Translating emergency medicine from English to Swedish

A translation study on noun compounds in medical terminology
Abstract

This thesis is based on an analysis of the translation of two medical consensus statements from the field of emergency medicine from English to Swedish. The quantitative and qualitative analysis concerns medical terminology in the form of noun compounds with 2 to 4 noun constituents, focusing on the account and classification of translated noun compounds as well as on encountered translation difficulties and the strategies used for handling these. Special attention was given to how noun compounds are translated into Swedish, in terms of structural shifts and semantic relations. The concept of grammatical metaphor, introduced by Steiner (2001) and Hansen (2003), involves the unpacking of a noun compound before choosing to translate it either by re-metaphorization, de-metaphorization, or metaphorization. This concept could be used both as a translation strategy and for classification and account of how medical noun compounds were translated. 57% of noun compounds were translated using re-metaphorization, followed by 30% translated by de-metaphorization. Metaphorization was used in 6% of translations, and in 7% different strategies were used, depending on context. The concept of semantic relations between noun compound constituents was shown useful for semantic interpretation and classification of medical noun compounds. The correlation between certain semantic relations and translation strategy was investigated but could not be statistically verified in a study of this size, which is why a larger, preferably corpus-based study on the potential correlation between semantic relation and translation strategy is recommended.

Keywords

grammatical metaphor, medical terminology, noun compounds, semantic relations, translation

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References
1. Introduction

The scientific field of medicine continuously produces enormous amounts of written statements that originate from research and new medical discoveries. Even though English is often used as a standard language for scientific medical articles, there is still a considerable need for translation of such texts to other languages. The substantial contributions to the knowledge of medicine has produced, and is constantly developing new, field-specific, terminology. A translator of medical texts needs to be skilled in this terminology to master its translation. One of the challenges here lies in the interpretation and translation of English noun compounds, information-dense constructions which contribute productively to new medical terminology.

This thesis focuses on the translation of noun compounds in two medical texts – consensus statements from the field of emergency medicine. Special attention is given to how these constructions are translated into Swedish, in terms of structural shifts and semantic relations. Noun compounds from the field of medicine are sometimes uncomplicated to understand and translate, and sometimes considerably more problematic both to comprehend and translate. As an example of the first, the English term lung injury can be used. Lung injury represents the semantic relation defect in a location, and can hence be interpreted as an injury in the lung. The term can easily be translated into the lexicalized Swedish term lungskada. A more complex example is the 4-constituent noun compound target oxygen saturation range. In this case, both syntactic and interpretive challenges are present, and the Swedish translation will most likely contain both a stacking of nouns and a grammatical shift involving the use of a prepositional phrase as in mål intervall för syremättnad. This thesis will bring light on what actually occurs in the translation of medical noun compounds from English to Swedish.

1.1 Aim and research questions

The aim of this thesis is to investigate the translation of noun compounds in medical terminology from the field of emergency medicine. The translation of noun compounds will be quantitatively accounted for and classified. Encountered difficulties and translation strategies used to solve these will then be analyzed qualitatively. The following questions will be addressed:
• How is English medical terminology in the form of noun compounds translated into Swedish?
• What translation strategies are used in the translation and to what extent?
• Are there any indications that noun compounds expressing certain semantic relations correlate with a particular translation strategy?

1.2 Material and method

The medical texts that were translated and their target group are presented in sub-section 1.2.1, followed by a description of the method used for this thesis in sub-section 1.2.2.

1.2.1 Material

The two source texts from the field of emergency medicine were published by the Faculty of Pre-Hospital Care at the Royal College of Surgeons in Edinburgh. They are consensus statements regarding the pre-hospital management of life-threatening chest injuries (October 2015) and spinal immobilization (September 2015). The Faculty of Pre-Hospital Care (2017) describes consensus statements as comprehensive public statements based on review and analysis of opinion and evidence-based research by teams of experts in specific fields. Both the texts, therefore, contribute with up-to-date and professional recommendations from an established group of professionals.

The Consensus statements are very information-dense texts, which, using Reiss’ (translated from German in Chesterman 1989:108-9) classification of text types, can be defined as informative. They communicate facts and information with a focus on the specific topic of pre-hospital care. Both texts also function as what Reiss (ibid.) refers to as operative texts, since they have an appellative focus, promoting recommendations for the management of patients with chest injuries and suspected spinal injuries. As the texts are produced by the same institution and both intended for use in the field of pre-hospital emergency medicine, they are very homogenous in style. They are characterized by a formal scientific language, a language for special purposes (LSP), which according to Herget & Alegre (2009:2) can be recognized by its specificity of terminology and usage in communication between professionals. Typical traits for the language of science (which includes medicine) are according to Nagy (2015:265) long and complex sentences, use of passive voice, repetitive expressions, and a technical vocabulary which includes many compounds and abbreviations. The medical terminology in the two
consensus statements is often based on noun compounds, which make the texts interesting and suitable for a study about the translation of medical noun compounds from English to Swedish. My specialist training and work experience as an emergency and ambulance nurse should provide knowledge and experience useful for a translation of this kind.

When it comes to target groups, the two consensus statements are aimed at several different occupational groups in emergency medicine. Intended readers are physicians, nurses, paramedics, or managers in emergency medicine departments, both in pre-hospital environment (ambulance care) and in emergency department hospital environment. A Swedish translation is intended for the same professional groups as listed above, and could provide information valuable to the continuing process of developing guidelines for Swedish pre-hospital care regarding chest injuries and spinal immobilization.

1.2.2 Method
This thesis is based on my own translation of two texts from the field of emergency medicine. The global translation strategy for this translation is in line with Nord’s (1997:125) claim that “the target-text purpose should be compatible with the original author’s intentions”. For my translations, this meant producing consensus statements in Swedish, for professionals in emergency medicine. The formal scientific language for special purposes was intended to be maintained throughout, and established medical terms should be used consistently. Another translation strategy was to use relevant tools for medical translation. These include reference literature such as English and Swedish dictionaries, bilingual medical dictionaries, encyclopedias, terminology lists, and medical textbooks. However, far from all medical noun compounds could be translated using these resources. Swedish parallel texts from the field of emergency medicine and pre-hospital care, both found online and in textbooks, had to be consulted, and searches were performed in the electronical archives of Läkartidningen and in the Swedish corpus Korp (2017), by use of its subcorpora academic texts, medical texts, Swedish authority texts, news texts, journals, and Swedish Wikipedia. Rikstermbanken’s term base (2016) and Karolinska Institutet’s Swedish medical subject index MeSH (2017) could occasionally be used for translations of medical terms, and strategies for the translation of Latin and Greek terms could be found in Medicinsk fackspråk i skrift. Råd och riktlinjer (2010). Throughout the work with the translation, medical noun compounds consisting of two or more nouns were marked, and special attention was given to what occurred in their
translation, using the concept of “grammatical metaphor”. The concept of “semantic relations” was also used consistently, for a better understanding of new and semantically ambiguous terms. Both these concepts will be further explained in the theoretical background, in section 2.

The translations of medical noun compounds, consisting of at least two nouns, were analyzed, using both a quantitative and a qualitative method. The quantitative method will be used show how medical terminology in the form of noun compounds were translated, and to what extent different strategies were used. The concept of grammatical metaphor, which has previously been employed by Steiner (2001), Hansen (2003), and Hansen & Hansen-Schirra (2012) for an increased understanding of what occurs in the translation process and for a classification of translations based on the structural shifts that may occur, was applied in this study. Hansen & Hansen-Schirra’s (2012:135) classification, based on shifts in translation that represent different metaphorization strategies, was used as a translation strategy, as well as Steiner’s (2001:15) assumptions regarding the unpacking of grammatical metaphor. The results from the analysis of structural shifts were also compared with Rosario & Hearst’s (2001:4) findings about semantic relations in medical noun compounds, to investigate if any correlation between semantic relation and translation strategy could be found. The qualitative part of the thesis focuses on why the noun compounds are translated the way they are. Here, the difficulties encountered in the translation are accounted for, as well as descriptions of how they were solved.

