

Evaluating the Efficiency of Ehalati and Electronic Coordination System (ECS) in Supporting Medical Referral Processes at King Abdullah Medical Complex and Specialized Maternity and Children's Hospital in Jeddah

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Abstract

Background: Effective healthcare delivery depends on well-coordinated and efficient medical referral systems that ensure timely access to appropriate healthcare services. Digital referral platforms have become essential tools for improving communication, continuity of care, and resource utilization across healthcare facilities.

Aim: This study evaluates the quality and efficiency of the Ehalati and Electronic Coordination System (ECS) in supporting medical referral processes at King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah.

Method: A descriptive evaluative approach was adopted to assess the performance of the Ehalati and Electronic Coordination System (ECS). The evaluation examined key components of referral management, including system structure, workflow efficiency, communication, documentation quality, coordination among physicians, nursing staff, medical referral coordinators, admission and bed management teams, ambulance services, and continuity of patient care. The assessment was guided by current evidence and established principles of healthcare referral systems and digital health.

Results: The evaluation indicates that Ehalati and ECS provide a structured digital framework for managing medical referrals and strengthening communication between referring and receiving healthcare facilities. The systems support multidisciplinary collaboration among physicians, nursing staff, referral coordinators, admission services, bed management teams, and ambulance services, contributing to improved referral coordination, standardized documentation, continuity of care, and more organized referral workflows. The evaluation also identified opportunities for further improvement in workflow integration, interdepartmental communication, staff engagement, and continuous quality improvement.

Conclusion: The Ehalati and Electronic Coordination System (ECS) represents an effective digital platform for supporting medical referral processes and enhancing healthcare coordination. Its effectiveness is strengthened through collaboration among multidisciplinary healthcare teams and continuous organizational support. Ongoing evaluation and quality improvement initiatives are recommended to optimize referral pathways, strengthen system integration, and further improve the quality, efficiency, and continuity of healthcare delivery.

Keywords: Ehalati; Electronic Coordination System; medical referral; healthcare coordination; referral management; digital health; multidisciplinary collaboration; continuity of care; healthcare quality; Saudi Arabia.

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Introduction

Effective healthcare delivery depends on well-coordinated medical referral systems that ensure patients receive timely and appropriate care across different levels of the healthcare system. As healthcare services become increasingly complex due to growing patient needs, expanding medical specialties, and the widespread adoption of digital technologies, efficient referral coordination has become an essential component of healthcare quality and continuity of care. Digital health

solutions have transformed referral management by improving communication, facilitating information exchange, and supporting coordinated clinical decision-making among healthcare providers. Effective referral systems rely not only on digital platforms but also on close collaboration among physicians, nursing staff, medical referral coordinators, admission services, bed management teams, ambulance services, and healthcare

administrators to ensure safe, timely, and patient-centred referral processes.[1]

In Saudi Arabia, digital transformation has become a strategic priority within the healthcare sector under Vision 2030. National initiatives have encouraged healthcare organizations to adopt integrated electronic referral platforms to improve service accessibility, optimize healthcare resources, and strengthen coordination between healthcare facilities. Among these initiatives, the Ehalati platform and the Electronic Coordination System (ECS) have become important components of medical referral management, supporting communication between referring and receiving healthcare institutions while facilitating timely referral processing, multidisciplinary collaboration, and continuity of patient care.[2]

King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah utilize Ehalati and ECS as part of their referral coordination services. These digital platforms contribute to organizing referral workflows, supporting communication among physicians, nurses, referral coordinators, admission and bed management teams, ambulance services, and healthcare administrators, improving documentation, and promoting continuity of patient care. Evaluating the quality and efficiency of these systems is important for identifying their strengths, recognizing operational challenges, and supporting continuous quality improvement within healthcare organizations.[3]

