

Original Research

Received 22 May 2026

Revised 18 June 2026

Accepted 09 July 2026

Natural Resources for Human Health 2026, Vol. 6 (6s): 622–635

KEYWORDS:

electronic health records; radiology workflow; administrative efficiency; RIS; PACS; health informatics; interoperability; digital radiology.

Electronic Health Records as a Driver of Radiology Workflow Optimization and Administrative Efficiency: An Interdisciplinary Review

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ABSTRACT:

Background: Radiology departments depend on rapid access to accurate clinical information and effective coordination across ordering, scheduling, image acquisition, interpretation, reporting, and result communication. Electronic Health Records (EHRs), particularly when integrated with Radiology Information Systems (RIS) and Picture Archiving and Communication Systems (PACS), can improve these interconnected clinical and administrative processes.

Objective: This interdisciplinary review examines how EHRs contribute to radiology workflow optimization and administrative efficiency, with emphasis on order management, scheduling, patient flow, documentation, reporting, communication, system interoperability, and professional collaboration.

Methods: A structured narrative review of relevant literature published primarily between 2020 and 2026 was conducted using PubMed, ScienceDirect, SpringerLink, SAGE Journals, JAMA Network Open, Google Scholar, and radiology-focused sources. Peer-reviewed studies and reviews addressing EHR implementation, RIS/PACS integration, radiology workflow, administrative performance, usability, and digital transformation were thematically synthesized.

Results: The reviewed evidence indicates that integrated EHR–RIS–PACS environments can improve the availability of clinical information, reduce duplicate data entry and paper-based processes, strengthen imaging-request tracking, facilitate scheduling, enhance reporting accessibility, and improve communication between radiology and referring departments. EHR-generated data can also support performance monitoring through indicators such as appointment waiting time, report turnaround time, request completion time, duplicate imaging rates, and patient throughput. Nevertheless, poor usability, limited interoperability, excessive alerts, incomplete data entry, inadequate training, and misalignment between system design and actual workflow may increase administrative burden and reduce user satisfaction. Effective implementation therefore requires coordinated involvement from radiologists, radiologic technologists, medical secretaries, nurses, referring physicians, health informatics professionals, information-technology teams, and departmental leaders.

Conclusion: EHRs can drive meaningful improvements in radiology workflow and administrative efficiency when implemented as part of an interoperable, user-centred digital ecosystem. Sustainable benefits require integration with RIS and PACS, structured documentation, workflow redesign, continuous staff training, and performance-based evaluation.

INTRODUCTION

Radiology departments have become increasingly dependent on digital health systems because imaging services are central to diagnosis, clinical decision-making, emergency care, and follow-up management (Bharadwaj et al., 2024). The growing complexity of radiology practice has created several operational challenges, including increasing imaging demand, fragmented communication, reporting delays, repeated administrative steps, and the need for rapid access to previous clinical and imaging information (Bharadwaj et al., 2024). Recent radiology literature emphasizes that workflow efficiency is no longer a secondary operational concern, but a core requirement for maintaining productivity, reducing delays, and supporting high-quality patient care in modern imaging departments (Bharadwaj et al., 2024).

Electronic Health Records (EHRs) are among the most important digital tools used to organize patient information and support continuity of care across healthcare settings (Alharbi, 2025). In radiology, EHRs provide access to clinical history, laboratory data, medication records, allergies, previous diagnoses, physician notes, and imaging requests, which can improve the quality of information available before, during, and after imaging procedures (Alharbi, 2025). This is particularly important because radiology workflow does not depend only on image acquisition and interpretation, but also on accurate referral information, appropriate scheduling, documentation, communication, and timely report delivery (Bharadwaj et al., 2024).

The value of EHRs in radiology becomes stronger when they are integrated with Radiology Information Systems (RIS) and Picture Archiving and Communication Systems (PACS). RIS supports the administrative and operational components of radiology, including examination ordering, appointment scheduling, patient tracking, and report management, while PACS enables the storage, retrieval, viewing, and sharing of medical images (Hanna et al., 2025). A recent narrative review reported that RIS/PACS integration can reduce examination steps, decrease errors, and improve productivity in radiology departments (Hanna et al., 2025). Therefore, the integration of EHR, RIS, and PACS can create a connected digital workflow in which patient data, imaging requests, radiological images, and final reports are linked within one coordinated process (Hanna et al., 2025).

From an administrative perspective, EHRs can improve radiology workflow by reducing paper-based documentation, minimizing duplicate data entry, supporting appointment coordination, and improving the traceability of imaging requests and reports (Alharbi, 2025). These functions are especially relevant for medical secretaries and administrative staff, who play a central role in receiving imaging requests, verifying patient information, coordinating appointments, following up incomplete documentation, and communicating with clinical departments. When EHR systems are well designed and properly integrated, they can help administrative personnel manage radiology services more efficiently and reduce avoidable delays in patient flow (Alharbi, 2025; Hanna et al., 2025).

