Zhaoyu Bing & Jim Hlavac

Chinese-English medical translation informed by findings from contrastive linguistics and discourse analysis

Abstract

The volume of technical, scientific, and academic texts translated between Chinese and English is considerable, and this volume will likely continue to increase. This paper examines Chinese and English medical research articles in both languages and provides an empirically-based examination of select syntactic and discourse-based features. Specifically, this paper focuses on characteristic features of the genre of pharmaceutical research articles in both Chinese and English: verb forms, voice and authorial positionality. Examination of the statistical frequency of the following is undertaken: verb forms (via either finite tense or 'overt' tense marking); grammatical voice (active vs passive); and authorial positionality (use of personal pronouns, full-form nouns, or impersonal constructions). By examining the statistical frequency of each of these in a sample of eight research articles across both languages, this paper offers a practice-based guide to the translation of medical research papers via findings from contrastive linguistics and discourse analysis. These findings may inform specialists as well as trainee translators working in either language direction.

1 Introduction

The translation of texts from the natural sciences including medicine makes up a large proportion of the global translation industry. Recent data from UK language services companies shows that the second largest requested area in translation services is that of life sciences, encompassing medicine (especially pharmaceutics) and clinical research texts. This area of translation services also records the highest level of expected expansion (Nimdzi Insights and Association of Translation Companies 2023: 19, 20). The translation of texts from the natural sciences and medicine falls within a larger field commonly known as *scientific and technical translation* (Olohan 2015), a field which, as Kingscott (2002: 247) points out, "comprises more than 90 % of the translation of the professional world output".

Studies on the translation of texts within this field have, since the 1970s, focused on particular features, e. g., terminological and lexical equivalence (Pinchuk 1977; Maillot 1981), acquisition of certain content knowledge (Hann 1992a,b), function and reception by target language readers (Byrne 2006). This last-mentioned feature reflects the

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 396

influence of *skopos theory* (Vermeer 1989) where the purpose of the text in the target culture and language guides the approach adopted and the translation choices made by the translator.

Many studies on the translation of texts, not only scientific and technical ones, have been influenced by contrastive linguistics as an approach that involves cross-linguistic comparison of features at the systemic level. Linguistic approaches to translation (Catford 1965; Newmark 1988) initially applied this focus of formal correspondence between languages to textual equivalence between source and target texts, but where the locus of equivalence seldom extended beyond the sentence level. The development of text-based approaches that examine syntactic, semantic and pragmatic regularities (Reiß 1971; Koller 1979) were a precursor to approaches that view translation as inter-semiotic transfer at the levels of genre and discourse (Hatim/Mason 1990). Discourse analysis offers an approach to translation that examines the way "texts are 'put together' in terms of product and form, sequential relationships, intersentential structure and organization" (Hatim 2009: 88). The ability to analyse source texts (STs) in relation to their discourse features is a skill that has become a regular part of translator training (Trosborg 2000) and of Translation Studies research (Baumgarten/Schröter 2017).

While the prominence that contrastive linguistics once enjoyed as a major sub-discipline of linguistics in the 1960s and 1970s has somewhat waned in that field, the application of contrastive linguistics approaches remains a regular feature of studies that examine texts of a particular genre and the linguistic features that characterise a text in one language compared to a text of the same genre in another language, e. g., Wang (2004), Pisanski Peterlin (2005). In general, Translation Studies continues to be a discipline in which contrastive analysis approaches are routinely employed (Ebeling 1998; Rojo 2009; Czulo/Hansen-Schirra 2017).

A more recent development in scientific and technical translation is the application of discourse analysis in the categorisation and analysis of texts. Here, texts that belong to the same genre from two different languages can be cross-linguistically examined, thus enabling a fine-grained comparison of the linguistic features that are employed in each language for texts of the same genre, e. g., Xiao, McEnery and Qian (2006), López Arroyo and Roberts (2017). The collation of texts belonging to the same genre from two different languages provides the basis for parallel text corpora which can be an amenable resource for translators (Pearson 2003; Wright 2011). In relation to medical translation, and in relation to medical research articles in particular, most translation-focused studies that examine this text genre focus on terminological or lexical equivalence (e. g., Jiménez-Crespo/Tercedor Sanchez 2017; Badziński 2018), with some also focusing on discourse features of medical texts that are known to present challenges for translators (e. g., Zethsen/Montalt 2022).

There are few studies that employ a methodological approach of applying contrastive linguistics as a tool to focus on specific features in a certain genre of text with the purpose of gaining empirically based findings to then inform translation practice, e. g., Williams (2004), Keresztes (2013). This appears to be an emerging method in translation practice

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 397

based on empirical findings of linguistic and discourse features that are specific to the genre of text with which the translator is working.

Based on these developments that feature the employment of combined approaches when undertaking the translation of specialist texts, in this article, we seek to demonstrate how generalisations from contrastive linguistics and discourse analysis of source language (SL) texts in both Chinese and English can assist translators and guide their choices in translating a scientific or technical text. This paper examines Chinese and English pharmaceutical research articles (RAs) and translation in both directions via a corpus-driven approach based on a sample of four Chinese-language and four English-language RAs. The empirically informed approach and the choices referred to here are the strategies that a translator may choose to employ when confronted with 'translation problems', a term first used by Nord (1997) in her functionalist approach to translation practice based on *skopos theory.* We adopt Montalt and González Davies's definition of a 'translation problem' from their guidebook on medical translation:

> A translation problem can be defined as a (verbal or nonverbal) segment that can be present either in a text segment (micro level) or in the text as a whole (macro level) and that compels the translator to make a conscious decision to apply a motivated translation strategy, procedure and solution from amongst a range of options.
>
> (Montalt/González Davies 2014: 169)

The term 'problem' here relates to the comprehension and analysis of the ST. A 'strategy' is a practical application that addresses a problem. The term 'strategy' as defined by Chesterman (2016: 86) encompass a process that "is a planned way of doing something" and therefore usually "conscious", an action that is "goal-oriented", a "solution that is problem-centred" and/or a form of "textual manipulation".

In this paper, we apply two linguistics-based approaches relevant to technical and academic translation. We identify source language (SL) RAs from the relevant specialist field to assemble a corpus that can provide evidence-based models to assist translators in making informed decisions when problems arise due to certain inter-lingual and inter-cultural differences apparent in the discourse structures of Chinese and English pharmaceutical RAs. As such, we seek to show how research- and corpus-based findings can inform translation practice in a way relevant to translation instructors and students as well as practitioners. The research questions addressed in this article are two folded. Firstly, which syntactic and rhetorical features are identifiable in a contrastive-linguistic focused comparison of and discourse analysis of Chinese and English RAs? Secondly, informed by the results to the first research question, which problems may become apparent when translating in either direction and which translation strategies can be drawn on to address these problems?

The structural organisation of this paper mirrors, in a chronological way, the sequential steps that can be relevant to a translator instructor or student undertaking the translation of a medical RA. Section 2 contains an overview of contrastive linguistics, discourse analysis and translation problems is provided with a focus on texts that are RAs from the natural sciences. The methodology and description of our corpora are in

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 398

Section 3. Section 4 contains results and discussion that address the first research question while Section 5 responds to the second research question by identifying problems and nominating strategies. This is followed by the conclusion in Section 6.

2 Review of relevant concepts and studies

This section contains literature reviews in three related areas. Sub-section 2.1 presents an overview of studies influenced by contrastive linguistics relevant to RAs in both languages. Sub-section 2.2 shows an overview of findings from studies with a discourse analysis focus on RAs in both languages. The findings from these two parts on the structural and discourse features of RAs in Chinese and English are the basis for the first research question. Through addressing this first research question via analysis of our data sample, we can arrive at results that are relevant to our second research question addressing the identification of translation problems. Sub-section 2.3 then discusses translation problems with reference to findings from technical and academic translation.

2.1 Contrastive linguistics

In basic terms, contrastive linguistics can be considered a linguistics sub-discipline that focuses on the "systematic synchronic study of similarities and differences in the structure and use of two or more language varieties" (Bugarski 1991: 77) and, as such, seeks to locate cross-linguistic equivalence (Chesterman 2016). This influence has increased with the development of computerised language corpora used in research and practice-based translation applications. The availability of electronic texts and the ease of their comparability has led to a significant increase in corpus-based studies on translation, some of which have adopted, in part, a contrastive linguistic approach, e. g., Ramón García (2002) and Granger, Lerot and Petch-Tyson (2003).

