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Genre Analysis of Abstracts in International Medical Journals

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This study systematically analyzes the genre structure and linguistic features of 42 English abstracts from six internationally renowned medical journals, based on the revised CARS model proposed by Swales. The research findings indicate that medical abstracts typically follow a three-step structure: "Establishing a Research Territory—Establishing a Research Niche—Occupying the Niche", where the steps "Research Purpose" and "Research Results" are the most frequently utilized, forming the core content of the abstracts. Within the sequence of moves, 81% conform to conventional patterns, while a minority of samples exhibit unconventional structures such as inversion, cycling, and repetition. In terms of linguistic features, the present simple tense and active voice are predominantly used, reflecting the universality of the research and the author's agency; conversely, the simple past tense and passive voice are primarily employed to describe research methods and processes. This study reveals the writing conventions of medical abstracts, providing empirical evidence and genre reference for non-native scholars in the preparation and publication of their work in international journals.

Keywords: CARS model, medical journals, genre analysis, abstract structure, linguistic features

Introduction

Genre is defined as "a type of communicative event", whose communicative purpose is shared among members of a specific discourse community (Swales, 1990, p. 93). Genre analysis explores how members of a discourse community assign a particular genre label to a particular communicative event (Paltridge, 1997, pp. 62-73).

The abstract is an indispensable part of a paper, providing an objective summary of the main content and significantly affecting the quality of the thesis (Zhao et al., 2019). A precisely worded, well-organized, and comprehensive abstract is crucial for both writing and publishing papers. This is why research on abstracts has become a focal point of interest for scholars both domestically and internationally in recent years. Researchers from various academic fields have analyzed research papers' abstracts, with particular attention on areas like mechanical engineering (Dong, 2023), aerospace (Zhang, 2014), linguistics (Wu, 2015), literature (Zhao et al., 2019), agricultural sciences (Yang & Zhou, 2020) and ethnology (Chen, 2012). While some scholars have analyzed abstracts from medical journals (Kang & Sun, 2011), there is a notable lack of systematic studies focusing on medical journal articles based on the CARS model in the academic community. Therefore, this study aims to systematically investigate the macro genre structures and micro linguistic features of English abstracts in

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international authoritative medical journals from the perspective of Swales' CARS model. The findings will help to summarize the writing patterns of abstracts within this field and provide valuable insights for scholars in related areas seeking to publish high-quality papers in international journals.

Theoretical Framework

CARS Model（2004）
Move 1 Topic generalizations in increasing specificity
Move 2 S1A Indicating a gap
Move 2 S1B Adding to what is known
Move 2 S2 Presenting positive justification
Move 3 S1 Announcing present research descriptively and/or purposively
Move 3 S2 Presenting Qs or hypotheses
Move 3 S3 Definitional clarification
Move 3 S4 Summarizing methods
Move 3 S5 Announcing principal outcomes
Move 3 S6 Stating the value of the present research
Move 3 S7 Outlining the structure of the paper
Move 3 S8 Inference

Figure 1. CARS model.

The CARS Model (Create-A-Research-Space Model) was introduced by Swales in 1990, initially to analyze the introduction sections of research articles (Swales, 1990, p. 45). In 2004, Swales revised the CARS model, making it more flexible and better aligned with the characteristics of contemporary academic discourse (Swales, 2004, p. 58). The revised CARS model serves as a linguistic structure analysis model based on moves and steps. In the context of abstract analysis, the CARS model comprises three main moves, each serving a distinct communicative purpose, collectively forming a typical cognitive structure for introducing a research topic.

The first move, "Establishing a Territory", emphasizes the significance and necessity of the research problem through brief topic generalizations in increasing specificity. The second move, "Establishing a Niche", reiterates the necessity of the current topic by indicating gaps in previous research. This move includes three steps: Indicating a gap, adding to what is known, and presenting positive justification with the aim of illustrating the academic significance of the topic. The third move, "Occupying the Niche", conveys to the reader how the issues raised in the paper will be addressed in the main text. Hence, the sequence of Establishing a Territory, Establishing a Niche, and Occupying the Niche constitutes the foundational framework for achieving the communicative objectives of the introduction.

Research Methods

This study randomly sampled seven academic paper abstracts from each of six journals that cover various subfields within the medical domain, resulting in a total of 42 abstract samples. Using a mixed-methods approach that combines qualitative and quantitative analysis, the author systematically examined the genre structure and linguistic features of these abstracts. Based on Swales' CARS model, the author carefully read and analyzed the

42 abstract samples, identifying and annotating the moves and steps within each abstract. The author statistically recorded the frequency of moves and steps, the order of occurrence, as well as the frequency of unconventional moves and steps, thereby exploring the genre structure in depth. Additionally, I quantified and organized the choices of verb tense and voice in order to investigate the linguistic features presented in the abstracts.