However, the benefits of EHRs are not automatic. Recent evidence shows that EHR usability strongly influences user satisfaction, documentation burden, and workflow alignment (Holmgren et al., 2024). In a large survey of family physicians, better usability in data entry, workflow alignment, information retrieval, and alert usefulness was associated with higher EHR satisfaction, while poor usability was linked to dissatisfaction and burnout-related concerns (Holmgren et al., 2024). Although this evidence is not limited to radiology, it is highly relevant to imaging departments because radiology workflow depends on fast information access, accurate documentation, and efficient communication between radiologists, technologists, referring physicians, and administrative staff (Holmgren et al., 2024).

In addition, EHR implementation should be understood as a sociotechnical process rather than a purely technical intervention. Successful use of EHRs in radiology requires not only software availability, but also workflow redesign, staff training, interoperability, data governance, user-friendly interfaces, and institutional support (Holmgren et al., 2024; Bharadwaj et al., 2024). This makes the topic interdisciplinary because radiology professionals, medical secretaries, health informatics specialists, and administrative leaders all contribute to the effectiveness of digital radiology workflow.

Therefore, this review aims to examine the role of Electronic Health Records in improving radiology workflow and administrative efficiency. It focuses on how EHRs support imaging request management, scheduling, communication, documentation, reporting, and integration with RIS and PACS. It also highlights the roles of radiology staff, medical secretaries, and health informatics professionals in achieving efficient digital radiology services. Finally, the review discusses key challenges related to usability, interoperability, administrative burden, training, and workflow redesign.

BACKGROUND AND CONCEPTUAL FRAMEWORK

Electronic Health Records represent a major component of digital health infrastructure because they allow patient information to be stored, accessed, updated, and shared across clinical and administrative units (Alharbi, 2025). In radiology departments, EHRs are particularly important because imaging decisions often require access to clinical history, laboratory findings, previous diagnoses, medication use, allergies, and prior imaging reports (Bharadwaj et al., 2024). Therefore, EHRs can support radiology workflow by improving the availability and completeness of clinical information at the point of imaging request, image interpretation, and report communication (Bharadwaj et al., 2024).

Radiology workflow refers to the sequence of clinical, technical, and administrative steps involved in providing imaging services, beginning with the physician's imaging request and ending with the delivery of the final radiology report to the referring clinician (Bharadwaj et al., 2024). This process usually includes order entry, request review, appointment scheduling, patient preparation, image acquisition, image interpretation, report generation, result communication, and documentation (Bharadwaj et al., 2024). Because these steps involve radiologists, radiologic technologists, nurses, medical secretaries, referring physicians, and health informatics personnel, radiology workflow should be understood as an interdisciplinary process rather than a purely technical imaging activity (Bharadwaj et al., 2024).

The administrative efficiency of radiology services depends on how accurately and quickly these workflow steps are completed. Administrative inefficiency may appear as incomplete imaging requests, duplicate data entry, delayed appointments, missing patient information, repeated phone calls between departments, lost paper forms, delayed reports, or poor communication of urgent findings (Alharbi, 2025; Hanna et al., 2025). In this context, EHRs can improve administrative performance by replacing fragmented paper-based processes with structured electronic documentation, traceable requests, automated information exchange, and easier retrieval of patient data (Alharbi, 2025).

However, EHRs do not function in isolation within radiology departments. Their effectiveness depends heavily on integration with RIS and PACS (Hanna et al., 2025). RIS usually supports operational and administrative radiology functions, including scheduling, patient tracking, examination management, reporting workflows, and communication between radiology staff and

other departments (Hanna et al., 2025). PACS, on the other hand, enables the digital storage, retrieval, viewing, and distribution of medical images across healthcare settings (Hanna et al., 2025). When EHR, RIS, and PACS are integrated, radiology departments can link clinical data, imaging requests, patient scheduling, image acquisition, image review, and final reports into one connected workflow (Hanna et al., 2025).

The integration of RIS and PACS has been associated with several workflow benefits, including reduced examination steps, fewer administrative errors, improved productivity, and better access to imaging information (Hanna et al., 2025). These benefits are important because radiology departments often manage high patient volumes and require rapid coordination between clinical and administrative teams (Bharadwaj et al., 2024). In a digital radiology environment, the EHR provides the clinical context, RIS manages the operational pathway, and PACS manages the imaging data; together, these systems form the backbone of modern radiology workflow (Hanna et al., 2025).

Another important concept is workflow alignment. EHR implementation can improve efficiency only when the system supports the real daily tasks of users, rather than forcing radiologists, technologists, and administrative staff to adapt to poorly designed digital processes (Holmgren et al., 2024). Recent evidence shows that EHR usability, data entry design, information retrieval, workflow fit, and alert usefulness are strongly related to user satisfaction and may influence documentation burden and burnout (Holmgren et al., 2024). This is highly relevant to radiology because imaging departments rely on rapid access to accurate information, smooth scheduling, timely reporting, and effective communication between multiple professional groups (Bharadwaj et al., 2024; Holmgren et al., 2024).

From a health informatics perspective, EHRs should be viewed as tools for data-driven workflow improvement. Health informatics professionals can support radiology departments by analyzing workflow bottlenecks, improving system configuration, supporting interoperability, monitoring data quality, training users, and evaluating digital performance indicators such as report turnaround time, patient waiting time, duplicate imaging rate, and request completion time (Bharadwaj et al., 2024). Their role is especially important because digital transformation requires continuous optimization after system implementation, not only the installation of software (Bharadwaj et al., 2024; Holmgren et al., 2024).

