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Problems of HL7/DICOM Integration in Healthcare Systems

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Abstract

Modern healthcare information systems are based on the integration of HL7 and DICOM standards, which enable the exchange of administrative, clinical, and imaging data between HIS, RIS, and PACS systems. This thesis focuses on the analysis of the most significant integration problems that occur during communication and data exchange between these systems, including inconsistencies in patient identification data, errors related to orders and Accession Numbers, difficulties in mapping HL7 messages into DICOM metadata, radiology workflow issues, differences in vendor implementations, security and organizational challenges, as well as architectural differences between HL7 and DICOM standards. An analysis of the causes, consequences, and possible solutions to these problems was conducted, with emphasis on their impact on everyday clinical practice. Special attention was given to the Croatian national CEZIH system, its role in the exchange of administrative data, and the limitations related to the integration of imaging systems. The thesis also presents future directions of development through HL7 FHIR, DICOMweb, integration engines, and artificial intelligence, with the aim of creating a more connected, stable, and organizationally efficient healthcare information system that enables a higher quality approach to patient care.

Keywords: CEZIH; difficulties; DICOM; HL7; information system; integration

Abbreviations and acronyms: ADT (Admission, Discharge, and Transfer), AE (Application Entity), API (Application Programming Interface), CEZIH (Central Health Information System of the Republic of Croatia), DA (Date Value Representation), DICOM (Digital Imaging and Communications in Medicine), FHIR (Fast Healthcare Interoperability Resources), HIS (Hospital Information System), HL7 (Health Level Seven), HTTP (Hypertext Transfer Protocol), HTTPS (Hypertext Transfer Protocol Secure), IHE (Integrating the Healthcare Enterprise), MPPS (Modality Performed Procedure Step), MWL (Modality Worklist), ORM (Order Message), PACS (Picture Archiving and Communication System), PID (Patient Identification), PV1 (Patient Visit), REST (Representational State Transfer), RIS (Radiology Information System), TM (Time Value Representation), UID (Unique Identifier).

1. Introduction

The digital transformation of healthcare systems over recent decades has significantly increased the volume and complexity of health data exchanged daily among various information systems. In such an environment, interoperability represents one of the key prerequisites for efficient, safe, and high-quality healthcare delivery.

The exchange of administrative and clinical data between health information systems is largely based on the HL7 standard, whereas the DICOM standard is used for the management, storage, and exchange of medical imaging data. The implementation of these standards has enabled the standardization of communication between different information systems and medical devices and forms the foundation of modern healthcare and radiological workflows [1].

As health information systems continue to develop, the need for their integration is also increasing to ensure reliable and seamless data exchange throughout the entire clinical process. The successful integration of the HL7 and DICOM standards is an important prerequisite for functional interoperability and the efficient operation of information systems within healthcare organizations [2]. Continuous evaluation of integration mechanisms is essential for the timely identification of shortcomings and their optimization, thereby improving clinical and organizational processes and enhancing the reliability and efficiency of health data exchange.

2. Materials and Methods

This study was designed as a systematic literature review focusing on the challenges associated with the integration of the HL7 and DICOM standards in health information systems. A literature search was conducted in the PubMed and DABAR databases using the terms HL7, DICOM, PACS, HIS, RIS, interoperability, and IHE, combined using the Boolean operators AND, OR.

Because of the technical and interdisciplinary nature of the topic, the official websites of the relevant standards, technical documentation, and implementation frameworks were additionally reviewed. Studies addressing

interoperability, standards integration, and their impact on clinical and organisational processes were included. Studies that did not address integration-related aspects or for which the full text was unavailable were excluded.

The selected studies were recorded in a tabular database according to their bibliographic information, area of application, identified challenges, and proposed solutions. The studies were grouped according to shared thematic characteristics, followed by the categorisation and comparative analysis of integration challenges.

