Terminological Analysis in the Construction of a Body-systems-based Medical English Glossary

Simon FRASER
Walter DAVIES
Keiso TATSUKAWA
Kazumichi ENOKIDA
Institute for Foreign Language Research and Education
Hiroshima University

The authors of this article are involved in an EMP (English for Medical Purposes) project to develop a medical English word list embedded in a set of pedagogic materials for undergraduates in their second and third years of university study. Here, we investigate the vocabulary that has emerged in the project as the materials are developed. At the time of writing, approximately half the materials for the project are complete, and it is the medical terms that are built into these completed materials that we consider. In the background section, we outline the development and design of the materials, which have been constructed on the basis of body systems, and show how these materials have been informed by corpus analytical methods and the input of medical specialists. We then describe the process of extraction of the key terms from the materials and the lexical characteristics of these items, before considering how best to organize them into a final list, or glossary, oriented towards learnability.

BACKGROUND

An Intensive Course for Third-Year Medical Students

The six-year project of which this study is a part began with the teaching of an intensive medical English course to the third-year students of the medical faculty at Hiroshima University. This responsibility was undertaken by a team of applied linguists from the university's Institute for Foreign Language Research and Education. The materials for the initial course came from a variety of sources, including CDs from educational publishers, online resources, articles from Wikipedia, and tasks designed by the instructors themselves. One of the instructors (Fraser) had experience in analyzing the vocabulary of specialized texts, and he used corpus analysis software to produce a list of key terms for the course. Since the two essays used for summary-writing tasks were on ebola and tuberculosis, the initial word list was primarily oriented towards the description of infectious bacterial and viral diseases. Further useful words were identified by individual instructors in their teaching materials; these were added to the list, resulting in 380 items.

In the feedback given by the students at the end of the course, the teaching team was surprised to discover how highly the word list itself was valued. As a result, with the continuation of the course into a second year, a small research team was created to explore how vocabulary-oriented corpus research could be used to create a pedagogic word list and study materials. While medicine itself is not short of word lists, these tend either to focus on the academic vocabulary of medical research articles, or to consist of a huge

number of decontextualized terms. The word list envisaged by the research team, on the other hand, would be oriented towards learnability rather than reference. The main challenge we faced was how to choose a core of terms from the dauntingly large number of words that comprise the terminology of the medical field.

Creating a Pedagogic Word List

The initial strategy proposed in addressing the issue was to be a linear one, involving the construction and analysis of a corpus of medical research articles. This approach, based on the extraction of terms with wide range and high frequency from a carefully constructed corpus, had been successfully used by, among others, Fraser (2007; 2009) in developing pharmacology word lists, and Wang, Liang, and Ge (2008) in the creation of their Medical Academic Word List (MAWL). Approximately ten broad areas of medicine were to be identified, and, for each of these, around ten articles would be selected and used to create a 100-article corpus. Key words would be extracted from the corpus, forming the basis of a medical English word list. This list would then be used to construct pedagogic materials and glossaries for students.

Several problems quickly became apparent with the initial approach, including the focus of the corpus analysis and the timescale required for producing materials. Regarding the texts to be used to build our corpus, we learned from interviews with medical staff that reference books were more important than research articles in the early stages of students' studies, and that anatomy was considered the foundation of the medical curriculum. Also, a linear process, with materials design following on from corpus analysis and word list development, would take a very long time, possibly several years. Consequently, corpus analysis was switched from articles to reference books and undertaken in parallel with materials design and development.

