

#### Context

Context. We are researchers at UC Berkeley, UCSF, and the University of Maryland conducting an experiment on the use of machine translation systems (e.g. Google Translate) in medical settings.

The purpose of this study is to understand how physicians rely on machine translation (e.g. Google Translate) when communicating with patients. We will use this data to gauge how physicians make decisions on when to give a discharge instruction to a patient in the presence of a language barrier.

Your participation in this survey is voluntary.

The survey should take you less than 30 minutes. You will be compensated for your time, and a \$50 gift card will be emailed to you from Tango Card / Rewards Genius upon completion of this survey.

If have any questions about this survey, please email nmehandru@berkeley.edu and nsalehi@berkeley.edu.

CPHS protocol ID number: 2020-07-13495

# **Demographic Information**

Q1. What is your full name? This information will solely be used to send you a gift card upon completion of this survey.

Q2. What gender do you identify with?

Male

## Female

# Non-binary / third gender

# Prefer not to say

Q4. Is English your first language	<b>?</b>	
	Yes	
	No	
Q5. How many languages (aside 1	rom English) do you speak fluently? Please list them	1.
If you speak Chinese, you are	ineligible to take this survey.	
Q6. What age range are you in?		
	20-30	
	31-40	
	41-50	
	51-60	
	61+	
	ess? This will not be distributed to members outside	ot or

Academic/ Research

Community

Private Practice

Other

Q9. What city and state do you practice in?

Q10. What is your highest degree?

MD

DO

#### Instructions

*Instructions*. Google Translate is a translation system that allows users to automatically translate text from one language to another. Automatic translation systems like Google Translate; however, can sometimes make errors.

Please respond to the following questions barring a lawsuit and regulatory requirements around showing an imperfect translation to a Chinese-speaking patient. You are solely focused on patient comprehension of discharge instructions as it pertains to clinical outcomes.

Please answer each question assuming that you have already reviewed the sentence from the discharge instruction with a patient using a medical interpreter. Use your best judgment when answering questions, and do not consult outside sources.

You will be shown 28 sentences from a total of six discharge instructions.

# **Discharge Note 1**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 1. You were in the hospital because you had a loss of consciousness after getting an IV placed. We believe this was due to something called vasovagal response which causes people to feel faint or lose consciousness. It is possible that mild dehydration could have made this response worse. Please try to drink fluids to make sure you are hydrated today. We also recommend laying down for future IV placement. We are glad you are feeling better now! We placed a discharge referral to primary care in order to get you a new primary care doctor.

MEDICATION CHANGES (for dosing see complete medication list below): No changes made to your medication list were made at this time.

FOLLOW-UP INSTRUCTIONS: Follow-up appointments with your outpatient providers are listed below. 1.) Primary Care: Someone will call to schedule 2.) Oncology

INSTRUCTIONS: -Please contact a healthcare provider or return to the emergency room for: Fevers >100F, recurrent loss of consciousness, vomiting, chest pain, shortness of breath, or any symptoms that are concerning to you. If you have questions, please contact your primary care provider or hospital team (phone numbers above). It was a pleasure taking care of you.

# **Discharge Note 1- Baseline**

D1. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

\${lm://Field/2}

#### Would you give this translation to a patient who only reads Chinese?

Yes No D1. How confident are you in your decision to give (or not give) the above translation to a patient? 1 2 3 5 4 Confidence level (1=Not Confident; 5=Very Confident) D1- Optional D1- Analysis. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 2**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 2. You were admitted for Symptomatic anemia. In the hospital, we gave you 1 unit of blood and your hemoglobin improved. We offered to do an EGD and Colonoscopy while you were here, but you would prefer to do this in the outpatient setting. Please discuss with your Hepatologist to schedule this. You should have your labs drawn on Thursday. I have placed an order for this. Be sure to avoid taking NSAIDs (ibuprofen, naproxen) and Aspirin for pain. These can cause GI bleeding and issues with your kidneys. Key information for you to know:

MEDICATION CHANGES (for dosing see complete medication list below): Please START taking

Omeprazole at higher dose (40mg twice daily).

FOLLOW-UP INSTRUCTIONS: Follow-up appointments with your outpatient providers are listed below. You should see your Hepatology doctor in the next 1-2 weeks.

