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The Lexical and Textual Characteristics of Medical Case Reports: A Preliminary Investigation

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Recent years have seen the consolidation of English as the lingua franca of the scientific community in general, and of medicine and health-related fields in particular. As an illustration of this trend, Salager-Mayer (2014) estimates that 10 million health-related peer-reviewed papers are published every year, with over 80% of them being written in English. In addition, English is the official language of most international conferences. Clearly, here in Japan, future doctors and medical researchers are increasingly going to need to be able to read, write, and present academic papers and reports in English within their specialized fields.

At Hiroshima University, as part of the drive towards globalization, the medical school has requested the help of our institute in developing the English skills their students will need. We have already successfully constructed units of material and pedagogical word lists for medical students at the early stages of their studies (see Fraser, Davies, Tatsukawa, & Enokida, 2020, for an overview). In the present article, however, we switch our focus to more advanced learners, and describe the preliminary steps of a research project designed to help students improve their professional English reading, writing, and presentation skills by increasing their awareness of the complex aspects of writing in medicine.

The project involves the construction of a corpus of medical case reports, with the aim of identifying the most salient lexical patterns and textual/rhetorical features of the genre. Our ultimate goal is to use these findings in the design and development of medical English materials and tasks for university undergraduates.

BACKGROUND

Corpora and Word Lists in English for Specific Purposes (ESP)

In EAP (English for Academic Purposes), lists such as the Academic Word List (Coxhead, 2000), the New Academic Word List (Browne, Culligan, & Phillips, 2013), and the Academic Vocabulary List (Gardner & Davies, 2014) have been developed to provide learners with words that are frequent across a wide range of disciplines. Lists of key technical and sub-technical words have also been produced for specialized fields such as electronics (Farrell, 1990), engineering (Ward, 1999), and business (Browne & Culligan, 2016). The medical field, too, has its own word lists, including those created by Fraser (2007, 2009), Wang, Liang and Ge (2008), Hsu (2013), and Lei and Liu (2016).

Corpus studies have also revealed the frequent use of multiword sequences in academic texts, with perhaps the most comprehensive analysis of academic lexical phrases being conducted by Simpson-Vlach

and Ellis (2010). Although multiword units have been relatively under-investigated in English for Medical Purposes (EMP), Gledhill (2000) and Marco (2000) have both addressed the use of collocations in medical research articles. Fraser (2009), investigating collocational patterns in a corpus of pharmacology research articles, found that 25% of multiword items (consisting of three or more words) had an important role in structuring the discourse of the text, e.g., *on the other hand*, *has been shown to*. Biber (2006), examining multiword sequences in university registers, has stressed their importance as discourse framing devices in a variety of university registers. In relation to the teaching of medical English in Japan, Guest (2017) has recently been highlighting the importance of focusing more on productive acquisition of formulaic lexical phrases rather than the passive memorization of large amounts of specialist terminology.

The Origins of the Present Research

Our previous research (Davies, Fraser, Tatsukawa, & Enokida, 2020) has focused on the transition from general English studies to EMP. The institute's involvement in EMP began in 2012 with a team of four institute teachers providing an intensive medical English course in September of that year. With the medical school's request that the course continue, a small research team was created to investigate the use and features of medical English in Japan, and to develop appropriate learning materials for students.

Interview-based research with senior members of the medical school led to the parallel development of units of teaching material and word lists, with corpus analysis being based on medical reference books (*Gray's Anatomy for Students* and *Harrison's Principles of Internal Medicine*), which were more appropriate for third-year medical students than research articles. This eventually resulted in the creation of 14 units of material with a strong anatomy/physiology underpinning and a glossary of approximately 2,000 words. Seven of these units were taught by the institute's team and seven by the medical school's English specialist to form an overall third-year curriculum.

A final development in the research was the use of flipped learning for the intensive course (Enokida, Fraser, Davies, & Tatsukawa, 2018), placing around half of the course materials on the university's learning management system (LMS), Blackboard Learn 9 (Bb9), for self-study, with the more productive-skills oriented parts being taught in class. With the increased flexibility of a flipped-learning system, the materials were trialled with second-year medical students in the autumn of 2017, after they had completed their dissection work. Results showed that second-year students were able to study the material successfully, so that in subsequent years medical students were offered either an eight-week term-based course in their second year or an intensive course in their third year. With the coronavirus pandemic of 2020, more units of material have been placed on the university's LMS, creating a large bank of material for potential online study.

Addressing the Needs of More Advanced Learners

Current research has been oriented towards building the curriculum further. The existing third-year medical curriculum is a "quasi-parallel" one; that is, it goes beyond the content syllabus that students have studied but is designed in such a way that the material can readily be learned. It is oriented towards giving students a broad grounding in medical English, both the technical English of doctor-doctor interaction and the more everyday English of doctor-patient conversations; students study anatomy terms, physiology, some

basic diseases, and treatments, as well as doctor-patient interaction, particularly in relation to taking patient histories. However, there is a need to go beyond this both in spoken and in written discourse. For example, in spoken discourse, although students study and practice doctor-patient dialogues and participate in role-plays, familiarizing themselves with structuring conversation and using open and closed questions to gain information about patient problems, more extensive role-plays using simulated patients could be set up. These could help students to develop consultation skills in situations closer to the real ones they may face.

In this article, we pay particular attention to written discourse and the skills and linguistic resources required for reading and writing medical articles. A connection is also made to spoken discourse through medical presentations. The reason for examining articles is that the structuring of the discourse is very different from that of medical reference books. In the existing third-year curriculum, the focus is on essays, informed by such reference books. This has enabled us to give students a feel for language describing the body, its systems, the ways in which they can be affected by disease, and the treatments available, which is of course important. However, journal articles provide a means of communication between practicing doctors. These professionals have shared understandings of the medical field, and know what needs to be communicated.