The first reference book chosen for analysis was *Gray's Anatomy for Students*, which was stocked in the medical campus bookshop. At the same time, work was being undertaken on materials development in anatomy, drawing on the diagrams relating to body systems in Chabner's *Medical Terminology*. However, a major breakthrough was achieved due to the initial strategy of building an article-based corpus, which necessitated dividing the medical field into ten broad areas. In response to an emailed question on how these divisions should be made, a senior member of the medical faculty provided the following categories: *cardiovascular medicine*, *digestive medicine*, *respiratory medicine*, *neuromusculokeletal medicine*, *infectious diseases and immunology*, *oncology*, *developmental medicine*, *nephrology and endocrinology*, *critical care and anesthesiology*, *sensory organology*. Although the question had been oriented towards corpus design and development, from a materials design perspective, the categories indicated that coherent units of material could be built on a body systems basis (Table 1), the exceptions being *oncology* and *critical care and anesthesiology*.

Word list development has emerged from the interplay of materials design and corpus analysis, with corpus analysis proving most valuable as a means of monitoring and editing the materials. In some cases, this has involved the creation of a whole unit. For example, analysis of *Gray's Anatomy* for *Students* (Fraser et al., 2014) showed the importance of positional terms such as *superior*, *inferior*, *posterior*, *anterior*, *distal* and *lateral*. Even the terms *left* and *right* are important in relation to the *anatomical position,* the key reference position for all medical specialists. In addition, subsequent analysis of *Harrison's Principles of Internal Medicine* (Fraser et al., 2016) has enabled us to sharpen the language of the pedagogic units and

include more key terms and text-structuring phrases. For example, a unit on the cardiovascular system has been modified to include the important terms *systole*, *systolic blood pressure*, *diastole*, and *diastolic blood pressure.*

TABLE 1. Units Based Primarily on Body Systems

1. Anatomical position	planes, terms of location, views
2. Orthopedics	musculoskeletal system (knee)
3. Neurology	central nervous system (brain)
4. Cardiology	cardiovascular system (heart)
5. Pulmonology	pulmonary system
6. Immunology	lymphatic system
7. Dermatology	integumentary system
8. Gastroenterology	digestive system
9. Endocrinology	endocrine system
10. Hepatology	digestive system (liver)
11. Nephrology/Urology	urinary system
12. Gynecology/Urology	female and male reproductive system
13. Ophthalmology	sense organs (eyes)
14. ENT	sense organs (ear, nose, throat)

EXTRACTION OF KEY WORDS FOR ANALYSIS

The analysis in this article is based on the first seven units of pedagogic materials listed in Table 1. This has been done manually through a review of the units to identify key words, which have been listed on spreadsheet pages, one spreadsheet page for each unit, with the terms ordered alphabetically on each page. The seven pages have then been unified into one list with terms presented in alphabetical order. This process has allowed us to identify which terms occur in more than one unit, and it has also helped with the identification of useful affixes, which may occur in different units.

TABLE 2. Number of Terms per Unit

Body system	Terms (n.)
1. Planes, terms of location, views	121
2. Musculoskeletal system (knee)	165
3. Central nervous system (brain)	152
4. Cardiovascular system (heart)	137
5. Pulmonary system	170
6. Lymphatic system *	105
7. Integumentary system *	106

* Incomplete unit, missing a section on treatment

With the unified list, when the repetitions are removed, we are left with a list of 855 terms for examination. At this stage of the research, it is important to note the following: The first five units are complete units of material, in contrast to Units Six and Seven, which lack a final section on treatments. The number of terms extracted from each unit is shown in Table 1, with the number of terms for the first five units averaging 149. A rough estimate of the size of the word list emerging from 15 units is 2,235 terms. While this is the calculation before analysis, from a pedagogic perspective, we would consider it to be a manageable number for students. In the analysis that follows, we examine the words more carefully to see what, if any, changes need to be made to the list.

ANALYSIS

In this section, we look at the terms in our preliminary list and investigate them from the following perspectives: Types and characteristics of medical terms; morphology of terms (structure of words and word parts); and considerations of the definition of "word" (e.g., single words vs. multiword units; types, lemmas, and word families).