This study evaluates the quality and efficiency of the Ehalati and Electronic Coordination System (ECS) in supporting medical referral processes at King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah. The evaluation focuses on the systems' contribution to multidisciplinary referral coordination, communication, workflow management, documentation quality, and overall support for healthcare service delivery. The findings are expected to provide practical insights that support healthcare administrators, policymakers, and digital health developers in strengthening referral services and advancing healthcare quality in alignment with Saudi Arabia's Vision 2030.[4,5]

Background

Healthcare referral systems play a fundamental role in ensuring continuity of care by facilitating communication between healthcare providers and enabling patients to access appropriate services without unnecessary delays. Well-designed referral systems improve care coordination, optimize resource utilization, and support safer and more efficient clinical practice. As healthcare organizations increasingly adopt digital technologies, electronic referral platforms have become an important element of modern healthcare systems worldwide.[6]

The Ehalati platform and the Electronic Coordination System (ECS) were introduced to support electronic referral management within Saudi healthcare organizations. These systems facilitate referral communication, improve documentation, enhance coordination between healthcare facilities, and contribute to more organized referral pathways. Their implementation reflects the Kingdom's commitment to

digital health transformation and continuous improvement of healthcare services.[7]

Although electronic referral systems offer significant operational and clinical advantages, their overall effectiveness depends on several factors, including multidisciplinary collaboration among physicians, nursing staff, medical referral coordinators, admission services, bed management teams, ambulance services, system integration, workflow compatibility, communication efficiency, user acceptance, information quality, and organizational support. Continuous evaluation of these aspects is essential to ensure that digital referral systems continue to meet the evolving needs of healthcare organizations while maintaining high standards of quality, efficiency, and patient-centred care.

Evaluating the performance of Ehalati and ECS within King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital provides an opportunity

Literature Review

Effective medical referral systems are essential for ensuring continuity of care and enabling patients to access appropriate healthcare services at the required level of specialization. Referral processes involve more than transferring a patient from one healthcare facility to another. They require coordinated clinical, administrative, and logistical activities involving physicians, nursing staff, referral coordinators, admission offices, bed management teams, ambulance services, and hospital administrators. Weak coordination between these stakeholders can result in delayed referrals, incomplete documentation, communication failures, inappropriate transfers, and inefficient use of healthcare resources.[10]

Traditional referral processes frequently depend on telephone calls, paper forms, fax communication, and informal communication between healthcare professionals. Such approaches may cause delays in identifying an appropriate receiving facility, difficulties in tracking referral status, and uncertainty regarding whether the receiving hospital has the required specialty, clinical capability, or available bed. Electronic referral systems have therefore been introduced in many healthcare systems to improve communication, standardize documentation, enhance referral tracking, and support timely clinical and administrative decision-making.[11,12]

Electronic referral platforms provide a structured mechanism through which the referring physician can communicate the patient's clinical condition, diagnosis, treatment history, investigation results, and reason for referral. Accurate and complete medical information helps the receiving physician assess the urgency of the case, determine the appropriate specialty, request additional information when necessary, and make an informed decision regarding acceptance or alternative management. The effectiveness of the system therefore depends substantially on the quality of clinical documentation entered by physicians.[13]

Nursing staff also play an important role in the referral pathway. Nurses assist in assessing patient stability, preparing patients for transfer, confirming that essential

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clinical information and medications accompany the patient, and communicating relevant nursing observations to the receiving team. In urgent and critical cases, nurses contribute to ensuring that the patient is clinically prepared for safe transportation and that appropriate monitoring and infection-control measures are maintained during the transfer process.[14]

Medical referral coordinators serve as a central connection between the clinical and administrative components of referral management. They follow referral requests, communicate with referring and receiving facilities, monitor responses, identify delays, escalate urgent cases, and ensure that the required documents are available. Through electronic systems such as Ehalati and ECS, referral coordinators can organize referrals according to clinical priority, specialty requirements, facility capability, and urgency. Their role supports continuity of communication and reduces the possibility of referrals being delayed or overlooked.[15]

