

A Background Study for the Development of Medical English Corpora, Word Lists and University Course Materials in Japan

Walter DAVIES
Simon FRASER
Keiso TATSUKAWA

Institute for Foreign Language Research and Education
Hiroshima University

In this article, we summarise the background research of a project to improve the learning of medical English in Japan. Previous teaching and research (Davies et al., 2013) has indicated that medical students place a high value on medical word lists in their studies. The current research has started with the aim of integrating corpora, word lists, syllabuses, and learning materials for university medical staff and students in Japan. A further key component of the project is to work with medical teaching staff to allow for their input and decision-making in building such pedagogical materials. Here, we describe the planning and background research in the project, which is based on interviews, discussion via email between applied linguists and medical teaching staff, as well as more informal data gathering through conversations with medical students and staff.

The research has been anchored by a focus on a key problem in a particular context: How do we improve the medical English of the undergraduate students in a particular medical faculty? In the ongoing process of addressing this problem, we believe that the project will yield results that will have wider relevance. It originated in the need to build a course for third-year medical students (Davies et al., 2013), and this acts as a focal point, requiring a bridge between corpus analysis and learning context, so that the creation of corpora and word lists are to be used in the development of teaching materials and syllabuses. While some decisions on what to teach and how to teach may be very specific, relating to a particular curriculum and set of institutional arrangements, areas such as the corpus analysis in the project may have relevance that goes beyond EFL and ESL.

In terms of English language education for medical faculty students, a considerable amount of knowledge is held by the authors of this paper, and it is against this background that consideration is given to developing the pedagogical materials. Medical students, like almost all other undergraduate students at the university, undertake two years of general English classes. In their first year, students take four classes, each of which emphasises one of the skills of reading, writing, speaking, and listening. In their second year the students take two classes, one with a focus on the productive skills of speaking and writing, and the other which emphasises listening and reading. Medical students also receive further English classes from a specialist in

their faculty. Since 2012, a four-day intensive medical English course has been held in September for third-year medical students, and it is the development of this course which has led to the current project. As noted in a previous article (Davies et al., 2013), it is clear that students also learn English from their own medical teaching staff, but the extent of this is not known.

LITERATURE REVIEW

Dudley-Evans and St John (1998) cite Berwick's (1989) view that, as ESP (English for Specific Purposes) practitioners, we need to know exactly what we are trying to find out and what we will do with the answers to the research before we start. An issue here relates to adaptability. Concerning this three-year project, as experienced researchers, we have a general plan; we know the direction in which we are travelling, and we are aware of the possibilities that are open to us. The research can be summarised as follows: The aim is, with the help and advice of medical teaching staff, to develop corpora, word lists, syllabuses and teaching materials for medical students with each of the components informing the others. We do not know the exact content areas that we are trying to find, but we have a clear conception of what the end products of the process will look like. Within this framework, a great deal lies open. For example, are the corpora primarily tools for the creation of word lists and syllabuses or is their role potentially much more autonomous? If the corpora are made available to medical students and staff, what effect will they have on the development of medical English within the faculty? This particular issue is reflected in the interview data, where the medical staff have concerns for English that extend beyond their ideas on the intensive medical English course; students and staff are involved in the writing of medical papers and conference presentations, and they may find it very valuable to have access to a medical corpus which gives them examples of how a term is used. In contrast, some undergraduates may have more interest in key word lists and teaching materials, rather than puzzling over the various examples that a corpus provides. Consequently, although we have a broad direction, and will produce corpora, word lists, syllabuses and materials, factors such as new information, technology such as scanners and software, institutional arrangements, and joint decision-making will influence the development of the overall project.

Needs Analysis, Evaluation, and Means Analysis

Much of the research in this article links to needs analysis. However, what is the needs analysis approach taken and how does a needs analysis fit within the overall structure of the research? As Dudley-Evans and St John (1998) note, needs analysis is often seen as something that is done prior to other stages in course development, being the first step in a five-stage circular process: Needs analysis leads to course design, which leads to teaching-learning, followed by assessment, then evaluation. This then leads to the next cycle. As they point out, needs analysis (focused on the *what* and *how* of a course) and evaluation (establishing the effectiveness of a course) are not one-off but ongoing activities. In this research, it is important to make a distinction between the macro-level and micro-level and more formal and informal processes.