Types of Medical Term

Traditionally, the vocabulary of specialized texts has been divided into technical and subtechnical or semi-technical categories. However, as Fraser (2006) points out, these terms are used inconsistently in the literature, and in the present article we adopt the categories suggested by Fraser, which we believe more accurately reflect the nature of the different kinds of vocabulary found in a specialized text: fully technical, cryptotechnical, and lay-technical terms. To illustrate these different types of medical term, we take words mainly from the Central Nervous System (CNS) unit as examples.

Fully Technical Terms

This category consists of words which are highly specific to the field and unlikely to be known in general language. They are almost exclusively of Greco-Latin origin (e.g., *astrocytoma, craniotomy, gyrus*), but we also find terms like *burr hole*, which will at least seem familiar to the layperson. Other multiword terms include *anterior cerebral artery*, *arachnoid membrane*, and *ultrasonic surgical aspirator*.

Cryptotechnical Terms

Cryptotechnical vocabulary consists of polysemous words, found in general language, which have an additional technical meaning that may be obscure to a non-specialist. These are more commonly known as subtechnical or semi-technical words, with the implication that they somehow lack in "technicalness". However, when they occur in a specialized text, they are used in the same way as words which are clearly and unambiguously technical. Examples of cryptotechnical words found in the CNS unit and used in neurosurgery are *compression, reflect, tension, navigate*, and *fix*.

Lay-technical Terms

These are words which are obviously technical, but whose basic meaning would still, to some extent, be understood by someone without specialist knowledge in the field. Words of this type in medicine include

acute, blackout, diagnosis, faint, chemotherapy, and *heal.* Of course, it is safe to assume that words such as *blood, headache*, or *knee* will be known, but they may not be as straightforward as they first appear, especially in the ways that they combine with other words to form more obviously technical multiword terms.

General words

In the list, we also find a considerable number of general words whose meanings, unlike those of cryptotechnical words, are substantially unchanged in medical texts. However, these words play an important role in medical descriptions and explanations, and so should be listed, along with examples of the contexts in which they occur and the ways in which they combine to form technical terms. Words of this type include *loss* (*memory loss, loss of blood*), *continuous, shrink,* and *insert.*

Morphology of Medical Terms

In examining the words in the list, we see that many of them are made up of two or more clearly discernible components. Chabner (2012) draws our attention to the importance of understanding the ways in which complex medical terms are made up of their constituent parts, noting:

> Medical words are like individual jigsaw puzzles. Once you divide the terms into their component parts and learn the meaning of the individual parts, you can use that knowledge to understand many other new terms. (p. 2)

Chabner argues that the best way to read a technical term is to read the suffix (the label she gives to "word ending") first, and then start from the beginning of the term. For example, *electrocardiogram* can be read as a record *(-gram*) of the electricity (*electr/o*) in the heart (*cardi/o*). Chabner defines the important parts of a word in the following way:

1. Root—gives the essential *meaning* of the term.
2. Suffix—is the word *ending*.
3. Prefix—is a small part added to the *beginning* of a term.
4. Combining vowel—*connects* roots to suffixes and roots to other roots.
5. Combining form—is the combination of the *root* and the *combining vowel.* (p. 4)

This is a practical and valuable way of classifying word-formational patterns, and it underlies the analysis in the present study. However, it is something of an over-simplification, and from an EFL pedagogic perspective a more detailed examination is required in order to better understand patterns of derivation and compounding, as well as to resolve issues relating to word types, lemmas, and word families. We begin by expanding on and fleshing out the detail in Chabner's definitions.

Word Root

Chabner's definition, while correct, is somewhat vague, and a more helpful definition is provided by Adams (2001: 17): "… a form stripped of all inflectional, derivational or combining elements." Word roots

may be free elements, able to occur on their own (often known as bases), or bound forms with no independent existence (stems). Stems represent Latin and Greek nouns, adjectives, and verbs, and they have as broad a range of meaning as English nouns, adjectives, and verbs.