The admission office and bed management team contribute to the operational success of the referral system by confirming the availability of appropriate beds and coordinating the patient's admission after clinical acceptance. A referral may be medically appropriate, but the transfer cannot be completed safely without an available bed in the required clinical area, such as an intensive care unit, pediatric unit, maternity ward, neonatal unit, or general inpatient service. Integration between electronic referral systems and bed management functions can improve the alignment between clinical acceptance and actual hospital capacity.[16]

Ambulance and medical transportation services are equally important components of the referral pathway. The selection of the transportation method should reflect the patient's clinical condition, level of urgency, monitoring requirements, and need for medical support during transfer. Effective coordination between referral teams, nursing staff, physicians, ambulance dispatch, and receiving facilities helps ensure that the patient is transported safely and arrives at a facility prepared to provide the required care. Electronic systems can support this process by providing clear information regarding the destination, patient condition, acceptance status, and required level of transport.[17]

Hospital administrators and digital health teams support referral systems through governance, resource allocation, staff training, system maintenance, performance monitoring, and the development of standardized procedures. Administrative support is particularly important when referral processes involve several departments or external healthcare facilities. Clear escalation pathways, assigned responsibilities, and continuous monitoring help reduce communication gaps and promote accountability among participating teams.[18]

Although electronic referral systems provide significant benefits, their effectiveness may be influenced by incomplete clinical documentation, delayed responses, limited system integration, technical interruptions, insufficient staff training, unclear responsibilities, and differences in operational procedures between facilities. The presence of an electronic platform alone does not

guarantee an effective referral process. Successful implementation requires coordinated human participation, supportive organizational policies, reliable technical infrastructure, and continuous quality improvement.

Within the Saudi healthcare system, Ehalati and the Electronic Coordination System support the national direction toward digital transformation and integrated healthcare delivery. Their use at King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah provides an opportunity to evaluate how electronic referral platforms support collaboration between clinical teams, referral coordinators, admission services, bed management, ambulance transportation, and hospital administration. Such evaluation is important for identifying practical strengths and opportunities for improving referral quality, operational efficiency, patient safety, and continuity of care.

Methods and Materials

Study Design

This study adopted a descriptive evaluative case-study approach to examine the quality and efficiency of Ehalati and the Electronic Coordination System (ECS) in supporting medical referral processes. The study did not involve statistical testing, patient sampling, participant recruitment, surveys, or quantitative comparison. Instead, it focused on describing and evaluating how the systems support clinical, administrative, and logistical referral activities.

The evaluation was guided by principles of healthcare quality, care coordination, continuity of care, digital health implementation, and the structure–process–outcome framework. The assessment considered the organizational resources supporting the systems, the referral activities performed through the systems, and their expected contribution to coordinated healthcare delivery.

Study Setting

The evaluation focused on King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah. Both hospitals provide specialized healthcare services and participate in referral processes involving primary healthcare centers, general hospitals, specialized hospitals, emergency departments, critical care services, maternity services, paediatric services, and other healthcare facilities.

The referral pathway within these institutions involves several stakeholders, including referring and receiving physicians, nursing teams, medical referral coordinators, admission offices, bed management personnel, ambulance services, hospital administrators, and health information technology teams.

Evaluation Scope

The evaluation examined the role of Ehalati and ECS in supporting the following areas:

1. Clinical communication between referring and receiving physicians.
2. Documentation of patient information and reasons for referral.
3. Coordination between healthcare facilities.
4. Follow-up of referral requests and responses.

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5. Prioritization and escalation of urgent referrals.
6. Coordination with nursing teams during patient preparation and transfer.
7. Confirmation of admission arrangements and bed availability.
8. Coordination with ambulance and medical transportation services.
9. Communication between clinical and administrative departments.
10. System usability, technical support, and workflow integration.
11. Continuity of care and patient safety during the referral process.
12. Opportunities for quality improvement and system development.