Alongside developments relating to the availability of large corpora, contrastive linguistics approaches have been used to inform studies focused on translation equivalence and outcomes (e. g., Ebeling 1998; Steiner 2015). In particular, we are informed by Pisanski Peterlin's (2008) and Williams's (2009) studies on the translation of RAs and the thematic structure of scientific papers. The findings from these two studies relate to the re-ordering of features of thematic structure in target texts (TTs), including the incidence of metadiscourse items and the ways authors report on their data. Regarding this last feature, Pisanski Peterlin (2008) and Williams (2009) choice of verb tense, use of grammatical voice, and use of personal pronouns are identified as characteristics of RAs as a genre in English of RAs. A contrastive linguistics approach immediately locates the first two of these as potential inter-lingual problems as tense and voice are represented in Chinese in ways different from English.

Looking firstly at verbs, we see that, in general, the feature of 'time' in Chinese is implied and is evident through context rather than a morphological marker contained in all finite verb forms as in English (Gao 2006). For most Chinese verbs, the 'tense' form is 'covert', i. e., the covert simple present tense and the covert simple past tense function

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 399

as 'default' or 'unmarked' choices. We use the term 'overt' to refer to only those verbs accompanied by particular particles or adverbs that mark the verb as occurring in a particular time period. In approximate terms, this is equivalent to 'tense' in English.

In Chinese, examples of such particles that mark an action or a state as having occurred in the past, for example, are 了 [le] 'before' and 过 [guò] 'already' (Tsai 2013). Concerning future markers, 将 [jiāng] 'will' can be classified as an overt marker of future tense. While its use is infrequent in spoken language, Li (2003) suggests it can be frequent in some formal written texts, such as scientific RAs. Thus, we see that the difference in the way that Chinese and English verbs have temporal marking consists of the following: English finite verbs overtly mark tense; most Chinese verb forms do not mark tense in an overt way.

Secondly voice is also a feature that is conceptualised in quite different ways. In short, passive is uncommon in Chinese, even in written language genres. Based on a large corpus of both written and spoken language, Xiao, McEnery and Qian (2006: 142) conclude that "passive constructions are nearly ten times as frequent in English as in Chinese". While the passive is much less frequent in Chinese than in English, Chinese has sub-categories of passive such as overt passive voice, the semi-overt passive voice, and the covert passive voice that do not have ready equivalents in English. Chinese grammar has distinctions of passive voice that are perhaps more fine-grained than the active-passive contrast in English, e. g., some markers indicate syntactic passives such as 被 [bèi] 'by', 为 [wéi] 'by', 所 [suǒ] 'by', 给 [gěi] 'by', and lexical ones such as 让 [ràng] 'let', 受 [shòu] 'receive', 挨 [āi] 'receive', 遭 [zāo] 'receive' that mark different degrees of passive voice. Regarding the instances where the passive is clearly indicated, Zhou and Liu (2015) point out that the forms 被 [bèi] 'by', 受 [shòu] 'receive' or 让 [ràng] 'let' are the most frequently used overt passive voice markers in Chinese.

The conspicuous typological differences between the two languages in relation to the marking of time and voice call for contrastive linguistics description to provide (para-digmatic) models that enable translators to make choices that are informed and to enable greater consistency in their choices of forms. As Fischbach (1986) and Pilegaard (1997) remind us, consistency in the choice of forms – not only lexical but also syntactic and pragmatic – are a desirable attribute of translated medical texts.

2.2 Discourse analysis of RAs: Syntactic and rhetorical features

Scientific and technical RAs, including medical ones, typically aim to inform the readers. The prominence of this role is such that Salager-Meyer (2001) claims that RAs constitute the most critical channel for presenting new information in the contemporary scientific arena today. This role that serves the dissemination of information means that most RAs belong to an informative/descriptive text type (Nord 1997; Reiß/Vermeer 2014).

In English, as in many other languages, RAs in the natural sciences typically have the IMRD structure (Introduction, Materials and Methods, Results and Discussion). This structure has become the default or preferred choice for papers based on empirical

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 400

research in the natural sciences and in some social sciences (Swales 1990, 2004; Bhatia 2002). The IMRD format of RAs reflects an organisation of text that is sequentially based and reflective of the procedural features that characterise this genre (Olohan 2015: 149–172). The linear and chronologically based organisation of text that characterises this genre has commensurate effects on the use of (English) verb tense across the respective sections of an IMRD-structured RA. Many studies identify certain patterns concerning the choice of verb forms used in RAs (Li/Ge 2009). For example, Malcolm (1987) and Liang (2005) all report a high frequency of present, followed by past simple and present perfect. Regarding patterns of functions that different tenses have, Malcolm (1987: 36) argues that the present tense is often used for generalisations and statements that do not relate to an author's actions; past simple is commonly located with references to specific experiments; use of present perfect co-occurs with connections to areas of inquiry. Thus, functions such as expressing authorial positionality, reference to the chronology of events and/or their relevance to the present call for use of particular verb tenses which tend to pattern in various ways according to the section of an RA.

Another feature that a discourse analysis of RAs can offer information is syntactic voice, i. e., the use of active or passive verb forms. Wingard (1981) finds that medical RAs contain, in general, more active than passive voice constructions. Ten years later, Master (1991) reports that passive voice was found in 47 % of all verb phrases in a corpus of scientific texts. In relation to RAs from the natural sciences, Tarone et al. (1998) find that 80 % of these contain active voice verbs and remark on a conspicuous feature where level of authorial positionality influenced the choice of verb form: "*we* indicates the author's procedural choice, while the passive indicates an established or standard procedure; *we* is used to describing the author's work and the passive to describe the work of others..." (Tarone et al. 1998: 113). The desired overtness of the author's voice (or not) appears to be a possible factor in the use of '*we* + active' constructions or the use of passive constructions. In a more recent study of verb forms used in a sample of 32 English-language natural sciences RAs published from 1985 to 2015, Banks (2017: 5) reports the following usage patterns: active voice 28 %; passive 27 %; intransitive verbs/copulas 45 %. While the use of active or passive verb forms in RAs is shown to be variable, some regularities of use according to function may be apparent.

Some discourse-based analyses of RAs identify 'metadiscourse', i. e., pragmatic textual feature that marks authors' direction and purpose in RAs (Hyland 2002). These can include, amongst others, engagement markers of authorial position, e. g., use of personal pronouns (Pisanski Peterlin 2016). The use of first-person pronouns (both singular and plural forms) is identified by Salager-Meyer (2001), Hyland (2002) and Li and Ge (2009) as a characteristic of English-language RAs. Based on an analysis of 36 RAs from the natural sciences, Kuo (1999: 125, 130) reports that 88 % of personal pronouns are first-person plural ones and that employment of the pronoun 'we' by authors performed the following functions (in order of frequency): explaining what was done; assuming shared knowledge, goals, and beliefs; hedging a proposition or claim; showing results or findings.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 401

Overall, though, the use of personal pronouns, even in English, is still relatively sparse. In a corpus of 80 RAs from the fields of electronic engineering and chemistry, Khedri and Kritsis (2020: 195) explain that impersonal constructions such as "it-clauses (e. g., it is supposed...) and passive voices of so-called 'periphrastic passives' (i. e., this was not found in...)" are more frequently employed than personal pronouns to perform the following discourse functions: "explaining the method and research procedures; expressing results; presenting the work; illustrating data, and self-citation". The only discourse function to yield more personal pronouns is when "authors state their personal opinions" (Khedri/Kritsis 2020: 213).

Less data is available on authorial presence in Chinese-language RAs. As one of the few studies in this area, Yang (2015) concludes that personal pronouns are uncommon. There are pragmatic features specific to Chinese discourse that account for the low incidence of personal pronouns. Structural and rhetorical features of the genre of Chinese RAs account for this.

Sections 2.1 and 2.2 have presented and discussed findings from previous research studies on the structural and discourse features of RAs in Chinese and English. These findings are the basis for the first research question. Through addressing this first research question via analysis of our data sample, we are able to arrive at results that are relevant to our second research question that addresses the identification of translation problems.