Suffixes / Final Stem-Elements

Chabner defines *suffix* as "the word ending", but this definition obscures the fact that a word ending can be a bound element which attaches to the root but has no meaning of its own (the traditional definition of suffix), or it can be the final element of a stem compound (Adams, 2001). It is helpful to consider the different types of word ending separately, because as Schmitt (2000) points out, the way in which the mental lexicon deals with affixes (and hence learning difficulty) depends to a large extent on what kind of affixes they are. To exemplify the very different types of word endings we find in medical terms, let us consider the 20 elements listed by Chabner in her first chapter (pp. 15-17) and considered by her to be suffixes. The items are: *-al*, *-algia*, *-cyte*, *-ectomy*, *-emia*, *-globin*, *-gram*, *-ia*, *-ic*, *-ism*, *-itis*, *-logist*, *-logy*, *-oma*, *-opsy*, *-osis*, *-scope*, *-scopy*, *-sis*, and *-tomy*.

The first point to note is that the items in the above list are almost all noun-forming; the exceptions are *–al* and *–ic*, which are clearly different from the others in that they are used to create adjectival forms. We also find that many of the endings are semantically autonomous, having meanings of their own which are independent of those of the bases they attach to or of the words in which they appear. Examples of these are *-cyte* (cell) and *-globin* (protein). These do not behave in exactly the same way: *globin* is the base form of a root word (*globin, hemoglobinopathies, globinal regulator*); *-cyte* is clearly linked to *cyto-* as in *cytology,* with both being derived from *cytos* (receptacle). Consequently, *cyt/* can be considered a stem (see below) to which *-e* or *-o* can be added depending on whether it is used as a word-initial or word-final element. Another interesting combining form is *-oma* (tumor/mass). When denoting tumors, *-oma* is used at the end of a term (*carcinoma*), whereas *onco-* (relating to tumors) is used at the beginning.

Prefixes

Adams (2001: 41) defines prefixes as "bound forms which attach initially to bases". These can be distinguished semantically from stems, or initial combining forms, such as *onco-, gastro-*, or *hepato-*. In a scientific register such as medicine, many prefixes combine productively with stems to form adjectives and nouns. Adams groups prefixes into the following categories: locative (e.g., *pre-, super-*); quantitative (*poly-, mono-*); reversative (*de-, dis-*); and negative (*an(a)-, un-*). Locative prefixes are of particular interest to us, occurring frequently in anatomical nomenclature: body parts, organs, and features. Taking *intra-* and *peri-* as examples, *intracranial* has the meaning "within the skull", and *periosteum* means "surrounding bone".

Combining Vowels / Forms

A combining vowel connects roots to suffixes, as well as roots to other roots. The vowel is usually *o* in Greek compounds, or *i* in Latin compounds). A combining form, also known as a stem, is the combination of the base form of a root and the combining vowel (e.g., *lymph/o-* as in *lymphocyte*), and, as mentioned above, does not exist independently.

Defining the Concept of "Word" in a Pedagogical List

Word Families

One of the key issues in lexical analyses and studies aiming towards the development of word lists is deciding what the unit of counting items in the list should be: word type, lemma, or family. This choice depends on the purpose of the word list, and it should be clear how the chosen unit best reflects that purpose. Regarding technical vocabulary, although the word type is usually preferred, Nation (2016) believes that it is acceptable to have a mixture of types, lemmas, and word families in a list, as long as all the members of a lemma or family are closely related semantically and are technical words in that field. If we do decide upon word families, we then need to consider which words should be included in the family. To this end, Bauer and Nation (1993) set up seven levels of affixes based on their frequency of occurrence, regularity, and predictability. However, decisions can be difficult because of the existence of polysemes and homonyms. Bogaards (2001: 323) illustrates this problem by questioning the shared ancestry of *sauceboat, saucebox, saucepan*, and *saucy*. In medicine, although the familial relationships might be more obvious, it is still by no means clear whether *basis, based (on), basic, baseline*, *basilar (artery)*, and *basal (ganglia)*, for instance, should be grouped together. Also, there are clearly word parts, such as *–cyte* and *hemo-*, which fit into semantic groups organized around a central meaning (*cell, cellular, cyt/o, -cyte; blood, bloody, hemo-*). An additional concern is, as Gardner (2007) points out, that even advanced learners will not necessarily recognize all, or even most, of the words in a family. However, this is an area in which specialized words may be less problematic than general words, in that their meanings are less likely to change over time. A fully technical word such as *intraperitoneal*, for example, may be complex in terms of form, but it has just one, fixed, meaning.