Sources of Information

The evaluation was informed by the operational functions of Ehalati and ECS, established referral procedures within the selected healthcare settings, relevant organizational practices, and published literature relating to electronic referrals, healthcare coordination, digital health systems, patient transfer, bed management, and medical transportation.

The literature was used to provide conceptual and practical context rather than to generate comparative numerical results. No findings from external studies were presented as original results from King Abdullah Medical Complex or the Specialized Maternity and Children's Hospital.

Evaluation Framework

The evaluation was organized around three interconnected dimensions:

Structural Dimension

The structural dimension included the availability of electronic referral platforms, trained personnel, referral coordination teams, communication channels, clinical specialties, admission services, bed management functions, ambulance resources, administrative support, and technical infrastructure.

Process Dimension

The process dimension included referral initiation, clinical documentation, review by receiving physicians, communication of acceptance or rejection decisions, requests for additional information, coordination of bed availability, preparation of the patient, ambulance arrangements, handover procedures, and referral closure.

Service-Quality Dimension

The service-quality dimension considered the contribution of Ehalati and ECS to timely communication, continuity of care, patient safety, workflow organization, referral traceability, accountability, and coordination between healthcare professionals and departments.

Data Analysis

A narrative and thematic evaluation approach was used. The functions and referral activities supported by the systems were grouped into major themes, including clinical coordination, nursing support, referral management, admission and bed coordination, ambulance

transportation, administrative governance, and digital system performance.

No quantitative variables, statistical tests, regression models, confidence intervals, comparative percentages, or significance testing were used.

Evaluation Findings

Support for Clinical Referral Decisions

Ehalati and ECS provide physicians with an organized electronic pathway for initiating and reviewing medical referrals. The systems allow referring physicians to communicate the patient's clinical condition, diagnosis, relevant investigations, treatment provided, urgency, and reason for requesting a higher or different level of care.

This structured communication supports receiving physicians in determining whether the requested specialty and facility are appropriate for the patient's needs. It also enables the receiving team to request additional clinical information before making a decision. The quality of this process depends on physicians entering accurate, complete, and clinically relevant information.

Contribution of Nursing Staff

Nursing staff contribute to referral effectiveness by preparing patients for transfer and ensuring that clinical instructions are carried out before transportation. Their responsibilities may include monitoring vital signs, confirming medication administration, preparing required equipment, checking infection-control precautions, and communicating nursing concerns to the physician and referral coordinator.

The electronic referral decision provides nursing teams with greater clarity regarding the transfer destination and required level of care. However, effective nursing participation also requires direct communication and appropriate clinical handover, particularly for critically ill patients, paediatric patients, pregnant women, neonates, and patients requiring continuous monitoring.

Role of Medical Referral Coordinators

Medical referral coordinators play a central role in managing the movement of referrals through Ehalati and ECS. They monitor pending requests, communicate with clinical departments, follow responses from receiving facilities, ensure that requested information is completed, and escalate urgent or delayed referrals according to organizational procedures.

The systems support coordinators by providing a traceable record of referral activity and communication. This improves accountability and helps identify the current status of each referral. Effective coordination reduces duplication of communication and supports timely follow-up across multiple healthcare facilities.

Admission and Bed Management Coordination

Clinical acceptance does not automatically guarantee that a patient can be transferred immediately. The admission office and bed management team must confirm that an appropriate bed and service capacity are available.

Ehalati and ECS support the referral process by creating a formal link between the clinical decision and the operational arrangements required for admission.

Coordination with bed management is particularly important for referrals requiring intensive care, emergency admission, maternity care, paediatric care, neonatal services, isolation rooms, or specialized inpatient units.

Effective integration between referral coordination and bed management helps prevent inappropriate transfers and reduces the risk of patients arriving before the receiving unit is operationally prepared.