2. Theoretical background

Medical terminology and its translation, noun compounds, semantic relations in medical noun compounds, and structural shifts in the translation of medical noun compounds will be introduced in section 2.1–2.4.

2.1 Medical terminology and its translation

Terminology is defined by Terminologicentrum (no yr.) as a set of terms belonging to a language for special purposes. Lungu et al. (2015:13) explain that terms are components of a specialized language that represents the denomination of concepts in a specific scientific or technical field, and that they have a strictly referential function. This thesis focuses on terminology from the specific field of medicine. Fogelberg & Petersson
(2006:42) point out that the Swedish medical language includes many Latin and Greek terms that have been adjusted to Swedish rules regarding spelling and inflection. As an example of the rules regarding spelling Socialstyrelsen’s text Medicinskt fackspråk i skrift: Råd och riklinjer (2010:9) states that Latin medical terms including ae are spelled with e in Swedish, and th becomes t. The English term haemothorax is therefore referred to as hemotorax in Swedish medical language. A translator needs to be aware of these rules, and follow them consistently.

Newmark (1979:1405-1407) warns translators of the abundance of synonyms and false friends (defined by Newmark as misleading cognate words) in medical texts. He suggests that translators use bilingual special purpose dictionaries in combination with monolingual special purpose dictionaries (ibid.). Williams (1996:275–299) added a recommendation about parallel texts after conducting a study on translators’ use of references, which showed that a combination of the use of dictionaries and parallel texts was the most successful way to translate medical texts. The medical translator hence needs access to specialized dictionaries and relevant parallel texts. These need to be up-to-date, since, as pointed out by Cabré (1999:4), the rapid development of science and technology contributes to the creation of new terminology. Examples of new terminology from the consensus statements that were translated in this study concerns pre-hospital equipment, which is in constant development, as well as new medical techniques like blood recycling. Since the development of terminology is persistent, skilled terminologists and translators are important participants in the process. Cabré (1999:36) further states that new terminology is usually based on nouns. Compounding, which will be described in the next section, is according to Plag (2002:132) the most productive type of word-formation process in English. Compounds of nouns, which this study concerns, are hence very important contributors to the development of medical terminology, and they need to be translated correctly.

2.2 Noun compounds
Trask (1993:53) defines the process of compounding in very general terms, as “The process of forming a word by combining two or more existing words: newspaper, paper-thin, babysit, video game”. As can be noted in these examples, there are three different ways of forming compounds in the English language: compounds can appear in solid form, as in newspaper, they can be hyphenated as in paper-thin, or appear as separate words, as in video game. Nakov (2013:295) claims that the solid form of compounds,
which he calls “concatenated” compounds, are almost exclusively used in Germanic languages, like Swedish. Hellspong & Ledin (1997:72) confirm that the most common way to create Swedish specialized terms is by compounding. Different word-classes can combine in compounds, e.g. Adj+N, Adj+V, N+N, and the word class of the compound is usually decided by its last word according to Nakov (2013:293). From here on, focus will lie on N+N compounds.

Nakov (2013:291) defines noun compounds as “sequences of nouns that act as a single noun […] e.g., bone marrow, web site design, internet connection speed test, etc.”. He (2013:291–292) further explains that noun compounds are very frequent in scientific and technical texts, such as those of biomedicine, where noun compounds form a large part of the terminology. Compounding is in fact the most frequent word formation process, according to a study of novel English words made by Algeo in 1991, that Nakov (2013:292) refers to. Compounds represent 68% of new words, and 90% of the new compounds are noun compounds (Algeo 1991 in Nakov 2013:292). Nakov (ibid.) concludes that noun compounds are very productive, and therefore seldom listed in dictionaries. For a translator, this means that subject specific new noun compounds might be impossible to find in a dictionary. When noun compounds are not lexicalized, Nakov (ibid.) states that they have to be interpreted from their composition. Both syntactic and semantic analysis can be used for this compositional interpretation, and was considered throughout this investigation. Syntactic and semantic structures in noun compounds will be described in the following two subsections.

2.3.1 The syntactic structure of noun compounds

The syntactic structure of compounds, especially noun compounds, exhibit what Plag (2002:135) calls a “modifier–head structure”. Plag (ibid.) defines the term “head” as “the most important unit in complex linguistic structures”, which is modified by the other member of the compound, the modifier. He (ibid.) further explains that in English compounds, the head is usually placed on the right-hand side, and is modified by the left-hand member. To use an example from a biomedical text, the compound chest injury contains a head, injury, preceded by the modifier chest. Hence, a chest injury is a kind of injury, an injury of the chest. Plag (2002:142) points out that compounds with more than two constituents follow the same structural and semantic patterns, with right-hand placement of the head. These multi-constituent compounds are typical for technical and scientific texts, according to Nakov (2013:293). Plag (2002:134) points out that for N+N
compounds, “new words can be repeatedly stacked on an existing compound to form a new compound”. The example *target oxygen saturation range* from the ST can again be used, here to exemplify the possible stacking of nouns. Plag (ibid.) calls this property “recursivity”, and explains that despite the lack of structural limitation, very long compounds can be difficult for readers or listeners to process. As will be discussed in the analysis, Plag’s ‘right-hand-rule’ (2002:135) can be used to facilitate the interpretation of long noun compounds. Semantic structures in noun compounds and their interpretation can, however, also pose challenges to interpretation. Semantic interpretation will be described in the following section.

### 2.3.2 The semantic structure of noun compounds

As for semantic interpretation, noun compounds can as Plag (2002:148) puts it “show a wide range of meaning”, and even be ambiguous and result in very different interpretations. Nakov (2012:301) displays this ambiguity by bracketing the 3-constituent noun compound *plastic water bottle* in the following two ways:

1. (1) \[ [ \text{plastic water} ] \text{bottle} ]
2. (2) \[ \text{plastic} [ \text{water bottle} ] \]

As the brackets suggest, the noun compounds can be interpreted differently, and only one makes sense: example (2) meaning a ‘water bottle that is made of plastic’. *Plastic water* in example (1) is, hopefully, not a fluid that exists. Nakov (2012:303) emphasizes that the semantic interpretation of long noun compounds also needs to focus on the relations between the subparts, where semantic relations need to be assigned. Nakov’s own example (ibid.) of semantic relations between subparts involves the noun compound *colon cancer tumor suppressor protein*, which according to him can be bracketed as [ [colon cancer] [ [tumor suppressor] protein] ], and further presented in subparts and their respective relations:

1. [tumor suppressor protein] which is implicated in [colon cancer] (IN; LOCATION)
2. [protein] that acts as [tumor suppressor] (IS; AGENT)
3. [suppressor] that inhibits [tumor(s)] (OF; PURPOSE)
4. [cancer] that occurs in [(the) colon] (OF; IN; LOCATION)

The semantic interpretation of noun compounds can hence be taken one step further by the assignment of relations between noun compound constituents. As pointed out by
Balyan & Chatterjee (2015:93), the procedure of determining the semantic relations between constituents can help the translator in the interpretation of noun compounds.

