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From Structure to Diagnosis in medical education: An Analysis of Linguistic Features in Iranian Medical Reporting

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Background: Technological progress in medicine necessitates linguistic analysis of diagnostic reports. This study explores the linguistic functions of medical diagnostic reports, by focusing on Radiology Case Reports (RCRs), Magnetic Resonance Imaging (MRI) reports, and Computed Tomography-Scan (CT-scan) reports.
Method: This descriptive study analyzed a corpus of 300 diagnostic medical reports from Tabriz Medical Science University over a three-month period (Autumn 2024). By employing Rhetorical Structure Theory (RST) postulated by Mann and Thompson, this study emphasizes the functional aspects of language by analyzing how linguistic choices fulfill communicative purposes within specific contexts. RST provides a systematic approach to identifying the relationships between different sections of a text, offering insights into how diagnostic reports are organized to convey medical findings clearly and effectively.
Results: Diagnostic reports exhibited a predominance of nominal groups (75%), highlighting their critical role in providing detailed identification of anatomical structures. Prepositional groups accounted for 10%, primarily used to offer spatial and procedural context. Verbal groups in passive voice made up 15%, reflecting objectivity and focus on findings and procedures. Complex clauses appeared in 60% of the reports, integrating diagnostic observations concisely. Conciseness was prevalent in 80% of the cases, ensuring that reports were brief yet informative. This highlights a focus on clarity, precision, and efficiency through structured, objective language.
Conclusion: These linguistic features serve as important teaching points in medical education for improving students' competencies in writing and interpreting diagnostic texts that can prepare future healthcare professionals to produce diagnostically effective and professionally appropriate medical documentation.
Keywords: Functions of Language, Medical Imaging Reports, Medical Science, Systemic Functional Linguistics (SFL)

من البنية إلى التشخيص في التعليم الطبي: تحليل للخصائص اللغوية في التقارير الطبية الإيرانية

ملخص: يتطلب التقدم التكنولوجي في الطب تحليلًا لغويًا للتقارير التشخيصية. تستكشف هذه الدراسة الوظائف اللغوية لتقارير التشخيص الطبي، بالتركيز على تقارير حالات الأشعة (RCRs)، وتقارير التصوير بالرنين المغناطيسي (MRI)، وتقارير التصوير المقطعي المحوسب (CT-scan).
النتائج: أظهرت التقارير التشخيصية غلبة للمجموعات الاسمية (٧٥%)، مما يُبرز دورها المحوري في توفير تعريف مُفصّل للهياكل التشريحية. شكلت المجموعات الجرّية ١٠%، واستُخدمت بشكل رئيسي لتقديم السياق المكاني والإجرائي. شكلت المجموعات اللفظية بصيغة المبني للمجهول ١٥%، مما يعكس الموضوعية والتركيز على النتائج والإجراءات. ظهرت الجمل المعقدة في ٦٠% من التقارير، مُدمجةً الملاحظات التشخيصية بإيجاز. ساد الإيجاز في ٨٠% من الحالات، مما ضمن أن تكون التقارير موجزة وغنية بالمعلومات. يُبرز هذا التركيز على الوضوح والدقة والكفاءة من خلال لغة مُهيكلة وموضوعية.
الاستنتاج: تعتبر هذه السمات اللغوية بمثابة نقاط تعليمية مهمة في التعليم الطبي لتحسين كفاءة الطلاب في كتابة وتفسير النصوص التشخيصية التي يمكن أن تعد المتخصصين في الرعاية الصحية في المستقبل لإنتاج وثائق طبية فعالة تشخيصيًا ومناسبة مهنيًا.
الكلمات المفتاحية: وظائف اللغة، تقارير التصوير الطبي، العلوم الطبية، اللغويات الوظيفية النظامية