Ambulance and Medical Transportation

Ambulance coordination is a critical stage of the referral pathway, especially for urgent, unstable, or critically ill patients. After acceptance and confirmation of the destination, the referral team must communicate with ambulance services regarding the patient's condition, transport priority, required medical equipment, level of monitoring, and receiving location.

Ehalati and ECS facilitate access to referral information, but safe transport still depends on timely coordination between physicians, nurses, referral coordinators, ambulance dispatch personnel, and the receiving clinical team. Clear communication helps ensure that the selected transport method matches the patient's clinical needs.

Administrative and Organizational Support

Hospital administrators contribute to the effectiveness of electronic referral systems by establishing policies, defining staff responsibilities, monitoring delays, supporting escalation processes, and ensuring that adequate resources are available.

Administrative leadership is also responsible for promoting staff compliance with referral procedures, supporting training, addressing repeated workflow problems, and coordinating with information technology teams when technical issues affect service delivery. Strong governance helps transform the electronic system from a documentation tool into an integrated operational process.

Documentation and Communication

The systems provide a standardized framework for documenting referral requests and responses. Structured documentation can improve the clarity of clinical communication and help ensure that relevant patient information is available to receiving teams.

However, system quality is affected when referral requests contain incomplete information, unclear reasons for referral, missing investigation results, or insufficient description of the patient's current condition. Timely and informative feedback from the receiving facility is also important for maintaining continuity of care and assisting the referring team in determining the next clinical action.

Workflow Efficiency

Ehalati and ECS contribute to workflow organization by centralizing referral information, enabling electronic follow-up, and reducing dependence on paper-based communication. They allow different stakeholders to identify the status of a referral and support more structured coordination between clinical and administrative teams.

Nevertheless, workflow efficiency may be reduced by delayed physician responses, unclear escalation pathways, limited availability of beds, ambulance delays, technical interruptions, and inconsistent use of the systems.

Continuous monitoring is therefore necessary to ensure that the technology is supported by responsive operational processes.

Patient Safety and Continuity of Care

Electronic referral systems support patient safety by improving information transfer and creating a documented communication pathway between referring and receiving facilities. They can help reduce the risk of essential clinical information being lost during transitions of care.

Patient safety remains dependent on accurate documentation, appropriate clinical acceptance, confirmation of service capacity, safe transportation, effective handover, and follow-up after transfer. Ehalati and ECS are therefore most effective when used as part of an integrated referral pathway rather than as isolated digital platforms.

Discussion

The evaluation indicates that Ehalati and ECS provide an important organizational foundation for medical referral management at King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital. Their primary value lies in connecting the clinical decision to refer a patient with the administrative and logistical processes required to complete the referral safely.

The role of physicians remains fundamental because the electronic system depends on the quality of the clinical information provided. The referring physician must clearly describe the patient's condition, urgency, required specialty, investigations, and treatment already provided. The receiving physician must review the information, assess the clinical appropriateness of the referral, and provide a timely response. Delayed or incomplete physician communication may reduce the effectiveness of the entire referral pathway even when the electronic platform is functioning correctly.[19]

Nursing involvement adds an essential patient-safety dimension to referral coordination. Nurses help ensure that the patient is prepared for transfer, that appropriate monitoring is available, and that clinical instructions are communicated during handover. This role is particularly important in maternity, pediatric, neonatal, emergency, and critical care referrals, where changes in patient condition may occur rapidly.

Referral coordinators provide continuity across the different stages of the process. They connect physicians, nurses, receiving facilities, admission services, bed management teams, and ambulance personnel. Their work reduces fragmentation and supports timely escalation when a referral remains unanswered or when operational barriers prevent transfer.