3. Results

3.1. Key Concepts

Health Level Seven (HL7)

Health Level Seven (HL7) comprises a set of standards intended for the exchange of clinical, administrative, and other health-related data between information systems. It is particularly widely used for communication between hospital and radiology information systems, where it enables the standardized transmission of patient, order, procedure, and report data [3].

HL7 v2 is based on the structured exchange of messages between systems, while subsequent developments have resulted in models such as HL7 v3 and the Clinical Document Architecture (CDA). A more contemporary approach is represented by FHIR, which uses web technologies, application programming interfaces (APIs), and structured resources to enable more flexible exchange and retrieval of health data, as well as simpler integration of different information systems [4].

Digital Imaging and Communications in Medicine (DICOM)

Digital Imaging and Communications in Medicine (DICOM) is an international standard for the storage, transmission, and management of medical imaging data and associated metadata. It enables interoperability among imaging modalities, workstations, and picture archiving and communication systems [5].

In addition to image data, DICOM contains metadata describing the patient, diagnostic procedure, and technical imaging characteristics. Identifiers such as the Patient ID, Study Instance UID, and Accession Number enable imaging data to be linked with administrative and clinical information exchanged among the HIS, RIS, and PACS. The correct exchange and alignment of these identifiers are important prerequisites for the integration of the HL7 and DICOM standards [6].

DICOM also defines network services for data storage, query, and transfer, as well as the Modality Worklist, which enables patient and procedure data to be transmitted to imaging modalities. Other elements of DICOM communication relevant to integration will be presented in the context of specific integration challenges.

3.2. Methodology for Categorising Integration Challenges

The analysis of integration challenges is primarily based on the HL7 v2 standard, as the most widely used data exchange model in existing health information systems, with HL7 v3 partially included as a reference conceptual framework. Through a qualitative analysis of the selected literature, specific interoperability challenges associated with the HL7, and DICOM standards were identified, together with their causes, mechanisms of occurrence, effects on information flow, and potential solutions.

The identified challenges were subsequently compared and grouped according to shared thematic characteristics, with particular attention given to challenges recurring across multiple analyzed sources. Based on this process, categories of integration challenges were established, enabling a systematic analysis of their causes, consequences, and potential resolution strategies across different health information environments.

3.3. Integration Challenges, Explanations, and Practical Solutions

3.3.1. Most Common HL7/DICOM Integration Challenges

(Table 1)

Table 1. Overview of the most common HL7/DICOM integration challenges

Category	Description	Cause	Impact	Solution
Patient identification	Inconsistent patient identity across systems	Different systems, manual entry, lack of an MPI	Incorrect image–patient association, duplicate records, security risks	Master Patient Index (MPI), validation
Order/ Accession Number	Failure to link orders with imaging data	Inconsistent number generation, incorrect ORM mapping	Inability to link orders with images	ORM standardization, uniqueness checks
Metadata and mapping	Differences between HL7 and DICOM data	Different data structures, incomplete mapping	Misinterpretation, poor interoperability	Definition of mappings, integration tools
Workflow synchronization	Inconsistent workflow across systems	Message delays, Modality Worklist (MWL) issues	Delays, incorrect examination status	IHE Scheduled Workflow (SWF), automation
Interoperability (vendor-related)	Differences in standards implementation	Vendor-specific differences, inconsistent conformance	Compatibility issues	Testing, standardization
Architectural differences	Different communication models	HL7 messages versus DICOM objects	Complex integration	Middleware, integration engine

3.3.2. Patient Identification

Reliable patient identification is essential for linking administrative, clinical, and imaging data within health information systems (Table 1). In HL7 communication, patient identification data are primarily transmitted through ADT messages, in which the PID segment contains key information such as the Patient ID, patient name, and date of birth [7]. Within the radiology information workflow, these data are linked to the procedure order and transmitted through the RIS and the DICOM Modality Worklist (MWL) service to imaging modalities, where the corresponding DICOM attributes become part of the metadata of the resulting imaging record [8].