RETURN INSTRUCTIONS: Please contact a healthcare provider or return to the emergency room for Fever greater than 38oC or 100.4o F and/or shaking chills, Shortness of breath, Severe cough, Bleeding that does not stop on its own, Nausea/vomiting that does not get better with nausea medications Inability to take oral medications, 3 or more loose or liquid stools per day.

Do NOT use My Chart to communicate any of these symptoms. ALWAYS CALL 911 for emergencies, such as: New or increase in chest pain, New or increase in shortness of breath, Changes in mental status, speech, ability to walk. If you have fallen and hit your head, are bleeding, unable to walk or move extremities, or are in severe pain. Do NOT use My Chart to communicate any of these symptoms.

General tips: A balance of activities is important. Be sure to gradually increase your exercise, but avoid overexertion & exhaustion. Hand-washing is important. Be sure that you and the others you live with wash their hands frequently and always before preparing food or after using the bathroom. You can resume a regular diet unless instructed otherwise by your doctor or nurse practitioner. If you have questions, please contact your primary care provider or hospital team (phone numbers above). It was a pleasure taking care of you.

# **Discharge Note 2- Baseline**

D2. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

*\${Im://Field/2}* 

#### Would you give this translation to a patient who only reads Chinese?

No

D2. How confident are you in your decision to give (or not give) the above translation to a patient?

1 2 3 4 5

Confidence level (1=Not Confident; 5=Very Confident)

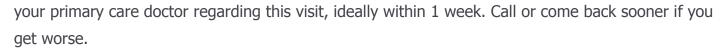
D2- Optional

D2- Analysis. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 3**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 3. You were evaluated in the emergency department for your knee pain and redness. The orthopedic surgeons drained your knee. There is no joint infection. You do have a skin infection that you need antibiotics for. If your symptoms do not improve as expected or get worse, if you develop nausea, vomiting, fevers, chills, shortness of breath, chest pain, have trouble walking, talking, or thinking, are not eating or drinking normally, or are confused, then come back to the emergency room right away or seek care from your primary care doctor. If you have any other symptoms that are concerning to you, come back to the emergency department. Follow-up with



# **Discharge Note 3- Baseline**

D3. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

\${lm://Field/2}

## Would you give this translation to a patient who only reads Chinese?

Yes

No

D3. How confident are you in your decision to give (or not give) the above translation to a patient?



# **D3- Optional**

D3- Analysis. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

5

## **Discharge Note 4**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 4. You were evaluated for right ankle sprain. Your exam is consistent with ligamentous injury. Please rest, ice, elevate 15-20 minutes at time, every day. Take ibuprofen 600 mg every 6 hours. You may take norco for pain, however, do not drink or drive as it will cause drowsiness. Avoid wearing high heel shoes. We have sent a referral for the ortho foot ankle clinic. The appointment will likely be available till at least 4 weeks if not more.

## **Discharge Note 4- Baseline**

D4. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

\${lm://Field/2}

Would you give this translation to a patient who only reads Chinese?

Yes

No

D4. How confident are you in your decision to give (or not give) the above translation to a patient?

1 2 3 4 5

Confidence level (1=Not Confident;

5=Very Confiden	1 t)	2	3	4	5
D4-Optional					
D4- Analysis. Optic you consider?	onal: When d	eciding whether	to give a transla	tion to a patient,	, what factors did

## **Discharge Note 5**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 5. Your diagnosis is epilepsy with breakthrough seizures we recommend resuming zonisamide and carbamazepine and 1 week of clonazepam bridge. Please go over the medication list with your nurse, and let them know if you have any questions.

Follow-up testing: You are being discharged home and we have not ordered additional testing at this time.

Follow-up appointments: We will help arrange an appointment with epilepsy clinic and they will call you with an appointment. We also recommend that you follow up with your primary care provider. If an appointment has not been made please make an appointment within 7 days from your discharge. If you have any questions, please call our general neurology clinic.

# **Discharge Note 5- Baseline**

D5. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

\${lm://Field/2}

## Would you give this translation to a patient who only reads Chinese?

Yes

No

D5. How confident are you in your decision to give (or not give) the above translation to a patient?

Confidence level (1=Not Confident; 5=Very Confident)

1	2	3	4	5

# **D5- Optional**

D5- Analysis. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 6**

*Instructions*. Please read the following discharge note carefully before continuing. In the next section, we will ask you to make decisions on the application of one or more automatic translation tools on a sample of sentences from this discharge instruction.