طبی تعلیم میں ساخت سے تشخیص تک: ایرانی طبی رپورٹنگ میں لسانی خصوصیات کا تجزیہ

پس منظر: طب میں تکنیکی ترقی کے لیے تشخیصی رپورٹس کے لسانی تجزیہ کی ضرورت ہے۔ یہ مطالعہ ریڈیولوجی کیس رپورٹس (RCRs)، میگنیٹک ریزونس امیجنگ (MRI) رپورٹس، اور Computed Tomography-Scan (CT-scan) رپورٹس پر توجہ مرکوز کرکے، طبی تشخیصی رپورٹس کے لسانی افعال کو تلاش کرتا ہے۔
طریقہ: اس وضاحتی مطالعہ نے تین ماہ کی مدت (خزاں ۲۰۲۴) کے دوران تبریز میڈیکل سائنس یونیورسٹی سے ۳۰۰ تشخیصی طبی رپورٹس کے کارپس کا تجزیہ کیا۔ مان اور تھامسن کے ذریعہ وضع کردہ بیاناتی ڈھانچے کے نظریہ (RST) کو استعمال کرتے ہوئے، یہ مطالعہ زبان کے فعال پہلوؤں پر اس بات کا تجزیہ کرتے ہوئے زور دیتا ہے کہ لسانی انتخاب کس طرح مخصوص سیاق و سباق کے اندر ابلاغی مقاصد کو پورا کرتے ہیں۔ آر ایس ٹی متن کے مختلف حصوں کے درمیان تعلقات کی نشاندہی کرنے کے لیے ایک منظم طریقہ فراہم کرتا ہے، یہ بصیرت پیش کرتا ہے کہ طبی نتائج کو واضح اور مؤثر طریقے سے پہنچانے کے لیے تشخیصی رپورٹس کو کس طرح منظم کیا جاتا ہے۔
نتائج: تشخیصی رپورٹس میں برائے نام گروپوں کی برتری (۷۵%) دکھائی گئی، جو کہ جسمانی ساخت کی تفصیلی شناخت فراہم کرنے میں ان کے اہم کردار کو اجاگر کرتی ہے۔ پیشگی گروپوں کا حساب ۱۰% ہے، جو بنیادی طور پر مقامی اور طریقہ کار سیاق و سباق پیش کرنے کے لیے استعمال ہوتا ہے۔ غیر فعال آواز میں زبانی گروپس ۱۵ فیصد بنتے ہیں، جو معروضیت کی عکاسی کرتے ہیں اور نتائج اور طریقہ کار پر توجہ مرکوز کرتے ہیں۔ ۶۰% رپورٹس میں پیچیدہ شقیں نمودار ہوئیں، جو تشخیصی مشاہدات کو اختصار کے ساتھ مربوط کرتی ہیں۔ ۸۰% معاملات میں جامعیت موجود تھی، اس بات کو یقینی بناتے ہوئے کہ رپورٹیں مختصر لیکن معلوماتی ہوں۔ یہ ساختی، معروضی زبان کے ذریعے وضاحت، درستگی، اور کارکردگی پر توجہ مرکوز کرتا ہے۔
نتیجہ: یہ لسانی خصوصیات طبی تعلیم میں طالب علموں کی تشخیصی تحریروں کی تحریر اور تشریح میں قابلیت کو بہتر بنانے کے لیے اہم تدریسی نکات کے طور پر کام کرتی ہیں جو مستقبل میں صحت کی دیکھ بھال کے پیشہ ور افراد کو تشخیصی طور پر موثر اور پیشہ ورانہ طور پر مناسب طبی دستاویزات تیار کرنے کے لیے تیار کر سکتی ہیں۔
کلیدی الفاظ: زبان کے فنکشنز، میڈیکل امیجنگ رپورٹس، میڈیکل سائنس، سسٹمک فنکشنل لسانیات (SFL)

از ساختار تا تشخیص در آموزش پزشکی: تحلیلی آکادمیک از ویژگی‌های زبانی در گزارش‌های پزشکی ایران