A Focus on the Medical Case Report

Case reports, the scientific documentation of a single clinical observation (case), play an important role in medical literature, being a powerful tool in the dissemination of information on unusual clinical syndromes, disease associations, or responses to treatment. Although they constitute only a small part of the literature, they have an important part to play in the advance of medical education. They have a wide audience, are easily accessible, and can be a valuable learning experience for both author and reader, as well as a source of teaching material. They require less time investment than original research articles, and combine both professional writing (as in case histories) and academic writing (as in medical journals). They will be of far more relevance for the majority of medical students, who are not going to pursue a career in higher education or research, and they provide a way into scholarly writing for those who are planning to conduct research in the future.

Primarily for pedagogic reasons, therefore, the research team decided to focus on the case report. Case reports usually focus on individual cases, and are short; in terms of both reading and writing they are of a manageable length for students, and they generally do not involve inferential statistics. They seemed most suitable for building to the next stage of the medical curriculum. In early interviews with senior staff, both case reports and case studies had been suggested as something that could potentially from part of students' English studies.

An additional important reason for our focus on case reports is that they have not received as much attention in EMP as original research studies, although Mungra & Canziani (2013) have produced an academic word list for clinical case histories, and Helán (2012) has conducted a comprehensive analysis on the evolution of the genre.

Research Questions

The purpose of this study is to conduct a preliminary investigation into the lexical and structural

features that are typical of medical case reports, using a combination of discourse analysis and corpus analysis. To this end, we attempt to obtain initial answers to the following questions:

1. What textual features of medical case reports can be identified?
2. From a small initial corpus of case reports, is it possible to identify key lexical items and formulaic sequences?
3. What are the pedagogical implications?

In the following sections of the article, we begin by describing how 108 case reports were selected in order to build a representative corpus for analysis. In the first part of our investigation, we select three articles from the corpus, and use discourse analysis to identify the most salient textual features of the genre, exploring the key sections of a case report, and gaining an overall feel for the language used. This is followed by corpus analysis of all 108 articles, in which we look for specific lexico-grammatical features and formulaic text-structuring phrases. Finally, some pedagogical implications of our preliminary analysis of the case reports are discussed.

SELECTING THE CASE REPORTS
Article Collection
A particular aim of the present research is to analyze the case reports through both discourse analysis and corpus analysis. If features of the discourse, text-structuring phrases, and key general terms can be identified, these can be incorporated into learning materials for students. Consequently, the institute team needed to obtain a broad range of case reports. To achieve this, senior medical staff members were approached and asked if the medical school could gather approximately 100 case reports, which we believed would be a sufficient number for our purposes, at least at the initial stage of our research. A variety of medical school members collaborated to provide a range of such articles, which were then sent to the research team.

The Case Reports: Some Initial Observations
We received a total of 108 case reports in PDF format, categorized into 23 areas of medicine (Table 1) by the doctors themselves according to their own field of specialization in the university. For most of the areas, we received 5 or 6 articles, which we felt provided sufficient coverage of the important areas of clinical medicine to build a representative corpus.

Details of the journals from which the case reports are taken are given in Appendix 1. In total, 72 different journals are represented, ranging from highly regarded publications such as *The Lancet* to less prestigious, more specialized journals. All the journals are published in English, and represent a range of countries including the US, the UK, Australia, and Japan, although many of them are international, open-access journals. Some of the journals are dedicated to the publication of case reports, while others publish a variety of medical articles. Most of the case reports are very recent, with the date of publication ranging from 1995 to 2020, and more than one third being published in either 2019 or 2020. (An interesting exception is *A case of inter-uterine and extra-uterine pregnancy*, published as long ago as 1886.)

Most of the 108 articles are labelled by the journals in which they appeared as case reports. However,

TABLE 1. Areas of Medicine Represented in the Case Report Corpus

Area of Medicine	No. of Reports
1. Clinical Immunology and Rheumatology	3
2. Endocrinology and Diabetic Medicine	4
3. Endoscopy	5
4. Proto-oncogene Surgery / Thoracic Surgery	5
5. Respiratory Medicine	5
6. Surgery	5
7. Pediatrics	5
8. Radiation Oncology	6
9. Diagnostic Radiology	6
10. Emergency and Critical Care Medicine	4
11. Orthopedic Surgery	4
12. Urology	5
13. Gastroenterology and Metabolism	6
14. Gastroenterological Transplant Surgery	5
15. Obstetrics and Gynecology	5
16. Dermatology	4
17. Ophthalmology	5
18. Psychiatry	5
19. General Medical Department	5
20. Otorhinolaryngology, Head and Neck Surgery	3
21. Neurology	5
22. Nephrology	4
23. Anesthesiology	4
TOTAL	108

there is a small amount of variation among the articles; for example, some are descriptions of a case in the form of letters to the editor or 'correspondence'. Also, although a standard case report involves a single case, some of the articles describe several cases, and these might be considered as small case studies rather than case reports. For the purposes of our research, however, these were not excluded as it was felt that the description and discussion of several cases and of one case were sufficiently similar in features, and they had been considered by their publications to be reports rather than case studies. The case reports in our corpus ranged from 1.5 to 12 pages in length, with a typical report comprising four pages.

DISCOURSE ANALYSIS

Three articles were selected from the corpus in PDF format for preliminary analysis to look for broad features of case reports. They came from three different journals: (1) *Case Reports in Gastroenterology* (Igawa et al., 2013); (2) *The Journal of Foot and Ankle Surgery* (Nakasa et al., 2015); and (3) *Medicine* (Yamasaki et al., 2018).

We take the general definition of a case report as:

A case report is a detailed report of the symptoms, signs, diagnosis, treatment, and follow-up of an

individual patient. Case reports usually describe an unusual or novel occurrence and as such, remain one of the cornerstones of medical progress and provide many new ideas in medicine. Some reports contain an extensive review of the relevant literature on the topic. The case report is a rapid short communication between busy clinicians who may not have time or resources to conduct large scale research. (Heart Views, 2017)

In terms of overall structure, all three case reports resemble the medical research article, in that they consist of an abstract and a body, with the body comprising three main sections: an introduction, the case report/ presentation, and a discussion section that includes a conclusion. As per the definition above, they communicate ideas and suggestions, based on treatment of an unusual case.