Discharge Note 6. You were admitted for Cellulitis. In the hospital, we gave you two doses of vancomycin. You subsequently left the hospital without further treatment. Key information for you to

know:

MEDICATION CHANGES (for dosing see complete medication list below): Please START taking Doxycycline 100mg twice per day for seven days, Keflex 500mg four times per day for seven days. Please return if you experience worsening pain or swelling of your leg, fevers, chills, fatigue, or other concerning symptoms. It was a pleasure taking care of you.

## **Discharge Note 6- Baseline**

D6. The following sentence was passed through Google Translate:

\${lm://Field/1}

Google Translate generated the following Chinese translation for the sentence above:

\${lm://Field/2}

## Would you give this translation to a patient who only reads Chinese?

Yes

No

D6. How confident are you in your decision to give (or not give) the above translation to a patient?



# **D6- Optional**

D6- Analysis. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

#### **BT Instruction**

BT Context. In the following section, you will be shown a Chinese translation of an English sentence that was passed through Google Translate. You will then be shown the English translation of that same Chinese sentence after it was passed through Google Translate again.

Please respond to the following questions barring a lawsuit and regulatory requirements around showing an imperfect translation to a Chinese-speaking patient. You are solely focused on patient comprehension of discharge instructions as it pertains to clinical outcomes.

You will be shown 28 sentences from a total of six discharge instructions.

## **Discharge Note 1-BT**

D1. The following sentence was passed through Google Translate:

## **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

# **\${Im://Field/2}**

Google Translate translated this text back into English as:

# \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

Yes

No

D1. How confident are you in your decision to give (or not give) the above translation to a patient?



D1. If a monolingual Chinese patient were to read the previous sentence, do you think the patient would understand the discharge instruction sentence?



# **D1-BT- Optional**

D1. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 2- BT**

D2. The following sentence was passed through Google Translate:

# **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

Google Translate translated this text back into English as:

## \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

Yes

No

D2. How confident are you in your decision to give (or not give) the above translation to a patient?



D2. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D2 BT Optional**

D2. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 3-BT**

D3. The following sentence was passed through Google Translate:

# **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

Google Translate translated this text back into English as:

## \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

Yes

No

D3. How confident are you in your decision to give (or not give) the above translation to a patient?



D3. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D3 BT Optional**

D3. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

## **Discharge Note 4-BT**

D4. The following sentence was passed through Google Translate:

# **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

# \${lm://Field/2}

Google Translate translated this text back into English as:

# \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

Yes

No

D4. How confident are you in your decision to give (or not give) the above translation to a patient?



D4. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



## **D4 BT Optional**

*D4.* Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 5-BT**

D5. The following sentence was passed through Google Translate:

# \${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

# \${lm://Field/2}

Google Translate translated this text back into English as:

## \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

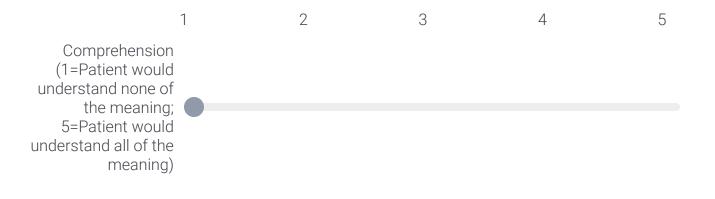
Yes

No

D5. How confident are you in your decision to give (or not give) the above translation to a patient?



D5. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D5 BT Optional**

D5. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

## **Discharge Note 6-BT**

D6. The following sentence was passed through Google Translate:

# **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

Google Translate translated this text back into English as:

## \${lm://Field/3}

Would you give the Chinese translation (in bold) to a patient who only reads Chinese?

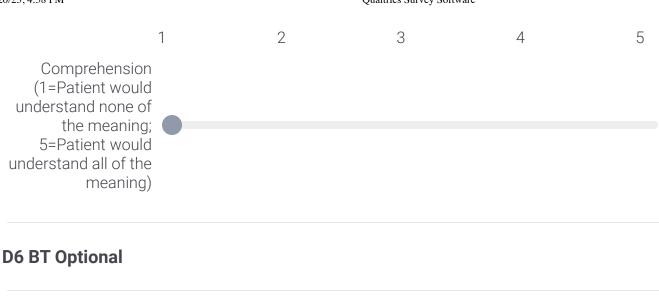
Yes

No

D6. How confident are you in your decision to give (or not give) the above translation to a patient?