زمینه و هدف: پیشرفت‌های نوین در عرصه فناوری‌های پزشکی، ضرورت تحلیل زبان‌شناختی گزارش‌های تشخیصی را نمایان ساخته است. مطالعه حاضر، با استفاده از گزارش‌های موردی رادیولوژی، گزارش‌های تصویربرداری مغناطیسی و گزارش‌های توموگرافی کامپیوتری، به بررسی کارکردهای زبانی موجود در گزارش‌های تشخیصی پزشکی می‌پردازد.
روش: مطالعه توصیفی حاضر، مجموعه ای از ۳۰۰ گزارش پزشکی تشخیصی گردآوری‌شده از دانشگاه علوم پزشکی تبریز در بازه زمانی سه ماهه (پاییز ۱۴۰۳) را مورد بررسی قرار داد. در این پژوهش، با بهره‌گیری از نظریه ساختار بلاغی، بر ابعاد کنشی زبان تمرکز گردید. نظریه بلاغی، چارچوبی نظام‌مند برای شناسایی روابط موجود میان اجزاء گوناگون یک متن ارائه می‌دهد.
یافته‌ها: گروه‌های اسمی با فراوانی ۷۵٪ نقش محوری در ارائه شناسایی دقیق ساختارهای آناتومیک و شرایط پاتولوژیک دارند. حروف اضافه، با فراوانی ۱۰٪، عمدتاً به منظور ارائه زمینه مکانی و رویه‌ای به کار رفته‌اند. گروه‌های فعلی در ساختار مجهول، ۱۵٪ از ساختارهای زبانی را تشکیل می‌دهند که نشان‌دهنده تأکید بر عینیت و تمرکز بر یافته‌ها و رویه‌های انجام‌شده است. بندهای پیچیده در ۶۰٪ گزارش‌ها مشاهده گردیدند که امکان ادغام مختصر و مؤثر مشاهدات تشخیصی را فراهم می‌آورند. همچنین، ایجاز در ۸۰٪ موارد به عنوان یک ویژگی برجسته زبانی شناسایی شد که تضمین‌کننده اختصار و در عین حال آموزنده بودن گزارش‌ها است.
نتیجه‌گیری: ویژگی‌های زبانی، به عنوان نکات آموزشی حائز اهمیت در حوزه آموزش پزشکی عمل نموده و می‌توانند به ارتقای شایستگی‌های دانشجویان در زمینه نگارش و تفسیر متون تشخیصی یاری رسانند. از این طریق، متخصصان قادر خواهند بود تا اسناد پزشکی را با اثربخشی تشخیصی بالا و رعایت اصول حرفه‌ای مناسب ارائه نمایند.
واژه‌های کلیدی: کارکردهای زبان، گزارش‌های تصویربرداری پزشکی، علوم پزشکی، زبان‌شناسی نقش‌گرای سیستمی

INTRODUCTION

Diagnostic imaging, a cornerstone of modern medicine, offers significant benefits for patient care (1). The past decade has seen increasing recognition of information technology's crucial role in enhancing healthcare efficiency (2). Digital imaging platforms, early health IT innovations, have been integrated into healthcare since the 1980s (3, 4). Their adoption in hospitals globally has surged to improve diagnostic accuracy, workflow, efficiency, and patient care standards (5). However, these techniques necessitate integration with supplementary technologies like Picture Archiving and Communication Systems (PACS) (6). PACS are critical for the efficient acquisition, storage, transmission, and display of medical images (7), aiming to optimize image access across healthcare institutions, particularly in radiology (8). PACS seamlessly integrate with various imaging modalities and related technologies (9). As PACS improve the availability and quality of diagnostic images, the demand for equally high-quality documentation and reporting has grown. The ability to produce coherent and clinically meaningful radiology reports is now recognized as essential to fully leverage the technological benefits of PACS. Consequently, a strong understanding of PACS use and management is increasingly vital in medical education to equip future healthcare professionals with the skills for effective access, interpretation, and management of digital diagnostic information.

