

Translation and Cultural Adaptation of Clinical Outcome Assessments (COAs): Is Machine Translation a Viable Option?

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OBJECTIVES.

As technology continues to advance and the need to expedite drug development increases, the applications of Machine Translation (MT) and Artificial Intelligence (AI) in the translation process should be further explored. The capabilities of iterative learning and feedback can serve as a tool for translation, but the limitations should be considered. This poster will compare human translation (HT) and machine translation (MT) in the back translation step for Clinical Outcome Assessments (COAs) as well as supporting study materials.

METHODS.

Patient-facing material was assessed to identify individual items with a diversity in text length as well as level of registry. Language selection was aimed at ensuring a global representation and included character-based languages, right-to-left scripts, as well as various language families.

Seventy-one items were selected from various COAs and patient diaries and compiled into an individual report. Each item selected previously underwent dual forward translation and reconciliation. The reconciled forward translation was then prepared for human and machine back translation.

A side-by-side comparison of two translation methods, human versus machine, was performed by COA experts with 30+ years of relevant combined experience. The comparison was performed specifically on un-edited, single-step, back translations (prior to resolution). The analysis categorized the findings based on similarities, differences, and any errors found.

DATA SPECIFICATIONS:

- 71 items from various COAs and patient diaries
- 10 languages (Arabic, Chinese, Czech, French, Hebrew, Hungarian, Korean, Polish, Russian, and Spanish)
- 710 total items analyzed - for both HT & MT

RESULTS.

The review of each method of back translation demonstrated that machine translation is comparable to human translation. Conceptual equivalency is found in machine as well as human translation. Errors were also found in both methods.

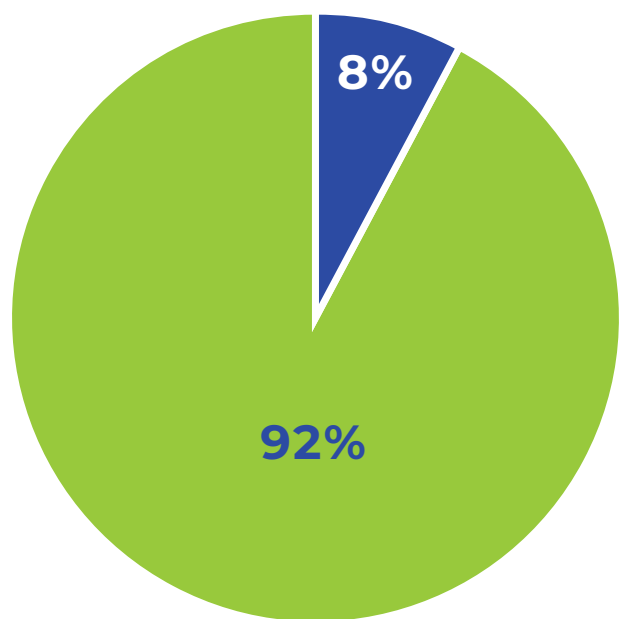
SPECIAL FINDINGS:

- HT was found to use more words than MT in many instances
- MT had a higher degree of literal equivalency than HT
- HT had a higher degree of conceptual equivalency than MT
- There was less than a 2% difference between MT & HT in conceptual equivalency
- MT was exactly the same as HT ~30% of the time
- Back translations of simple text ("date", for example) resulted in the same BT
- Table 1** demonstrates more accuracy in HT in conceptual equivalency for longer, more complex text
- Table 2** demonstrates more accuracy in MT in literal equivalency for shorter, simpler text

Conceptual Equivalency and Literal Equivalency in Human Translations & Machine Translations