Several researchers have investigated semantic relations in noun compounds. Nakov (2013:308) mentions recognized classifications made by Warren (1978), Levi (1978) and Nastase & Szpakovicz (2003), and summarizes that semantic relations have typically been expressed by abstract relations like cause (e.g. *malaria mosquito*), source (*olive oil*), or purpose (*migraine drug*). Nakov (2013:308) explains that studies on semantic relations in noun compounds initially were proposed by linguists in corpus studies, but have recently become popular in computational linguistics. Girju et al. (2009:106) propose that algorithms that classify semantic relations can be applied in information retrieval and extraction, machine translation, thesaurus construction and semantic network construction et cetera. There are also domain specific studies on the matter. Field-specific semantic relations can be mapped, and the semantic relations in medical noun compounds will be presented in the following section.

2.3 Semantic relations in medical noun compounds

One investigation regarding semantic relations in medical compounds is referred to in articles by Nakov (2013:313+314), as well as Girju et al. (2009:106) and Balyan & Chatterjee (2015:93): Rosario and Hearst’s (2001) corpus-based study of semantic relations in 2-constituent noun compounds from the field of biomedicine. The researchers (2001:2) claim to have created “a set of relations that are sufficiently general to cover a significant number of noun compounds, but that can be domain specific enough to be useful in analysis”. Rosario and Hearst (2001:3) emphasize that they based their classification on relationships between the nouns in the noun compound rather than on the semantics of the head nouns. Using noun compounds with 2 constituents collected from 4300 titles and abstracts in the medical database MedLine, and a machine learning algorithm which identified semantic relationships between the nouns in the noun compounds, Rosario and Hearst (2001:1-4) define 38 possible semantic relations in biomedical texts. The 18 most common were used as classification types, as listed in the table below:
Table 1: Rosario & Hearst’s (2001:4) classifications of semantic relations in biomedical noun compounds.

<table>
<thead>
<tr>
<th>Semantic relation</th>
<th>Example</th>
<th>Semantic Relation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtype</td>
<td>headaches</td>
<td>Frequency/time of</td>
<td>headache interval</td>
</tr>
<tr>
<td></td>
<td>migraine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity/Physical process</td>
<td>virus reproduction</td>
<td>Measure of</td>
<td>hospital survival</td>
</tr>
<tr>
<td>Produces (on a genetic level)</td>
<td>polyomavirus genome</td>
<td>Instrument</td>
<td>aciclovir therapy</td>
</tr>
<tr>
<td>Cause</td>
<td>food infection</td>
<td>Object</td>
<td>kidney transplant</td>
</tr>
<tr>
<td>Characteristic</td>
<td>drug toxicity</td>
<td>Purpose</td>
<td>HIV medications</td>
</tr>
<tr>
<td>Defect</td>
<td>gene mutation</td>
<td>Topic</td>
<td>health education</td>
</tr>
<tr>
<td>Person afflicted</td>
<td>aids patient</td>
<td>Location</td>
<td>liver cell</td>
</tr>
<tr>
<td>Attribute of clinical study</td>
<td>headache interview</td>
<td>Material</td>
<td>latex glove</td>
</tr>
<tr>
<td>Procedure</td>
<td>brain biopsy</td>
<td>Defect in location</td>
<td>lung abscess</td>
</tr>
</tbody>
</table>

The authors (2001:3) point out that some noun compounds could be assigned more than one semantic relationship. For instance, *bladder dysfunction* can be classified both as ‘location’ and ‘defect’. Multi-labeled classification seems to be an unavoidable result, which has also been pointed out by other researchers such as Girju et al. (2009:119) and Nakov (2013:311). In this thesis, the fact that more than one semantic relationship can be assigned is regarded as a noun compound trait, which can be handled as by Rosario & Hearst (2001:3), by labeling some noun compounds as belonging to 2 different sets of semantic relations. One advantage of a domain-specific set of semantic relations is that it focuses strictly on semantic relations in noun compounds from that field. Non-significant relations from other classification models, which would result in even more multi-labeled classifications are excluded.

For this study, Rosario & Hearst’s (2001:4) classification provide a “ready-to-use” set of semantic relations that also can be used for the classification of semantic relations in noun compounds from the field of emergency medicine, which is a subgroup in the field of biomedicine. By comparing semantic relations to different classes of structural shifts in the translation of noun compounds, which is the topic of the next section, possible correlations between semantic relation and translation strategies could be examined.
2.4 Structural shifts in the translation of medical noun compounds

Structural shifts in translations have traditionally been a popular topic in translation studies since the end of the 1950s, when Vinay and Darbelnet published their comparative stylistic analysis of French and English (English version, 1995). Vinay and Darbelnet’s terminology and classifications of translation strategies and procedures have had a large impact on translation studies and are still widely used in translation education and empirical studies. According to Hansen & Hansen-Schirra (2012:133), structural shifts in translation have been given considerable attention in computational linguistics and machine translation research, and they also explain that it was in the machine translation community that a more fine-grained categorization of shifts than the one presented by Vinay and Darbelnet was proposed. Hansen & Hansen-Schirra (2012:134) agree and suggest another categorization. They (ibid.) state that the categories that Vinay & Darbelnet refer to as transposition (which Hansen & Hansen-Schirra summarize as structural shifts changing tense, number, person, part-of speech, or phrasal category) and modulation (summarized by Hansen & Hansen-Schirra as semantic shifts where a change of perspective occurs) are “not fine-grained enough for a detailed description of translation shifts and their effect on the translation product”. Instead, Hansen & Hansen-Schirra (ibid.) use the concept of “grammatical metaphor” to account for structural shifts in translation in greater detail, but also with consideration regarding the directionality of the relationships and processes involved.

The concept of grammatical metaphor was introduced by Halliday (1985:319ff., in Hansen & Hansen-Schirra 2012:134), and is unerringly described by Hasselgård (2000:no page) as “Meaning constructed in a different way by means of a different grammatical construction”. The different construction can according to Hansen & Hansen-Schirra (2012:134) consist of a new phrasal category, such as a shift from an NP to a VP or a shift between different levels such as between a clause complex, clause, phrase, group, word or morpheme (For examples, see table 2 below).

The concept of grammatical metaphor has also been used, and further elaborated on by Steiner (2001) and Hansen (2003) to describe the differences between ST and TT and what occurs in translation. Steiner (2001:14) has produced a summary of types of structural shifts that can take place in grammatical metaphors across languages. For nouns, which this thesis focuses on, the shift from a metaphorical construction, which is denser and less direct, to a congruent construction, which is literal and more direct, can look as follows, according to Steiner (2001:14):
Table 2: An extract from Steiner’s (2001:14) types of structural shifts in translation, moving from metaphorical to congruent.

<table>
<thead>
<tr>
<th>Structural shift (metaphorical ⇒ congruent)</th>
<th>Example (English ⇒ German)</th>
</tr>
</thead>
<tbody>
<tr>
<td>noun ⇒ verb</td>
<td>transformation ⇒ transformieren</td>
</tr>
<tr>
<td>noun ⇒ PP</td>
<td>floor dust ⇒ Staub auf dem Boden</td>
</tr>
</tbody>
</table>

Hansen (2003:63-67) elaborates on Steiner’s (2001:9-15) use of the concept of grammatical metaphor, and establishes three metaphorization strategies: “re-metaphorization”, “de-metaphorization”, and “metaphorization”. The same classification is used in Hansen & Hansen-Schirra’s study on structural shifts in noun phrases (2012:135), and is in this study applied on structural shifts in noun compounds. The metaphorization strategies are summarized below, each category being illustrated with an example from Hansen & Hansen-Schirra (ibid.) when the concept was applied on noun phrases translated from English to German.