Patient identification issues arise when identification data becomes inconsistent between the HL7 and DICOM layers. Potential causes include incorrect data mapping, a lack of synchronization between systems, manual data entry at the modality, or differences in identifier implementation. For example, a delay in updating data from an HL7 ADT message may result in outdated information in the MWL entry, while the manual entry of a Patient ID at the modality increases the likelihood of creating a DICOM object that is not correctly linked to the existing patient record (Figure 1). An additional challenge is the use of different identifier namespaces, which may result in the same patient having multiple identifiers across different systems without a clearly defined relationship among them [8].

Such inconsistencies may result in imaging records being incorrectly associated with a patient or order, the fragmentation of health data, and difficulties in searching for and retrieving medical images. These errors are not merely technical interoperability issues; they may also disrupt clinical workflows and increase the risk of data being incorrectly interpreted or used [8].

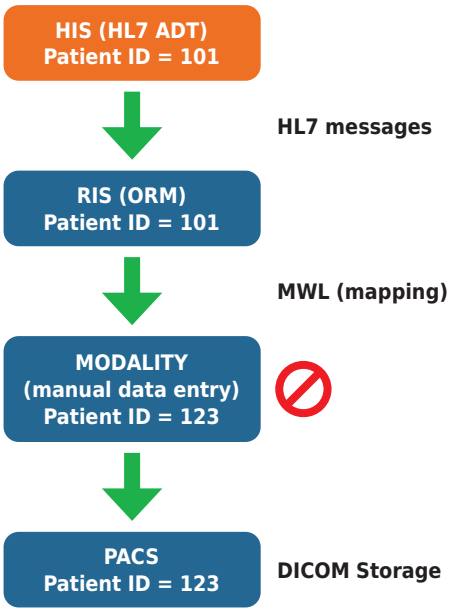


Figure 1. Schematic representation of the patient identification problem. The problem occurs at the modality level, where manual data entry or incorrect implementation of the Modality Worklist (MWL) results in the creation of a DICOM record that is inconsistent with the data transmitted via HL7. *Source: Author*

Risk reduction requires a combination of technical and organizational measures. The consistent use of DICOM MWL reduces the need for manual data entry, while a centralized Master Patient Index (MPI) enables patient identity management across multiple interconnected information systems. Additional support is provided by the IHE Patient Identifier Cross-referencing (PIX) and Patient Demographics Query (PDQ) profiles, which enable patient identities to be linked and verified across different systems [11]. When errors have already occurred, retrospective data reconciliation procedures may be performed within the PACS and integration layer. More contemporary approaches, including HL7 FHIR, also enable more flexible management of identification data and improve their availability across interconnected systems [9].

3.3.3. Order / Accession Number

A diagnostic procedure order represents an important link between the administrative and imaging components of a health information system (Table 1). Order information is transmitted through HL7 ORM messages, in which the OBR (Observation Request) segment contains data on the requested procedure. The Accession Number is one of the key order identifiers and, depending on the system architecture, is generated within the HIS or RIS. Its value is transmitted throughout the information workflow and links the order to the corresponding imaging data [10].

In the HL7–DICOM integration process, order data are used to create a DICOM Modality Worklist (MWL) entry, which is retrieved by the modality before the procedure is performed. The Accession Number is mapped to the corresponding DICOM attribute (0008,0050) and retained in the metadata of the resulting DICOM objects. It therefore provides a link among the order, the performed diagnostic procedure, and the study of imaging stored in the PACS [11].

Integration issues arise when inconsistencies occur in the generation, transmission, or mapping of the Accession Number. Differences in the interpretation of HL7 fields, incorrect MWL configuration, a lack of synchronization between the ORM message and the available MWL entry, or manual data entry at the modality may result in different identifier values across individual components of the system [11]. If the modality transmits DICOM objects containing an Accession Number that does not match the original order after the procedure has been performed, the PACS may store the study without an appropriate link to that order (Figure 2). This may make data linkage and retrieval more difficult and disrupt the continuity of the information workflow.