Medical secretaries and administrative staff are also essential to the conceptual framework because they manage many of the practical steps that determine radiology efficiency. Their responsibilities may include receiving imaging requests, verifying patient demographic data, checking appointment availability, coordinating patient preparation, following up missing information, communicating with clinical departments, and supporting report distribution. EHR-based workflows can strengthen these roles by making information more visible, reducing paper handling, supporting task tracking, and improving communication between radiology and other hospital units (Alharbi, 2025; Hanna et al., 2025).

Based on this framework, the role of EHRs in radiology can be understood through four connected dimensions: clinical information availability, workflow coordination, administrative efficiency, and interdisciplinary collaboration. Clinical information availability refers to the ability of radiologists and imaging staff to access relevant patient data before interpretation and reporting (Bharadwaj et al., 2024). Workflow coordination refers to the ability of EHR, RIS, and PACS to support smooth movement from request to scheduling, imaging, reporting, and result communication (Hanna et al., 2025). Administrative efficiency refers to reducing unnecessary manual work, delays, duplication, and communication gaps (Alharbi, 2025). Interdisciplinary collaboration refers to the coordinated contribution of radiology staff, medical secretaries, health informatics professionals, and clinical departments in achieving efficient digital imaging services (Bharadwaj et al., 2024; Hanna et al., 2025).

The following table summarizes the conceptual framework guiding this review.

Table 1. Conceptual framework for the role of EHRs in radiology workflow and administrative efficiency

Core dimension	Meaning in radiology workflow	EHR-related contribution	Main professional groups involved
Clinical information availability	Access to patient history, prior diagnoses, medications, allergies, and reports	Provides clinical context, previous imaging requests, and interpretation	for Radiologists, referring and physicians, radiologic technologists

Core dimension	Meaning in radiology workflow	EHR-related contribution	Main professional groups involved
Workflow coordination	Movement of the patient and imaging request across ordering, scheduling, scanning, reporting, and communication	Links EHR with RIS and PACS to reduce fragmented processes	Radiology staff, medical secretaries, informatics staff
Administrative efficiency	Reduction of paperwork, duplicate entry, missing information, and delays	Supports structured documentation, request tracking, and report access	Medical secretaries, administrative staff, department managers
Interoperability	Ability of digital systems to exchange and use data	Enables EHR, RIS, PACS, reporting systems, and other IT applications to communicate	Health informatics staff, IT teams, radiology leadership
Quality and safety	Timely, accurate, and traceable imaging communication	Improves documentation, follow-up, and communication of results	Radiologists, clinicians, quality teams

This table shows that EHRs affect radiology workflow through both clinical and administrative mechanisms. The main value of EHRs is not limited to storing patient records; rather, their value appears when they help professionals complete radiology tasks faster, more accurately, and with fewer communication gaps. Therefore, successful EHR use in radiology depends on system integration, workflow redesign, user training, and collaboration between clinical, administrative, and health informatics teams.

METHODOLOGY

This review was designed as an interdisciplinary narrative review examining the role of Electronic Health Records in improving radiology workflow and administrative efficiency. A narrative review approach was considered appropriate because the topic combines clinical radiology, health informatics, medical administration, and digital workflow management rather than focusing on a single clinical outcome or one narrowly defined intervention. This approach allows the review to synthesize evidence from different professional and technical domains and to explain how EHRs influence both clinical and administrative processes in radiology.

A structured literature search was conducted to identify recent and relevant publications discussing EHR implementation, radiology workflow, RIS/PACS integration, administrative efficiency, EHR usability, and digital transformation in healthcare. The search focused mainly on studies and reviews published between 2020 and 2026, with priority given to recent peer-reviewed articles from 2024 and 2025 where available. This time frame was selected because radiology departments have experienced rapid digital transformation in recent years, especially through increased use of integrated information systems, workflow automation, and artificial intelligence-enabled tools (Bharadwaj et al., 2024; Hanna et al., 2025).

The literature search included major academic databases and scientific sources such as PubMed, ScienceDirect, SpringerLink, SAGE Journals, JAMA Network Open, Google Scholar, and radiology-focused publications. Search terms were developed around the core concepts of the review, including “electronic health records,” “EHR,” “radiology workflow,” “administrative efficiency,” “RIS,” “PACS,” “radiology information system,” “picture archiving and communication system,” “EHR usability,” “health informatics,” and “digital radiology.” These terms were used individually and in combination to capture studies addressing both clinical and administrative aspects of digital radiology workflow.

Studies were included if they addressed at least one of the following areas: EHR implementation in healthcare settings, improvement of hospital or departmental efficiency through EHRs, integration of EHRs with RIS or PACS, radiology workflow optimization, digital documentation, communication and reporting in radiology, administrative burden, or EHR usability. Studies were also considered relevant if they discussed workflow efficiency applications in radiology or the role of digital systems in improving patient flow, reporting, documentation, or communication. For example, Bharadwaj et al. (2024) discussed how workflow efficiency applications can be structured and evaluated in radiology, while Hanna et al. (2025) reported that RIS/PACS integration can support workflow efficiency in radiology departments.

