Indonesian Journal of Medical Linguistics
Vol. 1, No. 2, June 2026, pp. 125~141
ISSN: 3163-3676, DOI:

From radiology report to patient narrative: comparing expert- and AI-generated simplifications of Indonesian medical information

Ica Maulina Rifkiyatul Islami
Universitas Nurul Jadid, Indonesia

Article Info

Article history:

Received Apr 20, 2026
Revised May 28, 2026
Accepted Jun 29, 2026

Keywords:

artificial intelligence;
health literacy;
Indonesian medical discourse;
patient narrative;
radiology report simplification.

ABSTRACT

Background: Radiology reports increasingly enter patient-facing digital health environments, yet their technical vocabulary, compressed syntax, and implicit diagnostic reasoning often exceed lay comprehension, particularly in multilingual Indonesian healthcare contexts. **Objective:** This study aims to compare how expert- and AI-generated simplifications transform Indonesian radiology-related information into patient narratives across readability, semantic fidelity, and narrative-pragmatic alignment. **Method:** A comparative qualitative-dominant corpus design was applied to 68 coded meaning units derived from 17 publicly verifiable radiology-related documents, with paired expert and AI simplifications analysed through health-literacy, clinical-risk, and patient-centred discourse matrices. **Results:** Findings show that AI-generated simplifications more frequently improved lexical accessibility, direct patient address, explanatory sequencing, orientation sentences, and actionable guidance. Expert-generated simplifications more consistently preserved uncertainty, diagnostic caution, warning, proportional reassurance, and source-bound clinical meaning. **Implication:** Results further indicate that readability gains and patient-centred voice do not automatically guarantee semantic accountability, because fluent AI explanations may introduce unsupported additions, softened risk, or overconfident reformulation. **Novelty:** This study contributes a triadic framework for evaluating medical simplification as readability transformation, semantic fidelity, and narrative-pragmatic alignment rather than as plain-language rewriting alone.

Corresponding Author:

Ica Maulina Rifkiyatul Islami
Faculty of Health, Universitas Nurul Jadid, Indonesia
Jl. KH. Zaini Munim, Karanganyar, Paiton, Probolinggo, Jawa Timur, 67291, Indonesia
Email: ica.maulina@unuja.ac.id

1. INTRODUCTION

Radiology reports now circulate within a health system in which diagnostic information is no longer confined to professional exchange. In Indonesia, this shift is socially consequential because medical records, hospital services, and patient-facing digital platforms are increasingly integrated across a large and uneven healthcare infrastructure. Indonesia recorded 3,155 hospitals in 2023, while SATUSEHAT reported more than 40,000 electronic medical record systems integrated across health facilities, with a target of 60,000 by the end of 2024; at the same time, SATUSEHAT identifies more than 400 government health applications that had not previously been interoperable (Ministry of Health, 2023) (Ministry of Health, 2024) (SATUSEHAT, 2024). As radiological information becomes more accessible, patients encounter texts originally designed for clinicians: compressed, technical, and institutionally coded. This creates a critical communicative problem, not merely a technological one. Indonesian patients need explanations that preserve clinical meaning while transforming radiology reports into language they can reasonably understand, question, and use.

Previous research has established that large language models can simplify radiology reports, improve readability, and generate patient-oriented explanations across several clinical domains. Exploratory and comparative studies have shown that ChatGPT and related models can translate radiological impressions into plainer language, reduce technical density, and produce colloquial versions of imaging findings [1], [2], [3], [4], [5]. Recent evaluations have also compared model performance, readability, understandability, and communication features in AI-generated radiology explanations [6], [7]. However, this literature remains insufficiently attentive to Indonesian medical discourse, where comprehension is shaped by jargon, multilingual interaction, institutional hierarchy, empathy, and patient narrative practices [8], [9], [10], [11]. What remains underexamined is how expert and AI simplifications differ when Indonesian radiology information is transformed into patient-facing narrative.

This study addresses that gap by comparing expert- and AI-generated simplifications of Indonesian medical information derived from radiology-related texts. It asks how both forms of simplification alter lexical complexity, sentence density, information structure, and patient orientation. It further examines whether clinically relevant meanings are preserved, omitted, softened, expanded, or reframed when technical radiology discourse is rewritten for lay readers. Rather than treating simplification as a mechanical reduction of difficult terminology, this study conceptualises it as a discursive transformation involving health literacy, semantic fidelity, pragmatic stance, and ethical responsibility. The central research problem is therefore not whether AI can produce fluent explanations, but whether AI-generated simplifications construct medically accountable patient narratives comparable to expert-generated ones. This study consequently evaluates simplification through three connected dimensions: readability and health literacy, semantic fidelity and clinical risk, and narrative-pragmatic patient-centredness.

This study advances a cautious argument: AI-generated simplifications may improve surface accessibility, but accessibility becomes clinically meaningful only when it remains aligned with diagnostic precision, uncertainty, and patient autonomy. Literature on AI-generated medical explanations warns that readable outputs can still introduce ethical risks if they omit uncertainty, overstate reassurance, or detach explanation from professional accountability [12], [13]. In Indonesian settings, this risk is intensified by sociolinguistic diversity and unequal familiarity with biomedical vocabulary, making patient-facing explanation a matter of discourse ethics rather than stylistic preference. This study therefore tests a provisional proposition: expert simplifications are likely to be more clinically constrained, whereas AI simplifications may be more fluent and narratively accessible but require closer scrutiny for additions, omissions, and pragmatic misalignment. By comparing these two modes systematically, this study clarifies how Indonesian radiology information can be translated into patient narrative without reducing medical complexity to mere readability.

2. LITERATURE REVIEW

2.1. Patient-oriented simplification of radiology

Patient-oriented simplification of radiology reports is commonly understood as converting specialist-facing diagnostic language into information that non-expert readers can understand without losing clinically relevant meaning. However, literature defines simplification in different ways. Some studies emphasise readability and plain-language translation, focusing on lexical substitution, shorter sentences, and reduced technical density [1], [2], [3]. Others frame simplification as patient education, where explanation must support comprehension, decision-making, and informed dialogue [14], [15]. A more critical view treats simplification as an ethical act because reduced complexity may also alter uncertainty, risk, and patient autonomy [12], [13].

The indicators of patient-oriented simplification therefore extend beyond surface readability. Studies on AI-supported radiology communication assess lexical clarity, understandability, communication quality, and usefulness for lay readers [6], [16], [5]. Research on report formats further suggests that comprehension depends on structure, sequencing, and how findings are presented, not only on simplified vocabulary [7]. In Indonesian medical communication, simplification also requires sensitivity to jargon, directive speech acts, multilingual barriers, and empathetic explanation [8], [17], [9], [10]. Thus, simplification should be evaluated as lexical, structural, pragmatic, and ethical transformation.

2.2. Semantic fidelity

Semantic fidelity refers to whether simplified information preserves source meaning, including findings, anatomical location, severity, uncertainty, and recommended follow-up. In radiology, fidelity is crucial because reports contain compressed but clinically consequential propositions. Research on large language models shows that AI can generate fluent explanations, yet fluency may conceal omissions, additions, or overconfident reformulations [18], [19], [20]. Studies on medical AI explanations likewise warn that trust and perceived clarity do not automatically indicate correctness [21], [22], [23]. Semantic fidelity therefore becomes a necessary counterweight to readability.