The prevention of such issues is based on consistent HL7–DICOM mapping, the correct configuration of MWL communication, and reducing the need for manual data entry. DICOM Modality Performed Procedure Step (MPPS) can additionally facilitate comparison between the scheduled and performed procedures, while validation mechanisms within the PACS and integration systems enable inconsistencies to be detected before they affect the clinical workflow [13]. Integration engines can provide continuous communication monitoring, while more contemporary approaches, such as HL7 FHIR and DICOMweb services, enable more flexible management of orders and their associated identifiers [9].

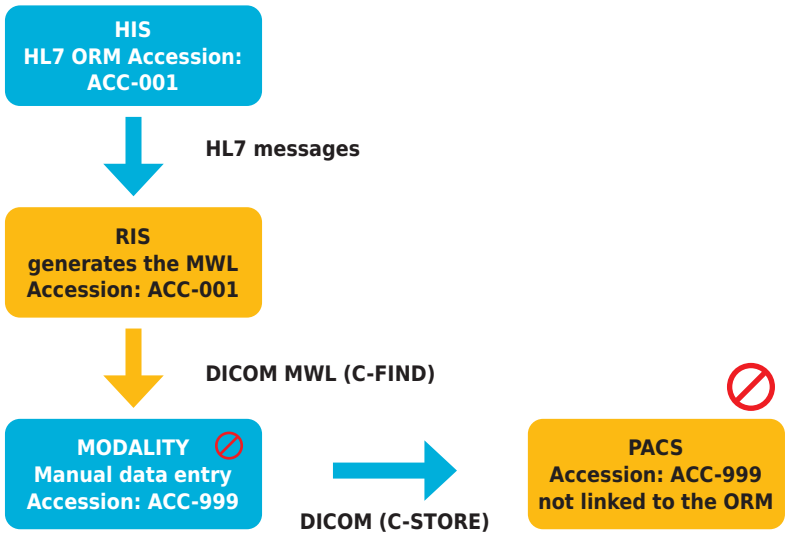


Figure 2. Schematic representation of an order transmission issue in HL7–DICOM integration. The issue occurs at the modality level, where the Accession Number is changed. This results in the loss of the link between the HL7 order and the DICOM imaging study within the PACS. *Source: Author*

3.3.4. Metadata and Mapping

Mapping represents one of the key aspects of HL7–DICOM integration because it enables data to be transferred and aligned between their different data structures (Table 1). Values contained in HL7 messages must be correctly extracted, transformed, and transferred to the corresponding DICOM attributes while preserving their semantic meaning and technical format. This process encompasses not only patient and order identification data but also information on the type and location of the procedure, as well as other elements required to describe the diagnostic procedure [8].

The alignment of different coding systems and local nomenclatures represents a particular challenge. Different names or codes for the same diagnostic procedure may result in semantic inconsistencies between systems; therefore, mapping tables and data normalization procedures are used in integration solutions. In addition, DICOM requirements regarding data formats and value types must be met, and the correct conversion of dates, times, textual values, and character encoding must be ensured [13].

