: Take with food, Seated up Photosensitivity: Esp for outdoor itinerary
<b>Mefloquine</b>	Weekly	2 – 3 weeks	4 weeks	Yes	5% Neuropsychiatric: Depression, suicidal, insomnia, vivid dreams, giddiness Bradycardia, Prolonged QTc
Tafenoquine	Weekly	Load daily 3 days	1 week	No	MUST check quantitative G6PD Not recommended if psych disorder
Chloroquine (If Chloroquine sensitive <i>P falcifarum</i> or <i>P vivax</i> )	Weekly	1 – 2 weeks	4 weeks	Yes	
Primaquine (If only <i>P vivax</i> )	Daily	1 – 2 days	7 days	No	Check quantitative G6PD

Terminal prophylaxis	Frequency	Initiation	Duration	Notes
<b>Primaquine</b> ( <i>P vivax</i> or <i>P ovale</i> )	Daily	On departure from destination	14 days	Check quantitative G6PD Tafenoquine is an alternative

# Appendix B: Patient info sheet example



## NUH Travellers' Health and Vaccination Clinic

### What to expect: Am I safe and ready to travel?

#### Discuss your travel itinerary in detail.

- Examine all the places that you intend to go, including your planned activities! (It is important to take precautions against the varied risks your itinerary may expose you to.)
- Review transits through various countries and the duration to be spent with the travel clinic. Each country may have specific precautions or vaccine requirements unique to them.
- Find out the latest travel alerts from countries you are travelling to from reputable resources. Useful sources include:
  - Singapore's Ministry of Foreign Affairs (<https://www.mfa.gov.sg/Where-Are-You-Travelling-To>)
  - United States Centers for Disease Control and Prevention (<https://wwwnc.cdc.gov/travel>)

#### Make sure you are up-to-date on your vaccinations.

- Check to make sure your routine vaccines are up-to-date:
  - Examples include: Influenza, COVID-19, Measles-mumps-rubella (MMR), Tetanus-diphtheria-pertussis (Tdap), Pneumococcal (PCV13 and PPSV23), Hepatitis B, Varicella (chickenpox), Polio
- Depending on where you are travelling and the nature of your activities, recommendations for additional travel related vaccines may vary.
  - Examples include: Meningococcal, Yellow fever, Typhoid, Cholera, Rabies, Japanese encephalitis, Hepatitis A

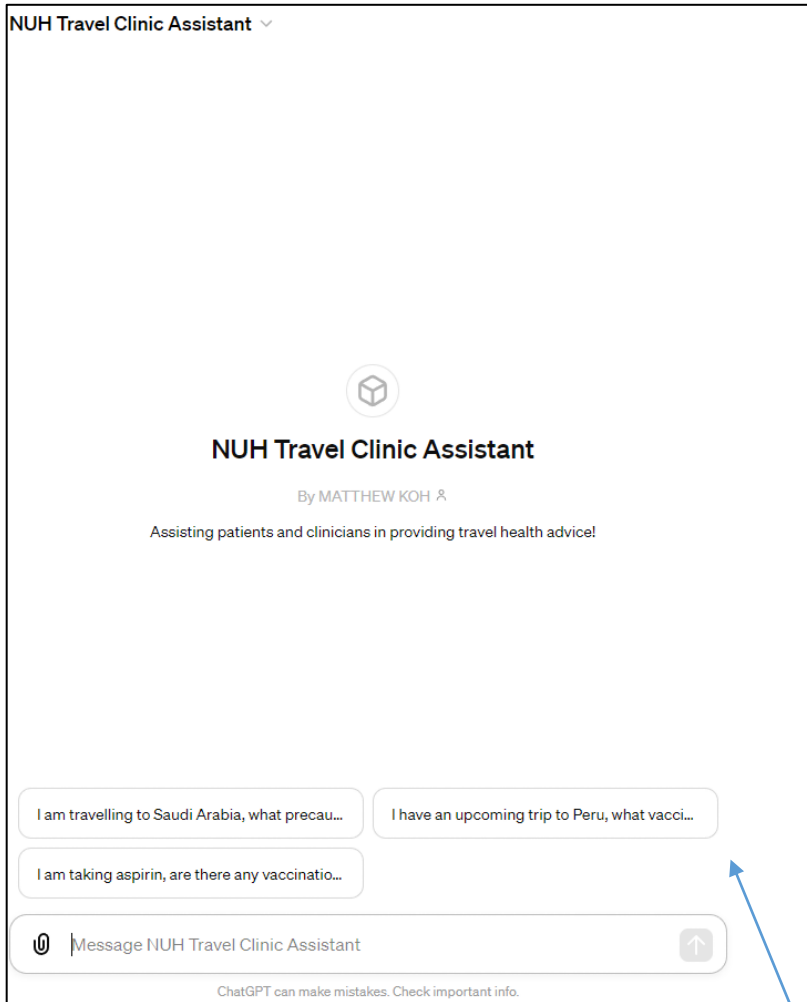
#### Protect yourself against diseases from insect bites: Mosquitoes (transmit malaria in certain destinations), ticks, fleas and others.