Multiword Terms

We saw earlier that medical terms can be made up of more than just single words. There are many types of multiword unit, including phrasal verbs, lexical chunks, and idioms, but the category we are interested in here when considering medical terminology is compound words. Compounds are created when two or more words are combined to form a single unit of meaning, or lexeme (Schmitt, 2000). Examples of these are *superior vena cava* and *vertebral column.* How should these word combinations be listed? In most cases, separating them and presenting the components individually will create confusion rather than clarity. For example, *superior* can be separated from *vena cava*, but because of the importance of *superior vena cava* and *inferior vena cava* as single-entity terms, this not practical. An analogy can be made with place names: To separate *vertebral* from *column* would be akin to separating *Nelson's* from *column*. The parts of the body have been identified and named and should be listed in their completeness. However, it may also be useful to list the individual words making up the multiword units separately. In the same way that an EFL learner might find it useful to understand the meaning of *square* in relation to *Trafalgar Square* and *Leicester Square*, so it is useful to know the term *cavity* in relation to *cranial cavity*, *thoracic cavity*, and *abdominal cavity*. Consequently, when we review the word list, ensuring that single-word terms with wide application are listed separately may help students in their learning and understanding of compound medical terms.

Glossaries in the Teaching of Specialized Language

A glossary is "essentially a list of terms in one or more languages" (Bowker & Pearson, 2001: 137) and typically contains the key words in a particular domain, listed alphabetically, along with their translations. Glossaries can range from very basic word lists to richly detailed references containing definitions, explanations, and examples. In the ESP (English for Specific Purposes) classroom, glossaries are often provided as a means of addressing the problems associated with dictionaries, such as their incompleteness and the fact that they do not provide enough in the way of contextual or usage information. In compiling a glossary of medical terms, the following issues need to be addressed: How to group the terms, how to deal with affixes and word parts, and what information to provide about each entry in the glossary.

PLANNING THE GLOSSARY

The word list from which our glossary will develop has resulted from the extraction of the terms from the teaching materials themselves, and through an analysis of these terms. As a result, a key problem of how to group the terms is already solved: As with the materials, they can be organized into approximately 15 groups based on body systems and associated medical fields; a pedagogic structuring is already in place. Within these groups, the question is then how best to present the terms for ease of learning.

Listing Terms and Word Parts

Types, Lemmas, and Families

Efficient learning is our priority, not the compilation of a list based on frequency counts and used for comparison purposes (although we should have some understanding of what we mean when we talk about a "list of 2,235 terms"). Therefore, as Nation suggests, there is no problem in using a mixture of types, lemmas, and word families; what is important is that the members of a family should all be used as technical words in the field, and that the semantic relationship between them can easily be discerned. Also, as discussed above, multiword units (compound terms) should be listed in the same way as single-word items.

Affixes and Combining Forms

By listing the most useful prefixes, suffixes, and combining forms in the glossary, we can encourage learners to analyze words of Greek or Latin origin whenever possible and relate the meanings of the word parts to the meaning of the word. Clearly, if learners can recognize the meaning of an affix, they will have a better chance of guessing the word's definition more accurately. In short, familiarity with these word parts will enable access to a large number of technical words in the broad field of medicine.

In glossary construction, the most important consideration is whether a word part is useful, and if so, how it might be listed. While it is important for the purposes of analysis to consider whether a word part is an affix with no independent meaning or a semantically independent stem, the semantic distinction between the two is often ambiguous (the suffix *–itis*, for example, indicating inflammation, might be considered to have a certain degree of semantic autonomy).