2.3 Translation problems and strategies

As stated, in this paper we apply Nord's (1997) notion of translation problems and Montalt and González Davies's (2014) definition thereof. Translation problems can be identified retrospectively by comparing the TT with the ST, or they can be identified before the production of the TT commences, i. e., in anticipation by way of examination of the ST (Krings 1986). There are four groups of translation problems distinguished by Nord (1997). The first two are inter-lingual problems that "result from structural differences in vocabulary, syntax and supra-segmental features" and inter-cultural problems that "arise from differences in the conventions between the two cultures involved such as […] text-type and genre conventions" (Schäffner/Wiesemann 2001: 24–25). Our research questions that focus on contrastive linguistics and discourse analysis are aligned with these two types of problems, and we do not focus on the two further ones, pragmatic translation problems and text-specific ones.

We are informed by studies focusing on translation problems and strategies employed in medical translation, such as Fischbach (1986) and Pilegaard (1997), who examined the translation of medical RAs. Congruent to other descriptions of technical and scientific translation, Fischbach (1986) remarks on lexical equivalence and the need to maintain consistency in lexical choices. He makes reference to healthcare realia and publicly available information on condition description, diagnosis and treatment as resources of assistance. Lexical equivalence is identified by Pilegaard (1997: 170, 175) as well, who

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 402

is mindful of inter-lingual and pragmatic problems when he observes that there is a need for the translator to locate 'equivalence at word level' as well as 'pragmatic equivalence'.

We are also informed by cross-linguistic studies of RAs that examine verb forms, voice and authorial position (Ge/Yang 2005) and Pisanski Peterlin (2008, 2016). In particular, Pisanski Peterlin's (2016: 270) study of a shift in academic discourse style from impersonal to a "writer-reader dialogue" in and the way these "engagement markers" are not always rendered as such in translated RAs. She locates structural and discourse differences between languages with differences in occurrence and use of personal pronouns as one factor as well as translators' application of strategies that are "impersonal and distant" (Pisanski Peterlin 2016: 286). This second strategy may be seen as a risk-averse one (Pym 2005) that translators need not feel motivated to apply where a clearer description of corpus-based cross-linguistic comparison is available to them.

3 Methodology and description of corpora

The research questions are related to the features of pharmaceutical RAs in Chinese and English and the translation into the other language. To gain a corpus of pharmaceutical RAs in both languages, academic journals that represent the thematic area and conform to specific quality and reputation measures were selected. Concerning journals that are published in Chinese, only journals that are indexed by the following bibliographical catalogues were considered for selection: Chemical Abstracts (CA); Japan Science and Technology Agency (JST); Chinese Science Citation Database (CSCD); and Guide to Core Journals of China (GCJC). Congruent English source journals were sourced via a quality control that the journal should have an impact factor of 2.0 or more and be listed in the Science Citation Index (SCI). The four Chinese-language journals and the three English-language journals chosen are listed in Table 1.

Title of Chinese-language journal	No. of RAs selected	Title of English-language journal	No. of RAs selected
中国临床药理学与治疗学 *Chinese Journal of Clinical Pharmacology and Therapeutics*	1	*European Journal of Pharmaceutical Sciences*	2
中国生化药物杂志 *Chinese Journal of Biochemical and Pharmaceuticals*	1	*Toxicology*	1
中国药科大学学 *Journal of China Pharmaceutical University*	1	*Biochemical Pharmacology*	1
中国药学杂 *Chinese Pharmaceutical Journal*	1		
Total	**4**	*Total*	**4**

Table 1: Chinese- and English-language source journals

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 403

Eight RAs from the seven journals listed above were selected randomly. These form our data sample from which we conduct analysis of the syntactic and rhetorical features contained in the eight RAs to address the first research question. This methodological approach of collecting a preliminary data sample is congruent with other studies or RAs in the natural sciences, such as Williams (1999) and Ge and Yang (2005).

The second research question deals with problems encountered in bi-directional translation. Insight into translation problems encountered is best obtained by translating an entire text from start to finish. Due to limited resources and time availability, only one RA in each language was selected for translation into the other language (see RA no. 4 in each language in Appendix 1). However, in some cases and to illustrate translation problems and/or translation strategies that can be encountered in the translation of pharmaceutical RAs, examples are drawn from the remaining six RAs (three in each language) listed in Appendix 1 and from the four RAs (two in each language) listed in Appendix 2. This is a methodological weakness of the paper. However, we believe that by applying the analysis provided in Section 2 to further RAs just as we do to the two chosen RA STs, we are able to point to structural and discourse phenomena that are characteristic of pharmaceutical RAs in general so that these do not represent a distortion to the discussion of data in Section 4 or to the overall presentation of both problems and strategies in Section 5.

The brief for the preparation of the TT was that the TT should achieve the function of presenting itself as a pharmaceutical RA in the target language (TL). With the findings from the contrastive linguistics-based analysis and the discourse analysis of the eight RAs, the first author translated one RA from each language into the other (both RA source texts are marked as no. 4 in Appendix 1). This 'combined approach' informed him regarding "global" strategies in translating and producing a TT that bears features characteristic of the same genre in the TL (Chesterman 2016). Findings from contrastive linguistics and discourse analysis also guided him in the choice of "local strategies" when translating "this structure/this idea/this item" (Chesterman 2016: 90–91). Our presentation of the translation problems encountered, and the strategies employed is given in Section 5 below. Examples taken from the RAs are identified in the following way, e. g., 'Chi.RA.2' refers to 'Chinese-language RA no. 2'.

4 Results and discussion of selected features of Chinese- and English-language pharmaceutical RAs

4.1 Tense

Section 2.1 outlined the differences between Chinese and English and how English finite verbs overtly mark tense but that most Chinese verb forms do not mark tense in an overt way. Thus, most frequently, Chinese verb forms are 'covertly marked' for the feature tense. The general 'unmarkedness' for the feature 'tense' characteristic of most Chinese verb forms is not further examined in this paper. We restrict our examination of Chinese

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 404

verbs to 'overtly tense-marked ones' only that bear 'present', 'past', and 'future' features according to co-occurring markers that exist in Chinese that endow verbs with these 'time-period' features. However, we note the relevance of 'unmarked', i. e., 'covertly tense-marked' verbs, as a strategy that can be employed in the Chinese-language TT. In looking at the feature tense or the concept of how 'time period' is (co-) marked, we are interested to see if this relates to current, previous or projected actions or events, informed by Malcolm's (1987) findings.

As stated, in relation to English verbs, we examine only finite verbs and exclude verb forms such as infinitives and gerunds. The following three groupings are distinguished for English verbs: 'present' (incl. present simple and continuous), 'past' (incl. past simple, perfect and continuous), 'future' (incl. future simple, perfect and continuous) with a fourth one added, 'present perfect'.

	Tense of Chinese verbs ('overtly' tense-marked verbs only)			Tense of English verbs (finite verbs only)			
	Present	Past	Future	Present	Pres. Perf	Past	Future
Introduction	29	0	1	70	19	21	0
Materials and Methods	45.5	0	0	18	5	174	0
Results	56.5	0	0	16	3	115	0
Discussion	62	0	3	90	10	56	1
Conclusion	N/A	N/A	N/A	7	2	5	3
Total	193	0	4	201	39	371	4

Table 2: Tense of finite/overt verb forms located in CHI.RA 1–4 and EN.RA 1–4.

In the Chinese RAs, we find that where a verb form has an overt marking, the tense form it relates to is overwhelmingly 'overt present tense'. This applies to all four selected RAs and the four IMRD sections therein. An instance of 'overt present tense' is given below in Example (1), in which the adverbial 常常 [chángcháng] 'frequently' marks the sentence as having this tense. We employ the same adverb and present tense in the English translation.

Example (1): 糖尿病肾损伤的临床症状起初不明显，常常表现为微量白蛋白尿，虽然病情进展缓慢，但是后期往往不可逆，因此早期采取手段进行防治尤为重要。 (Chi.RA.1. Zhu/Zou 2018: 914)

Transliteration: tángniàobìng shèn sǔnshāng de línchuáng zhèngzhuàng qǐchū bù míngxiǎn, chángcháng biǎoxiàn wéi wēiliáng bái dànbáiniào, suīrán bìngqíng jìnzhǎn huǎnmàn, dànshì hòuqī wǎngwǎng bù kěnì, yīncǐ zǎoqī cǎiqǔ shǒuduàn jìnxíng fángzhì yóu wéi zhòngyào.

Literal translation: diabetes – kidney – damage – clinical – symptom – originally – not – apparent, frequently – demonstrate – microscale – albuminuria, although – illness condition – progress – slowly, but – later period – frequently – not –

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 405

reversible, so – early period – adopt – measure – proceed – prevention and cure – particularly – important.