The Sections of a Medical Case Report

<u>Abstract</u>

In the articles investigated here, the length of the abstract varies considerably (from 135 to 267 words), but in each report it provides a brief overview of the case, stating why it is important and what conclusions can be drawn. A longer abstract can also include sub-sections, as is found in the third paper, where it is divided in the following way: rationale, patient concerns and diagnoses, interventions and outcomes, and lessons.

<u>Introduction</u>

The introduction provides a short general description of the medical problem that the case is about and a possible treatment. At the end of the introduction, there is a key statement about the particular case, for example:

Here, we report a case of small bowel metastasis of HCC detected by CE and double-balloon endoscopy (DBE) as a pedunculated epithelial polyp. (Igawa et al., 2013)

Herein, we report a case of EGFR mutation-positive putative lung adenocarcinoma presenting as CUP showing good response to EGFR-TKI therapy. (Yamasaki et al., 2018).

In all three papers, the pronoun 'we' is used as a clear marker to describe the actual case study. In the two examples above, 'we' is collocated with 'report', preceded by 'here' or 'herein', while in the third paper the key phrase is: "In the present report, we describe . . .".

<u>Case Presentation</u>

In the case report/ case presentation section, the patient is immediately introduced, and relevant background information given, including health history, and current problems:

A 67-year-old man with a 147 pack-year smoking history presented to a hospital with chief complaints of paresis of right lower extremity, dysarthria, and memory disturbance (Yamasaki et al., 2018)

A 39-year-old Japanese female with a 5-year history of RA had been treated for severe erosive arthritis with 12 mg/wk of methotrexate. She complained of left ankle pain and left elbow pain that was especially notable when she experienced left ankle pain. (Nakasa et al., 2015)

This information is followed by descriptions of diagnosis and treatment, and of tests and drugs administered.

<u>Discussion and Conclusion</u>

In the final section of the case report, the authors explain why the case is interesting, usually citing other literature in the area to put the case in context, and suggesting tentative hypotheses. The last paragraph is usually a short conclusion of their key hypothesis, with recommendations for future care:

In conclusion, we reported a case of small bowel metastasis of HCC detected by CE and resected by EMR to control continuous bleeding from the tumor. As in this case, there is possibility of small bowel lesions as the cause of gastrointestinal bleeding and anemia in patients with liver cirrhosis and HCC. We suggest that CE should be actively performed in the search for small bowel lesions in those patients. (Igawa et al., 2013)

In the writing of the case reports, researchers are occasionally cited in the body of the article, but more often the reader is referred to end notes should she/he wish to check. This makes the case report quick to read.

CORPUS ANALYSIS
Creating Frequency Lists

The PDF files were converted to text format and combined, resulting in a corpus of 223,334 running words (tokens). Abstracts and references were included in the analysis. The corpus analysis software *AntConc 3.5.8* (Anthony, 2019) was used to produce lists of the most frequent words and multiword items. It was also possible to determine the range of the items, i.e., the number of case reports in which each item was found to occur. *AntConc*'s concordance function enabled us to see how particular words were used in context.

Important Words used in Case Reports as Identified by Frequency and Range

The *AntConc* software produced a list of all the words in the corpus, which could be ranked according either to their total frequency of occurrence or to their range. In this preliminary investigation, the unit of counting was the individual word form rather the word family or lemma, as our purpose at this stage was not yet to construct a pedagogical word list for learners; instead, we wanted to gain insight into the ways the words are used in the text. Table 2 lists the 100 most frequent words, excluding articles and the most common function words; all of these words are found in at least 40 of the case reports, meaning that they are used in a wide variety of clinical sub-fields.

TABLE 2. Top 100 Words in the Case Report Corpus (Range over 40)

1. CASE	26. MG	51. HOSPITAL	76. ML
2. ET AL	27. CT	52. BOTH	77. HER
3. PATIENT	28. CLINICAL	53. CELL	78. DURING
4. AFTER	29. DAY	54. NORMAL	79. YEARS
5. WERE	30. HOWEVER	55. SYNDROME	80. LESIONS
6. PATIENTS	31. OUR	56. ALL	81. REPORTS
7. NO	32. REPORTED	57. STUDY	82. THAN
8. TREATMENT	33. IT	58. DEPARTMENT	83. RELATED
9. WE	34. MAY	59. OTHER	84. TOMOGRAPHY
10. FIG.	35. FINDINGS	60. OLD	85. USED
11. NOT	36. DIAGNOSIS	61. HIS	86. BIOPSY
12. CANCER	37. HAS	62. SHE	87. WITHOUT
13. ARE	38. YEAR	63. FIGURE	88. EXAMINATION
14. HAVE	39. REVEALED	64. UNIVERSITY	89. ALTHOUGH
15. REPORT	40. PERFORMED	65. CAN	90. ONE
16. LEFT	41. MONTHS	66. USING	91. DIAGNOSED
17. TUMOR	42. BLOOD	67. IMAGING	92. RECEIVED
18. CASES	43. BECAUSE	68. TREATED	93. TWO
19. THERAPY	44. THERE	69. HIGH	94. UP
20. DISEASE	45. HE	70. DUE	95. TYPE
21. SHOWED	46. ASSOCIATED	71. SUCH	96. CELLS
22. BEEN	47. PAIN	72. PRESENT	97. SMALL
23. HAD	48. THESE	73. SYMPTOMS	98. RARE
24. RIGHT	49. ALSO	74. NEGATIVE	99. FOLLOWING
25. WHICH	50. SURGERY	75. FIRST	100. TIME

Unsurprisingly, *case* is the most frequent word in the corpus. The second most frequent item is *et al*, indicating the prevalence of co-authorship of medical research articles, as well as underlining the importance of citing previous research in a case report. The frequent occurrence of the first person plural personal pronoun *we* in the corpus emphasizes this, and also suggests that the use of the active voice is common when detailing the case (e.g., *we performed, we diagnosed*). However, concordance analysis shows that *we* is most commonly found in the present tense constructions *we report a case* and *we describe a case*, which supports our discourse analysis finding of how the actual case study is introduced in the report.