Studies were excluded if they focused only on general information technology without relevance to healthcare workflow, discussed imaging technology without administrative or digital workflow implications, or addressed EHRs without any connection to clinical efficiency, documentation, communication, or system usability. Non-academic commercial webpages were not used as core evidence. Priority was given to peer-reviewed journal articles, systematic reviews, narrative reviews, and reputable healthcare or radiology sources.

The selected literature was reviewed thematically rather than statistically. This approach was chosen because the included studies varied in design, setting, population, and outcome measures. For instance, Alharbi (2025) examined EHR implementation in relation to hospital efficiency and patient outcomes through a systematic review, while Holmgren et al. (2024) examined EHR usability, satisfaction, and burnout among physicians using a survey design. These studies provide different but complementary perspectives on how EHRs influence healthcare workflow, user experience, and organizational performance.

The analysis was organized around five major themes: EHRs and radiology order management, EHR integration with RIS and PACS, administrative efficiency and patient flow, communication and reporting, and implementation challenges. These themes were selected because they represent the main points at which digital systems interact with radiology services. The review also considered the roles of radiologists, radiologic technologists, medical secretaries, administrative staff, and health informatics professionals, since radiology workflow depends on coordinated work between clinical, technical, and administrative personnel.

The following table summarizes the search strategy used to guide the review.

Table 2. Literature search strategy used in the review

Search element	Description
Review type	Interdisciplinary narrative review
Main topic	Role of EHRs in improving radiology workflow and administrative efficiency
Databases and sources	PubMed, ScienceDirect, SpringerLink, SAGE Journals, JAMA Network Open, Google Scholar, and radiology-focused sources
Main keywords	“Electronic Health Records,” “EHR,” “radiology workflow,” “administrative efficiency,” “RIS,” “PACS,” “health informatics,” “EHR usability,” and “digital radiology”
Time frame	Mainly 2020–2026, with emphasis on 2024–2025 publications
Inclusion criteria	Studies on EHR implementation, RIS/PACS integration, radiology workflow, administrative efficiency, reporting, communication, usability, and digital health transformation
Exclusion criteria	Non-healthcare IT articles, studies unrelated to workflow or administration, purely technical imaging papers without EHR/RIS/PACS relevance, and non-academic commercial sources
Synthesis approach	Thematic narrative synthesis

This methodology allows the review to integrate evidence from radiology, health informatics, and healthcare administration. Since the aim of the article is not to calculate pooled effect sizes, but to explain how EHRs can improve radiology workflow and administrative efficiency, a thematic narrative approach is appropriate. It also allows the discussion to connect technical integration with practical workflow outcomes such as reduced delays, improved documentation, faster reporting, better communication, and decreased administrative duplication.

EHRs and Radiology Order Management

Radiology order management is one of the first points at which Electronic Health Records can influence radiology workflow and administrative efficiency. The imaging process usually begins when a referring clinician enters a request for an examination, and the quality of this request affects the following steps, including prioritization, scheduling, patient preparation, protocol selection, image interpretation, and report communication (Bharadwaj et al., 2024). If the request is incomplete, unclear,

duplicated, or clinically inappropriate, the radiology department may experience delays, repeated communication with the referring team, unnecessary imaging, or inefficient use of imaging resources (Bharadwaj et al., 2024).

EHR-based order entry can improve this process by allowing clinicians to enter imaging requests in a structured electronic format. This may include the clinical indication, relevant symptoms, suspected diagnosis, patient history, allergy status, pregnancy status, kidney function, medication use, and previous imaging information. These details are important because they help radiology teams select the appropriate imaging protocol, determine whether contrast is needed, identify patient safety risks, and prioritize urgent cases. The American College of Radiology emphasizes that imaging appropriateness tools are designed to help referring providers select the most suitable imaging or treatment decision for a given clinical condition (American College of Radiology [ACR], n.d.-a).

Clinical decision support is another important function that can be linked to EHR-based radiology ordering. Clinical decision support provides electronic guidance during the order-entry process by connecting the clinical indication with evidence-based imaging appropriateness criteria. According to the American College of Radiology, clinical decision support represents a digital mechanism for delivering appropriate use criteria to clinicians and helping ensure that patients receive the right imaging examination at the right time (ACR, n.d.-b). This function is especially relevant in radiology because inappropriate imaging may increase costs, delay correct diagnosis, expose patients to unnecessary radiation, and place additional pressure on imaging departments.

Evidence suggests that computerized radiology order entry and clinical decision support can influence imaging ordering behavior, although the size and consistency of the effect may vary according to setting, implementation design, and user engagement. A JAMA study using data from the Medicare Imaging Demonstration examined computerized radiology order entry and clinical decision support systems in relation to advanced diagnostic imaging ordering and appropriateness (Hussey et al., 2015). More recent evidence also indicates that clinical decision support systems are increasingly evaluated as tools to improve imaging appropriateness, but their effectiveness depends on how they are implemented within real clinical workflows (Tay et al., 2025). Therefore, EHR-based order management should not be viewed as a simple electronic replacement for paper requests, but as a workflow intervention that requires structured data, clinical guidance, and user-centered implementation.