For example, on a micro-level many reflective teachers are in a process of constant evaluation in relation to the success or failure of particular materials and teaching techniques in their classrooms. This process of constant fine-tuning may well be the reason for success at the macro-level of overall course aims, but it may not be a formal process. It may take the form of a teacher using his/her experience to gauge the reactions of students to the teaching of new material. This contrasts with more formal evaluation in the form of questionnaires to students, involving number scales and written feedback. Also, while the five stages are all important to consider, Dudley-Evans and St John observe that they are highly interlinked. They also observe the importance of means analysis, which effectively focuses on the resources available to the course-builders as well as the constraints.

Syllabus and Materials Development

One of the key aspects of the research is the development of corpora and word lists that involve the judgements of members of a medical faculty, but this is being done in conjunction with the development of teaching materials. In relation to pedagogy, the background ideas fall within the broad range of the communicative approach. Clearly, one component of course development on this project is lexis. However, as noted in a previous article (Davies, 2012), in an approach that places a high value on communicative competence, a syllabus will not necessarily contain items of only one type such as lexis. In this sense, following Swan and Walter (1990) a multi-syllabus approach can be used. In the case of the current research, a set of sub-syllabuses will be used for building a course. In course design, the plan is to construct the overarching syllabus and materials through a process of judgement and decision-making which includes consideration of topic, lexis, grammar and task. However, a further point relates to the wider issue of where and when English learning is taking place within the faculty. As the data in the results and discussion section in this research indicate, English learning is happening beyond the sphere of English-language courses. From this perspective, the development of purely lexical syllabuses for English medical terms may be of use to medical teaching staff, who can use them to refine how they are bringing English terms into their medical courses.

RESEARCH METHOD

As Hutchison and Waters (1987) observe, there are a number of ways in which information can be gathered about needs: questionnaires; interviews; observation; data collection; informal consultations with sponsors, learners and others. This article is based on both formal and informal research processes, defined as follows: A formal research process follows an established set of research procedures, in contrast to informal research processes such as conversations, and chance observations. While the former is central to academic research, the latter may offer leads and possibilities that formal research misses. The results and discussion section incorporates both types of research, with the formal research acting as the core or spine with the informal research findings linked to it.

Formal Research: Interviews

In terms of formal research to gain some understanding of the medical faculty and medical teaching staff's views on the English that should be taught, the dean of the medical faculty organized three interviews with senior medical staff who are also involved in the teaching of students. The interviews were conducted on a one-to-one basis and lasted between thirty and forty minutes. The original plan was to record the three interviews and then summarise them. Due to a failure of recording equipment in the first interview, the interviewer took notes and made the summary on the basis of those notes. The other interviews were recorded, transcribed, and summarised. The summaries were then sent by email to the interviewees for comments if they so wished. A further part of the background research arose from email exchanges on the basis of the results of the interviews.

Informal Research: Conversations

Important pieces of information came to light through conversations with students and medical teaching staff. In contrast to an interview, in which, for the most part, the interviewee is responding to specific requests for information, conversations are more spontaneous and free flowing. For example, after some anatomy worksheets were produced in classes on the medical campus, several students started talking about their studies and reference books. This informal research added a great deal of richness to the understanding of the medical faculty.

General Approach to the Background Research

The interviews were semi-structured, with the interviewer seeking information in the following key areas:

1. *Organization of the medical faculty and areas of specialism.* The plan for building the corpus has been outlined in previous research (Fraser, 2013), requiring the identification of key medical areas from which to obtain medical articles. It was assumed that specialisms would be reflected in the organization of the faculty.
2. *Stages in the education and training of medical students/young doctors.* The anchoring point of the research is an intensive medical English course for third-year students (Davies et al., 2013). It was important to establish what students learn prior to the course and after.
3. *The views of medical staff on what English students should learn.* It was important to gain a perspective on what medical practitioners felt was important for students to learn in English.
4. *Medical practitioners' use of English.* One part of this project is to factor in the English needs of practising doctors in considering what to teach medical students. In previous research (Davies, 2013), an interview with a neurosurgeon at a non-university hospital indicated that he used English mainly for reading medical articles. As researchers, we were interested to see if the same applied in interviews with university hospital medical

staff.