Translation: The clinical symptoms of diabetic renal injury, <u>frequently</u> shown as albuminuria or albumin in urine, are not apparent in the initial period. Although not a rapidly progressing disease, it will often worsen when it is at an advanced stage. Therefore, we must affect its prevention as early as possible.

The SL sentence occurred in the Discussion section. The choice of present tense in the English TT sentence is congruent to the predominant use of this tense in that section of English-language RAs as shown in Table 2 (cf. Liang 2005).

No instances of 了 [le] 'before' and 过 [guò] 'already' were recorded, which would mark a verb as being 'overt past tense' (Tsai, 2013). However, in two RAs (Chi.RA.2 and Chi.RA.3), we locate four uses of the 'overt future tense'. Example (2) contains such an instance, ascertainable via the marker 将 [jiāng] 'will' together with the temporal adverbial 后期 [hòuqī] 'later period'. This was also rendered via the simple future in English.

Example (2): 本研究只采用一种国产药品与其参比制剂做溶出特性的比较研究，结果难免存在一定的片面性。这些问题<u>将</u>在<u>后期</u>研究中进一步完善和解决。 (Chi.RA.3. Li et al. 2018: 308)

Transliteration: běn yánjiū zhī cǎiyòng yīzhǒng guó chǎn yàopǐn yǔ qí cānbǐ zhìjì zuò róngchū tèxìng de bǐjiào yán jiū, jiéguǒ nánmiǎn cúnzài yīdìng de piànmiànxìng. zhèxiē wèntí jiāng zài hòuqī yánjiū zhōng jìnyībù wánshàn hé jiějué.

Literal translation: this – research – only – adopt – one – type – homemade – medicine – and – reference – preparation – do – dissolve– characteristic – contrast – research, result – inevitably – exist – certain – one-sidedness. these – problems – will – in – later period – research – further – perfect – and – solve.

Translation: In our studies, only one home-bred drug was used to contrast the dissolution characteristics with its reference product, so it is hard to avoid one-sided results. However, these issues <u>will</u> be entirely solved in <u>subsequent</u> research.

Employment of a future tense in English in the Discussion section is statistically unusual, as Table 2 shows. However, its use is justified given the clear referential content of the sentence that alludes to future areas of research.

Looking at the SL English RAs, we see that the most frequent tenses are past and present. The past is most often used in the Materials and Methods and Results sections, which is congruent to Malcolm's (1987) and Liang's (2005) observations that past simple is commonly utilised to refer to specific experiments and their outcomes. Below is an example of past tense found in the Materials and Methods.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 406

Example (3): The next day, cells <u>were starved</u> with DMEM for 1h, medium <u>was removed</u>, and stimulation buffer <u>was added</u> (Eng.RA.3. Eshleman et al. 2018: 29).

Translation: *第二天，将细胞放置于细胞培养基（ Dulbecco's Modified Eagle Medium, DMEM ）<u>饥饿培养</u> 1 小时，将培养基<u>移除</u>，并且<u>加入</u>缓冲刺激。*

Transliteration: dì èr tiān, jiāng xìbāo fàngzhì yú xìbāo péiyǎngjī (Dulbecco's Modified Eagle Medium, DMEM) jīè péiyǎng 1 xiǎoshí, jiāng méijiè yíchú, bìngqiě jiārù huǎnchōng cìjī.

Literal translation: second – day, let – cell – place – in – cell – medium (Dulbecco's Modified Eagle Medium, DMEM) hungry – cultured – one – hour, let – medium – remove, also – add – buffering – stimulation.

In the Chinese translation shown above for Example (3), the tense form used is 'covert'. The groups of characters underlined are verb forms that semantically but not grammatically replicate the equivalent English verbs. In the same way that use of the past tense is unmarked in the Materials and Methods section of English-language RAs, the use of a 'covertly tense-marked' form is the unmarked choice in the same section in Chinese RAs. The use of an overtly marked past tense verb form would be highly marked as shown in Table 2 where no such instances are recorded in Chinese-language Materials and Methods sections.

The present tense is the dominant one found in the Discussion and Introduction sections of the English RAs. This is unsurprising as these sections typically relate to general features found in a data sample or to on-going overall patterns in the field. Example (4) shows its use in the Discussion.

Example (4): It <u>is</u> important to note that phenotyping <u>relies on</u> metabolic ratios and not on absolute drug concentrations (Eng.RA.2. Kiene et al. 2019: 80).

Translation: *值得注意的是表型<u>取决于</u>代谢比值而非绝对药物浓度。*

Transliteration: zhídé zhùyì de shì biǎoxíng qǔjuéyú   dàixiè bǐzhí érfēi juéduì yàowù nóngdù.

Literal translation: deserve – notice – is – phenotyping – depend – metabolism – rate – is – not – absolute – medicine – concentration.

In the Chinese translation for Example (4), we locate the head verb – *取决于* [qǔjuéyú] 'depend on/rely on'. This verb is covertly marked for the feature tense and is not an example of Chinese's 'overt' present tense. This is appropriate as the English SL sentence contains no time-relational references and there are no further features contained in the sentence that call for 'overt' present tense in Chinese.

The present perfect is much less commonly reported. Nevertheless, where this tense is used, it is often to be found in the Introduction where it denotes the achievement or completion of certain actions. Example (5) contains such an instance of its use in the Introduction section.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 407

Example (5): We <u>have</u> chemically <u>developed</u> nicotinamide (NA) using NMR assessment as a SABRE agent for future MRI applications (Eng.RA.4. Linnik et al. 2019: 32).

Translation: *研究者<u>已</u>通过使用核磁共振*（ nuclear magnetic resonance, NMR ）*的评定，将烟酰胺以化学方式<u>发展</u>成为一种应用于未来磁共振成像* （ magnetic resonance imaging, MRI ）*的* SABRE *药剂。*

Transliteration: yánjiūzhě yǐ tōngguò shǐyòng hécí gòngzhèn (nuclear magnetic resonance, NMR) de píngdìng, jiāng yānxiānàn yǐ huàxué fāngshì fāzhǎn chéngwéi yīzhǒng yīngyòngyú wèilái cí gòngzhèn chéngxiàng (magnetic resonance imaging, MRI) de SABRE yàojì.

Literal translation: researcher – already – through – use – nuclear magnetic resonance (NMR) – assessment, let – nicotinamide – according to – chemical – way – develop – as – one – type – apply – future – magnetic resonance imaging – SABRE – medicament.

The Chinese translation also has a form equivalent to the present perfect. Alongside the verb form *发展* [fāzhǎn] 'develop' which can be considered a 'covert' form of the present tense, there is the character *已* [yǐ]. This is an abbreviated form of *已经* [yǐjīng] 'already' and 'overtly' manifests that something has been done.

4.2 Voice

We now turn to the use of voice and the incidence of active and passive forms in the 8 Chinese- and English-language RAs. As stated in Section 2.1, passive voice is much less common in Chinese than in English. Focusing on the use of voice in the sample, this contrast in frequency is even starker when looking at the distribution of this form, as shown in Table 3.

	Chinese		English	
	(Default) Active	Passive*	Active	Passive
Introduction	30	0	66	44
Materials and Methods	44.5	1	30	167
Results	56.5	0	99	35
Discussion	62	3	60	57
Conclusion	N/A	N/A	8	9
Total	193	4	263	312

Table 3: Frequency of active and passive voice forms* according to section of RA located in 4 Chinese-language RAs and 4 English-language RAs (*The category 'passive' for Chinese encompasses all three sub-categories: overt passive voice, the semi-overt passive voice, and the covert passive voice.)

Table 3 shows that the Chinese passive voice is rarely used in the four selected RAs, with three of the four incidences occurring in the Discussion. Example (6) contains an

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 408

example of 被 [bèi] 'by' that is linked to the transitive verb 滤过 [lǜ guò] 'filter', resulting in a meaning of 'being filtered'. In Chinese, the following prepositions occur which mark the voice of the verb as passive 被 [bèi] 'by', 叫 jiào] 'by', 受 [shòu] 'by' or 让 [ràng] 'by'. Prepositions are the most common means to mark passive voice in Chinese.