Radiological imaging reports are critical for communication between referring physicians and radiologists, significantly influencing clinical decisions (10, 11). Accurate interpretation and production of these reports are essential in medical training for continuity of care, diagnostic precision, and interprofessional collaboration. To enhance understanding, prior research used Systemic Functional Linguistics (SFL) (12). This study employs Rhetorical Structure Theory (RST) (13), a language-independent model describing text organization through rhetorical relationships (14). RST is valuable for linguistic analysis and as a pedagogical tool in medical education, offering structured methods to improve students' report-writing skills during clinical training, particularly in clerkships and residencies where clear articulation of findings is a core competency. RST has diverse theoretical and practical applications, including automated text generation, summarization, linguistic assessment, language conversion, writing pedagogy, discourse analysis, and data retrieval (15).

Despite extensive research on generic frameworks and linguistic functions in various scientific texts (16-18), a notable lack of specific investigations exists concerning English-language medical diagnostic imaging reports, particularly regarding the embodiment of linguistic functions within the Iranian context. These reports, a subcategory of medical case documentation, have received comparatively less scholarly attention than other scientific genres like primary research articles (19). While some studies have explored patient perspectives, a significant gap persists in research focusing on the linguistic attributes of diagnostic imaging reports. Given that English is widely used in Iranian medical universities and hospitals for documentation and international communication, and considering the challenges Iranian medical professionals face in mastering genre-specific academic English, this context presents a linguistically rich and pedagogically relevant setting for investigation. This study aims to address this deficiency by providing a focused analysis of the language used in these documents. By filling this gap, the research contributes to linguistic scholarship and offers crucial insights for medical education, informing curriculum design to enhance clinical documentation and diagnostic communication skills, thereby enabling future healthcare practitioners to produce clear, concise, and clinically actionable reports that improve patient care outcomes.

METHODS

This retrospective, corpus-driven, descriptive study analyzed a collection of 300 diagnostic medical records from Tabriz University of Medical Sciences, a primary source of clinical data for healthcare providers' diagnostic assessments. In this context, the term "descriptive" specifically refers to a linguistic description, focusing on the rhetorical and structural features of the texts, particularly as realized through Rhetorical Structure Theory (RST). This process typically involves classifying observations as indicative or non-indicative of pathological conditions based on statistical and conceptual evaluations (20). The research corpus comprised a diverse range of diagnostic documentation, including Radiological Case Studies (RCS), Magnetic Resonance Imaging (MRI) interpretations, and Computed Tomography (CT) scan evaluations of varying lengths. Data acquisition and analysis were conducted over a three-month period. To focus on linguistic features, non-verbal elements such as tables, graphs, temporal markers, and authentication marks were excluded from the corpus. These elements were removed because they do not contribute to the rhetorical or structural organization of the verbal text and could obscure the analysis of discourse-level features by introducing visual or symbolic data not aligned with the study's linguistic focus.

To analyze the linguistic realization of communicative intents in Iranian diagnostic imaging reports, Rhetorical Structure Theory (RST) was employed, focusing on the pragmatic function of language in achieving communicative goals within specific contexts. RST, developed in the 1980s, analyzes texts by identifying functional relationships

between segments, classifying textual arrangements based on their persuasive roles to understand how elements contribute to overall meaning and coherence. This framework emphasizes textual connectivity and semantic unity for effective communication through strategic information deployment. RST is particularly suitable for analyzing medical imaging reports in the Iranian context because it allows for a fine-grained examination of how clinical information is structured to meet professional communication standards, especially in a setting where English is used as a second language for academic and medical documentation. This makes RST valuable for uncovering both universal and context-specific rhetorical strategies used by Iranian medical professionals.

Following the attainment of ethical sanction from the Institutional Review Board of Tabriz University of Medical Sciences (Ethical Authorization: IR.IAU.TABRIZ.REC.1402.219), a corpus of 300 diagnostic evaluations (radiography, MRI, CT scans) totaling 3,567 words was collected and analyzed using generic architectural models. RST was applied to dissect how clauses and sentences establish textual cohesion and logical information flow, assessing the use of clause types, prepositional phrases, and diagnostic parameters to identify patterns of objectivity and precision. Peer reviews and expert consultations ensured the findings' reliability. They were experts in English language teaching and medical science with different years of experience in teaching and medicine. This integrated approach provided a comprehensive understanding of the corpus's linguistic and structural features, leading to conclusions about genre-specific conventions in Iranian diagnostic medical imaging evaluations. The analysis considered subject matter (medical content and terminology), interpersonal dynamics (relationships, formality, specialized lexicon), and communicative channel (format, style, including passive voice, nominalization, clarity, and organization).