5. *Key reference books and journals.* A major component of the project involves the building of corpora. Although the interviews involved only three specialists, we wished to see what major reference books and journals the interviewees recommended, which we could then consider for inclusion in the corpora.

RESULTS AND DISCUSSION

This section has been organized into sub-sections on the basis of the first four categories listed above. A further category emerged during the interviews, which concerned perceptions of students' abilities, motivation, and barriers to learning English. In relation to area 5 above, reference books and journals, these have not been written up as a sub-section, but the key reference books have been discussed within the other four sub-sections. In relation to such books, further data were collected through more informal processes, in which students and staff pointed out key medical books used for learning medical English.

Organization and Specialist Groups

There are about 18 hospital departments plus other groups within the Faculty of Medicine. The departmental organization is highly complex. For example, in relation to gastroenterology within the faculty, professors are spread across a variety of departments, such as Endoscopy, Hepatology, and Palliative Medicine. Within the Department of Surgery, there are three kinds of digestive surgeries, so the way the professors are organised is in overlapping groups and sub-groups, with specialist knowledge in a particular field being spread across a number of groups.

As applied linguists, we had hoped to find a simple diagram that would reveal structures and specialties. Through the interview process, it became apparent that if a diagram were constructed it would be a highly complex Venn diagram of overlapping circles. From the perspective of building a corpus, the complexity of the medical faculty presented the problem of identifying key medical areas. The process of building the corpus was planned on the basis of Fraser's (2013) construction of a pharmacology corpus, where ten key fields within pharmacology were identified and used to select 100 articles which were used to build the corpus. Following this approach, a major aim for the interview research was to identify the key areas through the interviews. However, due to the range of groups within the faculty and their specialisms, the interviewees felt it was difficult to classify the medical field into just ten major areas. With the pharmacology word list, Fraser (2013) had used his own background in the field to identify key areas. However, none of the applied linguistics research team has a background in the wider field of medicine and so it was necessary for the medical faculty to make a decision on the medical areas as a basis on which to start building the corpus. Consequently, we contacted the dean of the medical faculty, who asked a senior faculty member to demarcate the key areas. The provisional list is as follows:

1. Cardiovascular medicine
2. Digestive medicine
3. Respiratory medicine
4. Neuromusculoskeletal medicine
5. Infectious diseases and immunology
6. Oncology
7. Developmental medicine
8. Nephrology and endocrinology
9. Critical care and anesthesiology
10. Sensory organology

This list provides the initial starting point on which to start selecting articles. It has been made on the basis of a request for ten categories, but if necessary it can be extended. For example, neuromuskuloskeletal medicine appears to be a particularly large category and could be divided into neurology and musculoskeletal medicine.

Stages of Medical Education and Training

In terms of the structure of the university program for medical students, they spend their first two years studying basic knowledge about the human body: anatomy, physiology, and biochemistry. In the third and fourth years of the course, students take a wide variety of medical lectures.

In the fifth year, students visit the different hospital departments and experience what happens in them. They do a bedside learning course, and they also take some concentrated lectures. At the end of the fifth year they choose a specialism, and spend their sixth year working with doctors in that specialism. Students deal with patients when they are allowed to in these years.

To qualify as doctors students must pass the CBT and the OSCE. The CBT is Computer Based Testing in which students answer multiple choice questions on general medical knowledge. The OSCE is the Objective Structured Clinical Examination, in which students have to demonstrate medical knowledge, behaviour (manner in relation to a patient), and practical skills such as examining a patient.

Once the student has become a doctor he/she undergoes a two-year period of general residency, working in a hospital. After this, the doctor undertakes a period of special residency, which varies with the specialism, but is often around three years. Until recently, all doctors in general practice were originally trained as specialists. Now, general practice is becoming recognized as a specialism in itself.