When considering the usefulness of an affix or combining form, it may be helpful to think in terms of its "productivity". This, as defined by Adams (2001: 146), is "a useful heading under which we can review an array of conditions and circumstances which may affect the ease or frequency with which words are

formed on particular patterns".

The Three Major Parts of the Glossary

In this section of the article, we focus on the central nervous system (CNS) unit vocabulary to illustrate how the overall glossary can be effectively constructed. This construction involves dividing the glossary into three parts: Part 1 lists key words alphabetically within their respective unit domains; Part 2 lists the entire list of key words alphabetically; Part 3 lists word parts (combining forms and affixes).

Part 1

A major issue is learnability, in which a key aim is to present words in a manner that connects them from a discourse and semantic perspective. In the CNS unit, we have extracted 152 key terms. These appear in the materials and can be considered primary terms for listing alphabetically within their unit domain (the central nervous system). For referencing the terms, each unit can be allocated a letter (see Table 3), and each term within the unit a number. Consequently, the first term in the central nervous system section, *abnormal*, is allocated the reference C001.

TABLE 3. Units Based Primarily on Body Systems

1. Anatomical position	A
2. Orthopedics	B
3. Neurology	C
4. Cardiology	D
5. Pulmonology	E
6. Immunology	F
7. Dermatology	G
8. Gastroenterology	H
9. Endocrinology	I
10. Hepatology	J
11. Nephrology/Urology	K
12. Gynecology/Urology	L
13. Ophthalmology	M
14. ENT	N

As the adjective *abnormal* is the form appearing in the pedagogic materials, it is treated as a headword. However, another member of the word family is *abnormality*, and a check with our *Harrison's Principles of Internal Medicine* corpus shows that this is a frequently occurring form, and so should also be listed within the entry. Given that the term *abnormal* appears in the materials, a sentence example can be constructed:

C001 abnormal (*adj*) 異常な abnormality (*n*) 異常	Drowsiness is defined as abnormal sleepiness during the day.

A further complexity occurs in relation to semantically linked terms, particularly the links between words and word parts. For example, consider the relationship between *tumor* and *-oma*, both of which occur frequently in the CNS pedagogic unit. Although not technically part of a word family, the combining form *-oma* is very important from a semantic perspective, and helps with the understanding of a variety of terms denoting tumors, such as *adenoma* and *angioma*. From a pedagogic viewpoint, therefore, *-oma* should be listed in the entry for *tumor,* along with another important word part, *onco-*.

[C148] tumor *(n)* 腫瘍 -oma *(wp)* onco- *(wp)*	Brain tumors are due to abnormal cell division which may be benign or malignant.

It is also important to note that a number of headwords may be repeated throughout the 15 sections. For instance, *tumor* also appears in Unit 8: *Colon cancer is the growth of a malignant tumor in the colon*. Such items need to be listed and referenced, so that no matter which section of the glossary students are using they will be able to find their way to the entry.

[H85] tumor *(n)* 腫瘍	See C148

Part 2

In Part 2 of the glossary, the complete list of headwords can be shown, with a reference to the items in Part 1. This allows for the analysis of the full list and acts as an easy access glossary for students who want to quickly look up a word.

abdominal cavity *(n)* [EXXX] 腹腔
abnormal *(adj)* [C001, DXXX] 異常な
abscess *(n)* [GXXX] 膿瘍
absorb *(v)* [EXXX] 吸収する
ache *(n,v)* [BXXX] 痛み，痛む

Part 3

Here, word parts will be listed with examples of their use in full medical terms. As noted above, *-oma* is an important word part, occurring in multiple terms denoting tumors: *adenoma*, *astrocytoma*, *angioma*, *glioblastoma*, *glioma*, *medulloblastoma*, *meningioma.* Consequently, the word part can be listed with referenced examples from part 1.