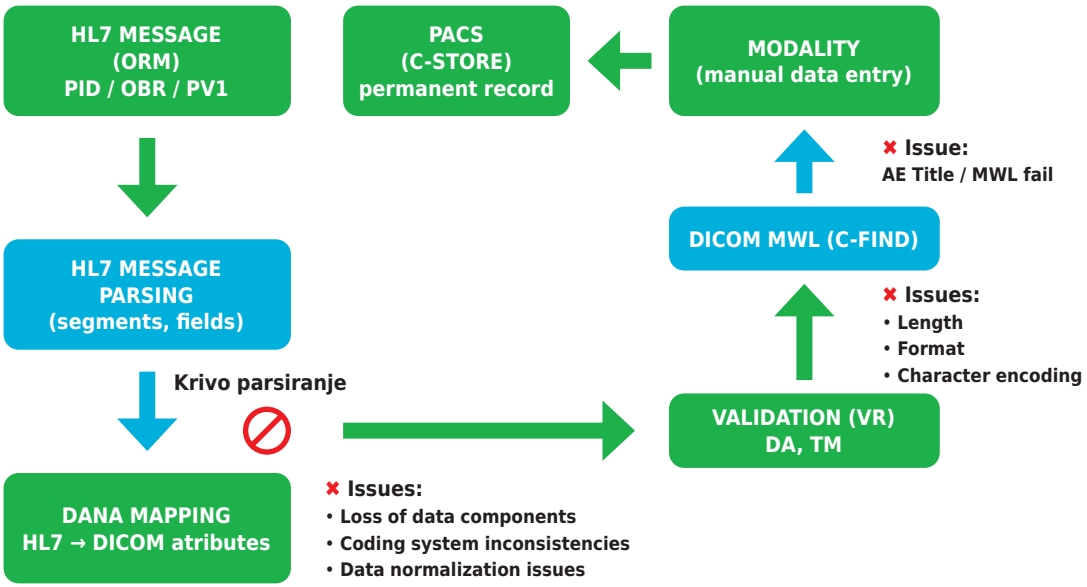


Figure 3. Schematic representation of errors occurring during the conversion of HL7 data into DICOM metadata. Numerous parameters may be incorrectly mapped, resulting in inaccurate metadata that affect the subsequent handling of imaging data. *Source: Author*

Integration issues arise when information is lost or values are incorrectly interpreted during data parsing, transformation, or validation. Incorrect mapping of multi-component HL7 fields, inconsistent local codes, inappropriate data formats, or incorrect character encoding may result in incomplete or inconsistent DICOM metadata (Figure 3). Because such data are not necessarily updated automatically after a DICOM object has been created and stored, an error introduced during mapping may persist throughout the subsequent stages of the information workflow [13].

These issues can be addressed through centralised integration systems that enable standardised parsing, the definition of mapping rules, and data validation before distribution. Code-mapping tables, terminology services, DICOM conformance checks, and the monitoring of HL7–DICOM communication enable the timely detection of inconsistencies and reduce the risk of incorrect metadata being propagated throughout the remainder of the system [14].

3.3.5. Workflow Synchronisation

The radiology workflow involves multiple interconnected components, including HIS, RIS, integration system, imaging modalities, and PACS (Table 1). In such a distributed environment, ensuring data transmission alone is insufficient; data must also be available in a timely manner, and their status must remain consistent across individual systems. Synchronisation issues arise when different components simultaneously hold conflicting information regarding the patient, order, or status of a diagnostic procedure.

HL7 messages represent events that change the state of an information system and are often processed through message queues within the integration system. Delays in message transmission or processing may result in a change being recorded in one system while another system still retains the previous state. Such temporal inconsistencies may disrupt automated workflows, make an order unavailable, or cause the status of a diagnostic procedure to be displayed incorrectly.

The DICOM Modality Worklist (MWL) represents a particularly important synchronisation point through which the modality retrieves current information regarding scheduled procedures. If the MWL does not reflect the current state of the system because of a delayed HL7 message, an unsuccessful update, or a lack of synchronization with the RIS, the modality may operate using outdated or incomplete data. Consequently, the need for manual data entry increases, further increasing the likelihood of errors and disrupting the continuity of the information workflow [15].

Preventing such issues requires controlled event processing, reliable synchronization between the RIS and MWL service, and continuous monitoring of communication status across interconnected systems. Integration systems can enable the monitoring of message queues, reprocessing of failed transactions, and timely detection of inconsistencies. The IHE Scheduled Workflow (SWF) profile provides an important reference framework by defining the roles of individual systems and the standardised sequence of their interactions. This approach reduces dependence on individual implementations and enables a more stable, predictable, and reliable radiology workflow [16].