Recommended Areas for English Study

One issue that emerged from the interviews was identification of the very broad areas on which to focus in relation to medical English. The course that drives the research is for third-

year students, and the interviewees had general recommendations on what would be beneficial for them. All three placed a strong emphasis on anatomy. Other suggested areas of study were physiology, biochemistry, medical examinations, and common diseases. Given the stress placed on anatomy, consideration was given to how to address and explore this perceived need. Initially, some stand-alone basic anatomy materials (Appendix 1) were trialled as a small component of a general English receptive skills course that involved second-year students from a mixture of departments on the medical campus. This led to a number of medical students volunteering information in informal conversations before, during and after classes, in which they talked about their textbooks and anatomy classes. One of the key texts to be revealed through these conversations was their dissection textbook (Figure 1), which is a text written primarily in Japanese, but with Latin, English, or German terms tagged to the key words in Japanese.

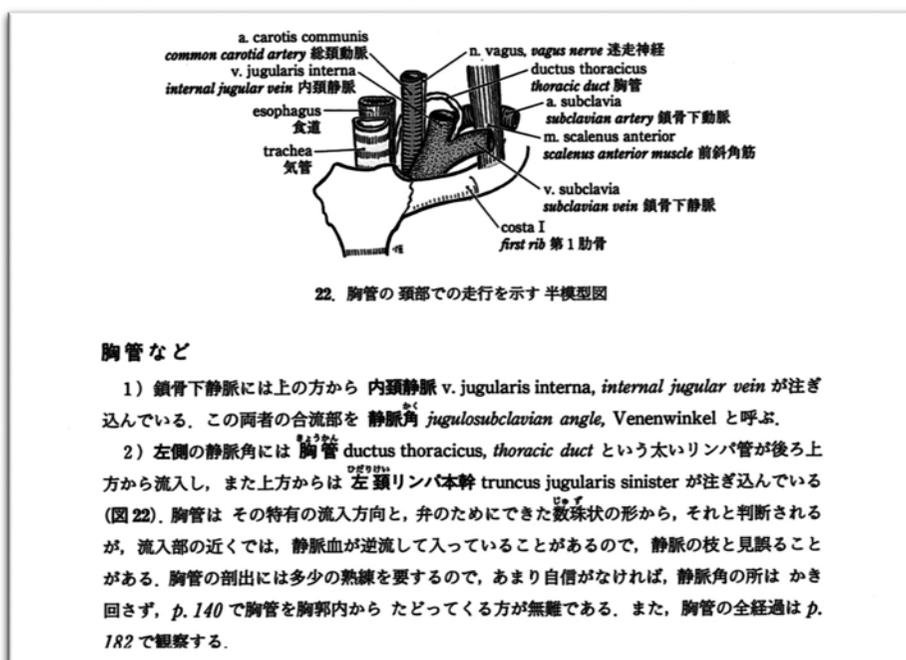


FIGURE 1. Extract from *Laboratory Manual of Dissection*

Another key text was Netter's *Atlas of Anatomy*, which can be described as a set of maps/diagrams of the human body, which in the Japanese edition is labelled in both English and Japanese. Also, students appeared to like the *Kikutan* series, a set of books which contain lists of words and diagrams and a CD, so that students can also listen to the words. What emerged from seeing these books was that medical students are exposed to a lot of key medical terms in English. Furthermore, a set of simple anatomy worksheets (Appendix 2) which extended the previously trialled material was prepared for the intensive medical English course taught in

2013 and given to the students. Over the four days of the course, a number of students completed all the exercises on the worksheets without being asked to do so; about 25% of all students appeared to do this, the estimate being based on impressions from classroom observation, and when asked how they had learned the terms, noted that their anatomy professor had taught them. This indicates that students are being taught a lot of key medical terms, but leaves open the question of how much exposure they have to reading the words in context.

On the basis of these findings, a new component was added to the research focusing on anatomy and described in another article in this journal (Fraser, Davies & Tatsukawa, 2014), in which a corpus-analysis of Gray's Anatomy for Students was started in order to look for frequently occurring single words and multi-word combinations. This was also used as a test to explore the use of corpus analysis on a major medical reference book; the interviewees were asked about key medical texts that were useful to students and, in addition to information on anatomy, provided views on other books such as Harrison's Principles of Internal Medicine, which is considered to be a seminal text, and has also been translated into Japanese. In relation to building word lists for students, it would be useful to run corpus analyses on such books.