- Avoid malaria transmitting mosquitoes by avoiding night time exposure. (This is when *Anopheles* mosquitoes feed.)
- Wear long-sleeved, light-coloured clothing and reduce exposed skin. (This will also protect against harmful sun exposure causing sunburns.)
- Use insect repellents containing at least 30-50% DEET (N-diethyl-m-toluamide): Common brands include: OFF, Zappy or Ceramoz.
- Sleep with insecticide (e.g. permethrin) impregnated bed nets or stay in well screened or air-conditioned rooms. (This will keep mosquitoes and other biting insects out.)
- Discuss the need for malaria prevention pills with the travel clinic.

#### Protect yourself against traveller's diarrhoea.

- Practice good food and water safety hygiene measures.
- Drink only bottled water and consume only foods that are fully-cooked. Avoid salads, uncooked vegetables or raw unpeeled fruits. (Ideally, boil it, cook it, peel it or...forget it!)
- If you do get diarrhoea, maintain adequate hydration and consider use of oral rehydration salts.
- Discuss with the travel clinic to carry anti-diarrhoeal medications (e.g. loperamide) and antibiotics (e.g. ciprofloxacin).

# Appendix C: AI LLM Chatbot to assist travel consult



Interface

Suggested questions/FAQs  
for patients to ask Chatbot

## Example of sample query to AI Chatbot and responses:

You: I am only staying in the city Mumbai, and only going shopping and temples. I have no health conditions.

### Travel clinic assistant:

Thank you for providing more details about your trip to Mumbai, India. Since you'll be staying in the city and visiting places like shopping centers and temples, here's some travel health advice tailored for your trip:

#### **Vaccinations**

- **Routine Vaccinations:** Ensure your routine vaccinations are up-to-date, including measles-mumps-rubella (MMR), diphtheria-tetanus-pertussis, varicella (chickenpox), polio, and your yearly flu shot.
- **Hepatitis A:** Recommended due to the potential for contaminated food or water in India, regardless of where you are eating or staying.
- **Typhoid:** Recommended for most travelers, especially if you are visiting smaller cities or rural areas, or if you are an adventurous eater.

Since you mentioned having no health conditions and didn't specify your vaccination history, it's important to consult with a healthcare provider or a travel medicine specialist for personalized advice and to receive any necessary vaccines well in advance of your trip.

#### **Food and Water Safety**

- **Food:** Only eat food that is cooked and served hot. Avoid street food unless you are confident it's safe and clean.
- **Water:** Drink bottled or filtered water only. Avoid ice in drinks unless you're sure it's made from bottled or purified water.

#### **Mosquito-Borne Diseases**

While Mumbai is a city environment where the risk of mosquito-borne diseases like malaria and dengue is generally lower, it's still advisable to take precautions:

- Use mosquito repellent.
- Wear long-sleeved shirts and long pants to prevent bites.
- Stay in accommodations with effective window screens or air conditioning.

#### **General Safety**

- Be mindful of your surroundings, especially in crowded places.
- Keep your valuables secure and be cautious when withdrawing money from ATMs.
- Use reputable transportation services.

#### **Health Insurance**

- Ensure you have travel health insurance that covers medical evacuation and any activities you plan to do.

#### **COVID-19**

- Stay informed about any COVID-19 travel advisories or requirements for entering India and for your return home.

Remember, it's best to consult with a healthcare professional who can provide advice based on your health history and specific travel plans. Also, registering with your country's embassy or consulate in Mumbai can be beneficial in case of emergency. Enjoy your trip to Mumbai, and stay safe!