The admission office and bed management team represent the connection between clinical acceptance and hospital capacity. A receiving physician may agree that a patient requires specialized care, but the transfer must also be aligned with bed availability and the readiness of the receiving unit. Coordination between referral systems and capacity-management services is therefore necessary to avoid delayed admission, unsafe transfer, or congestion within emergency and inpatient departments.[20]

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Ambulance services are not simply a transportation function. They are part of the clinical referral pathway and must receive accurate information about the patient's condition and transfer requirements. Safe ambulance transfer depends on appropriate preparation, trained personnel, required equipment, communication with the receiving facility, and confirmation that the destination is ready for the patient.[21]

The evaluation also highlights that electronic referral effectiveness depends on organizational culture and administrative support. Training, accountability, timely physician responses, clear escalation procedures, technical reliability, and coordination between departments are as important as the digital platform itself. Electronic systems cannot independently solve referral delays caused by limited capacity, lack of specialty availability, insufficient ambulance resources, or unclear operational responsibilities.

Ehalati and ECS can enhance transparency because electronic records allow referral actions and responses to be tracked. This may support quality improvement by helping administrators identify repeated delays, documentation problems, communication failures, and operational bottlenecks. Regular multidisciplinary review involving physicians, nursing leaders, referral coordinators, admission personnel, bed management, ambulance services, and information technology teams can help convert these observations into practical service improvements.[22]

Overall, the systems contribute to more organized referral communication and support the coordination required for patient transfer. Their full value is achieved when all participating teams understand their responsibilities and respond within clearly defined operational pathways.

Limitations

This study used a descriptive evaluative approach and did not include statistical measurement, patient-level outcome analysis, staff surveys, interviews, or direct observation of referral activities. Consequently, the findings describe the expected functions, operational contributions, and potential challenges of Ehalati and ECS without quantifying their effect.

The evaluation focused on two hospitals in Jeddah. Referral practices, resources, specialty availability, ambulance capacity, and administrative procedures may differ across other healthcare facilities and regions.

The study did not independently measure referral response time, transfer completion time, bed availability, user satisfaction, patient satisfaction, or clinical outcomes. It also did not compare electronic referrals with paper-based or alternative referral systems.

Some aspects of referral performance may be influenced by factors outside the electronic systems, including clinical workload, availability of specialists, hospital capacity, ambulance resources, technical infrastructure, and organizational policies.

Further research using mixed methods, direct observation, staff interviews, workflow analysis, and approved institutional performance indicators may provide a more detailed understanding of system effectiveness.

Conclusion

Ehalati and the Electronic Coordination System provide an organized digital framework for supporting medical referrals at King Abdullah Medical Complex and the Specialized Maternity and Children's Hospital in Jeddah. The systems facilitate communication, referral tracking, documentation, and coordination between referring and receiving healthcare facilities.

Their effectiveness depends on coordinated participation from physicians, nursing staff, medical referral coordinators, admission offices, bed management teams, ambulance services, hospital administrators, and information technology personnel. Physicians provide the clinical basis for referral decisions, nurses prepare and monitor patients, coordinators follow and escalate requests, bed management confirms operational capacity, and ambulance teams support safe transportation.

Continuous improvement should focus on strengthening clinical documentation, ensuring timely responses, improving communication between departments, integrating referral and bed-management activities, supporting ambulance coordination, providing regular staff training, and maintaining reliable technical systems. When supported by clear governance and multidisciplinary collaboration, Ehalati and ECS can contribute to safer transitions of care, more efficient use of healthcare resources, and improved continuity of healthcare services in alignment with Saudi Arabia's digital health transformation objectives.

Ethical Approval

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Ministry of Health, Jeddah, Saudi Arabia, under approval number A02502 (LEC Reference Number: KSA: H-02-J-002), Dated 30/04/2026.

This study was conducted as a descriptive evaluative case study of the Ehalati and Electronic Coordination System (ECS) and did not involve direct patient participation, interviews, surveys, or the reporting of identifiable patient information. All organizational information used in the evaluation was handled confidentially and in accordance with applicable ethical and institutional requirements.

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