

# Unified Identification Protocol for Cross-Border Healthcare

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**Abstract.** The Unified Identification Protocol (UIP) is an innovation which empowers patients and legal guardians to generate their unique digital identity for cross-border healthcare. This digital identity seamlessly links to local identifiers across different territories and organizations, bridging the gap between disparate systems. Combined with the International Patient Summary (IPS) - endorsed by the G7 and the EU - UIP is pioneering a new paradigm in telehealth services. Championing a user-centric approach in line with Web 3.0 principles, UIP places data control directly in the hands of patients and their legal guardians. This ensures accurate identification, streamlined access to health data, and robust privacy protection. When harmonized with tools like the SMART-On-FHIR API, FHIR Contract, DID Documents, and blockchain certification, UIP lays down transparent, user-approved guidelines for sharing healthcare data across borders. This framework guarantees that data is securely exchanged, encrypted specifically for the intended recipients upon user consent, adhering to international standards, and in full compliance with prevailing regulations. Furthermore, UIP facilitates certification of health courses and competences for patients, caregivers, and practitioners, enhancing healthcare understanding and management.

**Keywords.** cross-border, user-centric, identification

## 1. Introduction

In an increasingly interconnected world, the seamless fusion of the International Patient Summary (IPS) [1] [2] with the Unified Identification Protocol for Training and Health (UIP) [3] stands out as a revolutionary and essential response to enduring healthcare challenges. The UIP empowers patients, legal guardians, and caregivers to establish unique digital identities for cross-border healthcare, intricately linked with regional identifiers across diverse regions and organizations, effectively bridging the gap between disparate systems.

Furthermore, the UIP introduces a revolutionary mechanism to certify health courses and competences acquired by patients, caregivers, and practitioners. This not only

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bolsters self-care among patients but also equips family members and caregivers with vital insights for optimal care provision. Additionally, it assures that practitioners' qualifications and competencies are verifiable.

Utilizing DID Documents [4] and Verifiable Credentials [5] in this user-centric model, identities and relationships can be authenticated, ensuring trust and data security. Such advancements not only facilitate seamless, safe, and standardized global data sharing, but also amplify interoperability, patient safety, and versatility across diverse EHR systems.

This robust framework is further fortified by the inclusion of the SMART-On-FHIR API [6] and FHIR Contract [7], which accentuate security by enabling patients and legal guardians to generate consents and access rights, ensuring a comprehensive and protected healthcare experience.

## 2. Method

Our research methodologies address the challenges of telehealth and cross-border healthcare. Through a combination of technologies and protocols, we aim to demonstrate how seamless and secure interactions can be achieved among patients, practitioners, and legal guardians across diverse geographical contexts.

### 2.1 SMART-On-FHIR API & FHIR Contract

The SMART-On-FHIR API standardizes the exchange of resources among healthcare systems, patients, and practitioners, ensuring compatibility regardless of the EHR solution used. When integrated with FHIR Contract, it establishes transparent rules and agreements for data sharing in cross-border healthcare, ensuring regulatory compliance and patient consent.

### 2.2. International Patient Summary (IPS)

The IPS provides a consistent format to capture crucial patient health details. It is pivotal in cross-border healthcare, allowing seamless sharing of essential health information. By integrating with the SMART-On-FHIR API, FHIR Contract, and blockchain certification, it guarantees secure and standardized data exchange during telehealth consultations.

### 2.3. Blockchain Certification

Using private smart-contracts in platforms like Hyperledger Fabric, introduces enhanced security to the data sharing process. This technology ensures that records are tamper-proof and genuine, maintaining the trustworthiness of the FHIR Contract and other telehealth-related documentation.

### 2.4. Decentralized Identity Documents (DID Documents)

DID Documents play a pivotal role in anchoring unique digital identities tailored for cross-border healthcare. They not only encapsulate public cryptographic keys but also champion the creation of universal IDs. These universal IDs adeptly link to other local

identifiers, whether they pertain to the same individual or different entities like organizations and healthcare services. This intricate linkage ensures a cohesive identity representation, bridging potential gaps between varying healthcare ecosystems. This structure provides individuals with unparalleled control, facilitating their autonomy in data management and secure data-sharing during telehealth interactions. The universal IDs are represented as Interoperable URIs (iURI) [8], such as the iURI for a patient [9].