Perceptions of Students' Abilities, Motivation, and Barriers to Learning English

The interviewees also talked about their expectations for students, as well as some of their perceived problems in terms of English development. For example, one interviewee felt that fourth-year students should be able to present summaries of case reports in English. As noted in a previous article (Davies, 2013), medical practitioners produce case studies and clinical reports, and at some stage in their careers may also be involved in basic scientific research. Case studies are viewed as easier to read and understand than clinical studies. In addition, review articles were considered to be very useful for students. These are often produced in less prestigious journals and are articles which summarise developments in a particular medical area. Rather than being cutting edge research, they provide a useful overview.

Views on students' abilities varied. It was generally accepted that most students entering the faculty have a high level of English. However, concerns were expressed concerning the maintenance and/or development of these abilities. One view was that students tend to be very focused on their medical studies and do not need very much English to qualify as doctors; many good quality medical books have been produced in Japanese over the years, so that students can read much more in their first language in contrast to the past, where medical students needed to develop foreign language skills to read key texts. There was a worry that English studies tend to be neglected until students pass their medical exams; at this point, they usually need to read medical research in English, and suddenly realise that there is a big gap between their current level of English and that needed to read and understand medical research in English.

Interviewees' Use of English

One of the factors brought into consideration regarding the research is the way in which practising doctors in Japan use English, and this was asked of the interviewees. As experienced and senior practitioners they all use English both as medical practitioners and teachers. Medical English terminology is often taught in class. In addition, all the interviewees read articles in English. This reading is done to keep up with their specialist fields, and sometimes due to involvement with journals. It was the view of the interviewees that qualified doctors read a lot of articles in English. Also, a number of documents are produced by medical staff each year, including meeting abstracts, research articles and review articles. Other areas of involvement are reading seminars, web seminars, and international conferences.

CONCLUSION

Several key factors emerge from this background research. One area of particular importance is that a considerable amount of English learning is going on in classes other than English classes. Medical staff are identifying and teaching key medical English terms in their classes. As noted earlier, the research is being undertaken with word lists being used to form lexical sub-syllabuses. One of the difficulties for course design is knowing the level of difficulty at which to design materials. An example of this is the ease with which a minority of students were able to complete anatomy worksheets in the 2013 intensive medical course. One of the next stages in the research process will be to create a word list on anatomy and consult medical teaching staff on the level of complexity of English that the students need.

A further related point is the relationship between lexis and discourse. Students are clearly learning medical terms, but there is some indication from the books the students use that words are not seen in stretches of English discourse but are learned as lists, so that students do not get a feel for collocations and lexical chunks. One of the challenges for materials development is to embed the word lists in stretches of text. An example of an initial attempt to do this can be seen in Appendix 2.

In relation to corpus development, the approach of building a corpus on the basis of medical articles dovetails with the importance placed on reading. In previous research (Davies, 2013), a surgeon noted that he used his English predominantly for reading. The interviews with the three medical teaching staff indicate that reading is an essential skill for both practising doctors and for medical students. However, one of the key areas which may require advice from medical faculty staff is on the journals to select for using articles in the corpus. From this research and last year's research (Davies, 2013), there are three different types of article that should be included in the corpus: case study research, clinical research, and review articles. The interviewees pointed out that the most prestigious journals, such as the *Lancet* and the *New England Journal of Medicine* do not usually publish review articles, which tend to appear in other journals. Intuitively, it would be useful to get a reasonable balance between the three types of article. Also, there would be merit in the faculty members selecting articles for the corpus.

There is also the question of the function of the corpora themselves. In light of the new information emerging from the background research, at the current stage three corpora are being produced, one based on a textbook of anatomy, one based on a reference book on internal medicine, and the other based on medical articles. They will be used to create word lists and guide materials development, but as stated earlier, can they have a role that goes beyond this? The challenge faced in improving English in the medical faculty is that the learning and use of medical English is taking place in a variety of different contexts, ranging from classes to papers to presentations. Particularly in the area of productive rather than receptive skills, the corpora might be useful as tools for providing sentence-length examples of word use for medical terms.