The selected six journals are: the *Journal of Medical Ethics*, the *Journal of Applied Social Science* (JASS), the *British Medical Journal* (BMJ), the *Proceedings of the National Academy of Sciences of the United States of America*, *Current Science*, and the *Medical Anthropology Quarterly*.

Genre Structure

Number of Moves and Steps

According to the CARS model, in the 42 abstract samples, a total of 198 moves (steps) were identified, with the number of moves per sample ranging from 3 to 7. After categorizing and organizing the samples containing 3, 4, 5, 6, and 7 moves, the following data were obtained:

Table 1
Number of Moves and Steps

Number of Moves and Steps	Number of Abstracts	Total
3	4	9.5%
4	16	38.1%
5	13	31.0%
6	6	14.3%
7	3	7.1%
Total	42	100%

From table 1, it is evident that abstracts containing 4 to 5 moves are the most common, accounting for approximately 30.0%–40.0%, while abstracts with 7 moves are the least common. Upon analyzing the 17 abstracts with 4 moves, it was found that the sequence of moves M3 S1+M3 S4+M3 S5+M3 S8 appeared consistently across multiple abstracts. These moves were presented in the same order, adhering to a conventional sequence (M3 S1–M3 S4–M3 S5–M3 S8). For abstracts with 5 moves, the situation was slightly different. Among the 12 abstracts with 5 moves, two abstracts contained identical moves (M1+M3 S1+M3 S4+M3 S5+M3 S6), and the sequence was also conventional (M1–M3 S1–M3 S4–M3 S5–M3 S6). Another two abstracts contained identical moves (M1+M2 S1A+M3 S1+M3 S5+M3 S6), with the sequence also following a conventional pattern (M1–M2 S1A–M3 S1–M3 S5–M3 S6). Authors of the abstracts often first discuss the relevant findings in the research field, objectively describe the current research, then discuss the methodology, announce the conclusions, and finally state the research value. This approach clearly conveys the main information of the paper to the readers.

Move Sequence

Based on the CARS Model, if the sequence of moves in an abstract follows “Move 1–Move 2–Move 3”, and the internal order of steps within each move also adheres to “Step 1–Step 2–Step 3–…–Step 7”, the sequence of moves in that sample is considered a conventional move sequence. Otherwise, it is classified as an unconventional move sequence. The following table shows the number and percentage of conventional and unconventional move sequences in the 42 abstracts.

Table 2
Move Sequence in 42 Abstracts

Move Sequence	Quantity	Percentage
Conventional	34	81.0%
Unconventional	8	19.0%
Total	42	100%

According to table 2, 34 abstracts conform to the conventional move sequence, accounting for 81.0%, far exceeding the proportion of unconventional sequences. This indicates that most abstracts in the medical field follow the conventional move sequence of the CARS Model. Further research into unconventional move sequences revealed three main types: reversion, circulation, and repetition. Their respective frequencies and proportions are shown in the table below.

Table 3
Frequency of Unconventional Move Model

Unconventional Move Model	Quantity	Percentage
Reversion	6	75.0%
Circulation	1	12.5%
Repetition	1	12.5%
Total	8	100%

As shown in table 3, reversion is the most common type of unconventional sequence, while repetition and circulation are relatively similar in frequency. Below are examples of each type of unconventional move sequence.

Example (1)

> However, such initial responses are almost always followed by relapse, with the recurrent cancer being resistant to further treatments. (M2 S1A Indicating a gap) // The discovery of therapeutic approaches that counteract relapse is, therefore, essential for advancing cancer medicine. Cancer cells are extremely heterogeneous, even in each individual patient, in terms of their malignant potential, drug sensitivity, and their potential to metastasize and cause relapse. (M2 S2 Presenting positive justification)// Indeed, hypermalignant cancer cells, termed cancer stem cells or stemness-high cancer cells, that are highly tumorigenic and metastatic have been isolated from cancer patients with a variety of tumor types. Moreover, such stemness-high cancer cells are resistant to conventional chemotherapy and radiation. (M2 S1B Adding to what is known)

In the above abstract, the author first clarified the untreatability of recurrent cancer (M2 S1A), and then presented positive reasons or evidence in the argument or discussion to support a point of view, position or decision (M2 S2). It then builds on existing knowledge or research to provide new information, insights, or discoveries (M2 S1B), which is the reverse of an unconventional order.