> **Example (6):** β2-MG 是一种小分子单链多肽，在人体血浆、脑脊液等体液中广泛存在，正常情况下，能够被肾小球滤过，其血清水平可以反映肾小球的滤过功能。(Chi.RA.1. Zhu/Zou 2018: 914)
>
> **Transliteration:** β2-MG shì yīzhǒng xiǎo fēnzǐ dānliàn duōtài, zài réntǐ xuèjiāng, nǎojǐyè děng tǐyè zhōng guǎngfàn cúnzài, zhèngcháng qíngkuàng xià, nénggòu bèi shènxiǎoqiú lǜguò, qí xuèqīng shuǐpíng kěyǐ fǎnyìng shènxiǎoqiú de lǜguò gōngnéng.
>
> **Literal translation:** β2-MG – is – one – type – small – molecule – single-chain polypeptide, in – human body – plasma – cerebrospinal fluid – body fluid – extensively – exist, normal – situation – under, can – be – glomerulus – filtered, its – plasma – level – can – reflect – glomerulus – filter – function.
>
> **Translation:** β2-MG is a small-molecule single-chain polypeptide, which can be discovered in human body fluid, e. g., plasma and cerebrospinal fluid. Usually, it can <u>be filtered by</u> the glomerulus, and its serum level can reflect the glomerular filtration function.

In Example (6) above, the passive form in the Chinese RA is rendered in English via a passive construction as well. In our corpus of English RAs, passive forms are found to be nearly as frequent as active ones in the Discussion section. In fact, Table 3 shows us that passives are widely found in all sections of the English RAs and make up ca. 55 % of verb constructions, outnumbering active voice verbs.

The preponderance of passive voice constructions is recorded also recorded in the Materials and Methods section. Example (7) contains such an instance where the subject agent is absent.

> **Example (7):** Sf9 cells <u>were transfected</u> with these bacmids, and supernatant <u>was used</u> to generate the viral stoste (Eng.RA.1. Zwartsen et al. 2019: 70).
>
> **Translation:** Sf9 *细胞<u>由</u>杆粒<u>所转染</u>，且上层清液<u>用于</u>生成病毒原液。*
>
> **Transliteration:** Sf9 xìbāo yóu gānlì suǒ zhuǎnrǎn, qiě shàngcéng qīngyè yòngyú shēngchéng bìngdú yuányè.
>
> **Literal translation:** Sf9 – cell – through – transfect, and – supernatant – apply – generate – virus – stoste.

The Chinese translation in Example (7) does not contain 被 [bèi] 'by', an overt passive marker. Instead, it contains 用于 [yòngyú] 'apply' in the sense of 'to be used in…', a form which can be classified as a marker of 'covert' passive voice. The 'agentless' passive form found in the English ST accounts for the choice for a 'covert' passive form in

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 409

Chinese; the passive recipients of the actions become the subjects in the English ST and this construction is more congruent to a 'covert' than an 'overt' passive one in Chinese.

The overall high incidence of the passive in other sections is also of interest. This is significant because passive constructions can be commonly used across all sections of English-language pharmaceutical RAs. As Section 2.1 above reported, other samples of scientific or medical RAs showed that in some, the percentage of passive voice constructions could be as high as 47 % (Master 1991) or as low as 11 % (Xiao/McEnery/Qian 2006).

4.3 Authorial presence and nominal pronouns

Regarding the feature of authorial presence, the use of personal pronouns can be a means to enable authors of English-language RAs to define their positions, invoke their authority as a persuasive device, and for them to emphasise their research profile when, for example, presenting their research results (Ju 2016). We did not collate overt authorial presence in the English-language RAs via pronouns or instances where identification of the authorial presence or active agency is obviated through impersonal constructions or passive voice. Nor did we collate this feature in the four Chinese-language RAs. However, our cursory observation indicated that in the sample of the eight RAs, the assertions made in the previous paragraph and those from Section 2.2 concerning authorial presence appear to be confirmed. We also draw on four further pharmaceutical RAs, whose details are provided in Appendix 2, in providing examples of the use of personal pronouns.

In a Chinese-language extract in Example (8), we see the use of complete nominal forms and the copula in Chinese. In two parts, there are human agents referred to, *两位研究者* 'two researchers' and *第三位研究者* 'a/the third researcher'. However, mention of this does not result in the use of an overt personal pronoun in Chinese. In English, in contrast, the mention of a human agent prompted us to use the pronominal forms 'our' and 'we' in the first part of the translation as unmarked choices of authorial positionality.

> **Example (8):** 由两位研究者独立进行文献筛选、资料提取，若有分歧则通过讨论或参考第三位研究者的建议决定是否纳入。(Chi.RA.6. Wei et al. 2018: 654)
>
> **Transliteration:** yóu liǎngwèi yánjiūzhě dúlì jìnxíng wénxiàn shāixuǎn, zīliào tíqǔ, ruò yǒu fēnqí zé tōngguò tǎolùn huò cānkǎo dìsānwèi yánjiūzhě de jiànyì juédìng shìfǒu nàrù.
>
> **Literal translation:** through – two – researcher – independently – proceed – literature – screening, data – extraction, if – has – divergence – through – discussion – or – reference – third – researcher – advice – decide – whether – include.
>
> **Translation:** The two researchers from our team were responsible for the overview of the literature and data extraction. When there was a divergence in opinions, we based our decision on mutual discussion or the third researcher's suggestions.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 410

Example (9) contains 我们 [wǒmen] 'we', which is a rare example of the use of the first-person plural in a Chinese-language RA.

> **Example (9):** 另外，<u>我们</u>也进一步地模拟研究了在不同的样本含量的条件下，四种设计的检验效能与标志物阳性率及阴性亚组疗效的关系。(Chi.RA.5. Xu et al. 2018: 785)
>
> **Transliteration:** lìngwài, wǒmén yě jìnyībù de mónǐ yánjiū le zài bùtóng de yàngběn hánliáng de tiáojiàn xià, sìzhǒng shèjì de jiǎnyàn xiàonéng yǔ biāozhìwù yángxìnglǜ jí yīnxìng yàzǔ liáoxiào de guānxì.
>
> **Literal translation:** furthermore, we – also – further – simulate – study – in – different – sample – size – condition, four – designed – test – power – and – marker – positive – rate – and – negative – subgroup – therapeutic effect – relationship.
>
> **Translation:** In addition, under the condition of different sample sizes, <u>we</u> simulated and studied the relationship among the four designed test power and the positive rate of markers and the therapeutic effect of negative subgroups.

Use of 我们 [wǒmen] 'we' in Example (9) appears conspicuous. Its occurrence here may be an example of a nascent shift in some China-based scholars whose own writing style is influenced by a heavy exposure to English-language RAs that commonly contain 'we'. Furthermore, it may be that some scholars publishing in both languages employ 我们 [wǒmen] 'we' as a one-to-one equivalent to 'we' in Chinese-language RAs that are based on equivalent English-language RAs. Ge and Yang (2005) point to a single occurrence in their study of five RA abstracts.

In contrast, Salager-Meyer (2001), Hyland (2002) and Pisanski Peterlin (2016) claim that there are relatively few obstacles to using 'we' in English. Example (10) contains an instance of its employment.

> **Example (10):** To gain insight into the molecular basis of heat shock response regulation in cancer, <u>we</u> focused on T-ALL as a disease model (Eng.RA.5. Kourtis et al. 2018: 1157).
>
> **Translation:** *为了深入了解癌症中热冲击反应调节的分子基础，<u>我们</u>重点关注作为疾病模型的 T 细胞淋巴细胞白血病*（T-ALL, lymphoblastic leukemia）。
>
> **Transliteration:** wéile shēnrù liǎojiě áizhèng zhōng rèchōngjī fǎnyīng tiáojié de fēnzǐ jīchǔ, wǒmén zhòngdiǎn guānzhù zuòwéi jíbìng móxíng de T xìbāo línbā xìbāo báixiěbìng (T-ALL, lymphoblastic leukemia).
>
> **Literal translation:** for – in depth – understand – cancer – in – heat shock – response – regulation – molecular – basis, we – emphasis – focus – as – disease – model – T lymphoblastic leukemia (T-ALL, lymphoblastic leukemia).

Applying our analysis of Example (9) as an instance of a nascent trend evident in other Chinese-language RAs that contain 我们 [wǒmen] 'we', we employed it in the translation given in Example (10) in preference to other available constructions such as 研究者 [yánjiūzhě] 'researchers', which is also a frequently used way of showing the authorial

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 411

position in Chinese RAs. In the future, the use of first-person pronouns may become more frequent in Chinese-language RAs. As Section 2.2 shows, however, personal pronouns still tend to be infrequent in Chinese-language RAs. Hyland (2002) and Yang (2015) both locate that Chinese authors tend to be reticent in expressing their positions in a way that includes using first-person pronouns. Instead, third-person pronouns and impersonal constructions are pressed into service to convey their positions or viewpoints.