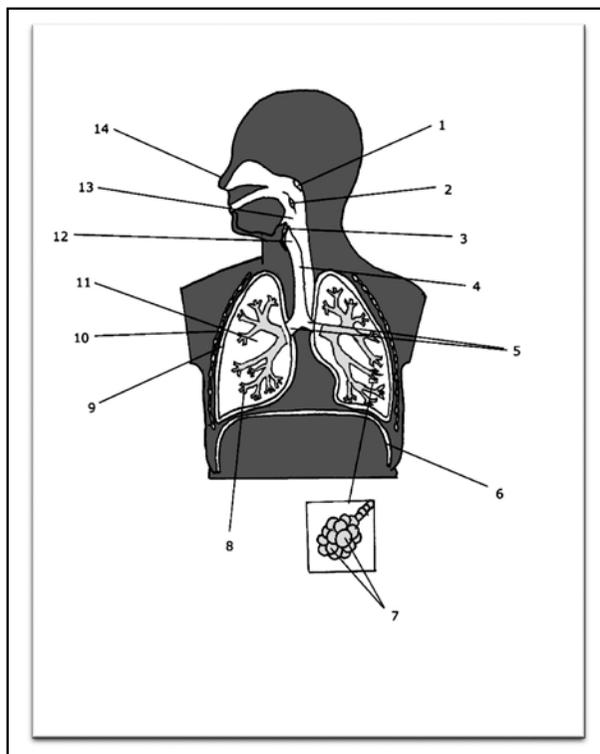
REFERENCES

- Berwick, R. (1989). Needs assessment in language programming: from theory to practice. In R.K. Johnson (Ed.) *The Second Language Curriculum*. Cambridge : Cambridge University Press.
- Chabner, D-E. (2012). *Medical Terminology* (6th Edition). St Louis, Missouri: Elsevier.
- Davies, W. (2013). Linking a medical practitioner's use of English for medical purposes in Japan to skills and abilities development at university. *Hiroshima Studies in Language and Language Education*, 16, 89-102.
- Davies, W., Fraser, S., Lauer, J. & Howell, P. (2013). English for medical purposes: Teaching an intensive English course to third-year medical students. *Hiroshima Studies in Language and Language Education*, 16, 49-64.
- Drake, R., Vogl, A.W., & Mitchell, W. (2004). *Gray's Anatomy for Students*. London: Churchill Livingstone.
- Dudley-Evans, T. & St John, M. (1998). *Developments in English for Specific Purposes*. Cambridge: Cambridge University Press.
- Fraser, S. (2013). Building corpora and compiling pedagogical lists for university medical students *Hiroshima Studies in Language and Language Education*, 16, 65-88.
- Fraser, S., Davies, W., & Tatsukawa, K. (2014). A corpus analysis of an anatomy textbook: Preliminary findings and implications for medical English materials development. *Hiroshima Studies in Language and Language Education*, 17, 119-140.
- Hutchison, T. & Waters, A. (1987). *English for Specific Purposes*. Cambridge: Cambridge University Press.
- Jordan, R.R. (1997). *English for Academic Purposes*. Cambridge: Cambridge University Press.
- Longo, D., Fauci, S., Kasper, D., Hauser, S., Jameson, L. & Loscalzo, J. (Eds.). (2011). *Harrison's Principles of Internal Medicine* (18th Edition). New York: McGraw Hill.
- Netter, F.H. (2011). *Atlas of Human Anatomy*. Tokyo: Elsevier Japan.
- Oshimi, T. & Takahashi, R. (2011). *Kikutan Medical 4. Healthcare*. Tokyo: ALC.
- Swan, M. & Walter, C. (1990). *The New Cambridge English Course 1 Teacher's Book*. Cambridge: Cambridge University Press.
- Terada, H. & Fujita, T. (2004). *Laboratory Manual of Dissection*. Tokyo: Nanzando.

APPENDIX 1

Trialled Anatomy Material (Based on Chabner, 2012)

Anatomy



larynx	pleural space	epiglottis	tonsils	bronchial tubes	diaphragm	lung
trachea	adenoids	alveoli	nose	bronchiole	pleura	pharynx

Write the correct words next to each number.