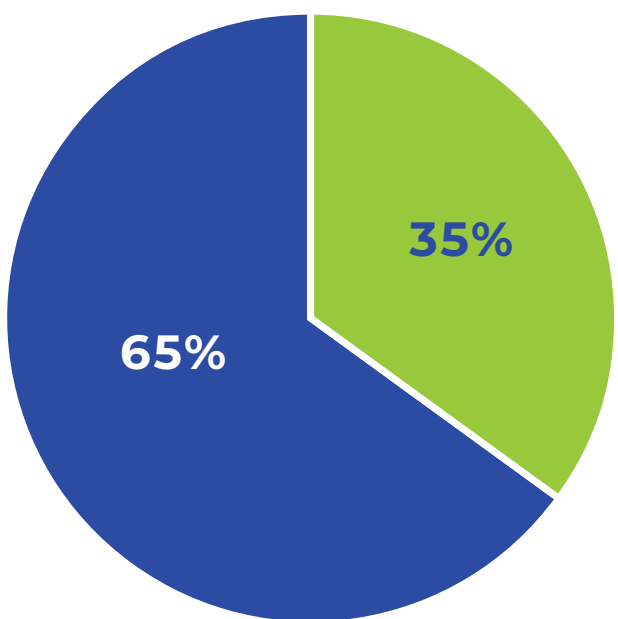
CONCEPTUAL EQUIVALENCE: MT

■ MT BT ≠ EN ■ MT BT = EN



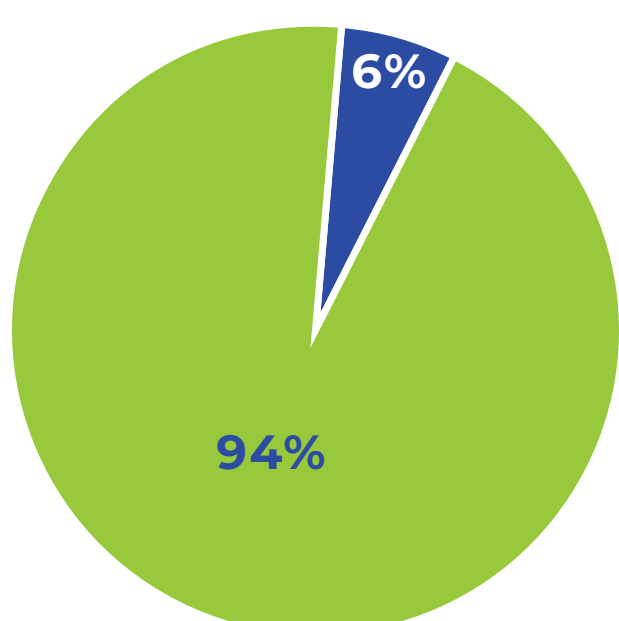
LITERAL EQUIVALENCE: MT

■ MT BT ≠ EN ■ MT BT = EN



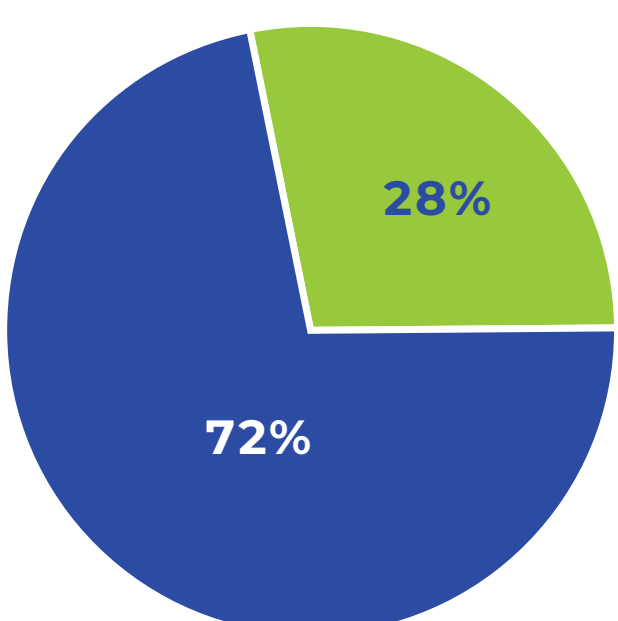
CONCEPTUAL EQUIVALENCE: HT

■ HT BT ≠ EN ■ HT BT = EN



LITERAL EQUIVALENCE: HT

■ HT BT ≠ EN ■ HT BT = EN



CONCLUSIONS.

The effectiveness and quality of machine translation relies heavily on its underlying engine. In this examination, the engine was trained and underwent post-editing, the process where the machine translated text is reviewed and corrected, in order to achieve the required quality level. It is crucial to emphasize that human interaction is needed in both traditional, purely human translation and in machine translation. Without proper set-up, guidance, parameter establishment and continuous real-time language oversight, the machine translation component cannot operate independently at this time for COAs specifically. Although machine translation can continually improve through training of the engines as well as evolve to an iterative learning system (artificial intelligence, AI), its use and process must still involve humans for this material type.

The use of machine translation should be considered as a future option in the translation process for COAs, and the advancement of this technology should continue to be a high priority. Although there are cautionary points to consider, iterative learning can provide improvement in quality and reduce time friction that is often seen in the traditional translation process. Further analysis is necessary to determine the time savings associated with the use of MT and AI in this and other linguistic steps.