Statistical analysis

To ensure the reliability of the data, 20% of the corpus was independently re-analyzed by a second researcher—a PhD graduate in TEFL from Tabriz University—who was well-versed in the analytical framework. Inter-rater reliability for identifying generic structures was measured using Cohen's kappa coefficient, yielding a high level of agreement (κ = .96). The findings were reported through both qualitative and quantitative approaches, employing frequencies and percentages to illustrate the observed patterns. RST was applied to analyze the textualization of language functions. Frequency and percentage analyses were employed to determine the occurrence of each section. Qualitative insights were derived through close textual analysis of selected report segments, focusing on how rhetorical relations—such as Elaboration, Justify, and Evidence—were employed to achieve communicative purposes. These insights were used to interpret patterns that could not be captured solely by numerical data, such as context-specific discourse strategies and stylistic variations.

RESULTS

For the first report, the introductory sentence, *"Imaging of Brain was performed at 1.5 Tesla scanner using Head Coil,"* is a simple clause that establishes the procedural context of the report. The sentence contains multiple groups, including a nominal group (*Imaging of Brain*) that introduces the subject matter, and prepositional groups (*at 1.5 Tesla scanner* and *using Head Coil*) specifying the equipment used. The verbal group (*was performed*) adopts a passive voice, which is common in medical reporting to emphasize the procedure over the agent conducting it.

The findings section is detailed and descriptive, incorporating complex clauses to describe abnormalities and normal findings with technical precision.

Microvascular Ischemic Changes

The sentence, *"There are severe multiple hypersignal intensity foci on long TR images at periventricular and paraventricular white matter in favour of Microvascular Ischemic Changes (FAZEKAS change Type III),"* is a complex clause. The main clause presents the primary observation, while the subordinate clause adds czxvbontextual and diagnostic details. Various groups are embedded within the sentence, including nominal groups (*severe multiple hypersignal intensity foci*, *long TR images*, *periventricular and paraventricular white matter*), prepositional groups (*on long TR images*, *at periventricular and paraventricular white matter*, *in favour of Microvascular Ischemic Changes*), and a verbal group (*are*).

Acute Lacunar Infarct

The sentence, *"which one of them at left frontal lobe shows restriction on DW images in favour of Acute Lacunar Infarct,"* is a complex clause dependent on the preceding context. The main clause, *"one of them shows restriction,"* conveys the central observation, while the subordinate clause, *"at left frontal lobe shows restriction on DW images in favour of Acute Lacunar Infarct,"* specifies the location and diagnostic implication. The sentence includes nominal groups (*one of them*, *left frontal lobe*, *DW images*, *Acute Lacunar Infarct*), prepositional groups (*at left frontal lobe*, *on DW images*, *in favour of Acute Lacunar Infarct*), and a verbal group (*shows*).

Normal Structures

In describing normal structures, the sentence, *"White and gray matter signal, cerebral ventricles, major intracranial vascular structures, basal ganglia, and*

brainstem are normal," is a complex clause with a coordinated list in the main clause, *"are normal."* The nominal groups include *White and gray matter signal*, *cerebral ventricles*, *major intracranial vascular structures*, *basal ganglia*, and *brainstem*, highlighting each examined structure. The verbal group (*are*) links the observations cohesively.

The lexicogrammatical analysis reveals the technical precision and structured nature of the medical reports, characterized by the prevalent use of complex clauses for integrating detailed observations and interpretations. The dominance of nominal groups ensures precise specification of anatomical structures and diagnostic findings, while prepositional groups enhance spatial and contextual clarity. The frequent use of passive voice in verbal groups maintains objectivity and emphasizes the findings. This systematic deployment of linguistic resources contributes to the diagnostic accuracy and professional tone. The second report follows a conventional diagnostic imaging structure (introduction, findings, impression/recommendation), with specific clause and group types employed in each section for concise and accurate information delivery. The introductory sentence, a simple clause, identifies the subject of the procedure ("*Imaging of Brain")* using a nominal group, while prepositional groups specify the equipment *("at 1.5 Tesla scanner," "using Head Coil"),* and the passive verbal group *("was performed")* focuses on the process.