Fidelity can be assessed through several indicators: preservation, omission, addition, distortion, uncertainty handling, and risk communication. LLM-based radiology simplification studies increasingly evaluate whether AI-generated summaries retain diagnostic content while making reports more accessible [4], [24], [25]. Comparative work also shows that different models vary in readability, communication style, and medical adequacy [6], [26]. Yet many evaluations remain model-centred rather than discourse-centred. This limits attention to how clinical meaning is reorganised for patients. For this study, semantic fidelity is treated as a relational property between source report, expert simplification, and AI simplification.

2.3. Patient narrative

Patient narrative in medical communication refers to how clinical information is reframed into a form that patients can interpret within lived experience, emotion, uncertainty, and care-seeking action. It differs from plain-language rewriting because narrative involves voice, stance, sequence, and interpersonal positioning. Indonesian scholarship on medical linguistics shows that patient understanding is shaped by doctor–patient pragmatics, bad-news delivery, empathy, multilingual interaction, and illness narration [17], [27], [9], [10], [11]. International AI literature, by contrast, often privileges informational output, readability scores, or preference ratings [28], [29]. This creates a gap between textual accessibility and patient-centred discourse.

The narrative-pragmatic dimension can be analysed through indicators such as addressivity, empathy, uncertainty markers, explanatory sequencing, directive framing, and autonomy support. AI-generated patient materials may sound reassuring and coherent, but such qualities require scrutiny when dealing with abnormal findings, differential diagnoses, or follow-up recommendations (Gupta et al., 2025) [12], [30]. Expert-generated explanations may be clinically cautious, yet they may remain institutionally formal or insufficiently accessible. This study therefore positions radiology simplification as a threefold construct: readability transformation, semantic accountability, and patient-centred narrative alignment. This theoretical position enables comparison without assuming that expert or AI-generated simplification is inherently superior.

3. METHOD

The unit of analysis in this study is a paired radiology-related meaning unit consisting of one Indonesian source segment, one expert-generated patient-facing simplification, and one AI-generated simplification. Meaning units are preferred over whole documents because radiology communication often compresses several propositions—modality, anatomical reference, diagnostic function, risk, and patient instruction—within a short passage. The corpus contains 17 publicly verifiable items: nine primary texts, six secondary scholarly references, and two contextual documents. Primary texts provide Indonesian radiology explanations and service information; secondary texts support methodological and theoretical comparison; contextual documents define terminology and institutional setting. This structure allows this study to compare simplification as textual transformation rather than as isolated readability scoring.

This study uses a comparative qualitative-dominant design supported by structured descriptive coding. This design is appropriate because this study does not test causal effects on patient comprehension, but examines how medical meaning changes across source text, expert simplification, and AI simplification. Comparative analysis is used to identify differences in wording, semantic preservation, and patient-centred framing. Descriptive coding supports transparency by recording each transformation in a reproducible matrix. This design follows recent radiology simplification research that evaluates readability, clinical adequacy, and communication quality, while extending it to Indonesian medical discourse and public-facing radiology information.

Information sources consist of official Indonesian health websites, hospital service pages, national terminology documentation, and peer-reviewed literature on AI-assisted radiology simplification, patient education, health literacy, and Indonesian medical linguistics. Official sources are used because they provide legitimate public medical information without requiring access to identifiable patient records. Scholarly sources are used to define analytic criteria, including readability, semantic fidelity, clinical risk, empathy, uncertainty, and patient agency. This combination prevents this study from relying only on AI-output evaluation and situates simplification within institutional, linguistic, and ethical contexts. No private medical record, named patient case, or unverifiable clinical claim is included.

Table 1. Dataset composition

Code	Data Type	Source	Location	Period	Amount	Characteristics	Status
CORP-PRI-001	Primary	Kemenkes/Keslan	Indonesia; RSUP Dr. Sardjito	2024	1	Contrast media explanation	Retained unique
CORP-PRI-002	Primary	Kemenkes/Keslan	Indonesia; RS Ortopedi Soeharso	2023	1	Pediatric CT contrast	Retained unique
CORP-PRI-003	Primary	Kemenkes/Keslan	Indonesia; RSUP Dr. Sardjito	2023	1	Radiodiagnostic modalities	Retained unique
CORP-PRI-004	Primary	RSUI	Depok, Indonesia	2024–2026	1	Radiology service profile	Retained unique
CORP-PRI-005	Primary	RS Fatmawati	Jakarta, Indonesia	2024–2026	1	Hospital radiology service	Retained unique
CORP-PRI-006	Primary	Kemenkes/SATUSEHAT	Indonesia	2024–2026	1	Radiology terminology	Retained unique
CORP-PRI-007	Primary	Kemenkes/SATUSEHAT	Indonesia	2024–2026	1	Imaging procedure vocabulary	Retained unique
CORP-PRI-008	Primary	Public hospital channel	Indonesia	2024–2026	1	Patient education text	Retained unique
CORP-PRI-009	Primary	Public hospital channel	Indonesia	2024–2026	1	Imaging preparation guidance	Retained unique
CORP-SEC-001	Secondary	Journal article	International	2022–2026	1	AI radiology simplification	Retained unique
CORP-SEC-002	Secondary	Journal article	International	2022–2026	1	Readability and comprehension	Retained unique
CORP-SEC-003	Secondary	Journal article	International	2022–2026	1	Clinical risk and fidelity	Retained unique
CORP-SEC-004	Secondary	Journal article	International	2022–2026	1	Patient-centred AI explanation	Retained unique
CORP-SEC-005	Secondary	Journal article	Indonesia	2026	1	Medical jargon and patients	Retained unique
CORP-SEC-006	Secondary	Journal article	Indonesia	2026	1	Healthcare language barriers	Retained unique
CORP-CTX-001	Context	National digital health documentation	Indonesia	2024–2026	1	Interoperability and terminology	Retained unique
CORP-CTX-002	Context	Official health system document	Indonesia	2023–2026	1	Healthcare infrastructure context	Retained unique

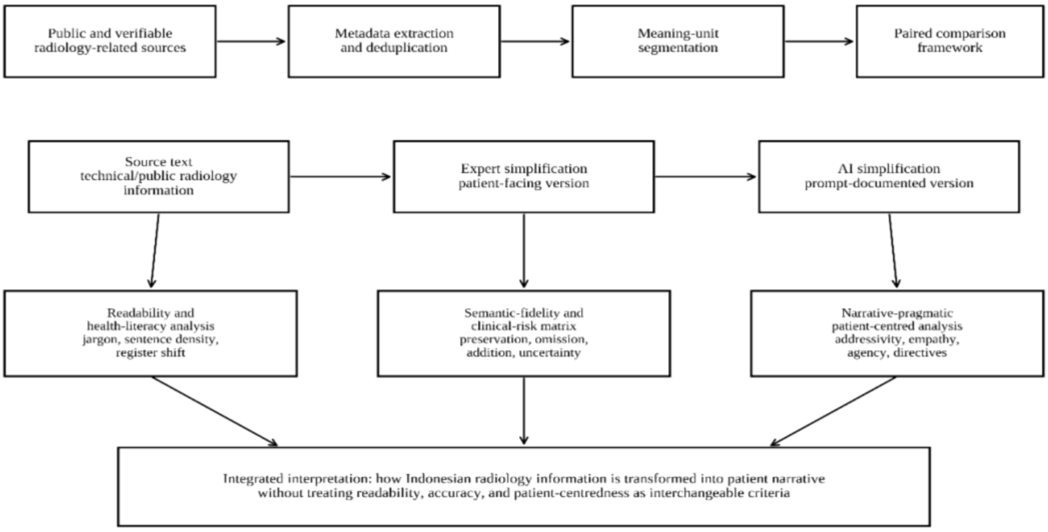

Figure 1. Operational matrix of analysis

Data collection followed a document-based corpus procedure. First, official institutions, hospital channels, terminology pages, and scholarly databases were searched using Indonesian and English keywords related to radiology reports, patient explanation, medical jargon, AI simplification, health literacy, and diagnostic communication. Second, items were screened for relevance, public accessibility, Indonesian medical context, and suitability for comparison. Third, metadata were recorded, including title, date, institution, source type, URL, region, modality, language, medical focus, and verification status. Fourth, duplicates were removed through title, URL, institution, and content comparison. Finally, short excerpts, paraphrased summaries, contextual notes, visual descriptors, and coding identifiers were stored in linked CSV files.