3.3.6. Differences in Implementation (Vendor-Related Issues)

In addition to the previously described data- and synchronization-related issues, further integration challenges arise from how different vendors implement the HL7 and DICOM standards (Table 1). Although these standards define the fundamental rules for communication and data exchange, a certain degree of implementation flexibility allows technical differences to emerge among individual systems [15].

Different systems may support different versions or only specific parts of a standard. In HL7 communication, these differences may involve the use of optional fields, message structure, and the processing of individual values. In DICOM, they may be reflected in varying levels of support for services such as MWL and MPPS. Vendor-specific extensions, including private DICOM tags and customized HL7 fields, introduce further complexity. Consequently, two systems may formally support the same standard while interpreting or processing the same data differently.

Such differences may result in situations in which communication between systems is technically established, but its outcome is not functionally aligned with the expected clinical workflow. Conformance statements play an important role in this context because they describe how an individual system implements the standard and specify its supported communication capabilities. However, documented compatibility alone is insufficient, and interoperability must be confirmed through practical testing within the specific information environment.

Reducing vendor-specific issues requires standardised implementation practices and systematic interoperability testing. IHE integration profiles further define the roles of individual systems, their mutual transactions, and their expected behavior within the clinical workflow, thereby reducing the potential for different interpretations of the HL7 and DICOM standards. Continuous communication testing and validation are particularly important in heterogeneous, multivendor environments because they facilitate the early detection of inconsistencies and reduce the need for subsequent modifications to the integration layer [16].

3.3.7. Architectural Differences Between HL7 and DICOM

In addition to the previously described issues related to patient identification, orders, mapping, workflow synchronization, and differences in vendor implementation, a further integration challenge arises from the distinct architectural principles underlying the HL7 and DICOM standards (Table 1). HL7 v2 is based on structured messages representing events within a health information system, whereas DICOM organises data through information objects, metadata, and network services. Integration therefore requires the continuous alignment of two different models of information representation and exchange [17].

In an HL7 environment, data may be transmitted through multiple consecutive messages associated with events such as patient registration, order creation, or changes in procedure status. The final state of the information system results from the correct processing of

these events. Consequently, delayed, lost, or incorrectly ordered messages may lead to inconsistencies between interconnected systems. DICOM, by contrast, requires the creation of structured objects that contain the relevant identification, procedural, and imaging data required for their interpretation and subsequent storage.

This architectural difference is particularly important when information from multiple HL7 messages must be consolidated and transferred into the appropriate DICOM context. The integration system must ensure that the data is available in a timely manner, semantically aligned, and correctly mapped before being used in the DICOM workflow. An error occurring during this process may be transferred to the metadata of the imaging study and persist after storage in the PACS, thereby shifting the issue from the communication layer to the data layer of the system.

Overcoming these architectural differences requires an integration layer that mediates between the different communication models, manages events, performs data transformation and mapping, and ensures temporal and semantic consistency. Standardized integration profiles, such as IHE Scheduled Workflow, play an important role by defining the respective roles of systems and the sequence of transactions within the radiology workflow. Although such models do not eliminate the architectural differences between HL7 and DICOM, they enable their controlled and predictable integration within a health information system [16].

4. Discussion

4.1. Integration Challenges in Health Information System Practice

The analysis of the identified issues demonstrates that the integration of the HL7 and DICOM standards is a complex process extending beyond the technical exchange of data alone. Integration challenges arise from the interaction between data structures, temporal synchronization, differences in system implementation, and information management within the healthcare workflow (Table 1). Owing to their interconnected nature, an individual issue may affect multiple components of the information system and, consequently, the entire clinical process.

In everyday radiology practice, these issues may arise as early as the order creation stage. Incomplete or inconsistent identification data, an unavailable Modality Worklist entry, or a mismatch between the order and DICOM metadata may require manual data entry and additional verification. This reduces the level of automation and increases the likelihood of further errors. After the procedure has been performed, inconsistent identifiers or statuses may make it difficult to link the imaging study to the corresponding order, locate it in the PACS, and subsequently interpret and distribute the report.

