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Rujukan Kesehatan Gigi dan Mulut**
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Large Multimodal Model (LMM) sebagai *Clinical Decision Support System* (CDSS) dalam Sistem Rujukan Kesehatan Gigi dan Mulut

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INTISARI

Latar Belakang: Sistem rujukan kesehatan gigi di Indonesia mengalami tingkat ketidaktepatan tinggi (52,2-58,2%) antara Fasilitas Kesehatan Tingkat Pertama (FKTP) dan Lanjutan (FKTL) akibat kurangnya pemahaman diagnosis serta kode ICD-10 dan ICD-9-CM. **Tujuan:** Penelitian ini mengevaluasi potensi *Large Multimodal Model* (LMM) *sebagai Clinical Decision Support System* (CDSS) untuk mengatasi kesenjangan tersebut dengan mengukur performa berbagai model LMM. **Metode:** Menggunakan desain *mixed-methods* sekuensial eksplanatori dalam tiga tahap. Tahap 1 mengevaluasi 11 model LMM (5 API *hosted* dan 6 *self-hosted*) dengan 140 soal Uji Kompetensi Mahasiswa Program Profesi Dokter Gigi (UKMP2DG) dari 14 departemen. Tahap 2 merupakan studi *Randomized Controlled Trial* (RCT) open-label dengan dua kelompok paralel yang melibatkan 62 dokter gigi FKTP di Daerah Istimewa Yogyakarta, membandingkan kelompok AI (n = 31) dan Non-AI (n = 31) dalam mendiagnosis 10 kasus klinis. Kelompok AI menggunakan model Claude (Claude Opus 4-20250514) yang diimplementasikan pada kondisi *baseline* dengan pendekatan *role* dan *simulation prompting*; risiko halusinasi dimitigasi melalui penilaian *outcome* objektif berbasis kunci jawaban dan desain *human-in-the-loop* di mana dokter tetap memvalidasi keluaran AI. Tahap 3 mengeksplorasi penerimaan teknologi berdasarkan kerangka kerja UTAUT2 dan prinsip etika AI WHO melalui *Focus Group Discussion* (FGD) dengan 8 partisipan. Analisis data menggunakan uji *Chi-Square*, Kruskal-Wallis, Mann-Whitney U, MANOVA, dan analisis terarah. **Hasil:** Tahap 1 menunjukkan Claude mencapai akurasi tertinggi (71,4%), dengan model API *hosted* secara signifikan mengungguli model *self-hosted* (67,9% vs 43,0%; $\chi^2 = 95,2$; $p < 0,001$). Tahap 2 menunjukkan kelompok AI memiliki ketepatan ICD-10 lebih tinggi (79,0% vs 49,4%; $p < 0,001$) dan ketepatan ICD-9-CM lebih tinggi (87,4% vs 63,9%; $p < 0,001$) dengan *effect size* besar ($r_{rb} = -0,852$ hingga $-0,789$). Durasi pengerjaan tidak berbeda signifikan antar kelompok ($p = 0,163$). Tahap 3 mengidentifikasi *Facilitating Conditions* sebagai konstruk UTAUT2 yang paling banyak dibahas dan *Human Well-being and Safety* sebagai prinsip etika WHO yang paling diperhatikan. **Kesimpulan:** Model LMM API *hosted*, khususnya Claude, menunjukkan performa superior dalam menjawab soal kompetensi kedokteran gigi dibandingkan model *self-hosted*. CDSS berbasis LMM terbukti efektif meningkatkan ketepatan diagnosis ICD-10 dan prosedur medis ICD-9-CM dokter gigi FKTP secara substansial tanpa memperpanjang waktu diagnosis. Implementasi CDSS memerlukan dukungan infrastruktur yang memadai dan perhatian terhadap aspek etika AI.

Kata Kunci: *Large Multimodal Model*, *Clinical Decision Support System*, Sistem Rujukan, Kesehatan Gigi dan Mulut, UTAUT2

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Large Multimodal Model (LMM) as a Clinical Decision Support System (CDSS) in the Dental and Oral Health Referral System

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ABSTRACT

Background: *The dental referral system in Indonesia faces high inaccuracy rates (52.2–58.2%) between Primary Healthcare Facilities (FKTP) and Advanced Healthcare Facilities (FKTL) due to suboptimal diagnostic understanding and limited proficiency in ICD-10 and ICD-9-CM coding.* ***Objective:*** *This study evaluated the potential of Large Multimodal Models (LMM) as a Clinical Decision Support System (CDSS) to bridge this gap by measuring the performance of various LMMs.* ***Methods:*** *This study employed an explanatory sequential mixed-methods design across three phases. Phase 1 evaluated 11 LMMs (5 paid APIs and 6 self-hosted models) using 140 questions from the Indonesian Dental Student Competency Examination (UKMP2DG) spanning 14 departments. Phase 2 was an open-label, parallel-group Randomized Controlled Trial (RCT) involving 62 primary care dentists in Yogyakarta, comparing AI (n = 31) and Non-AI (n = 31) groups in diagnosing 10 clinical cases. The AI group deployed the Claude model (Claude Opus 4-20250514) at baseline using role and simulation prompting. Hallucination risks were mitigated via answer key-based objective assessment and human-in-the-loop validation by doctors. Phase 3 explored technology acceptance based on the UTAUT2 framework and WHO AI ethical principles through a Focus Group Discussion (FGD) with 8 participants. Data analysis utilized Chi-Square, Kruskal-Wallis, Mann-Whitney U, MANOVA, and directed content analysis.* ***Results:*** *Phase 1 demonstrated Claude achieved the highest accuracy (71.4%), with commercial API models significantly outperforming self-hosted models (67.9% vs 43.0%; χ^2 = 95.2; $p < 0.001$). Phase 2 showed the AI group had higher ICD-10 accuracy (79.0% vs 49.4%; $p < 0.001$) and higher ICD-9-CM accuracy (87.4% vs 63.9%; $p < 0.001$) with large effect sizes ($r_{rβ}$ = -0.852 to -0.789). Completion time did not differ significantly between groups ($p = 0.163$). Phase 3 identified Facilitating Conditions as the most discussed UTAUT2 construct and Human Well-being and Safety as the most emphasized WHO ethics principle.* ***Conclusions:*** *Commercial API-based LMM models, particularly Claude, demonstrated superior performance in answering dental competency questions compared to self-hosted models. LMM-based CDSS proved effective in substantially improving ICD-10 diagnostic accuracy and ICD-9-CM medical procedure accuracy among FKTP dentists without prolonging diagnosis time. CDSS implementation requires adequate infrastructure support and attention to AI ethics aspects.*

Keywords: *Large Multimodal Model, Clinical Decision Support System, Referral System, Dental and Oral Health, UTAUT2*