-oma	tumor	腫瘍	adenoma[C003], angioma[C007], astrocytoma[CO16], glioblastoma[CO67], glioma[C093]

As we have noted in the analysis above, word parts behave and combine in a variety of ways, and the ways in which medical terms are formed from them is a complex process. However, while it is important to present information about terms and parts in a systematic manner, the glossary itself should be easy to use. Chabner lists 353 word parts by alphabetical order at the end of her book, and this is probably the easiest way

to do it, separating them into word-initial and word-final parts. For the glossary under discussion here, providing example terms with their Part 1 references allows readers to find them in Part 1.

Complexity of Analysis, Simplicity of Presentation

In this article, we have sketched a plan for creating a glossary of approximately 2,000 headwords, but with related forms and word parts also listed. As we have noted, the analysis of medical terminology is complex, and it might be argued that the way we are presenting word parts is somewhat simplistic in consideration of the preceding analysis. Regarding this potential issue, we argue that while a teacher needs to be aware of such complexity, for students it is important to have a simple and straightforward presentation of terms and word parts. This is also true when we consider how to deal with the different categories of technical vocabulary (e.g., cryptotechnical, lay-technical words). The glossary is planned so that students can refer to terms directly from teaching materials. Our approach to teaching medical terminology is to present it in context, and then sensitize students to the words or word parts that make up the terms. As MacDonald (2015) observes, students need to have acquired a certain level of medical vocabulary before they will be able to identify word parts. A teacher, too, needs to develop a good understanding of medical terminology so that she/he can offer students an insight into the meanings across and within words. Given that the glossary represents a word list that is embedded in a set of pedagogic materials, the teacher's guide to these materials needs to be written carefully to give EMP teachers sufficient guidance on how to teach terminology and illustrate its use.

CONCLUSION

This article has detailed the investigation of a section of the vocabulary emerging in a medical English project at a Japanese university. The word list resulting from analysis of a set of pedagogic materials will form a core glossary of around 2,000 terms for undergraduate students. We have shown how the glossary will be constructed for ease of use by students of medical English, and how an analysis of the terms offers a framework by which materials for teachers can be created to assist them in the often daunting task of teaching EMP.

The project itself has been designed to maximize the use of corpus analysis methodology within the framework of a communicative approach to language teaching, one that has a focus on discourse and meaning in context. As we have noted, students often place high value on lists, and this may be explained by the apparent simplicity of learning sets of words. However, to be able to use those words effectively, students need to engage with them actively in both receptive and productive language activities. Throughout the project, we have metaphorically described the word list as a spine: a central support structure; something very important but not to be used in isolation. By creating a glossary for a word list embedded in pedagogic materials we seek to create a reference document that is a valuable aid for students and teachers alike as they face the challenges of learning a specialized professional discourse.

REFERENCES

Adams, V. (2001). *Complex Words in English*. Harlow: Pearson Education.

Bogaards, P. (2001). Lexical units and the learning of foreign language vocabulary. *Studies in Second Language Acquisition 23*, 321-343.

Bauer, L., & Nation, I.S.P. (1993). Word families. *International Journal of Lexicography 6* (4), 253-279.

Bowker, L. & Pearson, J. (2002). *Working with Specialized Language*. London: Routledge.

Chabner, D-E. (2015). *Medical Terminology* (7th ed.). Maryland Heights, Missouri: Elsevier Saunders.

Drake, R., Vogl, A., & Mitchell, W. (2004). *Gray's Anatomy for Students.* London: Churchill Livingstone.

Fraser, S. (2007). Providing ESP learners with the vocabulary they need: Corpora and the creation of specialized word lists. *Hiroshima Studies in Language and Language Education, 10,* 127-143.

Fraser, S. (2009). Breaking down the divisions between general, academic, and technical vocabulary. *Hiroshima Studies in Language and Language Education, 12,* 151-167.