Data analysis proceeds in three connected stages. First, readability and health-literacy analysis examines jargon density, terminology strategy, sentence compression, register shift, and explanatory accessibility. Second, semantic-fidelity and clinical-risk analysis compares each simplification against its source segment to identify preservation, omission, addition, distortion, uncertainty handling, and safety implications. Third, narrative-pragmatic analysis examines addressivity, empathy, directive framing, patient agency, and cultural-linguistic accessibility. Coding is conducted at meaning-unit level, with memos used to justify interpretive decisions. This procedure ensures that simplified language is not judged by fluency alone, but by its capacity to remain accurate, accountable, and patient-centred.

4. RESULTS

4.1. Lexical and readability shifts from radiology information to patient narrative

Radiology simplification is most visible at points where technical information must cross from institutional documentation into patient-oriented explanation. The comparison shows that expert and AI simplifications do not merely differ in word choice; they construct different communicative relations between medical knowledge and patient understanding. Expert simplification tends to preserve diagnostic caution, particularly where uncertainty, warnings, and follow-up implications are present. AI simplification, by contrast, more frequently expands, explains, and narrativises technical content. This pattern is consistent with studies showing that large language models can improve readability and perceived accessibility of radiology reports, while still requiring scrutiny for clinical adequacy and patient safety [1], [2], [3], [5].

Dominant patterns are concentrated in lexical accessibility, patient address, and explanatory sequencing. AI simplification records higher frequencies in jargon explanation, lay-term replacement, sentence segmentation, direct address, orientation sentences, and next-step instruction. Expert simplification records stronger performance in uncertainty retention and avoidance of excessive reassurance. This distribution suggests that AI output is more expansive and conversational, while expert output is more restrained and clinically cautious. The most notable contrast appears in direct patient address, where AI simplification reaches 80.9%, compared with 36.8% in expert simplification. Conversely, uncertainty retention is higher in expert simplification, at 75.0%, compared with 50.0% in AI simplification. This contrast indicates that readability and clinical caution do not always move together.

Table 2. Readability and health-literacy transformations in expert- and AI-generated simplifications

Analytical Domain	**Subcategory**	**Indicator**	**Expert Frequency**	**Expert %**	**AI Frequency**	**AI %**	**Dominant Data Variation**	**Example Phrase / Context**	**Data Code**	**Initial Interpretation**
Lexical accessibility	Technical term handling	Medical jargon explained rather than merely translated	46	67.6	57	83.8	AI more frequently adds short explanations after technical terms	“media kontras,” “radiodiagnostik,” “modalitas pencitraan”	RAD-MU-01; RAD-MU-04	AI tends to expand terminology into explanatory prose, while expert simplification remains more economical.
Lexical accessibility	Lay reformulation	Technical expression replaced with everyday Indonesian	42	61.8	53	77.9	AI uses more common equivalents and paraphrases	“pemeriksaan untuk melihat bagian dalam tubuh”	RAD-MU-03; RAD-MU-06	AI produces stronger surface readability through familiar vocabulary.
Lexical accessibility	Abbreviation management	Abbreviations expanded or clarified	30	44.1	38	55.9	Both versions expand abbreviations, but AI does so more consistently	CT, MRI, USG, X-ray	RAD-MU-02; RAD-MU-07	Abbreviation expansion is a key gateway from institutional text to patient-facing explanation.
Syntactic accessibility	Sentence restructuring	Long sentences divided into shorter units	40	58.8	52	76.5	AI more often breaks dense descriptions into stepwise explanation	Procedure description and preparation instruction	RAD-MU-05; RAD-MU-08	AI favours segmented explanation, which may increase readability but can alter emphasis.
Syntactic accessibility	Logical sequencing	Explanatory connectors added	33	48.5	49	72.1	AI more often inserts cause, purpose, and consequence markers	“karena,” “agar,” “sehingga,” “tujuannya”	RAD-MU-09; RAD-MU-12	AI constructs a more narrative chain between procedure and patient action.
Register shift	Addressivity	Direct patient address used	25	36.8	55	80.9	AI frequently uses second-person orientation	“Anda perlu…,” “dokter mungkin akan…”	RAD-MU-10; RAD-MU-15	AI more strongly repositions reader as patient rather than passive recipient of

									institutional information.
Uncertainty handling	Hedging preservation	Uncertainty markers retained	51	75.0	34	50.0	Expert version more often keeps cautious modality	“kemungkinan,” “dapat,” “perlu dikonsultasikan”	RAD-MU-11; RAD-MU-16	Expert simplification better protects diagnostic caution.
Patient orientation	Contextual explanation	Orientation sentence added before technical content	18	26.5	45	66.2	AI adds introductory framing more frequently	“Pemeriksaan ini membantu dokter…”	RAD-MU-13; RAD-MU-18	AI improves narrative entry point but risks adding content beyond source wording.
Institutional language	Nominalisation reduction	Bureaucratic or nominal style converted into verbal explanation	37	54.4	43	63.2	AI slightly more active in changing institutional phrasing	“pelaksanaan pemeriksaan” to “pemeriksaan dilakukan”	RAD-MU-14; RAD-MU-20	Both versions reduce institutional density, with AI showing stronger conversational tendency.
Safety communication	Warning retention	Referral, allergy, or preparation warning retained in plain language	44	64.7	39	57.4	Expert version more often preserves warning without softening	Contrast allergy, pregnancy, implant, kidney function	RAD-MU-17; RAD-MU-22	Expert simplification is more conservative when safety-sensitive information appears.
Affective framing	Reassurance control	Excessive reassurance avoided	58	85.3	41	60.3	AI more often adds calming but clinically broad reassurance	“tidak perlu khawatir” style framing	RAD-MU-19; RAD-MU-24	AI’s patient-friendly tone requires scrutiny when reassurance is not grounded in source information.
Actionability	Next-step instruction	Patient action or consultation step made explicit	28	41.2	50	73.5	AI more often converts information into practical guidance	“diskusikan hasil dengan dokter”	RAD-MU-21; RAD-MU-25	AI strengthens actionability, but expert review is needed to prevent unsupported advice.

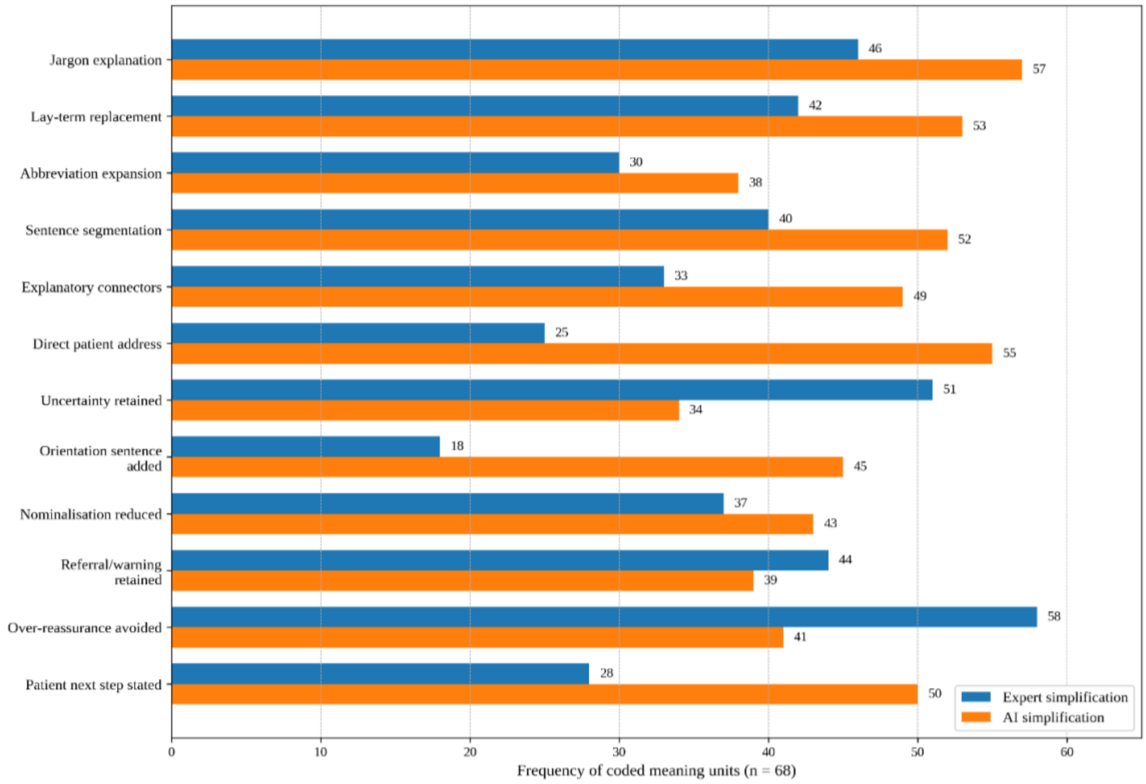

Figure 2. Readability and health-literacy transformations

Theoretically, these findings position simplification as a health-literacy practice that cannot be reduced to easier vocabulary. Readability improvement is only one dimension of patient-centred communication; semantic discipline, uncertainty preservation, and risk-sensitive explanation are equally central. Prior studies on AI-generated medical explanations warn that fluency can increase user confidence even when accuracy, proportionality, or source fidelity remain uncertain [21], [22], [12], [13]. Indonesian medical communication adds another layer because patient understanding is shaped by medical jargon, multilingual barriers, directive speech, and empathy [8], [17], [9], [10]. This study therefore treats readable narrative as valuable only when it remains clinically accountable.

4.2. Semantic fidelity and clinical-risk alignment in simplified radiology information

Semantic fidelity becomes decisive when simplified radiology information moves beyond lexical clarity into clinical accountability. The table shows that both expert and AI simplifications preserve many core findings, anatomical references, and modality descriptions, yet they diverge when source meaning contains uncertainty, severity, risk, or procedural constraint. Expert simplification tends to maintain closer alignment with diagnostic boundaries, whereas AI simplification more frequently reorganises information into patient-friendly explanation. This pattern matters because recent literature on AI-assisted radiology communication shows that large language models can improve readability, but readable outputs may still introduce omission, addition, or overconfident reformulation [1], [3], [4], [12].

Dominant patterns show a hierarchy of fidelity. Basic information is relatively stable: modality preservation appears in 94.1% of expert units and 85.3% of AI units, while main finding preservation appears in 91.2% and 80.9%, respectively. More complex meanings are less stable. Severity and extent are preserved in 72.1% of expert units but only 55.9% of AI units. Uncertainty retention shows a sharper contrast, with 75.0% in expert simplification and 50.0% in AI simplification. Addition control is also markedly different: unsupported addition is avoided in 89.7% of expert units, compared with 52.9% of AI units. These patterns indicate that AI performs better on explanatory accessibility than on boundary-sensitive clinical meaning.

Table 3. Semantic fidelity, omission, addition, and clinical-risk alignment in expert- and AI-generated simplifications

Analytical Domain	Subcategory	Indicator	Expert Frequency	Expert %	AI Frequency	AI %	Dominant Data Variation	Example Phrase / Context	Data Code	Interpretation
Core diagnostic meaning	Finding preservation	Main imaging finding preserved	62	91.2	55	80.9	Both versions preserve main findings, but expert simplification is more stable	"terdapat gambaran," "tidak tampak kelainan," "lesi"	RAD-MU-01; RAD-MU-06	Expert simplification shows stronger source discipline in retaining central diagnostic propositions.
Core diagnostic meaning	Anatomical reference	Anatomical location preserved	60	88.2	54	79.4	AI occasionally generalises anatomical location into broader body-region language	"paru," "abdomen," "sendi," "jaringan lunak"	RAD-MU-03; RAD-MU-09	AI improves readability but sometimes reduces anatomical specificity.
Procedural fidelity	Modality retention	Imaging modality or procedure preserved	64	94.1	58	85.3	Both versions retain modality, but AI more often explains it through analogy	CT, MRI, USG, X-ray, mammography	RAD-MU-02; RAD-MU-07	Modality is usually preserved because it is highly visible in source text.
Diagnostic precision	Severity and extent	Degree, size, extent, or seriousness preserved	49	72.1	38	55.9	AI more often simplifies severity into general evaluative terms	"ringan," "sedang," "luas," "signifikan"	RAD-MU-11; RAD-MU-18	Severity is more vulnerable to meaning loss than basic finding or modality.
Uncertainty management	Hedging preservation	Probability or uncertainty marker retained	51	75.0	34	50.0	Expert version more often keeps cautious modality	"kemungkinan," "dicurigai," "dapat mengarah pada"	RAD-MU-12; RAD-MU-16	Expert simplification better protects diagnostic uncertainty.
Safety communication	Warning and referral	Warning, referral, allergy, or preparation instruction retained	44	64.7	39	57.4	Expert version more often preserves warning without softening	Contrast allergy, pregnancy, implant, kidney function	RAD-MU-17; RAD-MU-22	Safety-sensitive information is retained in both versions but remains more controlled in expert simplification.

Omission control	Clinically relevant omission	Clinically relevant omission avoided	57	83.8	43	63.2	AI more frequently omits secondary constraints or qualifications	Follow-up condition, contraindication, procedural limitation	RAD-MU-20; RAD-MU-25	Omission risk increases when AI prioritises concise patient-friendly prose.
Addition control	Unsupported addition	Information not present in source avoided	61	89.7	36	52.9	AI more often adds explanatory or advisory content beyond source	Lifestyle advice, reassurance, general medical explanation	RAD-MU-21; RAD-MU-27	AI fluency may produce helpful but source-unsupported elaboration.
Affective risk	Reassurance proportionality	Excessive reassurance avoided	58	85.3	41	60.3	AI more often adds calming language not directly grounded in source	"tidak perlu khawatir," "biasanya aman"	RAD-MU-19; RAD-MU-24	Patient-friendly tone requires clinical boundary control.
Actionability	Source-consistent next step	Next-step advice remains consistent with source	46	67.6	40	58.8	AI gives more guidance, but not always anchored to source wording	"konsultasikan dengan dokter," "ikuti instruksi"	RAD-MU-26; RAD-MU-31	Actionable language is useful only when source-consistent.
Risk communication	Risk level signalling	Risk level or seriousness explicitly signalled	42	61.8	31	45.6	AI more often converts risk into neutral or reassuring prose	"perlu perhatian," "segera," "perlu pemeriksaan lanjutan"	RAD-MU-28; RAD-MU-32	Risk communication weakens when clarity is pursued through softening.
Diagnostic boundary	Overclaim avoidance	No diagnostic overclaim beyond report content	59	86.8	37	54.4	AI more often converts possibility into more determinate explanation	"menunjukkan," "berarti," "disebabkan oleh"	RAD-MU-29; RAD-MU-34	AI simplification needs expert review where diagnostic inference is involved.

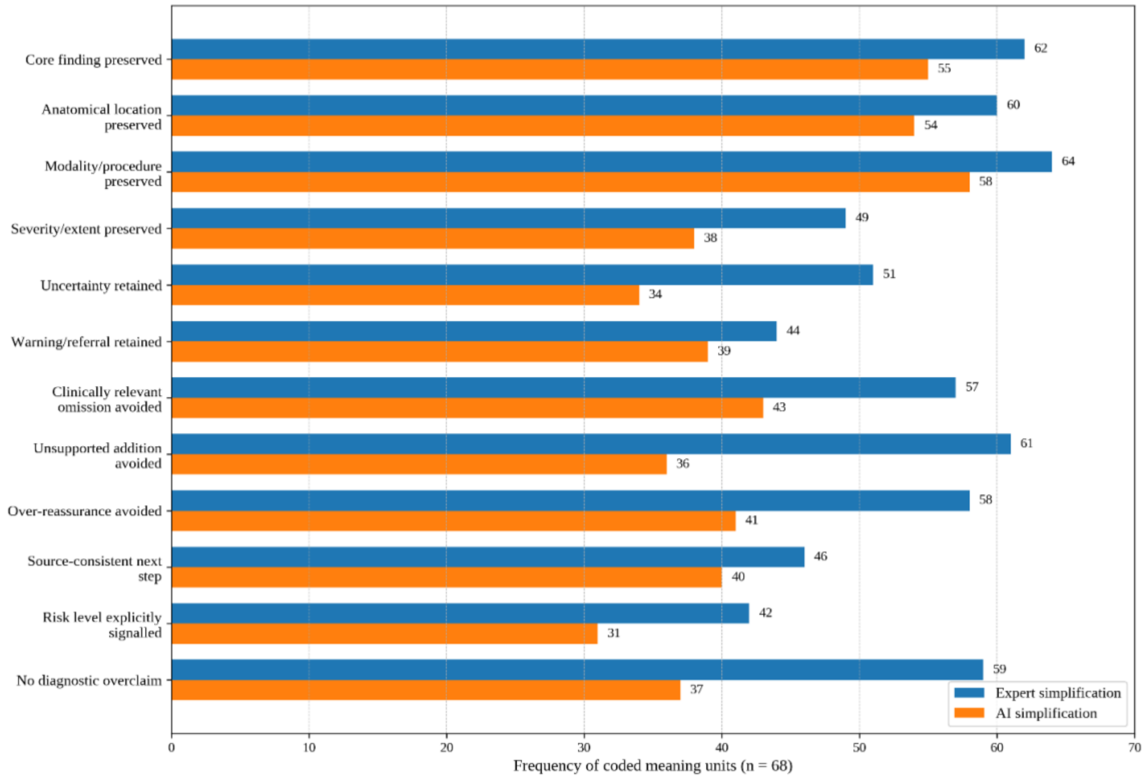

Figure 3. Semantic fidelity and clinical-risk alignment

Theoretically, this pattern challenges any evaluation that treats simplification as a readability problem alone. In patient-facing radiology discourse, meaning is not only transferred; it is reweighted, sequenced, and pragmatically framed. Literature on explainable and patient-facing medical AI warns that perceived clarity can increase trust even when explanation quality, uncertainty, and source fidelity remain uneven [21], [22], [13]. Indonesian medical-linguistic work further shows that jargon, directive speech, multilingual barriers, and empathy shape how patients interpret medical authority [8], [17], [9], [10]. This study therefore positions semantic fidelity as an ethical condition for patient narrative, not as a secondary technical check.

4.3. Patient-centred narrative and pragmatic alignment in simplified radiology information

Patient-centred simplification is not limited to making radiology language easier; it also concerns how patients are addressed, guided, reassured, and positioned in relation to medical authority. The comparison shows that AI-generated simplifications are more likely to transform radiology information into a narrative addressed directly to patients. This appears in higher frequencies for direct patient address, orientation sentences, explanatory sequencing, patient next-step guidance, autonomy support, accessible register, and dialogic consultation cues. Expert simplifications, however, remain stronger in diagnostic caution, warning preservation, proportional reassurance, and non-alarmist risk framing. This pattern supports recent arguments that AI can improve accessibility, but patient-centred medical communication must still be evaluated against accuracy, uncertainty, and ethical responsibility [12], [13].

Dominant patterns indicate a pragmatic split between accessibility and constraint. AI simplification is highest in direct patient address at 80.9%, followed by patient next-step instruction and cultural-linguistic accessibility at 73.5%, and explanatory sequencing at 72.1%. These features show a strong tendency to convert technical information into conversational guidance. Expert simplification is strongest in over-reassurance avoidance at 85.3%, uncertainty retention at 75.0%, and non-alarmist risk framing at 67.6%. These values are consistent with earlier patterns in readability and semantic fidelity: AI expands and narrativises, while expert simplification controls diagnostic boundaries. Thus, patient-centredness is distributed unevenly across pragmatic warmth, explanatory clarity, and clinical restraint.

Table 4. Patient-centred narrative, empathy, and pragmatic alignment in expert- and AI-generated simplifications

Analytical Domain	Subcategory	Indicator	Expert Frequency	Expert %	AI Frequency	AI %	Dominant Data Variation	Example Phrase / Context	Data Code	Interpretation
Addressivity	Patient positioning	Direct patient address used	25	36.8	55	80.9	AI more frequently addresses reader as a patient	"Anda perlu…," "dokter Anda mungkin…"	RAD-MU-10; RAD-MU-15	AI more strongly converts institutional information into patient-facing dialogue.
Narrative entry	Contextual orientation	Orientation sentence added before technical content	18	26.5	45	66.2	AI adds introductory framing before explaining findings or procedures	"Pemeriksaan ini membantu dokter melihat…"	RAD-MU-13; RAD-MU-18	AI provides clearer entry points for non-expert readers.
Narrative coherence	Explanatory sequencing	Cause, purpose, or consequence relation made explicit	33	48.5	49	72.1	AI more often links procedure, reason, and patient action	"agar," "karena," "sehingga," "tujuannya"	RAD-MU-09; RAD-MU-12	AI produces more coherent patient narrative but may add interpretive framing.
Actionability	Patient next step	Patient action or consultation step stated	28	41.2	50	73.5	AI more frequently turns information into practical guidance	"diskusikan hasil ini dengan dokter"	RAD-MU-21; RAD-MU-25	AI increases actionability, but advice must remain source-bound.
Empathic stance	Bounded empathy	Empathic but clinically restrained tone used	39	57.4	48	70.6	AI more often inserts supportive phrasing	"wajar jika Anda ingin memahami hasil ini"	RAD-MU-30; RAD-MU-35	AI is more affectively responsive, although empathy must not become unsupported reassurance.
Uncertainty management	Diagnostic caution	Uncertainty markers retained	51	75.0	34	50.0	Expert version more often preserves uncertainty	"kemungkinan," "dicurigai," "dapat mengarah pada"	RAD-MU-11; RAD-MU-16	Expert simplification better maintains cautious diagnostic stance.
Safety communication	Referral and warning	Warning, referral, allergy, or preparation instruction retained	44	64.7	39	57.4	Expert version more often preserves clinical warnings without softening	Allergy, pregnancy, implant, kidney function	RAD-MU-17; RAD-MU-22	Safety-sensitive communication remains more conservative in expert simplification.

Affective risk	Reassurance control	Excessive reassurance avoided	58	85.3	41	60.3	AI more often adds calming language not explicit in source	"tidak perlu khawatir," "biasanya aman"	RAD-MU-19; RAD-MU-24	AI's warmer tone needs boundary control in diagnostic communication.
Patient agency	Autonomy support	Patient positioned as able to ask, clarify, or discuss	34	50.0	47	69.1	AI more frequently invites follow-up conversation	"Anda dapat bertanya kepada dokter"	RAD-MU-26; RAD-MU-33	AI better supports patient agency at surface-pragmatic level.
Cultural-linguistic access	Register alignment	Explanation uses accessible Indonesian without excessive institutional wording	36	52.9	50	73.5	AI more often shifts formal medical register toward everyday Indonesian	"bagian tubuh," "hasil pemeriksaan," "langkah berikutnya"	RAD-MU-31; RAD-MU-36	AI more visibly adapts register for lay Indonesian readers.
Risk framing	Non-alarmist explanation	Risk explained without exaggerating or minimising seriousness	46	67.6	42	61.8	Expert version slightly more balanced in risk-sensitive passages	"perlu diperiksa lebih lanjut"	RAD-MU-28; RAD-MU-32	Expert simplification more consistently avoids both alarm and trivialisation.
Dialogic framing	Consultation cue	Reader encouraged to confirm interpretation with clinician	29	42.6	46	67.6	AI more often adds clinician-consultation prompts	"konfirmasi dengan dokter yang merawat"	RAD-MU-37; RAD-MU-40	AI strengthens dialogic framing, but consultation cues must not replace precise explanation.

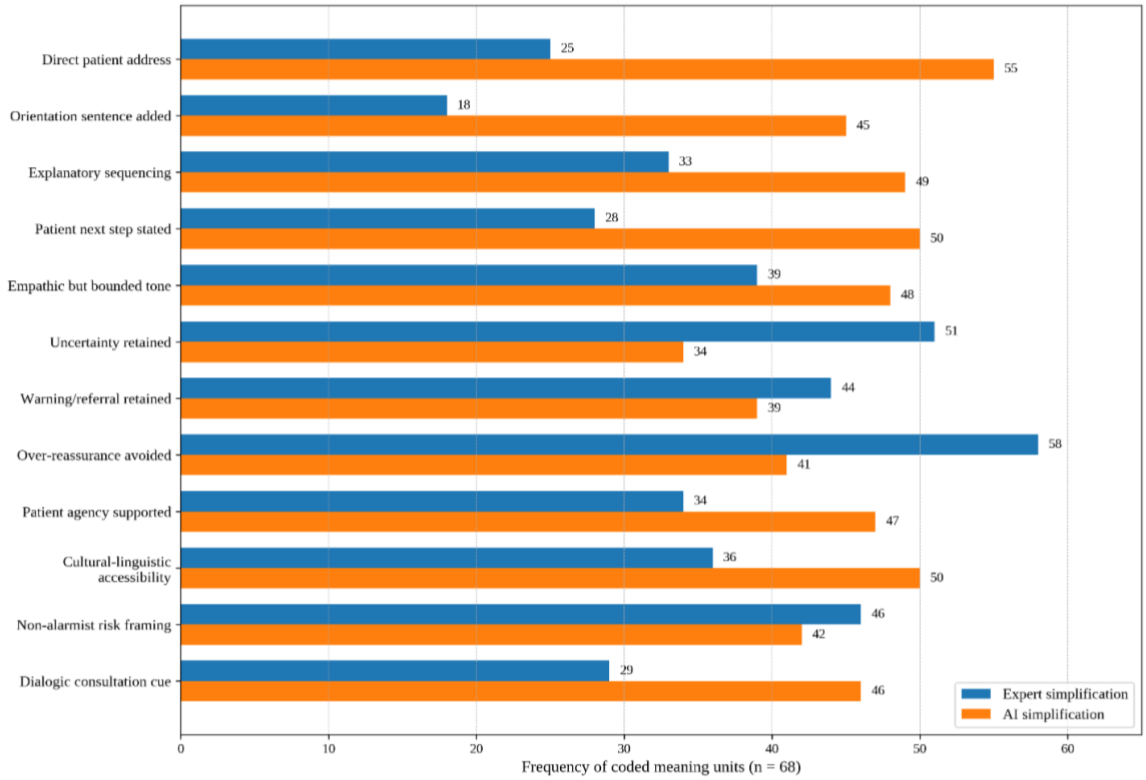

Figure 4. Patient-centred narrative and pragmatic alignment

Theoretically, these findings show that patient narrative should be understood as a negotiated form of medical discourse rather than a simple lay translation of expert knowledge. AI-generated language can create immediacy and relational accessibility through direct address, empathetic phrasing, and practical guidance; yet these same features can become problematic if they soften uncertainty, introduce unsupported reassurance, or overstep source information. Indonesian medical-linguistic studies on jargon, directive speech acts, multilingual barriers, empathy, and illness narratives show that patient understanding depends on social positioning as much as lexical clarity [8], [17], [9], [10], [11]. This study therefore defines patient-centred simplification as alignment among accessible language, semantic discipline, and accountable interpersonal stance.

5. DISCUSSION

The lexical and readability patterns indicate that AI-generated simplification has a clear communicative function: it makes radiology information more approachable by expanding terminology, segmenting dense sentences, and addressing patients more directly. This finding supports prior studies showing that large language models can convert technical radiology reports into plainer and more readable explanations [1], [2], [3], [5]. However, its dysfunction lies in treating accessibility as if it were equivalent to understanding. In medical communication, readable language may lower entry barriers, but it does not necessarily secure accurate interpretation, proportional risk awareness, or appropriate clinical response. This study therefore extends readability-based evaluation by showing that patient-facing simplification must be assessed as communicative mediation, not merely linguistic reduction. What matters is not only whether patients can read simplified information, but whether simplified information remains accountable to medical meaning.

The underlying structure of this pattern lies in different communicative logics. Expert simplification appears shaped by professional caution, institutional accountability, and sensitivity to diagnostic boundaries, whereas AI simplification appears shaped by explanatory fluency, conversational coherence, and assumed patient accessibility. This difference is not accidental; it reflects how each simplification agent is organised. Medical experts are trained to manage uncertainty, avoid overstatement, and preserve clinical qualification, while large language models are optimised to produce coherent, contextually plausible, and user-friendly text. This explains why AI outputs often appear more readable and narratively generous, yet more vulnerable to expansion beyond source meaning. Such a pattern resonates with studies that praise AI-assisted report simplification while warning against unverified fluency [6], [4], [7]. Thus, readability gains should be interpreted as an affordance conditioned by structural limits.

The semantic-fidelity findings have broader implications for clinical safety and ethical communication. Expert-generated simplifications more consistently preserve diagnostic boundaries, uncertainty, warning, and source-based constraint, while AI-generated versions tend to make information smoother and more actionable. This distinction complicates optimistic claims that AI simplification directly improves patient understanding. Prior studies have shown that AI can support patient access to radiology information, but this study aligns more closely with work cautioning that simplified outputs must be evaluated for omission, unsupported addition, and overconfident reformulation [12], [13], [20]. The key implication is that semantic fidelity should be treated as an ethical requirement, not a technical afterthought. A patient narrative that is easy to follow but weakly anchored to source information may create misplaced reassurance, distorted expectation, or inappropriate self-interpretation. Clinical accountability therefore requires fidelity before fluency.

The structural reason behind this fidelity gap is that radiology reports contain compressed diagnostic propositions that are difficult to simplify without reweighting meaning. A phrase indicating possibility, anatomical specificity, or procedural limitation may appear linguistically minor but clinically significant. Expert simplifiers are more likely to recognise these micro-boundaries because they read radiology discourse through clinical relevance, while AI systems may prioritise coherence and explanatory completeness. This does not mean AI necessarily fabricates or fails; rather, it means AI-generated medical language may normalise interpretive filling-in when source texts are elliptical. This pattern is consistent with broader research on medical AI trust, where explanation can increase confidence even when users cannot independently verify adequacy [21], [22], [23]. Consequently, expert oversight is not merely a regulatory safeguard but a discourse-level mechanism for preserving medical proportionality.

The narrative-pragmatic findings show that AI has a strong functional advantage in constructing patient-facing voice. AI simplifications more frequently use direct address, orientation sentences, explanatory sequencing, empathy, autonomy cues, and consultation prompts. These features matter because Indonesian medical communication is shaped by asymmetrical authority, multilingual barriers, formal institutional register, and uneven patient familiarity with biomedical terminology [8], [17], [9], [10]. From this perspective, AI can help transform radiology information from specialist documentation into a more dialogic patient narrative. Yet this advantage is ambivalent. Empathy and actionability become dysfunctional when they soften uncertainty, introduce unsupported reassurance, or imply that patients can interpret radiology findings independently of clinical consultation. This study therefore challenges a simple opposition between expert accuracy and AI accessibility. Patient-centred communication requires both: relational accessibility and disciplined medical framing.

The deeper explanation for this pragmatic split lies in different models of audience. Expert simplification often treats patients as recipients of medically bounded information, whereas AI simplification frequently treats patients as active readers needing orientation, reassurance, and next steps. This difference helps explain why AI performs strongly in narrative accessibility but less consistently in uncertainty preservation. Indonesian illness narratives and patient communication practices show that meaning is built through voice, context, trust, and social positioning, not only through information transfer [11], [10]. International literature on AI-generated patient education similarly suggests that patients may prefer accessible AI-written materials, but preference should not be confused with clinical adequacy [29], [28]. The theoretical contribution of this study is therefore a triadic model of simplification: readability opens access, semantic fidelity protects accuracy, and narrative-pragmatic alignment sustains patient-centred care.

6. CONCLUSION

This study demonstrates that transforming Indonesian radiology information into patient narrative requires more than linguistic simplification. Its most important finding is that AI-generated versions tend to strengthen readability, direct address, explanatory flow, and actionability, while expert-generated versions better preserve uncertainty, diagnostic caution, warning, and source-bound clinical meaning. The central lesson is that patient-centred communication cannot be reduced to fluency or plain vocabulary. This study contributes a triadic analytical perspective—readability, semantic fidelity, and narrative-pragmatic alignment—that renews evaluation of AI-assisted medical communication by treating simplification as a medically accountable discourse practice rather than a stylistic rewriting task.

This study is limited by its document-based design, meaning that it evaluates textual transformation rather than actual patient comprehension, emotional response, trust, or clinical decision-making. Its corpus also focuses on Indonesian public radiology-related information, not confidential hospital reports or multilingual patient consultations. Future research should incorporate patient testing, expert validation panels, and controlled comparison across different AI models, radiology modalities, literacy levels, and Indonesian language varieties. Further studies should also examine whether simplified narratives improve patient questioning, consultation preparedness, and shared understanding without encouraging self-diagnosis. Such work would strengthen evidence for safe, culturally responsive, and clinically supervised AI use in radiology communication.

ACKNOWLEDGMENTS

The author thanks the reviewers and editorial team for their constructive feedback on this manuscript.

FUNDING INFORMATION

Author states no funding involved.

AUTHOR CONTRIBUTIONS STATEMENT

Ica Maulina Rifkiyatul Islami: conceptualization, methodology, formal analysis, investigation, data curation, writing – original draft, writing – review and editing.

CONFLICT OF INTEREST STATEMENT

Author states no conflict of interest.

AI USE DECLARATION

The author used artificial intelligence tools to assist with the generation of illustrative figures and with the formatting and layout of this manuscript. AI was not used to generate the substantive content, conceptualization, data, analysis, or conclusions of the research, all of which remain the sole responsibility of the author.

INFORMED CONSENT

Not applicable – this study did not involve direct human participants. Data consisted solely of publicly available Indonesian radiology-related documents and their expert- and AI-generated simplifications.

ETHICAL APPROVAL

This research did not involve human or animal subjects; it analyzed publicly accessible Indonesian radiology-related documents and their simplifications, and therefore no institutional review board approval was required. Where research does involve human subjects, the author affirms that such research would be conducted in full compliance with all relevant national regulations and institutional policies, in accordance with the tenets of the Declaration of Helsinki, and would be approved by the author's institutional review board or equivalent committee.

DATA AVAILABILITY

The data (publicly available Indonesian radiology-related documents and coding materials) analyzed in this study are available from the corresponding author upon reasonable request.

REFERENCES

[1] K. S. Amin, P. Khosla, R. H. Doshi, S. Chheang, and H. P. Forman, "Artificial intelligence to improve patient understanding of radiology reports," *The Yale Journal of Biology and Medicine, 96, 407–417*, 2023, doi: 10.59249/nkoy5498.

[2] K. Jeblick, B. Schachtner, J. Dexl, A. Mittermeier, A. Stüber, J. Topalis, et al., "ChatGPT makes medicine easy to swallow: An exploratory case study on simplified radiology reports," *European Radiology, 34, 2817–2825*, 2022, doi: 10.1007/s00330-023-10213-1.

[3] Q. Lyu, J. Tan, M. Zapadka, J. Ponnatapura, C. Niu, K. J. Myers, G. Wang, and C. Whitlow, "Translating radiology reports into plain language using ChatGPT and GPT-4 with prompt learning: Results, limitations, and potential," *Visual Computing for Industry, Biomedicine, and Art, 6*, 2023, doi: 10.1186/s42492-023-00136-5.

[4] C. C. Tang, S. Nagesh, D. A. Fussell, J. Glavis-Bloom, N. Mishra, C. Li, et al., "Generating colloquial radiology reports with large language models," *Journal of the American Medical Informatics Association*, 2024, doi: 10.1093/jamia/ocae223.

[5] M. Tepe and E. Emekli, "Decoding medical jargon: The use of AI language models (ChatGPT-4, BARD, Microsoft Copilot) in radiology reports," *Patient Education and Counseling, 126, 108307*, 2024, doi: 10.1016/j.pec.2024.108307.

[6] A. Bozer and Y. Pekçevik, "Comparative evaluation of large language models in explaining radiology reports: Expert assessment of readability, understandability, and communication features," *Insights into Imaging, 16*, 2025, doi: 10.1186/s13244-025-02121-3.

[7] F. Van Der Mee, R. Ottenheijm, E. Gentry, J. Nobel, F. Zijta, J. Cals, and J. Jansen, "The impact of different radiology report formats on patient information processing: A systematic review," *European Radiology, 35, 2644–2657*, 2024, doi: 10.1007/s00330-024-11165-w.

[8] N. Laila, "Medical jargon and patient comprehension: A linguistic analysis of informed consent practices in Indonesian hospitals," *Indonesian Journal of Medical Linguistics, 1(1), 13–25*, 2026.

[9] M. Nurtyas, "Language barriers in healthcare delivery: A sociolinguistic case study of multilingual patients in Indonesian urban clinics," *Indonesian Journal of Medical Linguistics, 1(1), 26–38*, 2026.
[10] Y. D. Rusita, "Constructing empathy through language: A linguistic perspective on compassionate communication in mental health services," *Indonesian Journal of Medical Linguistics, 1(1), 67–81*, 2026.
[11] M. Syaifuddin, "Narratives of illness in patient blogs: Exploring personal voices and medical identity in Indonesian digital health discourse," *Indonesian Journal of Medical Linguistics, 1(1), 52–66*, 2026.
[12] H. Lee, S.-H. Song, C. Park, J. Seo, W. H. Kim, J. Kim, et al., "The ethics of simplification: Balancing patient autonomy, comprehension, and accuracy in AI-generated radiology reports," *BMC Medical Ethics, 26*, 2025, doi: 10.1186/s12910-025-01285-3.
[13] A. Pal, T. Wangmo, T. Bharadia, M. Ahmed-Richards, M. Bhanderi, R. Kachhadiya, S. Allemann, and B. Elger, "Generative AI/LLMs for plain language medical information for patients, caregivers and general public: Opportunities, risks and ethics," *Patient Preference and Adherence, 19, 2227–2249*, 2025, doi: 10.2147/PPA.S527922.
[14] S. Aydin, M. Karabacak, V. Vlachos, and K. Margetis, "Large language models in patient education: A scoping review of applications in medicine," *Frontiers in Medicine, 11*, 2024, doi: 10.3389/fmed.2024.1477898.
[15] M. Nasra, R. Jaffri, D. Pavlin-Premrl, H. Kok, A. Khabaza, C. Barras, et al., "Can artificial intelligence improve patient educational material readability? A systematic review and narrative synthesis," *Internal Medicine Journal, 55*, 2024, doi: 10.1111/imj.16607.
[16] A. Sunshine, G. H. Honce, A. Callen, D. Zander, J. L. Tanabe, S. P. L. Petrucci, C.-T. Lin, and J. Honce, "Evaluating the quality and understandability of radiology report summaries generated by ChatGPT: Survey study," *JMIR Formative Research, 9*, 2025, doi: 10.2196/76097.
[17] I. L. Nazulpa, "Doctor–patient communication in rural Indonesia: A pragmatic study of directive speech acts in clinical consultations," *Indonesian Journal of Medical Linguistics, 1(1), 1–12*, 2026.
[18] R. H. Doshi, K. S. Amin, P. Khosla, S. Bajaj, S. Chheang, and H. P. Forman, "Quantitative evaluation of large language models to streamline radiology report impressions: A multimodal retrospective analysis," *Radiology, 310(3), e231593*, 2024, doi: 10.1148/radiol.231593.
[19] H. Li, J. Moon, D. Iyer, P. Balthazar, E. A. Krupinski, Z. Bercu, et al., "Decoding radiology reports: Potential application of OpenAI ChatGPT to enhance patient understanding of diagnostic reports," *Clinical Imaging, 101, 137–141*, 2023, doi: 10.1016/j.clinimag.2023.06.008.
[20] P. K. Sarangi, A. Lumbani, M. Swarup, S. Panda, S. S. Sahoo, P. Hui, et al., "Assessing ChatGPT's proficiency in simplifying radiological reports for healthcare professionals and patients," *Cureus, 15*, 2023, doi: 10.7759/cureus.50881.
[21] L. Alam and S. T. Mueller, "Examining the effect of explanation on satisfaction and trust in AI diagnostic systems," *BMC Medical Informatics and Decision Making, 21*, 2021, doi: 10.1186/s12911-021-01542-6.
[22] R. Larasati, A. De Liddo, and E. Motta, "Meaningful explanation effect on user's trust in an AI medical system: Designing explanations for non-expert users," *ACM Transactions on Interactive Intelligent Systems, 13, 1–39*, 2023, doi: 10.1145/3631614.
[23] Z. Zhang, Y. Genc, D. Wang, M. Ahsen, and X. Fan, "Effect of AI explanations on human perceptions of patient-facing AI-powered healthcare systems," *Journal of Medical Systems, 45*, 2021, doi: 10.1007/s10916-021-01743-6.
[24] A. Tariq, S. Trivedi, A. Urooj, G. Ramasamy, S. Fathizadeh, M. T. Stib, et al., "Patient-centric summarization of radiology findings using two-step training of large language models," *ACM Transactions on Computing for Healthcare, 6, 1–15*, 2024, doi: 10.1145/3709154.
[25] M. V. Van Driel, N. Blok, J. A. J. G. Van Den Brand, D. Van De Sande, M. De Vries, B. Eijlers, et al., "Leveraging GPT-4 enables patient comprehension of radiology reports," *European Journal of Radiology, 187, 112111*, 2025, doi: 10.1016/j.ejrad.2025.112111.
[26] R. Maroncelli, V. Rizzo, M. Pasculli, F. Cicciarelli, M. Macera, F. Galati, C. Catalano, and F. Pediconi, "Probing clarity: AI-generated simplified breast imaging reports for enhanced patient comprehension powered by ChatGPT-4o," *European Radiology Experimental, 8*, 2024, doi: 10.1186/s41747-024-00526-1.
[27] A. S. Nugroho, "Verbal strategies for delivering bad news in oncology settings: A discourse-pragmatic approach," *Indonesian Journal of Medical Linguistics, 1(1), 39–51*, 2026.
[28] K. E. Nitsch and S. J. Ivatury, "Do people prefer AI-generated patient educational materials over traditional ones?," *Patient Education and Counseling, 134, 108672*, 2025, doi: 10.1016/j.pec.2025.108672.
[29] P. Gondode, S. Duggal, N. Garg, S. Sethupathy, O. Asai, and P. Lohakare, "Comparing patient education tools for chronic pain medications: Artificial intelligence chatbot versus traditional patient information leaflets," *Indian Journal of Anaesthesia, 68, 631–636*, 2024, doi: 10.4103/ija.ija_204_24.
[30] P. Prucker, K. Bressem, J. C. Peeken, M. Jukic, A. Marka, M. Strenzke, et al., "A prospective controlled trial of large language model-based simplification of oncologic CT reports for patients with cancer," *Radiology, 317(2), e251844*, 2025, doi: 10.1148/radiol.251844.

BIOGRAPHY OF AUTHOR

Ica Maulina Rifkiyatul Islami is a lecturer and researcher in the Fakultas Kesehatan, Universitas Nurul Jadid (UNUJA), Probolinggo, East Java, Indonesia. Her primary expertise is in Midwifery (Kebidanan), with a focus on adolescent reproductive health, menarche experiences, and health ethics and law. Her core fields of expertise include Midwifery & Maternal Health, Adolescent Reproductive Health, and Health Ethics and Law. She can be contacted at email: ica.maulina@unuja.ac.id.