The findings section includes detailed observations of abnormal and normal features, relying heavily on complex clauses to convey precise diagnostic details.

Mass Lesion Observation

The sentence, *"There is an intra-axial heterogeneous mass lesion (measured about 42×30×29 mm) at right frontoparietal lobes,"* is a complex clause. The main clause, *"There is an intra-axial heterogeneous mass lesion,"* states the primary observation, while the embedded clause, *"(measured about 42×30×29 mm) at right frontoparietal lobes,"* provides dimensions and location. The sentence includes nominal groups, such as *intra-axial heterogeneous mass lesion*, *right frontoparietal lobes*, and *42×30×29 mm*, as well as prepositional groups, including *at right frontoparietal lobes*. The verbal group, *is*, anchors the observation in present time.

Normal Structures

The sentence, *"Both 7th and 8th nerve complexes, pituitary fossa, both orbits and optic nerves are normal in shape and signal intensity,"* mirrors the structure of similar descriptions in the first report. It is a complex clause where the main clause, *"Both 7th and 8th nerve complexes, pituitary fossa, both orbits and optic nerves are normal,"* lists the observed structures. The subordinate clause, *"in shape and signal intensity,"* adds diagnostic detail. The nominal groups, such as *Both 7th and 8th nerve complexes* and *shape and signal intensity*, along with the verbal group, *are*, enhance the clarity of the normal findings.

The second report demonstrates a structured and precise application of lexicogrammatical features. The utilization of complex clauses facilitates the integration of detailed observations, while nominal groups enable technically specific descriptions of medical terms, findings, and recommendations. Prepositional groups enhance spatial and contextual understanding, and the frequent use of passive verbal groups maintains objectivity and a formal tone, collectively ensuring effective and professional communication of critical diagnostic and procedural information. The third medical report adheres to a conventional structure (introduction, findings, impression) and employs diverse lexicogrammatical features, including various clause structures and grammatical groups, to convey detailed diagnostic information concisely and accurately. Its introductory sentence, a simple clause, identifies the subject *("Imaging of shoulder")* via a nominal group, with prepositional groups specifying technical parameters ("*at 1.5 Tesla scanner," "using shoulder Coil")* and a passive verbal group *("was performed")* focusing on the procedure.

The findings section presents specific observations regarding the structures imaged, integrating complex clauses to provide clarity and precision.

Tendinosis in Supraspinatus Tendon

The sentence, *"There is some increased signal intensity in distal supraspinatus tendon on long TR images, suggesting Tendinosis,"* is a complex clause. The main clause, *"There is some increased signal intensity in distal supraspinatus tendon,"* describes the abnormal finding. The subordinate clause, *"suggesting Tendinosis,"* provides the probable diagnosis. The nominal groups, such as *increased signal intensity* and *distal supraspinatus tendon*, specify the location and characteristic of the anomaly. The prepositional group, *on long TR images*, adds context.

Degenerative Joint Disease (DJD)

The sentence, *"Mild DJD is seen at acromioclavicular joint,"* is a simple clause with the nominal group, *Mild DJD*, acting as the subject. The prepositional group, *at acromioclavicular joint*, indicates the location, and the verbal group, *is seen*, describes the observation in a formal tone.

Although lacking an explicit "*impression*" section, the findings of the third report indicate Tendinosis of the distal supraspinatus tendon and mild degenerative joint disease at the acromioclavicular joint, with other structures appearing normal. The report effectively employs lexicogrammatical features, including complex clauses for detailed descriptions, nominal groups for succinct medical and anatomical terminology, prepositional groups for spatial clarity, and often passive verbal groups for a formal, objective tone, ensuring accurate and professional communication of diagnostic results.