5 Translation problems identified and discussion of strategies employed

This section examines specific problems when translating a pharmaceutical RA from Chinese into English and English into Chinese. Our approach to the location of translation problems is aspirational (cf. Krings 1986). We focus firstly on inter-lingual problems that can arise due to the typological differences in the syntactic categories of both languages. We draw on findings from previous studies on the structural features of RAs in Chinese and English, presented in Sections 2.1 and 2.2. This section discusses how we addressed the problems encountered and identifies certain strategies based on Chesterman's (2016) taxonomy of strategies (see Section 2.3).

As shown in Table 2, we counted verb tokens in Chinese only if time markers or particles accompanied them. Table 4 below shows the tense forms and their frequency in the two STs (see Appendix 1) and the choices of tense forms used in the two TTs.

	Tense of 'overtly marked' verbs in Chinese ST			Tense of finite verbs in English TT				Tense of finite verbs in English ST				Tense of 'overtly marked' verbs in Chinese TT		
	Present	Past	Future	Present	Pres. Perf	Past	Future	Present	Pres. Perf	Past	Future	Present	Past	Future
Introduction	7	0	0	4	2	3	0	20	11	3	0	33	1	3
Materials and Methods	14	0	0	0	1	27	0	2	0	28	0	29	0	0
Results	4	0	0	10	0	0	0	10	2	16	0	28	12	0
Discussion	24	0	0	32	3	1	2	14	1	10	0	19	3	1
Conclusion	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	2	1	3	7	1	4
Total	49	0	0	46	6	31	2	50	16	58	3	116	17	8

Table 4: Frequency of verb tense forms in the two STs and two TTs according to section of RA

Looking at Table 4, we locate the following features in the TTs influenced by our findings in Table 2. Verb tense marking in the English TT was guided by the distribution of verb tenses in the data sample of the eight RAs: A higher number of present tense verb forms are found in the Introduction and Discussion sections compared to the Materials and

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 412

Methods, and Results sections. More past tense forms are employed in the Materials and Methods section. An anomaly to this is the Results section of the English TT, which is in the present tense only, based on the referential content of the Results section of the Chinese ST, which contained general, descriptive, and declarative statements rather than cause-and-effect ones. Conversely, most tense forms from the English ST were rendered in the Chinese TT via the 'default' (covert) present. An exception to this is, to an extent, the Results of the Chinese TT, whose tense marking was guided partly by the English ST, with 12 instances of 'past' marking. In general, the Chinese TT has many verbal forms due to the comparatively long length of the English ST that it is based on and the high number of English verbs in it.

Example (11) is taken from the Materials and Methods section and there is no 'overtly' tense-marked verb. Table 2 also indicates that in the Materials and Methods sections in English RAs, the past tense is the statistically most frequently used one. We use the syntactic/grammatical strategy of *phrase structure change* to render this into English via past tense.

Example (11): *乙腈、甲醇<u>为</u>色谱纯，磷酸氢二钾、磷酸、盐酸、氢氧化钠均<u>为</u>分析纯试剂 。* (Chi.RA.2. Kou et al. 201 8: 1302)

Transliteration: yǐjīng, jiǎchún wéi sèpǔchún, línsuānqīngèrjiǎ, línsuān, yánsuān, qīngyǎnghuànà jūn wéi fēnxīchún shìjì.

Literal translation: acetonitrile – methyl alcohol – are – chromatography – purity, dipotassium hydrogen phosphate – phosphoric acid – hydrochloric acid – sodium hydroxide – all – are – analysis – purity – reagents.

Translation: The acetonitrile and methyl alcohol used <u>was</u> chromatographically pure. In contrast, the dipotassium hydrogen phosphate, phosphoric acid, hydrochloric acid and sodium hydroxide <u>were</u> analytical-pure reagents.

We encountered converse problems when translating from English into Chinese. Past tense is used in Example (12) taken from the Materials and Methods section. We employed the same strategy as for Example (11) only in reverse: we utilised a 'covert present tense' in Chinese, i. e., a verb form without any distinct markers.

Example (12): (+)LSD (lysergic acid diethylamide), (−)tartrate, (−)DOM (Dissolved Organic Matter), (−)cocaine, and S(+)METH (methamphetamine) <u>were provided</u> by the National Institute on Drug Abuse Drug Supply Program (Rockville, MD) (Eng.RA.3. Eshleman, et al. 2018: 28–29).

Translation: *本实验所用的(+)麦角酸酰二乙氨（ LSD, lysergic acid diethylamide ）、 (−)酒石酸盐、(−)溶解有机物（ DOM, Dissolved Organic Matter ）、(−)可卡因及 S(+) 甲基苯丙胺 （ METH, methamphetamine ）<u>由位于马里兰州罗克维尔的美国药物滥用与 供应项目研究所提供。</u>*

Transliteration: běn shíyàn suǒyòng de (+) màijiǎosuānxiānèryīān (LSD, lysergic acid diethylamide), (−) jiǔshísuānyán, (−) róngjiě yǒujīwù (DOM, Dissolved Organic

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 413

Matter), (−) kěkǎyīn jí S(+) jiǎjīběnbǐngàn (METH, methamphetamine) yóu wèiyú mǎlǐlán zhōu luókèwéiěr de měiguó yàowù lànyòng yǔ gōngyīng xiàngmù yánjiūsuǒ tígōng.

Literal translation: this – experiment – use – lysergic acid diethylamide (LSD), tartrate, Dissolved Organic Matter (DOM), cocaine, and – methamphetamine (METH) – through – locate – Maryland – Rockville – American – drug – abuse – and – supply – program – institute – provide.

In the Chinese translation above, the underlined characters 由 [yóu] and 提供 [tígōng] relate to the use of the verb 'provide' in a 'covert present tense' form. Their use here is congruent to the use of the same tense form in Examples (3) and (4) above.

Another tense which occurs in English-language RAs is the present perfect. Example (13) contains an instance of this in the Discussion section, where it is otherwise seldom used and its use, therefore, appears somewhat marked. In the first place, we addressed this problem by employing overt markers in Chinese, such as 已 [yǐ] 'already' or 已经 [yǐjīng] 'already' as forms that correspond to English adverbs that often co-occur with present perfect in English. This amounts to a *sentence structure change*.

Example (13): Over the last decade, research into the pharmacological effects of polymorphisms and mutations in targets of psychoactive substances has gained interest (Eng.RA.1. Zwartsen et al. 2019: 73).

Translation: *在过去的十年里，关于多态性的药理学反应和精神活性物质靶点的突变的研究已引起了学界的关注。*

Transliteration: zài guòqù de shínián lǐ, guānyú duōtàixìng de yàolǐxué fǎnyīng hé jīngshén huóxìng wùzhì bǎdiǎn de tūbiàn de yánjiū yǐ yǐnqǐle xuéjiè de guānzhù.

Literal translation: in – past – decade, with respect to – polymorphism – pharmacological – effect – and – psychoactive – substance – target – mutation – research – already – cause – academia – focus.

In the Chinese translation, the underlined characters 已 (yǐ) meaning 'already' is combined with 引起了 [yǐnqǐle] meaning 'cause' which is an instance of 'overtly past tense'. This is a tense not recorded at all in the Discussion sections of our corpus of Chinese-language RAs. Thus, the marked form in the ST is rendered via an equivalently marked form in the TT.

Moving now to the feature of voice, Table 3 above shows us few examples of overt passive voice in Chinese academic writing, while in English RAs, passive is common. Looking at the use of voice in the English TT, we see the findings from Table 3 guided us in the choice of voice forms, as the Chinese ST contained mostly instances of the default active. Table 5 presents the voice forms found in the two STs and the choice of voice forms used in the two TTs. From Table 5, it can be seen that findings from our analysis guided us in the choice of active as the more common form in the Introduction, Results and Discussion sections of the English TT, while the same findings guided us in

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 414

the higher use of passive in the Materials and Methods in the English TT. Conversely, the default active was used in the Chinese TT, following the Results gained from Table 3, with an elevation in the incidence of passive forms compared to the overall figures from Table 3. The reason for this was that, as stated above, the English ST was comparatively long, and the higher number of English passives resulted in an elevated number of Chinese passive forms in the TT.