From the word list, we can also observe the high frequency of the third person personal pronouns *he, she, his*, and *her*. The use of such pronouns is obviously in order to protect anonymity, and to avoid repetition of 'the patient', but it also highlights the 'personal narrative' structure of the medical case report.

It is also interesting to note that *may* and *can* are the most commonly occurring modal verbs (with *should* appearing just outside the top 100). These verbs are all frequently found to collocate with *be*, as in the following examples from the corpus: "High doses to the portal vein also *may be* a risk factor for portal vein thrombosis through vascular injury"; "Other signs and symptoms, such as epiphora, anosmia, headache, facial pain, and visual disturbances, *can* also *be* present"; and "LA resistance *should be* considered and investigated when well-performed regional anesthesia fails". The modals *may* and *can* are typically used epistemically, but *should* is generally found in its deontic, or instructive, role in recommending future courses of action.

Table 3, which shows 50 of the most frequent words ranked by range (the number of articles they appear in), is perhaps even more illuminating. What stands out in this list are the verbs, in their past forms: *reported, showed, received, revealed, performed, accepted, treated*, and *diagnosed*.

With the exception of *accepted*, which is used primarily in the sense of 'accepted for publication', these all have important roles to play at the different stages of the case report narrative, including diagnosis ("Subsequently, pregnancy-induced hypertension was *diagnosed* at 32 weeks gestation"); testing ("In addition, laboratory tests *revealed* a hemoglobin level at 9.6 g/dL with normal leukocyte and platelet counts"); treatment ("Subsequently, we *treated* the patient with 60 mg of denosumab subcutaneously"); and follow-up ("7 days later, a follow-up CT *showed* loss of intestinal wall gas, so she was discharged").

Another interesting observation is that *rare* occurs with such high frequency and in so many of the reports. Examples of its use are "We report a *rare* case of metastasis of hepatocellular carcinoma (HCC) to the small bowel that presented as a pedunculated epithelial polyp"; and "Eagle syndrome is a *rare* and poorly understood clinical condition caused by an elongated or disfigured styloid process". Perhaps this finding should be expected – as we discussed earlier, one of the most common reasons for publishing a case report is to describe an unusual or novel occurrence.

TABLE 3. Top 50 Words in the Case Report (Range)

1. PATIENT (103)	14. HOSPITAL (77)	27. DISEASE (71)	40. HISTORY (65)
2. CASE (100)	15. PERFORMED (77)	28. HIGH (71)	41. REVIEW (65)
3. REPORT (98)	16. PRESENT (77)	29. ANY (70)	42. UP (65)
4. PATIENTS (92)	17. STUDY (77)	30. ONE (70)	43. BLOOD (64)
5. HOWEVER (89)	18. ASSOCIATED (75)	31. WITHOUT (72)	44. MONTHS (64)
6. SHOWED (88)	19. FIRST (75)	32. DUE (69)	45. RARE (64)
7. REPORTED (87)	20. FINDINGS (74)	33. INCLUDING (70)	46. TOMOGRAPHY (64)
8. TREATMENT (86)	21. SUCH (74)	34. THERAPY (69)	47. MORE (63)
9. CLINICAL (84)	22. THERE (74)	35. THAN (68)	48. MOST (63)
10. RECEIVED (81)	23. ACCEPTED (73)	36. TREATED (68)	49. WHO (63)
11. REVEALED (81)	24. NORMAL (73)	37. EXAMINATION (67)	50. LEFT (62)
12. CASES (80)	25. CAN (73)	38. DIAGNOSED (66)	
13. DIAGNOSIS (78)	26. ALTHOUGH (74)	39. TWO (66)	

Multiword Terms

Table 4 shows the most frequently occurring multiword terms in the corpus, many of which are markers of the different stages of the case report narrative: *literature review, medical history, risk factors, physical examination, laboratory tests, surgical treatment, adverse events*. What is particularly striking, though, is the number of terms that relate to diagnostic imaging. While this finding is not altogether surprising, it underlines the important role that imaging techniques such as magnetic resonance imaging (MRI) or computed tomography (CT) scans play in tracking the progress of an ongoing condition, whatever the medical area.

TABLE 4. Top 50 Multiword Terms in the Case Report Corpus

1. CASE REPORT
2. COMPUTED TOMOGRAPHY
3. FOLLOW UP
4. LUNG CANCER
5. CASE REPORTS
6. MAGNETIC RESONANCE
7. CT SCAN
8. CELL CARCINOMA
9. RADIATION THERAPY
10. LYMPH NODES
11. MAGNETIC RESONANCE IMAGING
12. RESONANCE IMAGING
13. LONG TERM
14. TOMOGRAPHY CT
15. SOFT TISSUE
16. COMPUTED TOMOGRAPHY CT
17. CONTRAST ENHANCED
18. BLOOD FLOW
19. NORMAL RANGE
20. CLINICAL COURSE
21. EMISSION TOMOGRAPHY
22. POSITRON EMISSION
23. SMALL CELL
24. POSITRON EMISSION TOMOGRAPHY
25. DIFFERENTIAL DIAGNOSIS
26. X RAY
27. BLOOD PRESSURE
28. IMAGING MRI
29. RESONANCE IMAGING MRI
30. RISK FACTORS
31. LITERATURE REVIEW
32. ADVERSE EVENTS
33. PATHOLOGICAL FINDINGS
34. PHYSICAL EXAMINATION
35. TUMOR CELLS
36. DRUG INDUCED
37. BLOOD CELL
38. CHEST X RAY
39. INTENSIVE CARE
40. MEDICAL HISTORY
41. PLEURAL EFFUSION
42. SURGICAL RESECTION
43. CLINICAL FEATURES
44. LABORATORY TESTS
45. SURGICAL TREATMENT
46. C REACTIVE PROTEIN
47. ENHANCED COMPUTED TOMOGRAPHY
48. HEMATOXYLIN AND EOSIN
49. MRI FINDINGS
50. REACTIVE PROTEIN

Text-structuring Phrases

Many items consisting of three words or more are expressions that can be understood as having a role in structuring the discourse of the text. Table 5 shows some of the most frequently occurring discourse-structuring expressions. Most of these can be considered to be prefabricated units of language in the sense of Lewis' (1993) lexical chunks, Nattinger and DeCarrico's (1992) lexical phrases, or Guest's (2017) formulaic academic phrases (FAPs): prefabricated multiword units that are working as set units, rather than being constructed through the use of syntactic rules.