From an administrative perspective, EHR-based ordering reduces several common problems in radiology departments. Paper-based or poorly structured requests may be difficult to read, incomplete, physically misplaced, or delayed between departments. In contrast, electronic order entry allows requests to be tracked, reviewed, prioritized, and linked to patient records. This can support medical secretaries and administrative staff by making it easier to verify patient information, identify missing documents, schedule appointments, and communicate with clinicians when clarification is needed. It can also reduce duplicate data entry because demographic and clinical information can be pulled directly from the patient record rather than re-entered manually.

EHR-based radiology order management also supports patient flow. When imaging requests are clear and complete, administrative staff can schedule patients more efficiently, determine whether special preparation is required, and reduce delays caused by missing information. For example, contrast-enhanced imaging may require checking renal function, allergy status, and medication history before the appointment. If these details are available in the EHR, the radiology department can prepare the patient more safely and efficiently. This supports both administrative efficiency and patient safety because fewer appointments need to be postponed due to incomplete preparation or missing clinical data.

The following table summarizes common problems in traditional radiology order management and the potential EHR-based solutions.

Table 3. Traditional radiology order management problems and EHR-based solutions

Traditional problem	Effect on radiology workflow	EHR-based solution	Expected administrative benefit
Incomplete request	imaging Delayed scheduling and repeated communication with departments	Structured electronic order forms with required fields	Fewer missing details and faster request processing

Traditional problem	Effect on radiology workflow	EHR-based solution	Expected benefit	administrative
Unclear indication	clinical Difficulty selecting the correct protocol or prioritizing the examination	Clinical indication fields linked to patient history and diagnosis	Better triage and more appropriate imaging workflow	
Duplicate requests	imaging Unnecessary workload and possible avoidable radiation exposure	Access to prior imaging records and previous reports	Reduced duplication and better resource use	
Manual data entry	Increased risk of typing errors and administrative delay	Automatic transfer of demographic and clinical data from EHR	Fewer administrative errors and less clerical workload	
Paper-based tracking	request Risk of lost forms and poor visibility of request status	Electronic tracking of order status from request to report	Improved traceability and accountability	
Inappropriate selection	imaging Unnecessary imaging, increased cost, and inefficient use of equipment	Clinical decision support linked to appropriateness criteria	Better imaging utilization and improved decision support	
Missing information	safety Risk related to contrast, allergy, pregnancy, or renal impairment	EHR access to allergy, laboratory, medication, and clinical data	Safer patient preparation and fewer postponed examinations	
Poor communication between departments	Delays in clarification and result follow-up	Electronic communication and documented order notes	Faster coordination between radiology and referring teams	

This table demonstrates that EHR-based order management affects radiology efficiency before the patient reaches the imaging room. The main administrative advantage is that the request becomes visible, structured, traceable, and connected to the patient's clinical record. This reduces the need for repeated manual verification and improves communication between radiology and other departments. For radiologists and technologists, better order quality supports more accurate protocol selection and interpretation. For medical secretaries and administrative staff, structured order management improves scheduling, follow-up, and documentation. For health informatics professionals, order data can be analyzed to identify bottlenecks, monitor incomplete requests, track turnaround time, and support continuous workflow improvement.

Overall, EHRs can improve radiology order management by transforming the imaging request from a passive administrative form into an active digital workflow tool. However, the effectiveness of this process depends on the quality of system design, the completeness of entered data, the integration of EHR with RIS and PACS, the availability of clinical decision support, and the willingness of users to follow structured ordering practices. Poorly designed electronic ordering systems may simply transfer paper-based inefficiencies into a digital format, while well-designed systems can reduce administrative burden, improve patient flow, and support more appropriate imaging utilization.

EHR Integration with RIS and PACS

The role of Electronic Health Records in radiology becomes more effective when EHRs are integrated with Radiology Information Systems and Picture Archiving and Communication Systems. Radiology workflow depends on the movement of information across multiple digital points, including the clinical order, patient registration, scheduling, imaging acquisition, image storage, radiologist interpretation, report generation, and report delivery (Hanna et al., 2025). If these systems are disconnected, staff may need to enter the same information more than once, move manually between platforms, or depend on phone calls and paper notes to complete routine workflow tasks. This can increase administrative workload and delay patient care.

RIS is mainly responsible for the operational and administrative management of radiology services. It supports functions such as patient scheduling, examination tracking, report management, billing-related data, and communication between radiology staff and other hospital departments (Hanna et al., 2025). PACS supports the digital storage, retrieval, display, and sharing of medical images. EHRs provide the broader clinical record, including patient history, laboratory results, medication records, allergies, diagnoses, and clinical notes. When these three systems are integrated, radiology departments can create a connected

digital workflow in which the imaging request, patient information, images, and final report are accessible through a coordinated process.

Recent literature indicates that RIS/PACS integration can improve radiology workflow by reducing examination steps, decreasing errors, and improving productivity (Hanna et al., 2025). This is especially important in departments with high imaging volumes, where even small delays in registration, scheduling, image retrieval, or report distribution can accumulate and affect service efficiency. Bharadwaj et al. (2024) also emphasize that radiology workflow efficiency applications should be evaluated according to their ability to support measurable workflow improvement, rather than being adopted only because they are technologically available.