Synchronisation issues and differences in standards implementation are of particular importance. Delayed or incomplete message processing may result in the same process being represented differently across individual systems, while vendor-specific implementations may require additional mapping rules and modifications to the integration layer. Consequently, interoperability depends not only on formal support for the HL7 and DICOM standards but also on their consistent implementation, configuration, and continuous evaluation.

The architectural differences between event-driven HL7 message exchange and DICOM's object- and service-oriented model further explain why these issues frequently occur simultaneously. The integration system must link data generated at different stages of the process, ensure their temporal and semantic consistency, and transfer them between different information models. Therefore, integration issues rarely occur in isolation but rather as interconnected inconsistencies that may result in data fragmentation, an increased workload for users, and reduced clinical workflow efficiency.

This interrelationship between technical and organizational factors allows the identified integration challenges to be further considered within the context of the broader health information infrastructure, including the Central Health Information System of the Republic of Croatia (CEZIH).

4.2. Comparison of the Identified Integration Challenges with CEZIH

The identified integration challenges can be further examined using the CEZIH as an example. CEZIH represents an important communication layer within the national health information infrastructure. Because publicly available literature on its detailed technical and architectural characteristics is limited, this analysis is based on the available system specifications and descriptions of its functionalities.

CEZIH enables the exchange of structured administrative and clinical data among different participants in the healthcare system. Its functionalities, such as eUputnice, eNalaza i eRecepta enable standardized data exchange among primary healthcare providers, hospital systems, pharmacies, and other participants, thereby facilitating interoperability at the national level [19]. The Health Portal additionally provides patients with access to some of the data available within the system, including medical reports, referrals, and treatment-related information [20].

Available specifications indicate a strong emphasis on the structured exchange of administrative and clinical information, whereas the centralized exchange of medical imaging data do not exist. Imaging data generated during radiological procedures are generally processed and stored within the local RIS and PACS environments of healthcare institutions. Consequently, the integration of the administrative and imaging layers is largely performed within individual healthcare organizations, where local HL7 and DICOM systems must be interconnected.

This organizational model may result in varying levels of interoperability among individual institutions because successful integration depends on the local architecture, implemented systems, and integration mechanisms used. Consequently, the availability of imaging data and associated clinical information across different healthcare organizations may be less consistent than the exchange of structured administrative data.

CEZIH therefore represents an important example of national standardization and centralized health information exchange. At the same time, it demonstrates that complete interoperability depends on more than merely connecting administrative and clinical data. The inclu-

sion of imaging information requires further integration of the national infrastructure with local DICOM environments, as well as the alignment of information models and integration mechanisms among individual healthcare organizations.

4.3. Future Development of Interoperability

The future development of health information systems is directed toward greater interoperability, flexibility, and data availability. HL7 FHIR plays an important role in this development by using web technologies, RESTful APIs, and structured resources to facilitate access to and exchange of health information among different systems. This approach reduces the need for complex transformations characteristic of traditional message exchange models and enables more flexible integration of clinical and administrative data [14]. The development of interoperability is also increasingly extending beyond the boundaries of individual healthcare organizations and national systems, as demonstrated by European initiatives such as the European Health Data Space, which aims to facilitate the secure and standardized cross-border exchange of health data [21].

In parallel, DICOMweb is being developed in the field of medical imaging, enabling DICOM data to be queried, retrieved, and stored using standard web protocols. Services such as QIDO-RS, WADO-RS, and STOW-RS facilitate the integration of imaging systems with web applications and other health information solutions [22]. The combination of FHIR and DICOMweb is particularly significant because it enables structured clinical data to be linked with imaging records within a more technologically harmonized environment [23].