Fraser, S. (2012). Factors affecting the learnability of technical vocabulary. Findings from a specialized corpus. *Hiroshima Studies in Language and Language Education, 15,* 123-142.

Fraser, S., Davies, W., & Tatsukawa, K. (2014). A corpus analysis of an anatomy textbook: Preliminary findings and implications for medical English development. *Hiroshima Studies in Language and Language Education, 17,* 119-140.

Fraser, S., Davies, W., & Tatsukawa, K. (2016). Applying internal medicine corpus analysis findings to the development of pedagogical materials. *Hiroshima Studies in Language and Language Education, 19,* 109-128.

Gardner, D. (2007). Validating the construct of word in applied corpus-based vocabulary research: A critical survey. *Applied Linguistics 28* (2), 241-265.

MacDonald, W. (2015). The efficacy of the etymological approach in English as a Foreign Language Instruction for Japanese medical students. *Journal of Medical English Education, 14* (1), 25-34.

Nation, I.S.P. (2016). *Making and Using Word Lists for Language Learning and Testing*. Amsterdam: John Benjamins.

Longo, D., Fauci, A., Kasper, D., Hauser, S., Jameson, J., & Loscalzo, J. (2012). *Harrison's Principles of Internal Medicine* (18th ed.). New York: McGraw-Hill Education.

Schmitt, N. (2000). *Vocabulary in Language Teaching*. Cambridge: Cambridge University Press.

Wang, J., Liang, S-l, & Ge, G-c. (2008). Establishment of a medical academic word list. *English for Specific Purposes, 27*(4), 442-458.

ABSTRACT

Terminological Analysis in the Construction of a Body-systems-based Medical English Glossary

Simon FRASER
Walter DAVIES
Keiso TATSUKAWA
Kazumichi ENOKIDA
Institute for Foreign Language Research and Education
Hiroshima University

This article provides an account of the process involved in creating a glossary of medical terms for undergraduate medical students. The present work forms part of a long-term EMP (English for Medical Purposes) project to develop pedagogic materials for students in their second and third years of study. The glossary, which is under development, will be an extension of a word list emerging from the interplay of materials design and corpus analysis. The units of materials are based on body systems, and have been informed by the input of medical specialists as well as corpus analytic methods.

We begin by describing the process of extraction of key terms from the classroom materials, before investigating the lexical characteristics of these items. Particular attention is paid to the morphology of words and the ways in which word parts and affixes combine to form complex medical terms. We then show how the glossary will be constructed for ease of use by students of medical English, and how our analysis of the terms offers a framework by which materials can be created for teachers to aid them in the challenging task of teaching EMP.

要　約

人体の構造と機能（Body Systems）に関する「医学英語用語集」構築に関わる語彙的分析

サイモン・フレイザー
ウォルター・デイビス
達　川　奎　三
榎　田　一　路
広島大学外国語教育研究センター

本稿は，医学部生のための「医学英語用語集」構築に関わる過程を詳述するものである。この研究は，長年にわたる「医学を目的とした英語（教育）= English for Medical Purposes, EMP」プロジェクトの一部であり，医学部2・3年生を対象とした教材開発を目指している。現在開発中の「医学英語用語集」は，教材作りとコーパスを用いた分析の相互作用を経て作成した「語彙リスト」を発展させるものになる予定である。教材の章分けは「人体の構造と機能」に基づいており，医学専門家からの助言とコーパス言語学の知見を生かしたものとなっている。

ここではまず，教材に登場する重要術語の抽出過程を報告し，その後これらの用語の語彙的特徴を探求する。とりわけ，語の「形態」や，語区分や接辞がどのように組み合わされて複雑な医学用語が作られているかに焦点を当てたい。その後，その用語集をどのように編めば医学英語生にとって学びやすいか，また，筆者らの語彙分析の成果が，決して容易ではない「医学英語教育」に従事する教師の教材開発をどのように支援できるかを示したい。