A number of the phrases shown below will be found in a wide variety of academic texts, and can be classified under 'general English': *as well as, on the basis of,* and *on the other hand*, for example. Others fall under Guest's (2017) definition of FAPs as being "…formulaic phrases [that] are markers of the type of educated or professional discourse that one expects members of an academic community to utilize" (p. 18). Examples of this type include *the differential diagnosis of* and *had a history of*.

Interestingly, the phrases *the first report of* and *the first reported case of* occur in several of the articles, indicating the importance of the case report in advancing knowledge of the field.

TABLE 5. Key Text-Structuring Phrases

(in) the presence of	we herein report
(in) the absence of	we describe (a)
in this case	based on (the)
in the present case	due to (the)
in our case	the onset of
as well as	on the other hand
(in) the present study	on behalf of (the)
(had) a history of	is characterized by
(there was) no evidence of	on the basis of
(for) the treatment of	to our knowledge (this is)
the (differential) diagnosis of	to the best of our knowledge (this is)
the risk of	the first report (reported case) of
at the time of	the role of
here we report	we believe that
we report a case	with regard to

PEDAGOGICAL IMPLICATIONS

In this section, we consider how the results of the analysis can potentially be used to construct materials and courses for students and medical practitioners. Although the main pedagogic aim of the research is to build on an existing curriculum for third-year medical students, developing the language skills for writing case reports in English is important for any medical practitioner. Case reports are often written because observant doctors have noticed something unusual when treating a particular patient, and wish to convey their ideas concerning the case to the wider medical community. A key issue relates to how pedagogical materials can be made available to a broad swathe of medical staff and students within the university; this may be partially achieved through an LMS such as Hiroshima University's Bb9 system.

While the Covid-19 pandemic has created many challenges, it has forced educators to consider what can be achieved through online learning. In the case of our research team, flipped learning has proved valuable in creating more flexible courses with shorter classroom components supported by online materials that are highly integrated with them. Receptive skills, grammar, and vocabulary are particularly suited to self-study through on-demand online learning. In contrast, productive skills, in this case writing, are more likely to require either in-class teaching or videoconferencing.

Regarding the construction of materials, we consider first how materials oriented towards reading case reports could be built on an LMS. In doing this, we assess the features that emerge from the analysis, and how they could be included in the materials. Then, we discuss how materials might be created which allow students and practitioners to develop their productive skills.

Receptive Skills, Grammar and Vocabulary

Due to their concise length and straightforward structure, actual case reports could be considered for use in building materials. Alternatively, selected case reports could be adapted, simplifying the English in them where necessary. Learning tasks can be designed that sensitize students to the purpose and overall structure of the case reports. More detailed work on each section can then be given, along with relevant

grammar and vocabulary tasks.

Purpose and Structure of a Case Report

As we noted at the beginning of this article, a case report is one of a range of articles that are published in medical journals. Students could be asked to match different types of article to their descriptions. They could then be asked to identify the key sections of a case report, and finally, they could be asked to match the section titles with their content and purpose.

Introduction

The structuring of the introduction of a case report is relatively straightforward. Authors need to outline the medical problem and the standard medical treatment, then introduce their case as something to add to the field. This switch from describing the established area to introducing the new case is, as we have seen, signalled by phrases such as "Here, we report a case . . .". 'We' sends a strong signal of the change from providing the background to introducing the new case; as we know from our corpus analysis, *we* occurs frequently with this function, collocating most often in the corpus with *report* and *describe.*

Regarding materials creation, students could be asked to insert several sentences into a case report introduction, which would help them to think through the location of key information contained in the case report. In particular, the first and last sentences of the introduction are important, and so tasks could be created that encourage students to focus on the language of those sentences through filling gaps or matching words to sentences.

Case presentation

As with the introduction, the structuring of the case presentation is straightforward, with the authors writing about the patient's signs and symptoms, testing, diagnosis, and treatment. A sentence insertion task could be set up to draw students' attention to the ordering of key information.

At the start of the section, the patient is nearly always introduced by age and sex, such as "A 67-year-old man … ". This is often followed by the signs and symptoms. These are likely to dovetail with the vocabulary learning of signs and symptoms in the existing third-year curriculum.

With regard to diagnosis, we found that many multiword terms relate to imaging: *magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography,* and *X-rays*, for instance. The verbs with which these terms collocate could also be identified with further analysis. For example, we might expect *revealed*, a highly frequent item as shown in Table 3, to be used in relation to the results of scans. A quick look at the concordance patterns of the word shows that this is indeed the case, a typical example being "Computed tomography (CT) revealed a PAVM in the left lower lobe of the lung in December 2003".

Discussion

This section of the case report in the most challenging because it involves a discussion of why the presented case is interesting in light of the existing literature. The authors make an argument for their tentative hypotheses, and the language they use is highly nuanced because they are effectively making suggestions based on their single case. Phrases such as ". . . should be considered" or "We suggest that . . .

should be . . ." appear in the discourse analysis above. Phrasing the concluding paragraph appropriately at the end of the discussion is clearly very important. In terms of pedagogic materials creation, sentence insertion tasks can be used to highlight key parts of the section, followed by vocabulary and grammar tasks which focus on modal verbs and phrases that convey the appropriate shade of meaning to the reader.

Productive Skills

One of the problems concerning the switch from input tasks to output tasks is that in most cases, students of English can read at a much higher level than they can write. Also, for undergraduate students, who still have a great deal to learn before becoming fully qualified doctors, the difficulties they face in terms of medical understanding are also considerable.