	Chinese ST		English TT		English ST		Chinese TT	
	(Def.) Active	Pass.	Active	Passive	Active	Passive	(Def.) Active	Pass.
Introduction	7	0	6	3	18	16	35	2
Materials and Methods	13	1	10	18	7	23	29	0
Results	4	0	8	2	8	20	38	2
Discussion	23	1	33	5	19	6	21	2
Conclusion	N/A	N/A	N/A	N/A	5	5	11	1
Total	47	2	57	28	57	70	134	7

Table 5: Frequency of active and passive voice forms in the two STs and two TTs according to section of RA

In the following example from the Discussion section, the Chinese default active is rendered via an English active, the most frequent voice used in this section in English.

> **Example (14):** *结核蛋白芯片技术<u>是</u>以微孔滤膜<u>为</u>载体，同时<u>将</u>结核菌的细胞壁脂多糖 LAM 抗原和结核菌 16kD 和 38kD 抗原<u>固定</u>在微孔滤膜上……* (Chi.RA.4. Song et al. 2016: 176)

> **Transliteration:** jiéhédànbái xīnpiàn jìshù shì yǐ wēikǒng lǜmó wéi zǎitǐ, tóngshí jiāng jiéhéjūn de xìbāobìzhīduōtáng LAM kàngyuán hé jiéhéjūn 16kD hé 38kD kàngyuán gùdìng zài wēikǒng lǜmó shàng......

> **Literal translation:** tubercle protein – chip – technology – is – millipore filter – as – carrier, meanwhile – let – tubercle bacillus – cytoderm lipopolysaccharides – LAM – antigen – and – tubercle bacillus – 16kD – and – 38kD – antigen – fix – on – millipore filter.

> **Translation:** Tubercle protein chip technology <u>uses</u> millipore filters <u>as</u> its carriers. This technology <u>can fix</u> LAM antigen (a kind of cytoderm lipopolysaccharides), 16kD antigen and 38kD antigen of tubercle bacillus onto millipore filters...

However, passive voice is more common in other sections, such as the Materials and Methods of English-language RAs. In Example (15), we employ a syntactic/grammatical strategy of *clause structure change* in translating the subject-less, active voice constructions in the Chinese ST into a passive voice sentence in the English target text.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 415

Example (15): *精密量取对照溶液* 10ml，*置于* 50ml *量瓶中，用稀释剂稀释至刻度，摇匀，作为灵敏度溶液。* (Chi.RA.2. Kou et al. 2018: 1302)

Transliteration: jīngmì liángqǔ duìzhào róngyè 10ml, zhì yú 50ml liángpíng zhōng, yòng xīshìjì xīshì zhì kèdù, yáoyún, zuòwéi língmǐndù róngyè.

Literal translation: precisely – measure – contrast – solution – 10ml, put – in – 50ml – measuring flask, use – diluent – dilute – to – scale, shake – uniform, as – sensitivity – solution.

Translation: The 10ml of control solution was precisely measured and put into a measuring flask (50ml). Then it was diluted to a certain scale and shaken well to function as a sensitivity solution.

Conversely, when passive voice constructions occur in English-language RAs, a problem arises regarding how these should be rendered in Chinese. These are frequent in the Materials and Methods section, and in Example (16), two passive constructions are evident. Again, a syntactic/ grammatical strategy of *clause structure change was used* to translate these into Chinese as subject-less active voice constructions.

Example (16): Both d2-NA and NA were formulated by dissolving appropriate amounts of each in 0.9% physiological saline and were assessed visually for complete dissolution. No cloudy suspension or particles were visible (Eng.RA.4. Linnik et al. 2019: 33).

Translation: 将实验试剂 d2-NA 和 NA 分别溶于适量的 0.9%的生理盐水中并进行配制，目测其在生理盐水中直至完全溶解。要求无可见浑浊悬浮物或微粒。

Transliteration: jiāng shí yàn shì jì d2-NA hé NA fēn bié róng yú shì liáng de 0.9% de shēng lǐ yán shuǐ zhōng jìn háng pèi zhì, bìng mù cè qí zài shēng lǐ yán shuǐ zhōng zhí zhì wán quán róng jiě. yào qiú wú kě jiàn hún zhuó xuán fú wù huò wēi lì.

Literal translation: let – experimental – reagent – d2-NA – and – NA – respectively – dissolve – in – appropriate – dosage – 0.9% – physiological – saline – and – proceed – formulation, visually assess – them – in – physiological – saline – completely – dissolve. require – without – visible – cloudy – suspension – or – particle.

In most of the Chinese RAs in our sample, third-person subjects were frequent. The use of equivalent English third-person pronouns would, in some instances, appear stylistically marked or conspicuously impersonal. We employed first-person plural pronouns in the English TT to overcome this problem. There are some, albeit rare instances of the use of the first-person plural pronoun in Chinese, as shown in Example (8) above in which *我们* [wǒmen] 'we' is used in the ST. Nevertheless, as observed, third-person forms are more frequent. We therefore applied a strategy of *phrase structure change* employing

Zhaoyu Bing & Jim Hlavac **trans-kom 16** [2] (2023): 395–424
Chinese-English medical translation Seite 416
informed by findings from contrastive linguistics and discourse analysis

an unmarked form of third-person nominal, *研究者* [yánjiūzhě] 'researcher[s]' in Chinese in Example (17).

> **Example (17):** <u>We</u> developed a unique method to quantify amoxicillin, azithromycin, cefotaxime, ciprofloxacin, meropenem, metronidazole and piperacillin. (Eng.RA.7. Magréault et al. 2019: 262).
>
> **Translation:** *研究者开发了一种独特的方式，用以量化阿莫西林、阿奇霉素、头孢噻肟、环丙沙星、美罗培南、甲硝哒唑及哌拉西林。*
>
> **Transliteration:** yánjiūzhě kāifā le yīzhǒng dútè de fāngshì, yòngyǐ liánghuà āmòxīlín, āqíméisù, tóubāosāiwò, huánbǐngshāxīng, měiluópéinán, jiǎxiāodāzuò jí pàilāxīlín.
>
> **Literal translation:** researcher – develop – one – type – unique – way, apply – as – quantify – amoxicillin, azithromycin, cefotaxime, ciprofloxacin, meropenem, metronidazole – and – piperacillin.

Looking back at the translation problems presented above, these represent only some of the most conspicuous ones that were encountered that, at the same time, aligned with the features that we outlined in Sections 2 and 4 above. A statistical re-cap of both the problems identified and the strategies employed shows that the eight identified interlingual problems called for syntactic strategies that were either phrase structure changes (4), clause structure changes (3) or a sentence structure change (1).

6 Conclusion

Amongst a large number of contrasting features between Chinese and English, selected ones identified in other studies on RAs and investigated in this study are tense forms, voice and authorial positionality (as a textual pragmatic subset of 'engagement markers'). In addressing our first research question which related to syntactic and rhetorical features in pharmaceutical RAs, we find that our corpus of 8 Chinese and English RAs contained a distribution of verb forms congruent to previous studies' findings. Concerning Chinese, verb forms with no further co-markers of tense or time period, i. e., 'covertly tense-marked' verbs are most common; where co-markers occur, they almost invariably bear present tense features. In English, the employment of verb tense forms is much more mixed. The sequential and linear ordering of the IMRD structure has some influence on the incidence of verb forms used: reporting on others' findings in the introduction (containing the literature review) and examining one's own findings in the discussion section often co-occur with the use of the present tense. The practice of authors reporting retrospectively on the steps followed in the Materials and Methods, and Results sections yield high incidences of past tense use. The implication of this for translation and the apparent problem that structural non-congruence in verb paradigms presents is that when covertly marked verb forms occur in the Chinese ST, these are regularly rendered into English by verb tenses that reflect the tense form most commonly

Zhaoyu Bing & Jim Hlavac   **trans-kom 16** [2] (2023): 395–424
Chinese-English medical translation   Seite 417
informed by findings from contrastive linguistics and discourse analysis

used in that section in English RAs. For Chinese verbs that are 'overtly tense-marked', it is more likely that an English verb tense form is used that is congruent to the Chinese one, regardless of the conventions of verb-tense frequency according to the section. When looking at English into Chinese translation, verb tenses that are statistically characteristic of the section that they occur in are typically rendered into Chinese by 'covertly tense-marked'; English verb tenses that are not such a characteristic result in 'overtly tense-marked' forms in the Chinese TT.

In relation to grammatical voice, a similar level of non-equivalence exists between both languages. Similar conventions are followed in relation to rendering this feature into the other language: relatively infrequent overt passive voice in Chinese is rendered into English through equivalent passive voice constructions. English passive voice is more likely to be translated into Chinese via covert passive constructions.