The lexicogrammatical analysis of diagnostic medical reports demonstrates a significant emphasis on precision, characterized by specific patterns in grammatical group usage. Nominal groups, often containing technical terminology and modifiers, are prevalent for the precise identification of anatomical structures and pathological conditions. Prepositional groups are essential for providing spatial and procedural context, such as imaging parameters. Verbal groups are predominantly passive, emphasizing procedures and findings to maintain objectivity and formality. The extensive use of complex clauses allows for the integrated and concise presentation of detailed diagnostic information, including procedures, findings, and implications, crucial for efficient communication. Stylistically, the reports prioritize objectivity through passive voice, precision in terminology, and brevity, facilitating effective information exchange among medical professionals and enhancing the reports' functional and professional quality. Table 1 presents the descriptive statistics of lexicogrammatical features across all analyzed medical reports.

The analysis of medical reports indicates a significant prevalence of nominal groups (75%), highlighting their crucial role in achieving specificity and precision by succinctly encapsulating detailed anatomical, pathological, and procedural information essential for clear medical communication and accurate patient care. Prepositional groups (10%), while less frequent, are significant for providing spatial and procedural context, linking findings to specific locations, instruments, or techniques, thereby enhancing interpretability and facilitating diagnostic accuracy and procedural alignment. Stylistically, the reports exhibit a preference for passive voice (15%), emphasizing findings and procedures to maintain objectivity, and conciseness (80%), ensuring efficient communication of critical information. The frequent use of complex clauses (60%) further enhances the integration of observations with diagnostic implications, demonstrating a balance between technical depth and communicative efficiency, ultimately underscoring the structured and functional nature of medical reporting for clarity, objectivity, and precision in professional practice.

DISCUSSION

The observed infrequency of iterative components within the medical reports signifies a reporting paradigm that emphasizes conciseness, explicitness, and operational effectiveness (21). Such precision and clarity are vital in medical education, where the training of future healthcare providers relies heavily on mastering the interpretation of standardized, well-structured diagnostic reports (22, 23). The present investigation aimed to analyze the linguistic manifestation of communicative intents within Iranian diagnostic imaging reports. Employing RST, the study examined lexicogrammatical attributes, including clauses, compound clauses, and phrasal constituents (nominal, verbal, and prepositional), to convey precise diagnostic information.

The study's findings reveal a consistent utilization of both elementary and compound clauses to establish procedural context and describe observations in Iranian diagnostic imaging reports. The frequent use of passive voice foregrounds processes over agents, and micro-level sentence analysis shows uniform patterns in representing pathological and physiological observations. Compound clauses facilitate the integration of multiple diagnostic aspects, reflecting an emphasis on precision and thoroughness. In summary, these reports adhere to a systematic format, employing meticulous lexicogrammatical attributes for effective communication of technical findings. The prevalence of nominal phrases specifies anatomical entities and pathological anomalies, while prepositional phrases provide spatial and contextual clarity. Verbal constructs, often passive, maintain an impartial tone. This deliberate linguistic architecture ensures professional decorum, technical accuracy, and efficient dissemination of critical healthcare information. From a medical education standpoint, understanding these linguistic structures is crucial for

Table 1. Descriptive Statistics of Lexicogrammatical Features at the Medical Reports

Feature	Frequency	Percentage (%)	Key Observations
Nominal Groups	4500	75%	Dominant feature; reflects detailed identification of anatomical structures and medical conditions.
Prepositional Groups	600	10%	Commonly used for spatial and procedural context (e.g., locations of findings or equipment details).
Verbal Groups (Passive Voice)	900	15%	Frequent use of passive constructions to maintain objectivity and focus on findings and procedures.
Complex Clauses	1800	60%	Extensively used to integrate diagnostic observations with implications in a concise manner.
Conciseness	2400	80%	High prevalence; ensures reports are brief yet informative, meeting professional communication needs.

medical students and trainees to accurately interpret diagnostic reports and communicate findings effectively in clinical practice.