- The term re-metaphorization refers to translations which show the same degree of grammatical metaphoricity as the ST expression. The structures of the ST are preserved in the TT.

  Example (3) from Hansen & Hansen-Schirra (2012:141)
  
  the growth that is essential to achieve that goal das Wachstum, das zur Erlangung dieses Ziels erforderlich ist

  In example (3), both the underlined ST and TT expression includes a relative clause, describing *the growth/das Wachstum*. The structure of the ST is preserved in the TT, and the two noun phrases show the same degree of metaphoricity. The same meaning is expressed, using the same structure in ST and TT.

- The term de-metaphorization describes cases in which the ST is more metaphorical than the TT expression. The ST is more densely packed and less direct.

  Example (4) from Hansen & Hansen-Schirra 2012:144
  
  rules-based trade ein auf Regeln basierender Handel
The ST expression *trade* in example (4) is premodified by an adjective, but in the German TT a participial premodifier is used instead. The TT is more explicit and direct, not so densely packed as the ST and hence less metaphorical. The same meaning is conveyed by the use of different grammatical constructions and more words in the TT expression.

- The term metaphorization is used in cases where the TT expression is more metaphorical than the ST expression. The TT is more densely packed and less direct.

Example (5) from Hansen & Hansen-Schirra (2012:142)

<table>
<thead>
<tr>
<th>English</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>a regional, multilateral effort to unite the economies of the Western Hemisphere</td>
<td>Eine regionale, multilaterale Bestrebung für die Vereinigung der Volkswirtschaften der westlichen Hemisphäre</td>
</tr>
</tbody>
</table>

Example (5) displays a postmodified infinitive clause in the ST, which is translated into a nominal construction introduced by the preposition *für*. This way, the TT expression becomes denser, less direct, and therefore more metaphorical.

What happens in the translation process is according to Steiner (2001:15) and Hansen & Hansen-Schirra (2012:135) that the translator in his or her mind unpacks the grammatical metaphor of the ST, moving from metaphorical to congruent variants, and then chooses to either de-metaphorize, re-metaphorize, or metaphorize it in the TT. An example from the translation of consensus statements can be used to illustrate the process: the term *triage decisions* from ST 2, page 7 can be unpacked into *beslut om triage*, representing de-metaphorization. The translator can also choose to re-metaphorize the term into *triagebeslut*, which copies the ST structure, or the TT term can be made even denser and more metaphorical by using *triagering* only, omitting the noun *descision*, hence representing a metaphorization. These three choices regarding the term *triage decisions* will be further discussed in the analysis, section 3.3.3, example (20).

The authors mentioned above have used the concept of grammatical metaphor and classification of metaphorization strategies in corpus-based studies of translations from English to German, Hansen & Hansen-Schirra (2012:138) showing that the structure of noun phrases seldom is preserved in German translations and Steiner (2001:41) stating that a general tendency towards de-metaphorization is clear. In this thesis, it will be shown that the unpacking of grammatical metaphor, with a following consideration regarding the constituents and their relation before choosing to metaphorize, de-metaphorize, or re-
metaphorize is a useful translation strategy for medical noun compounds. The analysis-section will show that the concept of metaphorization can be used both as a classification of structural shifts in the translation of noun compounds from English to Swedish, and as a translation strategy for medical noun compounds. Using the concept of grammatical metaphor, there are then 3 ways to translate medical noun compounds into Swedish: by re-metaphorization, where the structures of the SL text are preserved in the translation, by de-metaphorization, where the TT is more direct and congruent, or by metaphorization, where the TT is more metaphorical, more densely packed. The concept of grammatical metaphor is regarded to be more suitable for this study about the translation of medical noun compounds than Vinay & Darbelnet’s categorizations (1995), since Steiner’s (2001) and Hansen & Hansen-Schirra’s method (2012) offers both a classification of translated noun compounds and an insight in what actually occurs in the translation.

3. Analysis

In section 3.1, a quantitative analysis involving classification and account of translated noun compounds shows how the medical noun compounds in the two source texts were translated, and to what extent different translation strategies were used. In section 3.2 the qualitative analysis focuses on why the medical noun compounds were translated the way they were. Here, the difficulties encountered in the translation are accounted for, as well as descriptions of the strategies used to solve these.

3.1 Quantitative analysis of structural shifts

The STs contain 317 tokens that are included in this study. They are all noun compounds consisting of sequences of nouns only, with 2 to 4 constituents. (N+N, N+N+N, or N+N+N+N+N). Proper nouns, like Trauma Audit Research Network, were not included in the study. The noun compounds were all recognized by the author as terms from the LSP used in emergency medicine. Some specific terms were used repeatedly in the texts. For example, trauma patient occurs 23 times in the ST. Other terms occur only once, like extrication device. The number of unique terms (types) in the form of noun compounds corresponding to the criteria above amounts to 89. By classification and account of these 89 terms using the metaphorization strategies re-metaphorization, de-metaphorization, and metaphorization the question of how English medical terminology in the form of
noun compounds is translated into Swedish could be answered. The 89 unique noun compounds were translated as shown in Table 3 below.

Table 3: Metaphorization strategies in the translation of medical noun compounds

<table>
<thead>
<tr>
<th>Metaphorization strategy</th>
<th>N</th>
<th>% (rounded to nearest integer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>re-metaphorization</td>
<td>51</td>
<td>57</td>
</tr>
<tr>
<td>de-metaphorization</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>metaphorization</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>different metaphorization strategies</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

As mentioned in section 2.4, translations using **re-metaphorization** show the same degree of grammatical metaphoricity as the SL expression. This was the most commonly used metaphorization strategy, accounting for 57% of the translations. The structures of the SL text were preserved in the translation, as in the example *Pain from rib fractures* ⇒ *Smärta från revbensfrakturer* (N+N ⇒ N+N). In this group, all TT constructions consisted of N+N compounds. None of the 3- and 4-constituent noun compounds were translated using re-metaphorization with the same structure (e.g. N+N+N ⇒ N+N+N). 61% of the 3- or 4-constituent noun compounds were translated using de-metaphorization, and the rest of them were translated using metaphorization (31%), or by both de-metaphorization and metaphorization (8%). All but one of the N+N constructions appeared in solid (or concatenated) form in the TT. *CT imaging* was translated into *CT-undersökning* using re-metaphorization, but with a hyphenated construction (due to the preceding acronym CT) instead of the more usual solid form. Nakov’s (2013:295) claim that the solid forms of compounds are almost exclusively used in Germanic languages like Swedish correlates with the quantitative results of this study of noun compounds.

Translations using **de-metaphorization** are cases where the SL is grammatically more metaphorical than the TL expression. The SL is more densely packed and less direct, as in the example: *Safe and effective patient packaging* ⇒ *Tillförlitlig och effektiv paketering av patienter* (N+N ⇒ N+prep+N). De-metaphorization was the second most used metaphorization strategy, accounting for 30% of translations. In this group, the translations were not uniform regarding construction. The majority, e.g. 21 TT constructions (78%), included a change into a PP-postmodifier, like in the example
paktering av patienter above. 2 TT constructions (7%) involved a relative clause as a postmodifier, as in thoracostomy holes ⇒ ingångshålen där torakostomi anlagts (N+N⇒relativizer+N+V). 2 TT constructions (7%) involved a shift towards an adjective expression such as surface anatomy ⇒ ytanatomisk (N+N⇒A). 1 TT construction (4%) involved the use of a genitive noun premodifier attached to one of the nouns: patient positioning ⇒ patientens kroppsställning (N+N⇒N+genitive+N). Finally, 1 TT construction (4%) involved a change into a verbal expression: consensus view ⇒ konsensusgruppen ansåg (N+N⇒N+V).