Given the challenges at the undergraduate level, one possibility would be to focus on the simplest part of a case report: the case presentation. One way of doing this is to create a simulated case in which students are required to synthesize data to make a case presentation. As noted above, case presentation involves authors summarizing the pertinent points of the case, and a likely scenario includes several steps: history taking, testing and diagnosis, treatment, and results. Students could be given a doctor-patient history-taking dialogue and table of patient information, the results of tests, information about treatment, and results, before being asked to construct the case presentation.

An advantage of writing up a case as a task is that it is a simple step beyond the current curriculum for third-year students, and something that could easily be integrated into it. Having learned a large number of medical terms, the students can use them to focus on writing up a relatively simple case. This would aid them to build their skills in describing cases without the complexities of discussing why a case is unusual within an established field, something that could be better achieved with more experience. It would also connect more closely with the students' level of learning, where they could deploy their developing knowledge of medicine in standard cases. For example, the following table of test results (Table 6) and medical conversation (Figure 1) from the existing curriculum could be used:

TABLE 6. Information from the Medical Conversation Section of the Endocrine System Unit of the Materials

75g oral glucose tolerance test (OGTT)				
Day	Monday	Monday	Monday	Wednesday
Time	Before	1 hour after	2 hours after	1 hour after
Normal	60-100 mg/dL	under 200 mg/dL	under 140 mg/dL	under 200 mg/dL
Results	140 mg/dL	200 mg/dL	200 mg/dL	205 mg/dL

Other tests		
hemoglobin A1c	normal: 4% - 5.6%	6.7 %
BUN	(blood urea nitrogen) normal 6-20 mg	30 mg/dL
creatinine	normal: 0.84 to 1.21 mg/dL	1.7 mg/dL