Example (2)

> This sex inequality is reflected in scholarly publications. A recent bibliometric study examining over 5 million publications across disciplines showed that fewer than 30% of authors were women. The same study also revealed that women were one third as men to

> serve as first authors, and their work was less likely to be cited. (M2 S1A Indicating a gap)// Academic medicine is not immune to this sex inequality, Grants awarded to women are lower than those awarded to men. Women also have lower salaries, an effect that is not accounted for by productivity, specialty, rank, or working hours among men. (M2 S1B Adding to what is known) //

Further, the published medical literature is with the exception of psychiatric journals, predominantly written by men. (M2 S1A Indicating a gap) // This is not attributable to a dearth of women in medical faculties, as this bias occurs despite data from the United States indicating that female medical graduates have been more likely than males to assume medical school faculty positions. (M2 S1B Adding to what is known)

In example (2), it is clear that the M2 S1A and M2 S1B cycles occur twice, belonging to the circulation. Every time after introducing some defects in the research field, the author will use examples to clarify the research status, with a clear structure and rigorous thinking logic.

Example (3)

> The resulting Rb;p53 double mutant (DKO) animals are viable but develop early onset osteosarcomas with complete penetrance. These tumors display many of the characteristics of human osteosarcomas, including being highly metastatic. (M3 S5 Announcing principal outcomes)
>
> // We established cell lines from the DKO osteosarcomas to further investigate their properties. (M3 S4 Summarizing methods) // These immortalized cell lines are highly proliferative and they retain their tumorigenic potential, as judged by their ability to form metastatic tumors in immunocompromised mice. Moreover, they can be induced to differentiate and, depending on the inductive signal, will adopt either the osteogenic or adipogenic fate. Consistent with this multipotency, a significant portion of these tumor cells express Sca-1, a marker that is typically associated with stem cells/uncommitted progenitors. By assaying sorted cells in transplant assays, we demonstrate that the tumorigenicity of the osteosarcoma cell lines correlates with the presence of the Sca-1 marker. Finally, we show that loss of Rb and p53 in Sca-1-positive mesenchymal stem/progenitor cells is sufficient to yield transformed cells that can initiate osteosarcoma formation in vivo. (M3 S5 Announcing principal outcomes) (Tuomilehto-Wolf, 1993)

In example (3), M3 S5 is repeated in different discourse locations, and the authors state the conclusions of this study twice, highlighting the important correlation of RB-1 and p53 tumor inhibitor mutations in inducing the formation and development of human bone tumors, so it can be regarded as a repeat order.

Frequency of Moves and Steps

Based on the CARS Model, after annotating and categorizing each move (step), the frequency of use across the total samples was obtained, as shown follow.

Table 4
Frequency of Moves and Steps

	M1	M2 S1A	M2 S1B	M2 S2	M3 S1	M3 S2	M3 S3	M3 S4	M3 S5	M3S6	M3 S7	M3S8
42/42	33/42	17/42	8/42	11/42	32/42	5/42	0	22/42	37/42	23/42	0	10/42
%	78.6%	40.5%	19.0%	26.2%	76.2%	11.9%	0	52.4%	88.1%	54.8%	0	23.8%

Table 4 indicates the structural potential of abstracts in the medical field:

M3 S5 > M1 > M3 S1 > M3 S6 > M3 S4 > M2 S1A > M2 S2 > M3 S8 > M2 S1B > M3 S2

Except for M3 S3 and M3 S7, all other moves were found in the 42 abstracts. The frequency of M3 S5, M1, and M3 S1 was as high as 88.1%, 78.6%, and 76.2%, respectively, far exceeding other moves. These are thus classified as obligatory moves. The remaining moves are optional, with relatively low frequencies of M3 S3 and M2 S1B. Obligatory moves fulfill the basic functions of the genre and are indispensable in abstracts, whereas optional moves are less critical. Therefore, abstract authors typically begin with a summary of the topic or discussion, followed by a description of the research, and finally announce the research results. The research results play a crucial role in determining the success and validity of a study, thus occupying a significant position in the abstract, which also reflects its promotional function. Furthermore, medical paper authors rarely supplement existing information or insights in abstracts and seldom explain relevant medical terms, indicating that such information is not closely related to the communicative function of the abstract.

Linguistic Features

This study investigates the linguistic features from several aspects: tense, voice, first-person pronouns, and modal verbs. Through the examination of these microscopic features, the study aims to identify distinctive characteristics of language use in abstracts written for international medical journals.