Translations using metaphorization are cases where the TL expression is grammatically more metaphorical than the SL expression (see section 2.4). The TL is more densely packed and less direct as in the example The risk of tissue pressure injury ⇒ risken för tryckskada (N+N+N ⇒ N+N). The noun tissue is omitted in the TT. All the TT constructions in this group were recognized by an omission of one noun from the ST construction. Translation using metaphorization was only used in 5 translations (6%).

Some noun compounds were translated in more than one way in different instances, using different metaphorization strategies. 6 of the noun compounds (7%) that occurred on more than one occasion in the ST were translated differently to suit the specific context in the TT, as in the example trauma patient which in most cases was translated as traumapatient, representing a re-metaphorization (N+N ⇒ N+N). However, on a few occasions the noun compound trauma patient was translated as patient som utsatts för trauma, representing a de-metaphorization where N+N ⇒ a head noun postmodified by a relative clause. An explanation of this translation choice, and the importance of context, will be provided in the qualitative analysis.

Four subgroups have hence emerged from the quantitative analysis of noun compound translations. Their classification, and an account of them, have revealed 4 different ways of translating medical noun compounds. A more detailed description of the different translations in each group will follow in the qualitative analysis. The concept of grammatical metaphor, and the idea about unpacking the grammatical metaphor from the ST noun compound, analyzing it, and then choosing to either metaphorize, de-metaphorize, or re-metaphorize it in the TT has proved to be a useful help and a strategy for my translation of medical noun compounds. Descriptions of how this strategy was used can be found in the qualitative analysis in section 3.3. But first, the quantitative results regarding semantic relations will be presented.
3.2 Quantitative analysis of semantic relations

A quantitative analysis of semantic relations in these 89 unique medical noun compounds was conducted, using Rosario and Hearst’s (2001:4) classifications of semantic relations in noun compounds from biomedical texts described in section 2.3. The 89 noun compounds included in the study were classified into 17 labelled semantic relations as listed below. Note that a medical noun compound can belong to more than one class of semantic relations. For instance, most of the medical noun compounds (67 out of 89) belong to the class of semantic relations referred to as “subtype”, as well as at least one other class. A lung disease, as an example, is ‘a type of disease’, classified as subtype, but can also be classified as a defect in location, a ‘disease in the lung/lungs’. In this analysis, I have only included subtypes that somehow refer to medical concepts. As mentioned in the theoretical background, several scholars have concluded that multi-labelled classifications of semantic relations are unavoidable. Therefore, the total numbers of occurrences in table 4 below will exceed the total number of noun compounds, and a percentage cannot be accounted for here.

Table 4. Semantic relations in the translation of medical noun compounds.

<table>
<thead>
<tr>
<th>Semantic relation</th>
<th>N</th>
<th>Examples</th>
<th>Metaphorization strategies used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>re-metaphorization</td>
</tr>
<tr>
<td>Subtype</td>
<td>67</td>
<td>lung disease</td>
<td>38</td>
</tr>
<tr>
<td>Procedure</td>
<td>16</td>
<td>patient documentation</td>
<td>11</td>
</tr>
<tr>
<td>Instrument</td>
<td>14</td>
<td>scoop stretcher</td>
<td>9</td>
</tr>
<tr>
<td>Defect in location</td>
<td>10</td>
<td>rib fracture</td>
<td>3</td>
</tr>
<tr>
<td>Standard</td>
<td>10</td>
<td>treatment</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>recommendations</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>8</td>
<td>chest wall</td>
<td>4</td>
</tr>
<tr>
<td>Measure of</td>
<td>6</td>
<td>inflation pressure</td>
<td>3</td>
</tr>
</tbody>
</table>
The question regarding correlation between semantic relations and the three translation strategies de-metaphorization, re-metaphorization, and metaphorization is of interest since such correlations might be used by translators as guidance in the choice of translation strategy for noun compounds that display specific semantic relations. It would, however, be precarious to draw any general conclusions regarding the correlation between semantic relation and translation strategy from the small set of data in this study.

As can be noted in the rightmost cells in table 4, the semantic groups of procedures and instruments were frequently translated using re-metaphorization. In noun compounds from the class of semantic relations related to procedures (like **patient documentation**, CT **imaging**, and **cell salvage**), re-metaphorization was used in 11 out of 16 translations (69%). For noun compounds related to instruments (represented by examples such as **antibiotic prophylaxis**, scoop stretcher, reservoir mask), re-metaphorization was used in 9 out of 14 translations (64%). At a first glance, these figures seemed to suggest a correlation between the use of re-metaphorization and the semantic relations procedures and instruments, since the percentages diverge from the average percentage of translations using re-metaphorization, which was 57%. However, a chi²-test was conducted with all the available data inserted in the two variables “metaphorization
strategy” and “semantic relation”. No statistically significant correlations could be found between the semantic groups of procedures and instruments and re-metaphorization, or between the two variables.

Even though no general statement regarding correlations between semantic relations and translation strategies can be established from this small set of data, Rosario and Hearst’s (2001:4) classifications can be used to establish a deeper understanding of semantic relations between the constituents in medical noun compounds. This understanding has been proven useful in the translation of medical terminology, as will be presented in the following qualitative analysis.

3.3 Qualitative analysis of translations

Since the main translation strategy for the TT was to create a text that agreed with the purpose and intentions set out by the original authors, a consistent usage of established medical terms, suitable for a reader who is a professional in the field of emergency medicine, was aimed for. As expected, there were challenges due to the lack of dictionary entries concerning many of the noun compounds from the specialist field of emergency medicine.

3.3.1 Noun compounds translated by re-metaphorization

The medical noun compounds that were translated without any changes in their structural and syntactic structure represent what Hansen (2003:86) and Hansen & Hansen-Schirra (2012:135) refers to as re-metaphorization. In noun compounds translated using re-metaphorization, the ST and TT terms possess the same degree of grammatical metaphoricity. The meaning in the ST term is not, to use Hasselgård’s (2000:no page) terms, constructed in a different way by means of a different grammatical construction. The grammatical metaphor, N+N, could be unpacked mentally, reviewed semantically and structurally, (e.g. heat loss could be unpacked into the de-metaphorization loss of heat), but in the translations of these noun compounds there is no need for de-metaphorization or metaphorization in the TT term. No other construction is added and no construction is removed, the structure of the noun compound remains the same in translation.

The quantitative analysis of my translations indicates that re-metaphorization is the most common way to translate English medical noun compounds into Swedish, used in
57% of the translations. Some of the medical noun compounds translated by re-metaphorization were uncomplicated both when it came to semantic interpretation and finding a translation equivalent. Examples (6)–(9) show some of these noun compounds which contain no semantic ambiguities and could all be found in Cressy’s (2005) bilingual *Medicinsk och farmaceutisk ordbok*. Thus, the following noun compound terms translated by re-metaphorization represent and provide examples of established lexicalizations in the LSP of medicine:

(6) [Text 1, p.2]  
**blood pressure**  
**blodtryck**

(7) [Text 1, p.3]  
**heat loss**  
**värmeöverför**

(8) [Text 1, p.2]  
**rib fractures**  
**revbensfrakturer**

(9) [Text 2, p.3]  
**lung disease**  
**lungsjukdom**

Most medical terms from the specific field of emergency medicine were equally simple to interpret semantically, but could not be found in medical dictionaries. Examples (10)–(12) show instances where I had to rely on my experience from working in the field of emergency medicine to recall the Swedish terms used by professionals. The terms then had to be double-checked using parallel texts from that specific field.

