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Interoperable Health Terminology API for India

Harsh Bhade[1*], Dr. Kirti Jain[2], Vaibhav Suryawanshhi [3], Priyanka Vishwakarma[4]

[1]SOCA, Sanjeev Agrawal Global Educational University Bhopal,

[2]Professor and Head SOCA, Sanjeev Agrawal Global Educational University Bhopal,

[3,4]Assistant Professor SOCA, Sanjeev Agrawal Global Educational University Bhopal,

[*]*Corresponding author, harshbhade2003@gmail.com*

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Abstract

Healthcare information systems often face challenges related to fragmented Electronic Health Records (EHRs), inconsistent medical terminology, and poor semantic interoperability. These issues reduce the efficiency of healthcare communication, reporting, and clinical decision-making. This study presents the design and development of an Interoperable Health Terminology API for India that integrates ICD-11 and HL7 FHIR standards into a unified API-based framework. The proposed system provides terminology search, translation, autocomplete, and value set retrieval services through REST APIs. The framework is developed using Python, Flask, React, SQLite, and Docker technologies. It also supports ABHA-linked FHIR records with role-based access control and consent-aware workflows. By centralizing terminology management, the system improves semantic consistency, healthcare data exchange, and interoperability between Electronic Health Record systems. The proposed solution can support healthcare providers, researchers, hospitals, and digital health platforms in building standardized and scalable healthcare applications.

Keywords: Healthcare Interoperability; ICD-11; HL7 FHIR; Electronic Health Records; REST API; Health Informatics

1. Introduction

The healthcare sector is rapidly adopting digital technologies for managing patient records, clinical workflows, and healthcare analytics. However, healthcare systems often store information using different coding systems, terminology standards, and data structures. As a result, patient information becomes fragmented and difficult to exchange between institutions.

Semantic interoperability is a major challenge in modern healthcare environments. While standards such as ICD-11 and HL7 FHIR provide structured mechanisms for disease classification and health information exchange, many healthcare applications still lack effective terminology integration services. This limitation affects healthcare reporting, research, insurance processing, and continuity of patient care.

The objective of this research is to develop a centralized terminology API capable of integrating healthcare standards and improving interoperability within the Indian healthcare ecosystem.

2. Section

The World Health Organization developed ICD-11 to provide standardized disease classification and healthcare reporting mechanisms. ICD-11 enables healthcare organizations to maintain consistency in coding and data exchange.

HL7 FHIR has become one of the most widely adopted healthcare interoperability standards. It provides REST-based resources for exchanging healthcare information between systems. Research has shown that FHIR improves interoperability while reducing implementation complexity.

Several studies have also highlighted challenges associated with integrating traditional healthcare systems such as Ayurveda, Siddha, and Unani into standardized digital health environments. Existing Electronic Medical Record systems often focus on record storage rather than semantic interoperability, resulting in inconsistent healthcare terminology usage.

The literature indicates a need for a centralized terminology service that combines international standards with local healthcare requirements. The proposed system addresses this gap through a unified API architecture.

3. Methodology

The proposed framework follows a modular API-driven architecture. Healthcare requests are received through REST endpoints and validated before processing. After validation, the system searches terminology repositories that include ICD-11 and traditional medicine resources.

The backend is implemented using Python and Flask, while React is used for frontend development. SQLite provides lightweight data management and Docker ensures deployment portability.

The API provides the following core services:

- Terminology Search
- Value Set Retrieval
- Autocomplete Support
- Terminology Translation
- FHIR-Compatible Data Exchange

The system generates structured JSON and XML responses suitable for integration with healthcare applications. Role-based access control and consent-aware mechanisms are incorporated to improve healthcare data security.

4. Results and Discussion

The developed framework successfully demonstrates the integration of healthcare terminology services through standardized REST APIs. The system supports healthcare terminology retrieval, semantic mapping, and interoperability between Electronic Health Record systems.

Table 1 presents the major features supported by the proposed system. Table 1: Features of the Proposed Framework

Feature	Status

ICD-11 Integration	Supported
FHIR Compatibility	Supported
REST API Services	Available
Semantic Interoperability	Improved
Role-Based Access	Supported
Consent Management	Supported

The results indicate that centralized terminology services can significantly improve healthcare communication and reduce data fragmentation. The integration of ICD-11 and FHIR standards enables structured healthcare information exchange while maintaining semantic consistency.

The proposed architecture also provides flexibility for future expansion, including multilingual support, cloud deployment, and AI-assisted terminology mapping.

5. Conclusion

This research presents an Interoperable Health Terminology API for India designed to improve healthcare interoperability and semantic consistency. The framework integrates ICD-11 and HL7 FHIR standards into a unified API-based architecture capable of supporting healthcare terminology management and Electronic Health Record integration.

The proposed system improves healthcare data exchange, reduces terminology inconsistencies, and supports secure healthcare communication. Future work may include multilingual healthcare terminology support, advanced analytics, cloud-native deployment, and large-scale institutional integration.

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Declaration of Conflicting Interests

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