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A: Come in, Ms. Adams.  Please take a seat.
B: Thank you.
A: How are you feeling today?
B: Much the same as last week, doctor.  Generally more tired than usual, and feeling a bit irritable.
A: I see.  I have the results of your tests from last week, and I want to go through them with you.
B: OK.
A: So, you remember that we took some blood before and after you drank a sugar solution.  These figures show
   your blood sugar levels.  Both before and after the sugar drink your blood sugar was much higher than normal.
   When we did the test again on Wednesday, your blood sugar was again very high.
A: So, what does that mean, doctor?
A: Well, when we look at that and some of the other results, it's clear that you have type 2 diabetes.  This means
   you will need to make some changes to your lifestyle, particularly your diet.
B: In what way?
A: You need to reduce your calorie intake, particularly in relation to sugar.  I'm going to set up an appointment
   with our nutritionist, who can give you a lot of detailed advice.  For now, please concentrate on avoiding high-
   sugar foods and drinks, particularly cakes, icecream, and sugary drinks.
B: What about cookies?
A: They usually have a lot of sugar in them.  If you're feeling hungry, it's better to eat salad or fruit.  Also, last
   week you told me that you don't exercise.  I'm afraid you need to start taking some.  If you can walk for about
   20 minutes a day, that will also help.
B: How serious is this?
A: Well, you have diabetes type 2, which is quite a common problem.  You will need to be much more focused
   on diet and exercise than you have been in the past.  In many cases that's enough.  If not, there, are medications
   you can take.  I will need to see you regularly for check ups, so we'll schedule another appointment.
```

FIGURE 1. Doctor-patient Dialogue from the Conversation Section of the Endocrine Unit

Here, the addition of a history-taking dialogue and results from some tests two months after the dialogue in Figure 1 could provide sufficient information to write up the case.

To provide more input on cases for students, the third-year curriculum could be expanded to include examples of cases where students are asked to make diagnoses. These small cases would follow the example of John Rees, Pattison, and Kosky (2014), who use cases in their book to aid students make diagnoses. While the task for students would be to make the correct diagnosis for each case, an important aspect of this addition would be to expose them to the language used in writing up cases.

The next stage, going beyond the writing up of simple cases, would involve the production of actual case reports, which would be more likely to take place at the graduate level. Rather than setting up fictional cases, a better option might be to focus on building skills in corpus creation and analysis for participants who are actually involved in writing case reports. Given the range of specialist areas in medicine as well as the range of journals, it is important for specialists to analyze the language and format of particular journals in their own medical field. If a specialist develops basic skills in using corpus software such as *AntConc,* she/ he will be able to create a small corpus which could then be used as a resource in the construction of a case report.

CONCLUSION

In this article, we have performed a preliminary discourse analysis on three case reports and corpus

analysis on 108 case reports; we have then considered the pedagogical implications arising from the analyses, for third-year medical students in Japan as well as for graduate students and medical practitioners.

In terms of analysis, we have noted that case reports are usually short, have an easily recognizable overall structure, with sections that also contain identifiable structure. Although there are variations between case reports, from a pedagogical perspective, they are highly suitable for developing learning materials. A key issue, however, relates to the differences between the receptive skill of reading and the productive skill of writing.

In relation to receptive skills, we have outlined how case reports could be used to construct self-study materials on an LMS. Although the main aim would be to provide materials for undergraduate third-year or fourth-year students, the advantage of an online course is that it can be made available for whoever wants it, and whenever and wherever they want to take it.

When considering productive skills, we have argued that the writing of a case report may be too much of a challenge for undergraduates. However, writing up a normal rather than unusual case, involving standard treatments, is something that students could and should be able to achieve. This can be done by providing them with material relating to a simulated case in the form of dialogues, test results, treatments, and outcomes. The students would then have to write up the case. This could be supplemented with additions to the existing curriculum involving the reading of tasks containing partial case information in which they have to diagnose the disease. Regarding graduate students and practitioners, we have suggested that they could be introduced to corpus creation and analysis, perhaps through the provision of workshops. The acquisition of such skills would give them a valuable tool in the writing of case report drafts.

The corpus used in this preliminary investigation was, due to time constraints, relatively small and hastily assembled. The next step will be to build on our initial findings by increasing the size of the corpus and addressing gaps in the coverage of medical areas. Future analysis might also address the patterns of distribution of lexical items and formulaic expressions across the different sections of medical case reports.

To conclude, as we have noted, the case report is an important genre used by medical practitioners to communicate ideas within the profession. With English as the lingua franca of the medical profession worldwide, and with many journals both in and outside Japan publishing articles in English, developing the skills and resources necessary to write case reports in English is essential. By creating accessible materials and integrating the writing up of cases into an existing curriculum at Hiroshima University, we hope to aid students and practitioners alike in developing their medical writing skills in English.

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APPENDIX. The Case Reports

Journal	Med. area	Country	Year	Type of article	Pages
1) Rheumatology		UK	2020	Letter to the editor	1.5
2) Rheumatology	1	UK	2020	Letter to the editor	1.5
3) The Lancet		UK	2020	Correspondence	2
4) Journal of Diabetes and Obesity		US	2017	Case report	3
5) Internal Medicine		Japan	2003	Case report	4
6) Internal Medicine	2	Japan	2015	Case report	4
7) Endocrine Journal		Japan	2007	Case report	5
8) Pancreas		US/Japan	2017	Letter to the editor	2.5
9) Clinical Journal of Gastroenterology		Japan	2012	Case report	5
10) Clinical Journal of Gastroenterology		Japan	2016	Case report	6
11) Internal Medicine	3	Japan	2018	Original article	6.5
12) Case Reports in Gastroenterology		US	2013	Case report	5.5
13) Case Reports in Gastroenterology		US	2015	Case report	4
14) Annals of Thoracic and Cardiovascular Surgery		Japan	2013	Case report	4
15) Surgery Today		Japan	2015	Case report	5
16) Annals of Thoracic and Cardiovascular Surgery	4	Japan	2019	Case report	3
17) General Thoracic and Cardiovascular Surgery		Japan	2014	Case report	3
18) Annals of Thoracic Surgery		US	2012	Case report	2
19) Internal Medicine		Japan	2017	Case report	5
20) Internal Medicine		Japan	2019	Case report	4
21) Medicine	5	UK	2018	Clinical case report	4
22) Medicine		UK	2019	Case report	3
23) Medicine		UK	2020	Two case reports	6
24) Interactive Cardiovascular and Thoracic Surgery		UK	2012	Case report	2
25) Asian Cardiovascular and Thoracic Annals	6	US	2014	Case study	3
26) Annals of Vascular Diseases		Japan	2019	Case report	3
27) The Heart Surgery Forum		Inter.	2017	Case report	3
28) Asia Pacific Allergy		Asia	2018	Case report	4
29) Neurology		US	2019	Single observational study	2