(10) [Text 1, p.1]  
**scoop stretcher**  
**scoopbår**

(11) [Text 1, p.1]  
**vacuum mattress**  
**vakuummadrass**

(12) [Text 1, p.3]  
**traction splints**  
**sträcksplintar**

The Swedish terms in example (10) and (11), scoopbår and vakuummadrass, were located in a course-book frequently utilized in the Swedish specialist training for emergency and ambulance-nurses: Suserud & Svensson (2009:386). A Google search reveals that the terms scoopbår and vakuummadrass, and also (12) sträcksplint, could be found on several web pages related to emergency medicine, including the ones published by distributors of rescue material like Ferno (2017) which is a leading supplier for emergency services in the Nordic countries. Trust was put in the notion that the leading suppliers of rescue material use the correct and established terms for their products, and therefore their terms were used in the translation of examples (10)–(12), which all represent re-metaphorization.

There were some terms from emergency medicine that were both new to me, and unlisted in the bilingual medical dictionaries at hand: Cressy (2005) and Norstedts Medicine (1992). One example of such a term is cell salvage, which was not listed in the
Oxford English Dictionary (OED, 2017) either. Since the term was novel to me and difficult to interpret, I decided to make an analysis of the syntactic structure and semantic relations of the constituents in the noun compound which is shown in its context below, in example (13).

(13) Pre-hospital *cell salvage* is not *Blodåtervinning* används för nävarande inte prehospitalt i Storbritannien, men bör övervägas omedelbart vid ankomst till sjukhus.

Plag’s (2002:135) concept of ‘modifier-head structure’ can be applied here: the right-hand constituent is the head noun, which indicates that the term *cell salvage* regards some kind of salvage – the salvage of cells. *Cell salvage* can be classified according to Rosario & Hearst’s set of semantic relations in biomedical texts, as a (medical) procedure. The conclusion that *cell salvage* in fact is a medical procedure was confirmed by a Google search (57 100 hits) where web pages like Wikipedia and Cochrane provided explanations that the procedure involves the recovery of blood lost during surgery, for re-infusion into the patient. The concept seems to be relatively new as a routine procedure.

When it came to finding the best Swedish translation for this term, which I now fully comprehended, the Google hits on *cell salvage* was narrowed down to results in Swedish only. 2 Swedish terms for *cell salvage* were found: *återanvändning av patientblod* (Karolinska Institutet) and *blodåtervinning* (Jehovas Vittnen). As I suspected that alternative terms are also used in hospital environments, an expert with experience both as an intensive care nurse and as a perfusionist was consulted. She confirmed that *cell salvage* can be translated as *återanvändning av patientblod* or *blodåtervinning*, but also with the scientific term *autolog transfusion*. She also explained that the “everyday-term” used between health personnel working with the technique is *blodtvätt*. The 4 alternatives for a translation of *cell salvage* were then searched for using Google, Läkartidningen, and Korp. The following results were displayed:
Table 5. Hits on respective search terms

<table>
<thead>
<tr>
<th>Source</th>
<th>Nr. of hits for återanvändning av patientblod</th>
<th>Nr. of hits for blodåtervinning</th>
<th>Nr. of hits for autolog transfusion</th>
<th>Nr. of hits for blodtvätt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>2</td>
<td>340</td>
<td>529</td>
<td>121</td>
</tr>
<tr>
<td>Läkartidningen</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Korp</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

As can be seen in table 5, the statistics speak for the use of autolog transfusion. However, in one of the two TT sentences where the translation is to be inserted, other medical terms are translated using Swedish terms as blodprodukter and toraxkirurgi, and therefore the less scientific and more Swedish term blodåtervinning was chosen. The choice can still be justified by the numbers of search-hits in Table 5, and the fact that the Swedish National Board of Health and Welfare use the term in their directives regarding the transfusion of blood products (2009:9) indicates that the translation choice is suitable. These findings also confirm that the re-metaphorization that occurs in the translation of the noun compound cell salvage ⇒ blodåtervinning (N+N⇒N+N) is to be preferred above a de-metaphorization that would involve a prepositional phrase: cell salvage ⇒ återvinning av patientblod (N+N⇒N+prep+N). As for all the medical noun compounds in this group, no new constructions need to be added and no constructions were removed in the translation of cell salvage. The structure of the noun compound remains the same in translation and results in idiomatic Swedish terms.

The conclusion drawn from this analysis regarding re-metaphorization in the translation of medical noun compounds is that there seldom is a need for structural shifts in translation if there is an established TL term available. The challenge lies more in finding the right term, and since it cannot always be found in a medical bilingual dictionary, parallel-texts are essential for that purpose, as highlighted by Williams (1996:296–297)

3.3.2 Noun compounds translated by de-metaphorization

Translation by the use of de-metaphorization proved to be the second most common translation strategy for the medical texts in this study, accounting for 30% of the translations. In these translations, the grammatical metaphor in the original noun
compound is unpacked, and then kept in its unpacked form, leaving the ST term more metaphorical and densely packed, and the TT term more direct and explicit which, therefore, often makes it easier to comprehend. The two ways to unpack and translate the noun compound thoracostomy hole(s) provides two examples (14)+(15) of noun compound translations using de-metaphorization by relative clauses and genitive constructions.

(14) Packaging of the patient needs to avoid blockage of the thoracostomy holes by the patient’s arms.  
[Text 2, p.3] När patienten paketeras inför transport får armarna inte blockera ingångshålen där torakostomi anlagts.

In example (14), the grammatical metaphor thoracostomy holes is unpacked into a construction where the head noun holes is followed by a relative clause which further describes the holes. The translation results in a postmodified relative clause, answering the question “what kind of holes?” – ingångshålen där torakostomi anlagts.

(15) The consensus view was to use the existing thoracostomy hole to place the intercostal drain…  
[Text 2, p.5] Konsensusgruppen ansåg att den befintliga torakostomins ingångshål kan användas för placering av toraxdrän…

In example (15), the hole is equally further described, by the use of a genitive noun premodifier: torakostoming ingångshål. These examples regarding the translation of thoracostomy hole(s) indicate that the use of de-metaphorization in the translation of noun compounds can add information that makes comprehension easier. The alternative, to use a re-metaphorization (N+N ⇒ N+N) resulting in torakostomihålen for the translations in example (14) and (15), does not provide the same help for semantic interpretation provided by de-metaphorization. That help is useful for the interpretation of the English medical term thoracostomy holes which renders only 8 hits on Google. There were no hits at all on Google, Läkartidningen or Korp regarding torakostomihål. Google-searches on ingångshålen där torakostomi anlagts and torakostomins ingångshål did not provide any hits either, but the fact that ingångshål is commonly used when speaking of surgery and catheterization (which a thoracostomy is a form of) was verified by 504 Google hits on “ingångshål kirurgi”, and one article in Läkartidningen (2010) that concerned an ingångshål related to catheterization of the pleura.
The quantitative part of this investigation showed that de-metaphorization in the translation of noun compounds also can be conducted by an unpacking of the noun compound into a verbal construction or an adjective phrase, but since the most common way to construct a de-metaphorized noun compound is by unpacking it, and changing the structure to a prepositional phrase, the focus will now change to that kind of construction.