First-person plural pronouns are very infrequent in Chinese RAs. This means that when translating from Chinese into English, the translator is left to assess to what degree engagement is intended and appropriate and on the basis of this, to consider whether the use of personal pronouns in the English TT is situationally called for. From English into Chinese, first-person pronouns are replaced by nominal forms that refer to the role of the authors, resulting in nominal hyperonyms such as 'the researchers' as an equivalent for English 'we'. In one instance, 我们 [wǒmen] 'we' is employed in a Chinese TT based on its occurrence in the English ST. This is based on an instance, albeit one only, of 我们 [wǒmen] 'we', which occurs in our sample of Chinese-language RAs.

Reflecting these occurrences of structural and discourse-level non-congruence at the level of inter-lingual transfer, the strategies employed to address these problems are also mostly syntactically based, including changes in the phrase, clause, and sentence structure. As stated, these reflect our focus on problems located in the inter-lingual and intercultural categories.

This paper has examined bidirectional translation of medical RAs between two major languages within the larger field of scientific and technical translation. This field comprises a very considerable proportion of the translation services industry worldwide. At the same time, translators working in this field sometimes do not possess detailed content knowledge of the particular area of natural sciences that a text may be from. As a way of providing instructors and students, as well as practitioners with a guide as to how to approach medical RAs, this paper provides an approach to medical RAs that analyses them as a specific genre. Informed by findings from contrastive linguistics about the differences between Chinese and English in relation to temporal marking and voice marking of verbs and informed by discourse analysis about the frequency and distribution of verb forms across the sections (IMRD) that characterise medical RAs as a genre, we show how this approach can be applied as a principled and empirically based model. The practice-based value of such a model is demonstrated via bi-directional translation that reveals how comparative analysis offers findings that enable the identification of 'conspicuous mismatches' or problems. Further, strategies to overcome such problems can be drawn from the linguistic forms found more frequently in the target language corpus.

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 418

In this way, we advocate translation practices that allow for the combining of approaches to enable fine-grained analysis of texts belonging to specific genres. We show how medical RAs can be examined in such a way and how this is a methodological model for the teaching and practice of medical translation. The need for lexical and terminological equivalence in medical translation has long been acknowledged. The need to examine features of the medical text as a genre and to locate cross-linguistic equivalence of discourse features presents itself as a further practice that calls for acknowledgement.

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Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 419

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Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 420

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Zhaoyu Bing & Jim Hlavac   **trans-kom 16** [2] (2023): 395–424
Chinese-English medical translation   Seite 421
informed by findings from contrastive linguistics and discourse analysis

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Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 422

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Appendix 1

	Chinese-language pharmaceutical RAs	English-language pharmaceutical RAs
1	朱廷富, 邹朝春. (2018). "百令胶囊对小儿糖尿病肾损伤患儿疗效研究." *中国临床药理学与治疗学* 23(8), 912–915. Zhu, Tingfu; Chaochun Zou (2018): "Clinical effect of bailing capsule in children with diabetic renal injury." *Chinese Journal of Clinical Pharmacology and Therapeutics* 23 [8]: 912–915.	Zwartsen, Anne et al. (2019): "Differential effects of psychoactive substances on human wildtype and polymorphic T356M dopamine transporters (DAT)." *Toxicology* 422 [4]: 69–75. https://doi.org/10.1016/j.tox.2019.04.012
2	寇晋萍 等. (2018). "反相梯度 HPLC 测定注射用阿奇霉素有关物质." *中国药学杂志* 53(15), 1301–1308. Kou, Jinping et al. (2018): "Determination of related substances of Azithromycin for injection by gradient RP-HPLC." *Chinese Pharmaceutical Journal* 53 [15]: 1301–1308.	Kiene, Klara et al. (2019): "Microdosed midazolam for the determination of cytochrome P450 3A activity: development and clinical evaluation of a buccal film." *European Journal of Pharmaceutical Sciences* 135 [5]: 77–82. https://doi.org/10.1016/j.ejps.2019.05.010
3	李辉 等. (2018). "基于流通池装置的新溶出方法用于尼莫地平片的一致性评价." *中国药科大学学报* 49(3), 301–309. Li, Hui et al. (2018): "A new method based on flow-through cell apparatus to evaluate dissolution consistency of nimodipine tablets." *Journal of China Pharmaceutical University* 49 [3]: 301–309.	Eshleman, Amy et al. (2018): "Neurochemical pharmacology of psychoactive substituted N-benzylphenethylamines: high potency agonists at 5-HT2A receptors." *Biochemical Pharmacology* 158 [9]: 27–34. https://doi.org/10.1016/j.bcp.2018.09.024
4*	宋能 等. (2016). "结核分枝杆菌 IgG 抗体蛋白芯片对活动性与非活动性结核患者疗效的评价." *中国生化药物杂志* 36(12), 174–176. Song, Neng et al. (2016): "Evaluation of mycobacterium tuberculosis IgG antibody protein chip in patients with active and inactive tuberculosis." *Chinese Journal of Biochemical and Pharmaceuticals* 36 [12]: 174–176.	Linnik, Inna et al. (2019): "Pharmacokinetics of the SABRE Agent 4, 6-d2-nicotinamide and also nicotinamide in rats following oral and intravenous administration." *European Journal of Pharmaceutical Sciences* 135 [5]: 32–37. https://doi.org/10.1016/j.ejps.2019.05.004

Appendix 1: Corpus of eight pharmaceutical research articles from Chinese and English scientific journals (*The RAs numbered 4, Song et al. (2016) in Chinese and Linnik et al. (2019) in English are the two RAs that were the STs chosen for translation into the other language.)

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 423

Appendix 2

	Chinese-language pharmaceutical RAs	English-language pharmaceutical RAs
5	徐昌榕 等. (2018). "靶向临床试验全随机设计四种分析策略的比较." *中国临床药理学与治疗学* 23(7), 782–789. Xu, Changrong et al. (2018): "Comparison of four testing strategies for all-randomized design in targeted clinical trials." *Chinese Journal of Clinical Pharmacology and Therapeutics* 23 [7]: 782–789.	Kourtis, Nikos et al. (2018): "Oncogenic hijacking of the stress response machinery in T cell acute lymphoblastic leukemia." *Nature Medicine* 24 [8]: 1157–1166. https://doi.org/10.1038/s41591-018-0105-8
6	韦柳萍 等. (2018). "乳铁蛋白预防早产儿晚发型败血症有效性和安全性的系统评价." *中国临床药理学与治疗学* 23(6), 653–660. Wei, Liuping et al. (2018): "Effect and safety of lactoferrin for prevention of late-onset sepsis in premature neonates: a systematic review." *Chinese Journal of Clinical Pharmacology and Therapeutics* 23 [6]: 653–660.	Magréault, Sophie et al. (2019): "UPLC/MS/MS assay for the simultaneous determination of seven antibiotics in human serum - application to pediatric studies." *Journal of Pharmaceutical and Biomedical Analysis* 174 [3]: 256–262. https://doi.org/10.1016/j.jpba.2019.03.004

Appendix 2: Four further pharmaceutical research articles from Chinese and English scientific journals.

Authors

Zhaoyu Bing is a lecturer at the School of Foreign Languages, China Pharmaceutical University, Nanjing. He is currently doing his PhD research at the University of Liverpool (Suzhou Campus). He obtained his double M.A. in Translation and Interpreting Studies from Monash University and Southeast University. Then he was a visiting academic and TA for postgraduate programs at the Faculty of Arts, Monash University, Melbourne (2018–2019). His research interests involve Translation Studies and China Studies.
E-mail: zybing1983@cpu.edu.cn
ORCID: 0000-0002-6946-8774

Zhaoyu Bing & Jim Hlavac
Chinese-English medical translation
informed by findings from contrastive linguistics and discourse analysis

trans-kom 16 [2] (2023): 395–424
Seite 424

Dr Jim Hlavac is a senior lecturer in the Monash Intercultural Lab (within the field of Translation and Interpreting Studies) at Monash University, Melbourne. He is a NAATI-certified and practising interpreter and translator with over 20 years' experience working in health, legal, welfare, educational and business settings. He has published in the field of Translation and Interpreting Studies, as well as in the related disciplines of multilingualism, contact linguistics, intercultural communication, pragmatics, and heritage/minority language maintenance.
E-mail: jim.hlavac@monash.edu
ORCID: 0000-0002-4998-9273

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