1.	8.
2.	9. space
3.	10.
4.	11. lung
5.	12.
6.	13.
7.	14.

APPENDIX 2

Additional Exercises Designed for Intensive Course (Based on Chabner, 2012)

Reading

Fill in the gaps with the words from the box.

Air enters through the nose and travels to the _____ (throat). From the throat, air passes through the epiglottis and _____ (voice box) into the _____ (windpipe).

The windpipe splits into two tubes, called the _____, that carry air into the lungs. The bronchial tubes divide into smaller tubes, called _____, that end in the small _____, or air sacs. The thin walls of the sacs allow oxygen to pass through them into tiny _____ containing red blood cells. Red blood cells transport the _____ to all parts of the body. In a similar manner, _____ leaves the body by entering the alveoli and travelling back up to the nose.

capillaries	bronchioles	carbon dioxide	alveoli
bronchial tubes	pharynx	oxygen	trachea larynx

Vocabulary Extension

Term	Letter	Description
1. epiglottis		A. throat
2. larynx		B. windpipe
3. pharynx		C. muscle that separates the chest from the abdomen
4. diaphragm		D. flap of cartilage over the top of the trachea.
5. trachea		E. small air tube leading to some alveoli
6. bronchial tube		F. thin-walled sac through which gases can enter and leave the bloodstream
7. bronchiole		G. one of the two tubes that carry air from the windpipe to the lungs
8. alveolus		H. voice box

Match the combining form to its meaning.

Combining term	Letter	Body part
1. pharyng/o		A) diaphragm
2. bronch/o		B) air sac
3. bronchiol/o		C) windpipe
4. nas/o rhin/o		D) nose
5. laryng/o		E) throat
6. phren/o		F) voice box
7. trache/o		G) tube that connects the windpipe to the lung
8. epiglott/o		H) lung
9. alveol/o		I) small bronchus
10. pneumon/o		J) epiglottis

要 約

日本人大学生を対象とした「医学英語コーパス・語彙リスト・教材」 開発のための基礎研究

デービス・ウォルター

サイモン・フレーザー

達 川 奎 三

広島大学外国語教育研究センター

本論文は、日本の大学における医学英語学習を充実させるためのプロジェクトに関する背景(基礎)研究をまとめ、報告しようとするものである。プロジェクトの目的は、医学専攻学生のためのコーパス、語彙リスト、及び教材を統合することである。具体的には、言語(英語)教員チームは、意志決定の段階で大学医学教員と連携を図り、医学部3年生を対象とした「医学英語集中講義(コース)」を担当した。背景(基礎)研究においては、公式・非公式に医学教授陣に聞き取りを行い、医学専攻学生との対話なども参考にした。

背景(基礎)研究の結果、論文データに基づいたコーパスを作成するために、次の10分野に分類することとした。それらは、「循環器学」「消化器学」「呼吸器学」「神経筋骨格学」「伝染病と免疫学」「腫瘍学」「発生学」「腎臓病学と内分泌学」「救急医療と麻酔学」「感覚器学」である。

公式・非公式に行った調査から、医学用語の学習の多くが、英語授業ではなく医学専門授業でなされ、それ故、適切なレベルの教材を開発するためには、医学教授陣との密接な連携が必要であることが分かった。さらに、医学部生は英語での談話(英語使用の文脈)とは離れて、多くの医学英語を身に付けるという報告もある。

医学部3年生が何を学ぶべきかについては、調査協力した医学教授陣は「解剖学」を一番重視した。また、「生理学」「生化学」「医的検査」「一般疾病」なども挙げられた。解剖学の重視という知見から、言語教員チームは解剖学教科書のコーパス分析を試みた。

さらには、医師がどの言語技能が必要かについて、英語で書く力や話す力も大切ではあるが、リーディング(能力の伸長)が最も優先されるべきであると思われる。また、聞き取り調査を踏まえると、コーパス分析に際しては、「臨床研究」「症例報告」「レビュー(総説)論文」の3つのタイプを含めるべきであろう。