Multiple studies utilizing RST support the present investigation's findings concerning the linguistic realization of communicative functions in diagnostic imaging reports. Zulkarnain (24) demonstrated RST's effectiveness in standardizing sonographic evaluations through structured formatting, emphasizing the importance of discourse analysis in clinical settings, consistent with the current study's identification of systematic clausal and phrasal deployment. Cunha's cross-linguistic analysis of persuasive frameworks in medical research using RST highlighted the influence of translation on rhetorical configurations, potentially explaining the observed lexicogrammatical attributes in Iranian reports (25). Iruskieta's examination of persuasive links in medical summaries via RST, focusing on macrostructure consensus and rhetorical relations, reinforces the present study's observations on the systematic presentation of diagnostic data (26). Georg's research on automated medical record organization using RST underscored the relevance of identifying persuasive indicators in clinical protocols, aligning with the current study's emphasis on lucidity and consistency in diagnostic imaging reports (27).

Chan et al.'s analysis of Malaysian pharmaceutical promotional materials highlighted their function as persuasive documents with standardized rhetorical strategies for sales, contrasting with medical imaging evaluations' prioritization of objective accuracy (28). This comparison underscores how communicative intention shapes genre architecture: medical evaluations aim for efficient diagnostic data transmission, while promotional materials seek to influence consumers. Yu's study on organizational patterns in medical scholarly article debate segments identified variations in persuasive strategies across authorship cohorts, contrasting with the present study's finding of high uniformity in the Generic Structural Paradigm (GSP) of medical imaging evaluations (29). This consistency reflects the standardized nature of diagnostic discourse in healthcare, where deviation could lead to misinterpretation, unlike the cross-cultural and linguistic divergences observed by Yu in a genre less constrained by technical and clinical specificity. While previous studies have demonstrated RST's utility in medical discourse analysis across varied genres and cultural settings, the present research offers a novel contribution by focusing specifically on Iranian diagnostic imaging reports—a context previously underexplored. Unlike studies emphasizing either patient-centered language or research article rhetoric, this study uniquely highlights how Iranian radiologists deploy lexicogrammatical and rhetorical strategies to maintain clarity, standardization, and clinical relevance in diagnostic communication. This context-specific insight provides a localized linguistic model for medical education in Iran, bridging theoretical discourse analysis with practical clinical training.

Medical diagnostic imaging evaluations integrate subject matter, interpersonal dynamics, and communicative channels to form a cohesive text. The subject matter (imaging modality, observations, directives) provides comprehensive clinical content. Interpersonal dynamics highlight the radiologist's expert authorship and the referring clinician's need for interpretations guiding intervention. Emphasizing these integrated aspects in medical education helps students grasp both the content and communicative purpose of medical texts, ultimately improving their clinical documentation and interpretation skills.

LIMITATIONS

This study's findings are limited in generalizability as the investigation focused solely on the textual components of Iranian diagnostic evaluations, excluding visual elements like images, tables, and graphs due to their medical, rather than linguistic, interpretative demands. Similarly, broader linguistic and sociocultural factors were not comprehensively explored, prioritizing a foundational understanding of text-based structures.

CONCLUSION

This study demonstrates that Iranian diagnostic imaging reports primarily emphasize conveying factual information accurately (ideational metafunction) through precise language to support clinical decisions. While important, interactional cues and clear structure (interpersonal and textual metafunctions) also contribute to effective communication among healthcare professionals. The study recommends that medical education should focus on training students to accurately describe radiological findings using the structured format of these reports, stressing clarity, precision, and conciseness. Integrating the linguistic functions of medical reports into curricula will better equip future practitioners for effective communication, ultimately improving patient care and collaboration. The application of Rhetorical Structure Theory (RST) was instrumental in revealing the underlying rhetorical organization and functional relationships within the texts, allowing for a nuanced understanding of how diagnostic information is systematically structured and communicated. This analytical approach not only clarified the distribution of linguistic metafunctions but also underscored the importance of teaching report-writing skills that align with the communicative purposes identified through RST.

Ethics approval: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of

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