An analysis of 42 samples reveals that four tenses are utilized, ranked in frequency from highest to lowest as follows: simple present tense, simple past tense, present perfect tense, and simple future tense. The distribution of these tenses across different rhetorical moves is illustrated in the table below:

Table 5
Distributions of Four Verb Tenses in Moves and Steps

	Simple Present	Simple Past	Present Perfect	Simple Future	Total
M1	31	/	3	/	34
M2 S1A	14	1	3	/	18
M2 S1B	5	1	5	/	11
M2 S2	9	/	1	2	12
M3 S1	31	18	1	/	50
M3 S2	10	5	/	/	15
M3 S4	7	62	/	/	69
M3 S5	67	127	6	4	204
M3 S6	52	14	/	3	69
M3 S8	12	2	/	1	15
Total	238	230	19	10	

From table 5, it can be observed that the simple present tense is used in all moves and steps, with the highest frequency among all tenses, underscoring its role in emphasizing the universality and regularity of

research or related phenomena. The simple past tense is also used frequently but is absent in some steps (e.g., M1, M2 S2). The present perfect tense and the simple future tense are used selectively in certain steps, such as M2 S2 and M3 S5, but show significant variation in their distribution. For example, the present perfect tense is also employed in M1, M2 S1A, M2 S1B, M2 S2, and M3 S1. The simple future tense appears in M2 S2, M3 S5, M3 S6, and M3 S8. Below are specific examples:

Example (4)

> To understand in more detail the origins of such dysregulation, we identify specific components of the protein homeostasis system associated with these metastable proteins by using a gene coexpression analysis. (M3 S1)

Example (5)

> Of the 1158 cancer survivors, 70 (6.0%) reported that they did not receive all necessary cancer care. Adjusted analyses found that cancer survivors who reported not receiving all necessary cancer care were also less likely to report receiving general medical care (78.0%) than cancer survivors who reported having access to necessary cancer care (87.1%) and people who had no history of cancer (87.8%). (M3 S5)

Example (6)

> Whole-exome sequencing has been successful in identifying genetic factors contributing to familial or sporadic Parkinson's disease (PD). (M1)

Example (7)

> We argue that this approach is beneficent because it will decrease global health inequalities and promote social justice worldwide. (M3 S6)

The simple present tense (e.g., Example (4)) is commonly used to objectively describe the content and results of the research. The simple past tense (e.g., Example (5)) is frequently employed to detail the research methods, particularly data collection and processing, as well as to present and interpret research results. This highlights the author's efforts during the research and underscores the study's reliability. The present perfect tense (e.g., Example (6)) is often used to introduce the research topic, describe gaps and deficiencies in the field, provide new insights, and present research outcomes. The simple future tense (e.g., Example (7)) is used to support the research design, methods, or conclusions, or to explain the research's value.

The usage of active and passive voices across the moves and steps in the 42 abstracts is summarized below:

Table 6
Distribution of Two Verb Voices in Moves and Steps

	Active Voice	Passive Voice	Total
M1	27	8	35
M2 S1A	11	10	21
M2 S1B	6	6	12
M2 S2	9	3	12
M3 S1	40	10	50
M3 S2	11	2	13
M3 S4	39	28	67

M3 S5	165	38	203
M3 S6	60	6	66
M3 S8	12	3	15
Total	380	114	

The table 6 shows that both active and passive voices are used in all moves and steps. The active voice highlights the author's ownership of the research, emphasizing their contributions and viewpoints, as demonstrated in Example (8). However, the active voice is used more frequently than the passive voice in almost all steps, except M2 S1B, where the two are used equally (see Example (9)).

Example (8)

> These findings support the hypothesis that specific HLA haplotypes exhibit a common genetic determinant for insulin dependent and non-insulin dependent diabetes. Furthermore, HLA is a major genetic determinant of glucose intolerance in elderly Finnish men. The belief that the HLA predisposition to diabetes is specific for insulin dependent diabetes mellitus is largely incorrect. (M3 S6)

Example (9)

> Women also have lower salaries, an effect that is not accounted for by productivity, specialty, rank, or working hours among men. (M2 S1B)

Conclusion

Based on Swales' CARS model, this study provides a comprehensive genre and linguistic feature analysis of abstracts in medical journal articles. In terms of genre structure, the abstracts typically encompass two to four moves, with M3S1 and M3S5 being obligatory moves; they usually follow the conventional sequence prescribed by the CARS model, although some employ unconventional orders such as reversion, circulation, and repetition. The linguistic features of the abstracts predominantly employ the present simple and active voice, while the passive voice is more frequently used to describe research methods, and the past simple and present perfect are also applied uniquely within specific moves.

This research, by employing both qualitative and quantitative analysis, deduces the linguistic realization of each move and step, demonstrating that the choice of linguistic features aligns closely with their communicative functions in the abstracts. In terms of verb tenses, different moves exhibit distinct preferences due to their communicative aims; for instance, past tense dominates M3 S4 and M3 S5 to discuss the processes, methods, and results, while the present tense is commonly used in M3 S5 and M3 S6 when emphasizing the general significance of the findings.

This study not only aids readers of medical journals in more effectively reading and understanding abstracts but also provides researchers with valuable references for mastering the genre patterns and linguistic features of such abstracts, assisting them in composing abstracts that align with journal preferences.

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