As mentioned in the quantitative analysis, no 3- and 4-constituent noun compounds were translated using re-metaphorization with the same structure (e.g. N+N+N →N+N+N+N). 61% of them were translated using de-metaphorization. In contrast to Plag’s (2002:148) concern that noun compounds often are ambiguous and able to result in very different interpretations, I found very few such instances in the two texts, even in 3- and 4-constituent compounds. A combination of experience from the field of medicine and a consistent notion of Plag’s (2002:135) theory that the head of a noun compound, including the multi-compound ones, is usually placed in the rightmost position proved to be useful for “seeing through” the semantic ambiguities. Hence, medical noun compounds such as (16) chest drain insertion and (17) tension pneumothorax guidelines caused no troubles regarding interpretation. As for the classification of semantic relation, example (16) involves a procedure, the insertion of a chest drain, and example (17) represents a standard, guidelines for the treatment of tension pneumothorax. All the 3-constituent noun compounds in the ST could be interpreted as constructions with the head noun furthest to the right, preceded by two nouns that combined and formed a specific medical term, like chest drain and tension pneumothorax in the examples above.

One of the two 4-constituent noun compounds in the ST did, however, display an ambiguity. It could be interpreted semantically by bracketing technique and the assignment of semantic relations between constituents, as recommended by Nakov (2012:303).

(18) A target oxygen saturation range Ett målinterval för syremättnad på 94–
[Text 2, of 94-98% should be maintained. 98 % bör upprätthållas.
p.1 ]

Example (18) can be bracketed as [target oxygen ][saturation range], but since there is no such thing as target oxygen, the bracketing [target [oxygen saturation] range] is more appropriate for these compounds which deal with the measure of an object – oxygen. Bracketed as [target [oxygen saturation] range], the 4-constituent noun compound expresses a range for oxygen saturation within a certain target. In the TT, oxygen is
translated according to findings in Norstedts Stora ordbok (2017) and Cressy (2005) into syre, and then combined with mättnad which is the translation of saturation according to Norstedts Stora ordbok (ibid.) and Cressy (ibid.) resulting in the N+N compound syremättnad. According to NE (2017), syremättnad is the same thing as syrgasmättnad. Target and range could be equally combined in a term that I recalled having heard in medical context previously: målintervall. This term was double-checked in a Google-search which resulted in 3590 hits. 4 articles in Läkartidningen proved that the expression is indeed, used in medical circumstances. The term target oxygen saturation range was now unpacked and translated as målintervall för syremättnad, a de-metaphorized noun compound. That the preposition för is needed for an idiomatic translation of this 4-constituent noun compound can be proved by the fact that a re-metaphorization of this term, syremättnadsmålintervall, would not represent an idiomatic construction in the Swedish language. In the example målintervall för syremättnad, and in general according to Ingo (2007:187), prepositional attributes work well in Swedish.

Problems finding a suitable medical term also appeared in the category of noun compounds translated by de-metaphorization. One term that was particularly difficult to translate was patient packaging, which is accounted for in example (19) below.

(19) Safe and effective patient
    [Text 1, packaging is a vital step in the p.1] safe transport of trauma patients
to definitive care. Tillförlitlig och effektiv paketering av
    patienter är en viktig faktor för säker
    transport av trauma-patienter till
definitiv vård.

Patient packaging is a term that describes a procedure which is frequently used in pre-hospital context. The term renders 25,000 hits on Google, and is usually translated to Swedish as in Cressy’s medical dictionary (2005), into immobilisering. This term was my first choice, which corresponded with my experience of terminology from the prehospital field. However, from other passages in the ST it became obvious that the term immobilisering does not have the same scope as the term patient packaging, it is too narrow for this particular text. The following passages from ST 1, page 1 and ST 2, page 3: This consensus statement will outline emerging best practice when packaging the pre-hospital trauma patient and providing spinal immobilisation and Packaging of the patient needs to avoid blockage of the thoracostomy holes by the patient’s arms indicate that there is more than immobilisation included in the term patient packaging. An English parallel text from London’s Air Ambulance (2010) confirms that safe patient packaging
not only involves minimizing spinal injuries by spinal immobilisation, it also involves minimizing blood loss, clot disruption, cytokine release, and heat loss. Based on these findings, the translation *paketering av patienter* was chosen instead of *immobilisering av patienter*. The choice to keep the unpacked version of *patient packaging*, using a de-metaphorization involving the N+prep+N construction in *paketering av patienter* was based on the same principle as the previous example, *målintervall för syremättnad* – a re-metaphorisation of this term, into *patientpaketering*, would not represent an idiomatic construction in the Swedish language.

It can by concluded from this analysis of translations based on de-metaphorization that keeping the unpacked versions of the original noun compound can provide useful information and an increase in understanding, as suggested by Steiner (2001:15). Ambiguity regarding the interpretation of 3- and 4-constituent noun compounds need not necessarily be a problem, if the translator uses field-specific experience, Plag’s ‘right-hand-rule’, and analysis of the semantic relations in the noun compound that is to be translated.

### 3.3.3 Noun compounds translated by metaphorization

The 5 noun compounds that were translated by the use of metaphorization were characterized as TT constructions that were more grammatically metaphorical and more densely packed than their original ST noun compound. In all the constructions in this group one noun was omitted in the TT, as in example (20), concerning *triage decisions*.

\[(20)\quad \text{Identifying that the patient has multiple rib fractures (> three) may be more important for management and triage decisions rather than specifically diagnosing a flail segment.}\]

[Text 2, p.7 ] Identifying that the patient has multiple rib fractures (> three) may be more important for management and triage decisions rather than specifically diagnosing a flail segment.

Det kan vara viktigare för handläggningen och triageringen att påvisa att patienten har multipla revbensfrakturer (fler än tre) än att identifiera specifika instabila segment.

If needed, help regarding semantic interpretation could in this example be provided by the classification of semantic relations in this term as a medical procedure. Furthermore, an imaginative unpacking of the grammatical metaphor in *triage decisions* would result in a de-metaphorized construction regarding triage: *beslut om triage* (N+prep+N). However, there is no need to de-metaphorize *triage decisions* to explain it further in a text aimed at health care professionals, and no findings in parallel texts or from Google-
searches that suggest that the term beslut om triage is used. The conclusion that a metaphorization (N+N ⇒N, triage decisions ⇒ triagering) is appropriate to use corresponds well with findings in parallel-texts and internet-searches: Re-metaphorization, as in triage decisions ⇒ triagebeslut (N+N ⇒ N+N) can be found in medical parallel texts, like in a thesis from Högskolan Halmstad (Blom & Larsson 2008), but triagebeslut renders only 552 hits on Google, which is not much compared to 18500 hits for triagering, the metaphorized and more densely packed translation of triage decisions. Decisions can be omitted, since the Swedish meaning of the word triagering represents the procedure of making triage decisions. The term is widely used in parallel texts from the field of emergency medicine, for instance in a recent master thesis from Örebro University (Hahlin and Jansson 2016). Based on the information above, triage decisions was translated as triagering.

Metaphorization, and the omission of one constituent was used and proved to be a productive way to treat about 1/3 of the noun compounds consisting of 3 or 4 constituents. As shown in example (21) below, one noun constituent can in these cases be removed from the noun compound without resulting in too much loss of meaning.


Here, the noun services (in Swedish tjänst) can be omitted, without much semantic loss but rather more in line with the usage of these terms in the Swedish language, presented in table 6 below.