The following table summarizes the functional relationship between EHR, RIS, and PACS in radiology workflow.

Table 4. Functional integration of EHR, RIS, and PACS in radiology workflow

System	Main function in radiology	Contribution to workflow	Administrative value
EHR	Provides the patient's clinical record	Supplies clinical history, medications, allergies, laboratory results, previous diagnoses, and referral information	Reduces missing information and supports safer preparation
RIS	Manages radiology operations	Supports scheduling, patient tracking, examination status, reporting workflow, and departmental coordination	Improves appointment management and operational traceability
PACS	Stores and displays medical images	Enables image retrieval, viewing, comparison, and distribution	Reduces physical film handling and improves image availability
EHR–RIS integration	Links clinical order with radiology operations	Connects imaging requests to scheduling, tracking, and reporting	Reduces duplicate entry and improves request visibility
RIS–PACS integration	Links examination workflow with images	Ensures that images are attached to the correct patient and examination	Reduces image mismatch and supports faster interpretation
EHR–RIS–PACS integration	Connects clinical data, operational workflow, and images	Creates a complete digital radiology pathway from request to report	Improves coordination, accountability, and administrative efficiency

This table shows that EHRs do not replace RIS or PACS; instead, they add clinical context to the radiology workflow. RIS manages the operational process, PACS manages the imaging data, and EHRs connect radiology activity to the patient's broader clinical record. The administrative benefit appears when these systems reduce repeated data entry, improve request tracking, support faster image and report access, and make the radiology workflow more visible to all authorized users.

EHRs, Scheduling, and Patient Flow

Efficient scheduling is a critical part of radiology workflow because imaging departments usually manage patients from emergency units, inpatient wards, outpatient clinics, and referral services. Delays in scheduling may occur when requests are incomplete, patient preparation requirements are unclear, or administrative staff cannot access the information needed to prioritize examinations. EHRs can support scheduling by providing access to clinical indications, patient demographics, previous appointments, laboratory results, allergies, and other preparation-related information.

EHR-based scheduling can improve patient flow by allowing administrative staff to identify the type of examination required, determine whether contrast is needed, check whether the patient requires special preparation, and coordinate the appointment with the available imaging modality. This is especially important for CT, MRI, and contrast-enhanced studies, where preparation may depend on renal function, allergy status, implanted devices, medication use, or pregnancy status. When such data are available electronically, the probability of postponement due to missing information may be reduced.

Patient flow also improves when EHRs support visibility across departments. For example, clinicians can see whether an imaging request has been submitted, scheduled, completed, interpreted, or reported. Radiology staff can also identify pending

requests, urgent cases, and incomplete documentation. This type of workflow visibility can reduce repeated phone calls and make administrative follow-up more systematic. Alharbi (2025) reported that EHR implementation may enhance hospital efficiency and improve patient outcomes when it supports documentation, communication, and workflow organization.

The following table presents key administrative indicators that can be used to evaluate the impact of EHRs on radiology scheduling and patient flow.

Table 5. EHR-related indicators for radiology scheduling and patient flow

Indicator	Meaning	How EHRs may improve it
Appointment waiting time	Time between imaging request and scheduled appointment	Supports faster request review and prioritization
Request completion time	Time needed to complete order verification and scheduling	Reduces missing data and repeated manual checks
Patient no-show rate	Percentage of patients who miss scheduled imaging appointments	Supports appointment reminders and clearer preparation instructions
Examination delay rate	Percentage of delayed or postponed imaging examinations	Improves access to preparation-related information
Duplicate request rate	Frequency of repeated or unnecessary imaging requests	Allows access to previous imaging records and reports
Report turnaround time	Time from image acquisition to final report availability	Supports faster report distribution and workflow tracking
Administrative error rate	Frequency of registration, scheduling, or documentation errors	Reduces duplicate entry and supports structured documentation
Patient throughput	Number of patients processed within a defined period	Improves coordination between ordering, scheduling, scanning, and reporting

This table highlights that the effect of EHRs on radiology is not limited to clinical decision-making. EHRs can also improve administrative indicators that directly affect service efficiency. For medical secretaries and administrative staff, these indicators are practical because they reflect daily workflow problems such as missing information, appointment delays, repeated communication, and request tracking difficulties. For managers and health informatics professionals, these indicators can be used to monitor performance and identify workflow bottlenecks.

EHRs, Communication, and Radiology Reporting

Communication is a central component of radiology because the value of imaging depends not only on producing high-quality images, but also on delivering accurate findings to the right clinician at the right time. EHRs can support communication by making imaging orders, clinical notes, previous reports, and final radiology reports accessible to authorized healthcare professionals. This can reduce fragmentation between radiology and other departments and improve continuity of care.

Radiology reporting is also affected by the availability of clinical information. When radiologists can access relevant clinical history, previous diagnoses, laboratory data, and earlier imaging results, they may be better able to interpret findings within the patient's clinical context. EHRs can support this process by linking the imaging examination to the broader patient record. This is important because radiology interpretation often requires more than visual image analysis; it also requires understanding the reason for the examination and the patient's clinical background.