The application of artificial intelligence represents an additional area of potential development. In addition to medical image analysis and clinical decision support, algorithmic approaches may be used to identify inconsistent metadata, link previously unassociated records, and monitor integration processes. The integration of such solutions with FHIR and DICOMweb technologies could further improve automation, data quality, and clinical workflow efficiency [23].

The increased availability and interconnectedness of health data simultaneously introduce greater requirements regarding security, access control, and the protection of patient privacy. The successful implementation of new integration models will therefore depend not only on technological development but also on the consistent implementation of security mechanisms, standardization, and the continuous education of healthcare and technical personnel. Future developments in interoperability may gradually reduce some of the limitations of existing HL7 and DICOM integration models; however, they will require the simultaneous alignment of technological, organisational, and security-related aspects.

5. Conclusion

The integration of the HL7 and DICOM standards represents an important prerequisite for the functional interoperability of modern health information systems. The analyzed challenges associated with patient identification, order management, data mapping, workflow synchronization, differences in vendor implementation, and architectural differences confirm that successful interoperability depends not only on the existence of standards but primarily on their consistent and coordinated implementation.

The practical significance of these issues is reflected in data fragmentation, the increased need for manual intervention, and difficulties in linking administrative, clinical, and imaging information. The analysis of CEZIH further highlights the importance of connecting the national exchange of structured health data with local radiology information environments to achieve a higher level of interoperability among healthcare organisations.

Further development of technologies such as HL7 FHIR and DICOMweb offers opportunities for more flexible integration of clinical and imaging data, while the application of artificial intelligence may contribute to automated monitoring, improved data quality, and optimized clinical workflows. Their successful implementation will require appropriate security infrastructure, standardisation, and the continuous education of healthcare and technical users.

In this process, radiologic technologists, as direct users of radiology information systems, can play an important role in identifying workflow issues, ensuring data quality, and aligning clinical requirements with the technical capabilities of the systems. Improving interoperability therefore requires interdisciplinary collaboration between clinical and information technology professionals, together with the continuous evaluation of existing integration mechanisms. The ultimate objective of these developments remains to ensure timely, reliable, and accessible health information that directly contributes to the quality and safety of patient care.

All data presented in this paper are part of the results of the master'thesis "Problems of HL7 and DICOM Integration in Healthcare Systems," written at the Faculty of Health Sciences, University of Split [24].

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Problemi HL7/DICOM integracije u zdravstvenim sustavima

Sažetak

Suvremeni zdravstveni informacijski sustavi temelje se na integraciji HL7 i DICOM standarda koji omogućuju razmjenu administrativnih, kliničkih i slikovnih podataka između HIS, RIS i PACS sustava. Rad za fokus ima analizu najvažnijih integracijskih problema koji nastaju tijekom komunikacije i razmjene podataka između navedenih sustava, uključujući neusklađenost identifikacijskih podataka pacijenta, pogreške povezane s narudžbom i accession number-om, poteškoće mapiranja HL7 poruka u DICOM metapodatke, probleme radiološkog workflowa, razlike u implementaciji između vendora, sigurnosne i organizacijske izazove te arhitekturne razlike između HL7 i DICOM standarda. Provedena je analiza uzroka, posljedica i mogućih rješenja navedenih problema, uz naglasak na njihov utjecaj u svakodnevnom kliničkom radu. Posebno je razmotren nacionalni sustav CEZIH, njegova uloga u razmjeni administrativnih podataka i ograničenja u povezivanju sa slikovnim sustavima. Rad također prikazuje buduće smjerove razvoja kroz HL7 FHIR, DICOMweb, integracijske softverske oblike i umjetnu inteligenciju, s ciljem stvaranja povezanijeg, stabilnijeg i organizacijski učinkovitijeg zdravstvenog informacijskog sustava koji omogućuje kvalitetniji pristup pacijentu.

Ključne riječi: CEZIH; DICOM; HL7; informatički sustav; integracija; poteškoće