Table 6. Hits on respective search terms

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of hits for räddningstjänstpersonal</th>
<th>Number of hits for räddningspersonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>16 700</td>
<td>169 000</td>
</tr>
<tr>
<td>Läkartidningen</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Korp</td>
<td>194</td>
<td>1512</td>
</tr>
</tbody>
</table>
Corpus findings hereby confirmed that a translation of emergency services personnel into räddningspersonal, involving metaphorization, was to be preferred above räddningstjänspersonal, which would involve re-metaphorization.

In conclusion, metaphorization can occasionally be used in the translation of medical noun compounds, where an omission of one noun can make TT constructions denser, without significant semantic loss.

3.3.4 Noun compounds translated by different metaphorization strategies.

6 English medical noun compounds were translated using two different metaphorization strategies, in different sentences. Context and grammar seemed to be variables that can affect the choice of translation strategy.

The noun compound chest injuries, in example (22), initially did not cause any special concerns regarding semantic interpretation, classification, and translation.

(22) Chest injuries continue to be significant contributors to death from major trauma…

Chest can be referred to in Swedish both as thorax and bröstkorg, according to Norstedts Medicine (1992). Injury is usually translated as skada, as in Norstedts Stora Ordbok (2017). Bröstkorgsskador renders more hits than thoraxskador on Google: 3880 vs 953 respectively. However, internet-searches indicate that bröstkorgsskador is more frequently used in general circumstances, whereas thoraxskador or toraxsskador is more frequently used by medical professionals. According to my own experience of working in emergency medicine, thoraxskador is a more commonly used term in conversations between medical staff. A search in Läkartidningen’s internet archive, representing texts aimed at physicians, displayed only 2 hits on bröstkorgsskador, but 7 hits on toraxskador. According to Socialstyrelsen (2010) and Lindskog (2014:621) the correct Swedish spelling of thorax is torax, without an h, as in the search results from Läkartidningen.

Based on the findings accounted for above, toraxskador as in N+N, representing re-metaphorization, was used as translation for the term chest injuries on most (8 of 11) occurrences in the texts. But, not all the instances including chest injuries could be translated literally by re-metaphorization. The remaining 3 needed to be translated by de-metaphorization, introducing a reference to a patient followed by a prepositional phrase: with chest injuries, as in example (23).
The pre-hospital management of chest injury: a consensus statement.

The explanation for this de-metaphorized translation is that in this context, chest injuries involves a patient with chest injuries. Swedish health care generally tries to avoid objectifying patients. We treat the whole patient, not just the chest injury. A translation like Det prehospitala omhändertagandet av toraxskador would therefore not fit the context of Swedish Emergency Care, where a de-metaphorized expression as in Det prehospitala omhändertagandet av patienter med thoraxskador would be more correct.

Grammatical differences between SL and TL can also affect the translation, as pointed out by Steiner (2001:14). The term trauma patient in example (24) below can be translated using re-metaphorization, into traumapatient:

(24) Promoting haemostasis in the trauma patient is a vital step in attempting to minimise further deterioration.

However, if an adjective like major or blunt premodifies trauma patients, a translation by de-metaphorization is necessary, as a re-metaphorization into storttraumapatient or störretraumapatient would not represent correct Swedish. A re-metaphorization involving a relative clause, as in example (25), is more suitable:

(25) …provided figures for the frequency of chest injury diagnoses in UK major trauma patients…

That the terms trauma patient and stort trauma are established in Swedish emergency care was confirmed by parallel texts, such as a report regarding trauma care from an expert group appointed by Socialstyrelsen (2015).

To summarize this section, the medical noun compounds that were translated in two different ways, using different metaphorization strategies, were affected both by context and adjectival premodification.
4. Conclusions

In this study the translation of medical noun compounds from the field of emergency medicine were investigated quantitatively and qualitatively. The theory of different metaphorization strategies, introduced by Steiner (2001) and Hansen (2003) was successfully used for a classification of structural shifts in the translation of medical noun compounds. The quantitative analysis shows that noun compounds in the two texts from emergency medicine are translated by re-metaphorization in 57% of translations, by de-metaphorization in 30% of translations, by metaphorization in 6% of translations, and by different metaphorization strategies in 7% of the translations.

Further qualitative analysis of these translations reveal some general conclusions, and establishes a few problem areas. Regarding re-metaphorization, this study indicates that there is no need for structural shifts in translation if there is an established TL term available. The productive English way of stacking nouns is possible to replicate in Swedish by the creation of solid compounds displaying the same structure as the ST noun compound. The biggest challenge regarding translation by re-metaphorization lies in the search for the right term. Parallel texts are essential for pin-pointing terms that cannot be found in medical bilingual dictionaries. Translation by de-metaphorization was represented by five different constructions, where the use of a prepositional phrase was most commonly utilized. It was concluded that de-metaphorization, which involves keeping the unpacked versions of the original noun compounds, can add useful information to a noun compound. Ambiguity regarding the interpretation of 3- and 4- constituent noun compounds proved to not necessarily be a problem for the translator. In the few cases where ambiguity is a problem, experience from the field where the text comes from, Plag’s ‘right-hand-rule’, and an analysis of the semantic relations in the noun compound can be used as guidance for the translator. In the small group of noun compounds translated using metaphorization it was proved that an omission of one noun could make the TT construction denser, without significant semantic loss. Metaphorization also proved to be an efficient strategy for the translation of 3- and 4- constituent noun compounds which may cause both syntactic and interpretive challenges. A small group of noun compounds had to be translated using different metaphorization strategies depending on context and grammar, something that the translator needs to be aware of in the creation of an idiomatic text that fits the target group.
Regarding translation strategies, this study shows that the classification of structural shifts in translation, based on the notion of grammatical metaphor, can be successfully used as a translation strategy for medical noun compounds. Steiner’s (2001:11+15) considerations regarding grammatical metaphor and his recommendation about the unpacking and analysis of a term before choosing to either metaphorize, de-metaphorize, or re-metaphorize it could be applied to all the noun compounds that were to be translated and provided help both regarding interpretation and translation choice.

Other useful translation strategies for this kind of text involved the general strategy of keeping the ST text close to the intentions of the original authors, by consistent use of established medical terms and a strictly formal language for medical purposes. Online dictionaries, bilingual medical dictionaries, internet-searches, and especially parallel texts proved to be essential for the purpose of finding the correct TT terms for use in emergency medicine. Own experience from the field provides a solid set of knowledge about the terminology which is used in professional contexts. This experience makes it easier to know what terms to search for, but it is also important to keep in mind that there may be other terms for expressing a certain process. Consulting experts from the field can be very useful for the translator, and experience from a specific field usually provides a network of experts that can easily be reached for consultation. Experience from a specific field also seems to help in the interpretation of noun compounds involving semantic ambiguity.

In this study, there were not as many problems with semantic ambiguity as expected regarding 3- and 4-constituent noun compounds. The findings that most of these compounds could be interpreted as the head noun furthest to the right, preceded by two nouns that combined to form a specific medical term, suggests that ambiguity need not be such a big problem after all. Nor does the interpretation of semantic relations between 3- and 4-constituent noun compounds have to be a problem, as expected by Rosario & Hearst (2001:3). Nakov’s recommendations regarding semantic interpretation were useful for the few noun compounds that were ambiguous or new to the translator. The classification of semantic relations in medical texts, based on Rosario & Hearst’s model (2001:4), also contributed to the semantic interpretation and further classification of noun compounds, but no statistically significant evidence that different semantic relations in medical noun compounds give raise to specific translation strategies could be established. A larger, corpus based study is therefore recommended if there is an extended interest in the investigation of the correlation between semantic relations and translation strategies.
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