30) Journal of Clinical Endocrinology and Metabolism	7	UK	2017	Case report	4
31) Journal of Clinical Oncology		US	2013	Diagnosis in oncology	3
32) Pediatric Rheumatology		Europe	2020	Case report	5
33) International Journal of Radiation Oncology and Biological Physics		Australia	1995	Brief communication	5
34) International Cancer Conference Journal		Japan	2014	Case report	4
35) Hepatology Research	8	Japan	2014	Case report	3
36) Practical Radiation Oncology		US	2017	Case report	6
37) Practical Radiation Oncology		US	2018	Teaching case	4
38) Practical Radiation Oncology		US	2018	Teaching case	4

39) Radiology Case Reports		US	2020	Case report	6
40) Radiology Case Reports		US	2020	Case report	4
41) Radiology Case Reports	9	US	2020	Case report	3
42) Radiology Case Reports		US	2020	Case report	4
43) Radiology Case Reports		US	2020	Case report	3
44) BJR Case Reports		UK	2017	Case report	3
45) Journal of Artificial Organs		Japan	2018	Case report	4
46) BMC Pulmonary Medicine		Inter.	2016	Case report	4
47) Intensive Care Medicine	10	Inter.	2017	Imaging in intensive care medicine	2
48) Internal Medicine		Japan	2017	Pictures in clinical medicine	2
49) Journal of Pediatric Orthopaedics		US	2016	Case report	5
50) Journal of Foot and Ankle Surgery		US	2015	Case report	5
51) Medicine	11	Japan	2020	Clinical case report	5
52) Journal of Orthopaedic and Sports Physical Therapy		US	2016	Case report	12
53) Journal of Medical Case Reports		Inter.	2013	Case report	4
54) International Cancer Conference Journal		Japan	2017	Case report	4
55) IJU Case Reports	12	Japan	2019	Case report	4
56) IJU Case Reports		Japan	2019	Case report	3
57) IJU Case Reports		Japan	2020	Case report	4
58) Journal of International Medical Research		Inter.	2018	Case report	9
59) Hepatology Research	13	Japan	2015	Case report	6
60) Internal Medicine		Japan	2015	Case report	5
61) Case Reports in Hepatology		Int.	2017	Case report	7
62) Hepatology		US	2020	Case report	3
63) Digestive Endoscopy		Japan	2017	Letter, techniques and images	2
64) Surgical Case Reports		Japan	2016	Case report	7
65) Surgical Case Reports		Japan	2017	Case report	6
66) Clinical Case Reports		US	2019	Case report	8
67) International Journal of Surgery Case Reports	14	Inter.	2018	Case report	5
68) International Journal of Surgery Case Reports		Inter.	2018	Case report	6
69) BMC Pregnancy and Childbirth		Inter.	2019	Case report	4
70) European Journal of Obstetrics and Gynecology and Reproductive Biology		Inter.	2013	Case report	4
71) Gynecologic Oncology	15	Int.	2006	Case report	3
72) Intra-uterine and Extra-uterine Pregnancy		US	1886	A case of…	2
73) Journal of Perinatology		US	2002	Imaging casebook	3
74) Allergology International		Japan	2020	Letter to the editor	3
75) Journal of Dermatology		Japan	2020	Letter to the editor	2
76) Australasian Journal of Dermatology	16	Australia	2018	Letter to the editor	2
77) Journal of Dermatology		Japan	2019	Letter to the editor	2
78) Allergology International		Japan	2020	Letter to the editor	2

79)	American Journal of Ophthalmology Case Reports		US	2018	Case report	4
80)	American Journal of Ophthalmology Case Reports		US	2019	Case report	4
81)	American Journal of Ophthalmology Case Reports	17	US	2018	Case report	4
82)	American Journal of Ophthalmology Case Reports		US	2019	Case report	4
83)	Pediatric Rheumatology		Europe	2019	Case report	9
84)	Case Reports in Psychiatry		Inter.	2020	Case report	4
85)	International Journal of Neuroscience		UK	2014	Case report	2
86)	Journal of the Neurological Sciences	18	Inter.	2006	Short communication	3
87)	Journal of Clinical Case Reports		Inter.	2017	Case report	
88)	Asian Journal of Psychiatry		Inter.	2018	Case report	2
89)	New England Journal of Medicine		US	2014	Clinical problem solving	6
90)	New England Journal of Medicine		US	2016	Clinical problem solving	7
91)	New England Journal of Medicine	19	US	2014	Clinical problem solving	5
92)	New England Journal of Medicine		US	2014	Clinical problem solving	6
93)	New England Journal of Medicine		US	2020	Case records	8
94)	Skull Base		Inter.	2007	Case report	5
95)	Human Genome Variation	20	Inter.	2016	Article	6
96)	ORL		US	2018	Case report	5
97)	Neurological Science		Inter.	2020	Case report	3
98)	Journal of Neuroradiology		France	2020	Correspondence	3
99)	Internal Medicine	21	Japan	2019	Case report	5
100)	Journal of Stroke and Cerebrovascular Diseases		Inter.	2020	Case report	3
101)	Internal Medicine		Japan	2019	Case report	5
102)	CEN Case Reports		Japan	2018	Case report	5
103)	CEN Case Reports		Japan	2019	Case report	5
104)	CEN Case Reports	22	Japan	2017	Case report	4
105)	CEN Case Reports		Japan	2017	Case report	4
106)	Interactive Cardiac and Thoracic Surgery		Inter.	2004	Case report	3
107)	Journal of Anesthesia	23	Japan	2012	Clinical report	4
108)	Regional Anesthesia and Pain Medicine		US	2020	Case report	2

ABSTRACT

The Lexical and Textual Characteristics of Medical Case Reports:
A Preliminary Investigation

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In this article, we present our findings on an analysis of a corpus of 108 medical case reports in English. We first summarize the history of our involvement with medical English curriculum development, then present our findings from a discourse analysis of three case reports and a preliminary corpus analysis of the entire collection of articles. We conclude with a consideration of the pedagogical implications.
The following research questions are addressed:

1. What textual features of medical case reports can be identified?
2. From a small initial corpus of case reports, is it possible to identify key lexical items and formulaic sequences?

The results of the analyses show that although the medical terminology of case reports may be challenging, their overall organization and structure is quite simple, comprising three main sections (introduction, case presentation/report, and discussion) plus an abstract and references. The introduction describes the key area and introduces the new case. The case presentation/report narrates the salient features of the case, and the discussion involves an explanation of why the case is interesting or unusual, usually citing other literature in the area, and concluding with some suggestions. From the detailed corpus analysis a variety of terms and expressions that occur frequently and in a wide range of case reports can be identified. For example, phrases such as *"We report a case . . ."* are used to introduce the atypical case described in the study, and the modal verbs *'may'* and *'can'* often collocate with *'be'* in the suggestions made by the authors in the discussion.

In the section on pedagogical implications, we discuss the difference between reading case reports and actually writing them. While reading and analyzing case reports can start relatively early in students' medical studies, we argue that writing case reports is too big a challenge for third-year undergraduates. However, these students could be taught first to write up usual rather than rare cases by using simulated patient information, effectively developing skills for the presentation section of a case report. For the writing of actual case reports, we consider how training in basic corpus analysis could be provided, enabling researchers to build small corpora relevant to their needs.

<div align="center">要　約</div>

英語症例報告の語彙的・テキスト的特徴 ― 予備調査の結果から

<div align="right">
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　本稿では英文の症例報告108本を対象としたコーパス分析の結果を報告する。まず，筆者らによる医学英語カリキュラム開発のこれまでの取り組みを概観し，次に3本の症例報告を対象とした談話分析，および108本すべてのコーパスを対象とした予備的分析の結果を報告する。最後に，本研究の教育的示唆を考察する。

　本稿のリサーチクエスチョンは以下の2点である。

1. 症例報告にはどのようなテキスト的特徴が見られるか。
2. 症例報告の小規模な初期コーパスから，主要な語彙項目や定型的言語表現の特定は可能か。

　分析結果によれば，症例報告で用いられる医学用語は難解なものもあるが，全体的な構成や展開は極めてシンプルで，3つの主要セクション（緒言，症例提示，考察）および抄録と参考文献で構成されている。緒言では当該疾患についての概要を述べ，新しい症例の導入説明を行う。症例提示では症例の顕著な特徴を記述し，考察では関連文献を引用しつつ，その症例が興味深い理由を論述し，最後は示唆で締め括る。詳細なコーパス分析により，症例報告において広範囲かつ高頻度で出現する用語や表現の特定が可能である。例えば，非定型的症例の導入説明には，"We report a case…" のような表現が用いられる。また，考察で著者の示唆が記述される部分では，'may' や 'can' のような法助動詞と be 動詞のコロケーションが頻出する。

　本稿の教育的示唆として，症例報告を読むことと実際に書くことの違いを考察する。症例報告の読解と分析は医学教育の比較的初期から開始できるが，症例報告を書くことは，学部3年生の段階では難易度が高すぎると思われる。しかしそうした学生であっても，まずは模擬患者の情報を用い，ごく一般的な症例について書く指導から始めることで，症例報告における症例提示の技能を効果的に伸長できるだろう。さらに次の段階では，実際の症例報告を書くために，研究者が自分のニーズにあった小規模コーパスの構築を行えるよう，基本的なコーパス分析の訓練を行う方法について考察する。