Structured reporting can further improve the value of EHR-linked radiology reports. Structured reports use standardized sections, terminology, and formats, which may make results easier for clinicians to read, compare, search, and analyze. When structured reports are integrated into EHRs, they may also support data extraction, quality monitoring, follow-up tracking, and communication of important findings. Bharadwaj et al. (2024) emphasized that workflow efficiency applications in radiology should be assessed according to their ability to support real operational improvement, including reporting and communication processes.

The following table summarizes how EHRs can support communication and reporting in radiology.

Table 6. EHR contributions to communication and radiology reporting

Workflow area	Common problem	EHR-supported improvement
Clinical context	Radiologist may receive limited referral information	EHR provides access to patient history, notes, laboratory data, and previous diagnoses
Report availability	Reports may be delayed or difficult to locate	Final reports can be stored and accessed electronically
Result communication	Important findings may require repeated phone calls or unclear documentation	EHR can document communication and support traceable result delivery
Follow-up recommendations	Follow-up imaging may be missed or poorly tracked	EHR can support reminders, documentation, and follow-up visibility
Referring clinician access	Clinicians may wait for printed or manually delivered reports	Reports can be viewed directly in the patient record
Comparison with previous studies	Prior reports may be unavailable or difficult to retrieve	EHR/PACS integration supports access to previous images and reports
Administrative tracking	Staff may not know whether reports are pending, completed, or communicated	Electronic status tracking improves visibility and accountability

This table shows that EHRs can improve the communication cycle surrounding radiology reports. The administrative advantage is that reports become easier to locate, track, and share. The clinical advantage is that radiologists and referring physicians can work with more complete information. However, the quality of communication still depends on system design, user discipline, alert management, and clear institutional policies for critical result communication.

Administrative Burden, Usability, and Workflow Alignment

Although EHRs can improve efficiency, they may also increase administrative burden if they are poorly designed or poorly aligned with actual workflow. Electronic documentation can become time-consuming when users must click through multiple screens, enter repetitive information, respond to excessive alerts, or use systems that do not match daily clinical tasks. Holmgren et al. (2024) found that EHR usability is strongly associated with physician satisfaction, and that poor usability may contribute to dissatisfaction and burnout. Although this study focused on family physicians, its findings are relevant to radiology because radiology also depends on fast information retrieval, efficient data entry, and smooth workflow alignment.

In radiology departments, poor EHR usability can affect radiologists, technologists, medical secretaries, and administrative staff. Radiologists may experience delays if clinical information is difficult to find. Technologists may face problems if preparation details or protocol instructions are unclear. Medical secretaries may spend more time correcting incomplete requests or navigating multiple systems. Health informatics staff may need to manage user complaints, data quality issues, and system configuration problems.

Therefore, EHR implementation should be treated as a sociotechnical process. This means that the system must be evaluated not only as software, but also as part of a larger work environment involving people, tasks, policies, training, and organizational culture. Successful implementation requires workflow mapping, user training, technical support, data governance, and continuous evaluation. Bharadwaj et al. (2024) similarly suggest that workflow efficiency applications should be selected and assessed according to practical workflow value, not only technological sophistication.

The following table presents common EHR-related challenges and possible mitigation strategies.

Table 7. Challenges of EHR implementation in radiology and mitigation strategies

Challenge	Possible impact	Mitigation strategy
Poor usability	Slower documentation, user frustration, and possible burnout	User-centered system design and regular usability evaluation
Lack of interoperability	Duplicate data entry and fragmented workflow	Integration between EHR, RIS, PACS, laboratory systems, and reporting tools
Excessive alerts	Alert fatigue and ignored warnings	Careful alert design and prioritization of high-value alerts
Incomplete data entry	Poor request quality and delayed scheduling	Required fields, structured templates, and user training
Limited staff training	Incorrect system use and workflow disruption	Continuous training for radiology, administrative, and informatics staff
Resistance to change	Low adoption and inconsistent system use	Change management and involvement of end users during implementation
Data privacy concerns	Risk of unauthorized access or confidentiality breaches	Access control, audit trails, cybersecurity policies, and staff education
Poor workflow alignment	Digital system adds burden instead of improving efficiency	Workflow mapping before and after implementation

This table demonstrates that EHR challenges are not only technical. Many problems occur because the system does not fit the real work of the department. For this reason, improving EHR performance in radiology requires collaboration between clinical users, administrative staff, health informatics professionals, and leadership. The goal is not simply to digitize old processes, but to redesign workflow in a way that reduces unnecessary administrative work and improves patient care.

Interdisciplinary Roles in Digital Radiology Workflow

Radiology workflow is interdisciplinary by nature. It involves radiologists, radiologic technologists, medical secretaries, nurses, referring physicians, health informatics professionals, IT teams, and administrative leaders. EHRs can support these groups by improving access to information, reducing duplication, and increasing workflow visibility. However, the benefits of EHRs depend on how each professional group uses the system and how well their responsibilities are coordinated.

Radiologists benefit from EHRs when they can access relevant clinical information and previous reports during image interpretation. Radiologic technologists benefit when the system provides clear examination details, preparation requirements, and safety information. Medical secretaries benefit when EHRs support scheduling, request tracking, documentation, and communication with patients and departments. Health informatics professionals contribute by supporting system integration, data quality, workflow analysis, training, and performance monitoring.