TABLE 1: Representative Excerpt

ENGLISH ITEM	LANGUAGE (COUNTRY)	FRONT TRANSLATION	HUMAN BACK TRANSLATION	MACHINE BACK TRANSLATION
What was the severity of your nausea (feeling like you wanted to throw up) at its worst over the last 24 hours?	Arabic (Israel)	كيف تُقيِّمُ شدة الغثيان لديك (الشعور وكأنك كنت على وشك التقيؤ) في أسوأ حالاته خلال الـ 24 ساعة الماضية؟	How would you rate the severity of your nausea (feeling like you are about to vomit) at its worst within the past 24 hours?	How would you rate the severity of your nausea (feeling like you were about to vomit) at its worst in the past 24 hours?
	Czech (Czech Republic)	Jak silná byla Vaše nejhorší nevolnost (pocit na zvracení) během posledních 24 hodin?	How strong was your worst nausea (urge to vomit) during the last 24 hours?	How severe was your worst nausea (feeling sick) in the past 24 hours?
	Spanish (Spain)	¿Cuál fue la intensidad de sus náuseas (sensación de ganas de vomitar) en su peor momento durante las últimas 24 horas?	What was the severity of your nausea (feeling of wanting to vomit) at its worst during the last 24 hours?	What was the severity of your nausea (feeling like vomiting) at its worst during the past 24 hours?
	French (Canada)	Quelle a été la gravité de vos pires nausées (sensation d'avoir envie de vomir) au cours des dernières 24 heures?	What was the severity of your worst nausea (sensation of having an urge to vomit) over the past 24 hours?	How severe was your worst nausea (feeling like you want to vomit) in the past 24 hours?
	Hebrew (Israel)	מה הייתה מידת החומרה של הבחילה שלך (תחושה שצריך להקיא) במצב הגרוע ביותר ב-24 השעות האחרונות?	What was the level of severity of your nausea (a feeling you need to vomit) at the worst state in the last 24 hours?	How severe was your nausea (feeling sick) at its worst in the past 24 hours?
	Hungarian (Hungary)	Milyen súlyos volt a hányingere (olyan érzés, mintha hánynia kellene), amikor a legrosszabb volt az elmúlt 24 órában?	How serious was your nausea (a sensation that you want to vomit), when you were the worse over the last 24 hours?	How severe was your nausea (feeling like you want to vomit) at its worst over the past 24 hours?
	Korean (South Korea)	지난 24시간에 걸쳐 귀하의 오심(토할 것 같은 느낌)은 가장 심했을 때 어느 정도로 심하였습니까?	How severe was your nausea (feeling like vomiting) at its worst over the last 24 hours?	Over the past 24 hours, how severe was your nausea (feeling sick) at its worst?
	Polish (Poland)	Jak duże było nasilenie występujących u Pana/Pani nudności (uczucia, że chce się wymiotować) w najgorszym momencie w ciągu ostatnich 24 godzin?	How severe was your nausea (feeling like you want to vomit) at the worst point in the last 24 hours?	How severe was your nausea (feeling like you want to vomit) at its worst over the last 24 hours?
	Russian (Israel)	Насколько сильной была у Вас тошнота (ощущение, что Вас вырвет) в наихудшем проявлении за последние 24 часа?	Over the past 24 hours, how severe was your nausea (feeling of needing to vomit) at its worst?	How severe was your nausea (feeling like you vomited) at its worst in the past 24 hours?
	Simplified Chinese (China)	在过去 24 小时内，您恶心（感觉想呕吐）的严重程度如何？	What was the severity of your feeling nausea (feeling of wanting to vomit) at [its] most severe in the past 24 hours?	In the past 24 hours, how severe was your nausea (feeling like you vomit)?

TABLE 2: Representative Excerpt

ENGLISH ITEM	LANGUAGE (COUNTRY)	FRONT TRANSLATION	HUMAN BACK TRANSLATION	MACHINE BACK TRANSLATION
Stool Frequency:	Arabic (Israel)	وتيرة التبرز:	Bowel movement frequency:	Frequency of bowel movements:
	Czech (Czech Republic)	Jak často jste byl/a na toaletě:	How often you had a stool:	How often did you have a bowel movement:
	Spanish (Spain)	Frecuencia de las deposiciones:	Frequency of bowel movements:	Stool Frequency:
	French (Canada)	Fréquence des selles :	Frequency of bowel movements:	Stool Frequency:
	Hebrew (Israel)	תדירות פעולת מעיים:	Bowel movement frequency	Bowel movement frequency:
	Hungarian (Hungary)	Székkletgyakorláság:	Frequency of bowel movement:	Stool frequency:
	Korean (South Korea)	대변 빈도:	Stool Frequency:	Stool frequency:
	Polish (Poland)	Częstotliwość oddawania stolców:	The frequency of passing stool:	Stool frequency:
	Russian (Israel)	Частота дефекаций:	Bowel movement frequency:	Stool frequency:
	Simplified Chinese (China)	大便频次:	Bowel movement frequency:	Stool frequency: