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Graph Berbasis Rekam Medis FHIR, Panduan Klinis, dan Literatur Biomedis**
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DAFTAR PUSTAKA

[1] G. A. Roth, G. A. Mensah, C. O. Johnson *et al.*, "Global burden of cardiovascular diseases and risk factors, 1990–2019: Update from the GBD 2019 study," *Journal of the American College of Cardiology*, vol. 76, no. 25, pp. 2982–3021, 2020.

[2] W. S. P. Harmadha, F. R. Muharram, R. S. Gaspar *et al.*, "Explaining the increase of incidence and mortality from cardiovascular disease in Indonesia: A global burden of disease study analysis (2000–2019)," *PLOS ONE*, vol. 18, no. 12, p. e0294128, 2023.

[3] S. S. Virani, L. K. Newby, S. V. Arnold *et al.*, "2023 AHA/ACC/ACCP/ASPC/NLA/PCNA guideline for the management of patients with chronic coronary disease," *Circulation*, vol. 148, no. 9, pp. e9–e119, 2023.

[4] J. W. McEvoy, C. Jennings, K. Kotseva *et al.*, "Variation in secondary prevention of coronary heart disease: The INTERASPIRE study," *European Heart Journal*, vol. 45, no. 39, pp. 4184–4196, 2024.

[5] HL7 International, "HL7 FHIR release 4," 2019, http://hl7.org/fhir/R4/.

[6] O. Bodenreider, "The Unified Medical Language System (UMLS): integrating biomedical terminology," *Nucleic Acids Research*, vol. 32, no. Database issue, pp. D267–D270, 2004.

[7] P. Lewis, E. Perez, A. Piktus *et al.*, "Retrieval-augmented generation for knowledge-intensive NLP tasks," in *Advances in Neural Information Processing Systems (NeurIPS)*, vol. 33, 2020, pp. 9459–9474.

[8] J. Walonoski, M. Kramer, J. Nichols *et al.*, "Synthea: An approach, method, and software mechanism for generating synthetic patients and the synthetic electronic health care record," *Journal of the American Medical Informatics Association (JAMIA)*, vol. 25, no. 3, pp. 230–238, 2018.

[9] Tenasol, "Tenasol FHIR viewer," Aplikasi web, https://fhir.tenasol.com/, diakses 31 Juli 2026.

[10] J. L. Kwan, L. Lo, J. Ferguson, H. Goldberg, J. P. Diaz-Martinez, G. Tomlinson, J. M. Grimshaw, and K. G. Shojania, "Computerised clinical decision support systems and absolute improvements in care: Meta-analysis of controlled clinical trials," *BMJ*, vol. 370, p. m3216, 2020.

[11] J. Cai, P. Li, W. Li, and T. Zhu, "Outcomes of clinical decision support systems in real-world perioperative care: A systematic review and meta-analysis," *International Journal of Surgery*, vol. 110, no. 12, pp. 8057–8072, 2024.

[12] P. A. de Clercq, J. A. Blom, H. H. M. Korsten, and A. Hasman, "Approaches for creating computer-interpretable guidelines that facilitate decision support," *Artificial Intelligence in Medicine*, vol. 31, no. 1, pp. 1–27, 2004.

[13] P. de Clercq, K. Kaiser, and A. Hasman, "Computer-interpretable guideline formalisms," *Studies in Health Technology and Informatics*, vol. 139, pp. 22–43, 2008.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[14] T. Oliveira, P. Novais, and J. Neves, "Development and implementation of clinical guidelines: An artificial intelligence perspective," *Artificial Intelligence Review*, vol. 42, no. 4, pp. 999–1027, 2014.

[15] P. Papadopoulos, M. Soflano, Y. Chaudy, W. Adejo, and T. M. Connolly, "A systematic review of technologies and standards used in the development of rule-based clinical decision support systems," *Health and Technology*, vol. 12, no. 4, pp. 713–727, 2022.

[16] D. Bosetti *et al.*, "Computerized decision support for antimicrobial prescribing: What every antibiotic steward should know," *Antimicrobial Stewardship and Healthcare Epidemiology*, vol. 5, no. 1, 2025.

[17] S. T. Silva *et al.*, "Rule-based clinical decision support system using the OpenEHR standard," in *Proceedings (venue to be confirmed)*, vol. 201, 2022, pp. 726–731.

[18] B. Abu-Salih *et al.*, "Healthcare knowledge graph construction: A systematic review of the state-of-the-art, open issues, and opportunities," *Journal of Big Data*, vol. 10, no. 1, 2023.

[19] H. Cui *et al.*, "A review on knowledge graphs for healthcare: Resources, applications, and promises," *Journal of Biomedical Informatics*, vol. 169, p. 104861, 2025.

[20] S. Budhdeo *et al.*, "Scoping review of knowledge graph applications in biomedical and healthcare sciences," *medRxiv*, 2023, pracetak, diunggah 14 Desember 2023.

[21] G. Xiao *et al.*, "FHIR-Ontop-OMOP: Building clinical knowledge graphs in FHIR RDF with the OMOP common data model," *Journal of Biomedical Informatics*, vol. 134, p. 104201, 2022.

[22] Y. Shang, Y. Tian, K. Lyu, T. Zhou, P. Zhang, J. Chen, and J. Li, "Electronic health record-oriented knowledge graph system for collaborative clinical decision support using multicenter fragmented medical data," *Journal of Medical Internet Research*, vol. 26, p. e54263, 2024.

[23] H. Cui, . Zhu, and . Peng, "From knowledge silos to integrated insights: Building a cardiovascular medication knowledge graph for enhanced medication knowledge retrieval, relationship discovery, and reasoning," *Frontiers in Cardiovascular Medicine*, vol. 12, 2025.

[24] I. Semenov, G. Kopanitsa, D. Denisov *et al.*, "Patients decision aid system based on FHIR profiles," *Journal of Medical Systems*, vol. 42, no. 9, p. 166, 2018.

[25] O. Seneviratne *et al.*, "Semantically enabling clinical decision support recommendations," *Journal of Biomedical Semantics*, vol. 14, no. 1, 2023.

[26] G. Zhou, H. E, Z. Kuang, L. Tan, X. Xie, J. Li, and H. Luo, "Clinical decision support system for hypertension medication based on knowledge graph," *Computer Methods and Programs in Biomedicine*, vol. 227, p. 107220, 2022.

[27] R. de Groot *et al.*, "ATC-to-RxNorm mappings: A comparison between OHDSI standardized vocabularies and UMLS metathesaurus," *International Journal of Medical Informatics*, vol. 195, p. 105777, 2025.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[28] Z. Kraljevic, T. Searle, A. Shek, L. Roguski, K. Noor, D. Bean *et al.*, "Multi-domain clinical natural language processing with MedCAT: The medical concept annotation toolkit," *Artificial Intelligence in Medicine*, vol. 117, p. 102083, 2021.

[29] M. Neumann, D. King, I. Beltagy, and W. Ammar, "ScispaCy: Fast and robust models for biomedical natural language processing," in *Proceedings of the 18th BioNLP Workshop and Shared Task*, 2019, pp. 319–327.

[30] L. M. Amugongo *et al.*, "Retrieval augmented generation for large language models in healthcare: A systematic review," *PLOS Digital Health*, vol. 4, no. 6, p. e0000877, 2025.

[31] M. Lewis *et al.*, "Grounding large language models in clinical evidence: A retrieval-augmented generation system for querying UK NICE clinical guidelines," *arXiv preprint arXiv:2510.02967*, 2025.

[32] S. Kresevic *et al.*, "Optimization of hepatological clinical guidelines interpretation by large language models: A retrieval augmented generation-based framework," *npj Digital Medicine*, vol. 7, no. 1, 2024.

[33] Y. Ke *et al.*, "Retrieval augmented generation for 10 large language models and its generalizability in assessing medical fitness," *npj Digital Medicine*, vol. 8, no. 1, 2025.

[34] C. Park *et al.*, "Synergistic joint model of knowledge graph and LLM for enhancing XAI-based clinical decision support systems," *Mathematics*, vol. 13, no. 6, p. 949, 2025.

[35] J. Walonoski, M. Kramer, J. Nichols, A. Quina, C. Moesel, D. Hall *et al.*, "Synthea: An approach, method, and software mechanism for generating synthetic patients and the synthetic electronic health care record," *Journal of the American Medical Informatics Association*, vol. 25, no. 3, pp. 230–238, 2018.

[36] J. Walonoski *et al.*, "The "coherent data set": Combining patient data and imaging in a comprehensive, synthetic health record," *Electronics*, vol. 11, no. 8, p. 1199, 2022.

[37] J. Chen, D. Chun, M. Patel, E. Chiang, and J. James, "The validity of synthetic clinical data: A validation study of a leading synthetic data generator (synthea) using clinical quality measures," *BMC Medical Informatics and Decision Making*, vol. 19, no. 1, 2019.

[38] M.-M. Bouamrane, A. Rector, and M. Hurrell, "Using OWL ontologies for adaptive patient information modelling and preoperative clinical decision support," *Knowledge and Information Systems*, vol. 29, no. 2, pp. 405–418, 2011.

[39] S. Hussain, S. S. R. Abidi, and S. R. Abidi, "Semantic web framework for knowledge-centric clinical decision support systems," in *Artificial Intelligence in Medicine (AIME 2007)*, ser. Lecture Notes in Computer Science, vol. 4594, 2007, pp. 451–455.

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GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[40] M. Ali *et al.*, "Ontology-grounded knowledge graphs for mitigating hallucinations in large language models for clinical question answering," *Journal of Biomedical Informatics*, vol. 175, p. 104993, 2026.

[41] SNOMED International, "SNOMED CT," https://www.snomed.org/.

[42] S. J. Nelson, K. Zeng, J. Kilbourne, T. Powell, and R. Moore, "Normalized names for clinical drugs: RxNorm at 6 years," *Journal of the American Medical Informatics Association (JAMIA)*, vol. 18, no. 4, pp. 441–448, 2011.

[43] C. J. McDonald, S. M. Huff, J. G. Suico *et al.*, "LOINC, a universal standard for identifying laboratory observations: a 5-year update," *Clinical Chemistry*, vol. 49, no. 4, pp. 624–633, 2003.

[44] Neo4j, Inc., "Neo4j graph database," https://neo4j.com/.

[45] N. Francis, A. Green, P. Guagliardo *et al.*, "Cypher: An evolving query language for property graphs," in *Proceedings of the 2018 International Conference on Management of Data (SIGMOD)*, 2018, pp. 1433–1445.

[46] K. W. Church and P. Hanks, "Word association norms, mutual information, and lexicography," *Computational Linguistics*, vol. 16, no. 1, pp. 22–29, 1990.

[47] J. Cohen, "A coefficient of agreement for nominal scales," *Educational and Psychological Measurement*, vol. 20, no. 1, pp. 37–46, 1960.

[48] J. R. Landis and G. G. Koch, "The measurement of observer agreement for categorical data," *Biometrics*, vol. 33, no. 1, pp. 159–174, 1977.

[49] T. Byrt, J. Bishop, and J. B. Carlin, "Bias, prevalence and kappa," *Journal of Clinical Epidemiology*, vol. 46, no. 5, pp. 423–429, 1993.

[50] A. R. Hevner, S. T. March, J. Park, and S. Ram, "Design science in information systems research," *MIS Quarterly*, vol. 28, no. 1, pp. 75–105, 2004. [Online]. Available: https://www.jstor.org/stable/25148625

[51] K. Peffers, T. Tuunanen, M. A. Rothenberger, and S. Chatterjee, "A design science research methodology for information systems research," *Journal of Management Information Systems*, vol. 24, no. 3, pp. 45–77, 2007.

[52] Synthetic Health, "Synthea wiki: HL7 FHIR," Wiki proyek, https://github.com/syntheticheath/synthea/wiki/HL7-FHIR, diakses 28 Agustus 2026.

[53] The MITRE Corporation, "Synthea CSV file data dictionary," Wiki proyek, https://github.com/syntheticheath/synthea/wiki/CSV-File-Data-Dictionary, diakses 8 Agustus 2026.

[54] A. Aminoshariae, J. C. Kulild, M. Donaldson, and E. V. Hersh, "Short-term use of nonsteroidal anti-inflammatory drugs and adverse effects: An updated systematic review," *Journal of the American Dental Association*, vol. 147, no. 2, pp. 98–110, 2016.

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[55] A. Magni, P. Agostoni, C. Bonezzi, G. Massazza, P. Menè, V. Savarino, and D. Fornasari, "Management of osteoarthritis: Expert opinion on NSAIDs," *Pain and Therapy*, vol. 10, no. 2, pp. 783–808, 2021.

[56] S. Ussai, L. Miceli, F. E. Pisa, R. Bednarova, R. Petelin, G. Della Rocca, and A. Giordano, "Impact of potential inappropriate NSAIDs use in chronic pain," *Drug Design, Development and Therapy*, vol. 9, pp. 2073–2077, 2015.

[57] A. Hessami, A. Pourali, M. Saeedi, A. A. N. Ghara, M. Kheradmand, and M. Moosazadeh, "A study of demographic and clinical characteristics of consumers of non-steroidal anti-inflammatory drugs: A large population-based study utilizing enrollment phase data from the tabari cohort," *BMC Public Health*, vol. 25, no. 1, 2025.

[58] N. Abdu, A. Mosazghi, S. Teweldemedhin, L. Asfaha, M. Teshale, M. Kibreab, I. S. Anand, E. H. Tesfamariam, and M. Russom, "Non-steroidal anti-inflammatory drugs (NSAIDs): Usage and co-prescription with other potentially interacting drugs in elderly: A cross-sectional study," *PLOS ONE*, vol. 15, no. 10, p. e0238868, 2020.

[59] H. Campbell, A. Murata, T. A. Conner, and G. Fotieo, "Chronic use of non-steroidal anti-inflammatory drugs (NSAIDs) or acetaminophen and relationship with mortality among united states veterans after testing positive for COVID-19," *PLOS ONE*, vol. 17, no. 5, p. e0267462, 2022.

[60] S. Kikuchi *et al.*, "A retrospective database study of gastrointestinal events and medical costs associated with nonsteroidal anti-inflammatory drugs in japanese patients of working age with osteoarthritis and chronic low back pain," *Pain Medicine*, vol. 22, no. 5, pp. 1029–1038, 2021.

[61] D. Rebholz-Schuhmann, A. Jimeno Yepes, E. van Mulligen, N. Kang, J. Kors *et al.*, "The CALBC silver standard corpus for biomedical named entities: A study in harmonizing the contributions from four independent named entity taggers," in *Proceedings of the International Conference on Language Resources and Evaluation (LREC)*, 2010.

[62] D. Rebholz-Schuhmann, A. Jimeno Yepes, C. Li, S. Kafkas, I. Lewin, N. Kang *et al.*, "Assessment of NER solutions against the first and second CALBC silver standard corpus," *Journal of Biomedical Semantics*, vol. 2, no. Suppl 5, p. S11, 2011, pMID: 22166494.

[63] I.-E. Nogues *et al.*, "Weakly semi-supervised phenotyping using electronic health records," *Journal of Biomedical Informatics*, vol. 134, p. 104175, 2022.

[64] S. V. Shah, "Accuracy, consistency, and hallucination of large language models when analyzing unstructured clinical notes in electronic medical records," *JAMA Network Open*, vol. 7, no. 8, p. e2425953, 2024.

[65] B. Efron and R. J. Tibshirani, *An Introduction to the Bootstrap*. Chapman and Hall/CRC, 1994.

[66] C. A. Field and A. H. Welsh, "Bootstrapping clustered data," *Journal of the Royal Statistical Society Series B: Statistical Methodology*, vol. 69, no. 3, pp. 369–390, 2007.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[67] A. Gangemi, C. Catenacci, M. Ciaramita, and J. Lehmann, "Modelling ontology evaluation and validation," in *Proceedings of the European Semantic Web Conference (ESWC)*, 2006, pp. 140–154.

[68] M. Franco, J. M. Vivo, M. Quesada-Martinez, A. Duque-Ramos, and J. T. Fernandez-Breis, "Evaluation of ontology structural metrics based on public repository data," *Briefings in Bioinformatics*, vol. 21, no. 2, pp. 473–485, 2020.

[69] S. Seo, H. Cheon, H. Kim, and D. Hyun, "Structural quality metrics to evaluate knowledge graphs," *arXiv preprint arXiv:2211.10011*, 2022.

[70] S. Tartir, I. B. Arpinar, M. Moore, A. P. Sheth, and B. Aleman-Meza, "OntoQA: Metric-based ontology quality analysis," in *Proceedings of the IEEE ICDM Workshop on Knowledge Acquisition from Distributed, Autonomous, Semantically Heterogeneous Data and Knowledge Sources*, Houston, TX, USA, Nov. 2005.

[71] S. Issa, O. Adekunle, F. Hamdi, S. S.-S. Cherfi, M. Dumontier, and A. Zaveri, "Knowledge graph completeness: A systematic literature review," *IEEE Access*, vol. 9, pp. 31 322–31 339, 2021.

[72] B. Xue and L. Zou, "Knowledge graph quality management: A comprehensive survey," *IEEE Transactions on Knowledge and Data Engineering*, vol. 35, no. 5, pp. 4969–4988, 2023.

[73] D. Van Veen *et al.*, "Adapted large language models can outperform medical experts in clinical text summarization," *Nature Medicine*, vol. 30, no. 4, pp. 1134–1142, 2024.

[74] A. Ehtesham *et al.*, "Enhancing clinical decision support and EHR insights through LLMs and the model context protocol: An open-source MCP-FHIR framework," in *2025 IEEE World AI IoT Congress (AIIoT)*, 2025, pp. 0205–0211.

[75] K. Sudri *et al.*, "Enhancing coronary revascularization decisions: The promising role of large language models as a decision-support tool for multidisciplinary heart team," *Circulation: Cardiovascular Interventions*, vol. 17, no. 11, 2024.

[76] H. Wu *et al.*, "A knowledge graph-based analytical model for mining clinical value of drug stress echocardiography for diagnosis, risk stratification and prognostic evaluation of coronary artery disease," *International Journal of Cardiology*, vol. 387, p. 131107, 2023.

[77] E. Asgari *et al.*, "A framework to assess clinical safety and hallucination rates of LLMs for medical text summarisation," *npj Digital Medicine*, vol. 8, no. 1, 2025.