The following table summarizes the roles of key professional groups in EHR-supported radiology workflow.

Table 8. Interdisciplinary roles in EHR-supported radiology workflow

Professional group	Main role in radiology workflow	EHR-related contribution
Radiologists	Interpret images and produce reports	Use clinical information and prior records to support accurate interpretation
Radiologic technologists	Perform imaging examinations	Use electronic orders and patient information to prepare and scan patients safely
Medical secretaries	Coordinate administrative workflow	Manage scheduling, request verification, documentation, and follow-up
Referring physicians	Request imaging and use reports for patient care	Submit structured orders and review reports electronically
Nurses	Support patient preparation and safety	Access allergies, medications, preparation instructions, and clinical alerts

Professional group	Main role in radiology workflow	EHR-related contribution
Health informatics professionals	Optimize digital workflow	Support integration, data quality, workflow analysis, user training, and system improvement
IT teams	Maintain technical infrastructure	Ensure system availability, cybersecurity, and technical support
Department managers	Monitor performance and resources	Use EHR/RIS data to evaluate efficiency and improve service planning

This table shows that EHR-supported radiology workflow is not the responsibility of one profession alone. Administrative efficiency depends on coordinated roles. Medical secretaries are particularly important because they connect clinical requests with operational scheduling and patient communication. Health informatics professionals are also essential because they translate workflow problems into system improvements. Therefore, digital radiology improvement requires interdisciplinary cooperation rather than isolated technology adoption.

The future of EHR-supported radiology workflow is likely to involve deeper integration between EHRs, RIS, PACS, artificial intelligence, structured reporting, and workflow analytics. Artificial intelligence may support radiology by helping prioritize urgent cases, detect abnormal findings, automate routine measurements, improve report structuring, and identify workflow bottlenecks. However, AI tools will be more useful when they are integrated into the existing digital workflow rather than functioning as separate applications.

Workflow analytics is another important future direction. EHR and RIS data can be used to measure turnaround time, waiting time, incomplete request rates, modality utilization, report delays, and patient throughput. These indicators can help managers and health informatics professionals identify inefficiencies and evaluate the effect of interventions. Bharadwaj et al. (2024) emphasize that radiology workflow efficiency applications require objective evaluation criteria, which supports the use of measurable performance indicators.

Future systems should also focus on improving usability. Holmgren et al. (2024) showed that EHR usability is closely related to satisfaction and burnout, which means that digital transformation should not be judged only by system availability. A successful future radiology system should be fast, integrated, easy to use, clinically useful, and administratively supportive. It should reduce unnecessary tasks rather than adding new digital burdens.

RECOMMENDATIONS

Based on the reviewed evidence, healthcare institutions should not implement EHRs in radiology as isolated documentation tools. Instead, EHRs should be integrated with RIS and PACS to support a complete digital workflow from imaging request to report delivery. This integration can reduce duplication, improve visibility, and support more efficient coordination between clinical and administrative teams.

Radiology departments should also improve the quality of electronic imaging requests by using structured order forms, required clinical fields, and decision-support tools where appropriate. This can reduce incomplete requests, improve protocol selection, and support safer patient preparation. Administrative staff and medical secretaries should receive specific training on EHR-based scheduling, request tracking, documentation, and communication because they are central to daily workflow efficiency.

Health informatics professionals should be involved continuously in radiology workflow improvement. Their role should include system configuration, data quality monitoring, workflow analysis, interoperability support, user training, and performance evaluation. Institutions should also measure key indicators such as report turnaround time, appointment waiting time, request completion time, duplicate imaging rate, and administrative error rate.

Finally, EHR usability should be regularly evaluated. If users experience excessive clicks, poor information retrieval, alert fatigue, or workflow mismatch, the system may increase burden rather than improve efficiency. Therefore, EHR optimization should be treated as a continuous process that requires feedback from radiologists, technologists, medical secretaries, and other users.

CONCLUSION

Electronic Health Records play an important role in improving radiology workflow and administrative efficiency when they are implemented as part of an integrated digital ecosystem. Their value appears through improved access to clinical information, better order management, more efficient scheduling, clearer communication, faster report availability, and stronger workflow

traceability. However, EHRs are most effective when they are connected with RIS and PACS, supported by structured documentation, and aligned with the real needs of users.

The review shows that EHRs can reduce administrative burden by minimizing paper-based processes, duplicate data entry, incomplete requests, and communication gaps. At the same time, poor usability, weak interoperability, inadequate training, and poor workflow alignment can limit the benefits of EHR implementation. Therefore, successful use of EHRs in radiology requires a sociotechnical approach that combines technology, workflow redesign, staff training, leadership support, and continuous performance monitoring.

Radiology workflow is interdisciplinary, and its improvement depends on the coordinated efforts of radiologists, radiologic technologists, medical secretaries, referring physicians, nurses, health informatics professionals, IT teams, and department managers. In this context, EHRs should be understood not only as digital records, but as workflow tools that can support safer, faster, and more efficient imaging services. Future radiology departments should focus on integrated systems, user-centered design, workflow analytics, and evidence-based digital transformation to achieve sustainable improvements in patient care and administrative performance.

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