D6. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# consider?

D6. Optional: When deciding whether to give a translation to a patient, what factors did you

# **Post-Survey-BT**

Q1. Given the known inaccuracies of automatic machine translation tools, there are a variety of ways to provide estimates on the quality of the translation. Of the three options below, what would you most prefer?

Binary: is the translation accurate?

Explaining where the errors occurred

Error categories relevant for medical purpose

Q2. How many years of experience do you have writing discharge instructions?

Q3. What is your medical specialty?

Translate for decision-making.

# Q4. How often do you interact with Limited English Proficiency (LEP) patients?

Daily

2-3 times a week

Bi-weekly

Every month

Rarely

# Q5. Please answer the following questions according to the system you interacted with.

	l disagree strongly.	I disagree somewhat.	I'm neutral about it.	l agree somewhat.	l agree strongly.	
	1	2	3	4		5
I am confident in Google Translate. I feel that it works well.						
Google Translate is very reliable. I can count on it to be correct all the time.						
I would use AI systems in my clinical practice if endorsed by a medical board.						
I like using Google						

# Q6. How often do you use Google Translate when writing discharge instructions?

Daily

2-3 times a week

Bi-weekly

#### Every month

#### Rarely

Q7. ChatGPT is an artificial intelligence (AI) chatbot that gained attention for its detailed responses spanning various domains of knowledge.

Barring regulatory and legal implications, would you use ChatGPT in your clinical workflow?

Yes

No

Q8. How would you be open to using ChatGPT as part of your clinical workflow? Check all that apply.

To provide clinical decision support and make evidence-based recommendations

To summarize patient notes, including symptoms and treatment plans

To respond to patient questions

I would never consider using ChatGPT in my clinical workflow

Q9. Would you be open to a 15-minute virtual interview with our research team? You will be compensated for your time with a \$40 gift card.

Yes

No

# **QE Instruction**

QE Context. A quality estimation system can estimate the quality of the translated text by comparing the machine-generated translation (e.g. Chinese) to the original text (e.g. English). This model is trained to try to estimate how a human would rate the quality of a translation.

The system will generate one of the three ratings:

- The meaning of the translation is consistent with the source.

- The translation retains most of the meaning of the source.
- The translation preserves only some of the meaning of the source but misses significant parts.

Please respond to the following questions barring a lawsuit and regulatory requirements around showing an imperfect translation to a Chinese-speaking patient. You are solely focused on patient comprehension of discharge instructions as it pertains to clinical outcomes.

You will be shown 28 sentences from a total of six discharge instructions.

## **Discharge Note 1- QE**

D1. The following sentence was passed through Google Translate:

## **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

# **\${Im://Field/3}**

Would you give the Chinese translation to a patient who only reads Chinese?

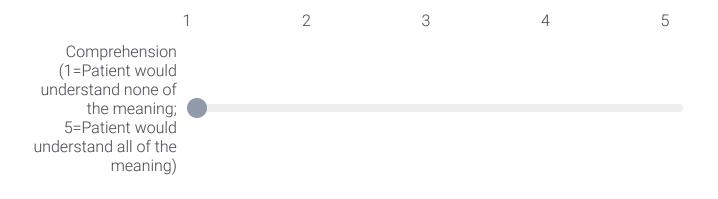
Yes

No

D1. How confident are you in your decision to give (or not give) the above translation to a patient?

Confidence level (1=Not Confident; 5=Very Confident)

D1. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



## **D1 QE Optional**

D1. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 2- QE**

D2. The following sentence was passed through Google Translate:

# **\${Im://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

# \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

# **\${Im://Field/3}**

## Would you give the Chinese translation to a patient who only reads Chinese?

Yes

No

D2. How confident are you in your decision to give (or not give) the above translation to a patient?



D2. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D2 QE Optional**

D2. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

**Discharge Note 3- QE** 

D3. The following sentence was passed through Google Translate:

## **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

# \${lm://Field/3}

Would you give the Chinese translation to a patient who only reads Chinese?

Yes

No

D3. How confident are you in your decision to give (or not give) the above translation to a patient?



D3. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



## **D3 QE Optional**

D3. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 4- QE**

D4. The following sentence was passed through Google Translate:

## **\${lm://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

# **\${Im://Field/3}**

Would you give the Chinese translation to a patient who only reads Chinese?

Yes

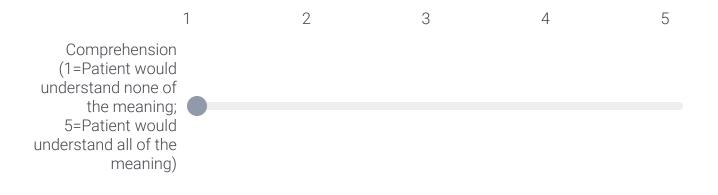
No

D4. How confident are you in your decision to give (or not give) the above translation to a patient?

Confidence level (1=Not Confident; 5=Very Confident)

5

D4. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D4 QE Optional**

*D4.* Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 5- QE**

D5. The following sentence was passed through Google Translate:

# \${lm://Field/1}

Google Translate generated the following **Chinese translation** for the sentence above:

# \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

# \${lm://Field/3}

Would you give the Chinese translation to a patient who only reads Chinese?

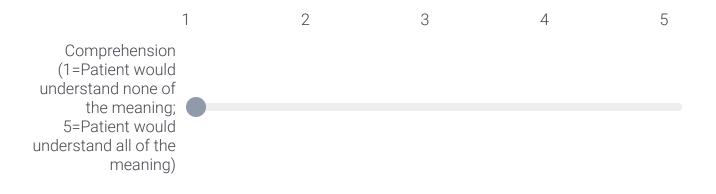
Yes

No

D5. How confident are you in your decision to give (or not give) the above translation to a patient?



D5. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D5 QE Optional**

D5. Optional: When deciding whether to give a translation to a patient, what factors did you consider?

# **Discharge Note 6- QE**

D6. The following sentence was passed through Google Translate:

# **\${Im://Field/1}**

Google Translate generated the following **Chinese translation** for the sentence above:

## \${lm://Field/2}

A quality estimation automatic translation system estimated the translation quality as:

## \${lm://Field/3}

Would you give the Chinese translation to a patient who only reads Chinese?

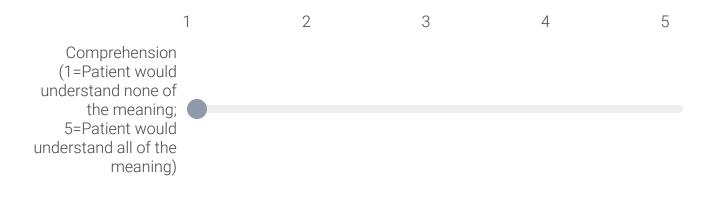
Yes

No

D6. How confident are you in your decision to give (or not give) the above translation to a patient?



D6. If a monolingual Chinese patient were to read the previous sentence, do you think the the patient would understand the discharge instruction sentence?



# **D6 QE Optional**

D6. Optional: When deciding whether to give a translation to a patient, what factors did you

Post-S	Survey QE
ways to	ven the known inaccuracies of automatic machine translation tools, there are a variety of opposite provide estimates on the quality of the translation. Of the three options below, what would post prefer?
	Binary: is the translation accurate?
	Explaining where the errors occurred
	Error categories relevant for medical purpose
Q2. Ho	Error categories relevant for medical purpose  w many years of experience do you have writing discharge instructions?
Q3. WI	ow many years of experience do you have writing discharge instructions?
Q3. WI	ow many years of experience do you have writing discharge instructions?  That is your medical specialty?
Q3. WI	ow many years of experience do you have writing discharge instructions?  that is your medical specialty?  ow often do you interact with Limited English Proficiency (LEP) patients?
Q3. WI	ow many years of experience do you have writing discharge instructions?  that is your medical specialty?  ow often do you interact with Limited English Proficiency (LEP) patients?  Daily

 ${\it Q5}$ . Please answer the following questions according to the system you interacted with.

Q8. How would you be open to using ChatGPT as part of your clinical workflow? Check all that apply.

To provide clinical decision support and make evidence-based recommendations

To summarize patient notes, including symptoms and treatment plans

To respond to patient questions

I would never consider using ChatGPT in my clinical workflow

Q9. Would you be open to a 15-minute virtual interview with our research team? You will be compensated for your time with a \$40 gift card.

Yes

No

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