### *2.5. Unified Identification Protocol*

The UIP does more than just facilitate patient identification; it also encompasses a framework that certifies health courses and competences, and integrates security measures by encrypting data using the public keys of the recipients. This ensures that only intended recipients can access the shared information. This empowerment of patients, caregivers, and practitioners to validate and showcase their knowledge and skills, combined with robust security measures, enriches the telehealth ecosystem. Integration with FHIR Contract, blockchain, and IPS further enhances patient identification accuracy and bolsters safety in cross-border telehealth endeavors.

### *2.6. JSON Web Encryption (JWE)*

JWE offers an additional layer of encryption to protect health data during transfer. In conjunction with DID Documents, it ensures that all healthcare records are securely encrypted, bolstering confidentiality and cybersecurity in cross-border data exchange.

## **3. Results and Discussion**

Cross-border healthcare and telehealth have historically grappled with issues related to interoperability, security, and trustworthiness. Through our research, we present innovative solutions that address and transform these traditional challenges, paving the way for an enhanced global healthcare experience. Central to these advancements is the Unified Identification Protocol for Training and Health (UIP). The UIP not only strengthens data-sharing and security but also introduces the ability to certify health courses and competences. This empowers patients, caregivers, and practitioners by allowing them to validate and showcase their expertise, thereby facilitating more informed healthcare decisions and fostering better health outcomes. This empowerment, combined with the protocol's core strengths in data-sharing and security, marks a significant stride toward reshaping global healthcare experiences.

### *3.1. Data Sharing*

Through the Unified Identification Protocol (UIP) and related technologies, patients or legal guardians can seamlessly:

- Share health records and medical history before consultations.
- Engage in real-time data sharing during consultations, including receiving instant prescriptions.
- Obtain follow-up information, schedule subsequent appointments, and receive administrative documents post-consultation.

### 3.2. Security

The amalgamation of DID Documents, JSON Web Encryption (JWE), and blockchain certification ensures that every data exchange is encrypted for the intended recipient(s). This approach prioritizes the patient or legal guardian's control, allowing them to manage access permissions to their data.

### 3.3. Comprehensive Identification for Cross-border Healthcare

With the integration of the Unified Identification Protocol (UIP):

- Patients: Their unique IDs ensure that the right patient data is accessed and shared during consultations.
- Legal Guardians and Family Members: UIP aids in securely identifying and involving them in the healthcare decisions, especially when the patient is a minor or incapacitated.
- Caregivers: They can be accurately identified, ensuring that they have appropriate access to the medical information they need to provide care.
- Healthcare Professionals: UIP and DID Documents establish digital identities for healthcare providers, ensuring that patients and legal guardians are interacting with verified professionals. It also facilitates the secure sharing of medical credentials, licenses, and qualifications.

All these identifications are recorded and verified on the blockchain network, providing a tamper-proof and transparent system of identity management.

### 3.4. Blockchain-Based Evidence Generation

Beyond clinical and insurance evidences, blockchain can also store and verify:

- Identity Documents: Proof of identity, whether for patients, legal guardians, or healthcare professionals, can be stored and verified against the blockchain.
- Relationship Verification: Evidence that establishes relationships (like father, mother, caregiver) with the patient can be recorded, providing a clear and immutable record of who is authorized to make decisions or access patient data.

This ensures transparency, trustworthiness, and swift verification for all stakeholders involved.

### 3.5. Insurance

Integrating UIP, blockchain, and FHIR standards enhances telehealth by:

- Streamlining insurance coverage verification before and during consultations.
- Facilitating efficient claims submission and processing post-consultation.
- Ensuring secure and standardized payment processes.
- Prioritizing data integrity and security throughout the telehealth process.

## 4. Conclusion

The Unified Identification Protocol (UIP) represents a paradigm shift in cross-border healthcare, granting patients, legal guardians, and authorized persons (such as spouses or children) unparalleled agency in their healthcare decisions. UIP facilitates these

individuals to generate and manage their unique digital identities, ensuring seamless integration across diverse territories and organizations. Notably, UIP enables each patient and authorized person to act as a FHIR server with an Universal Identifier for Training and Health, a game-changing approach in the realm of cross-border healthcare.

In conjunction with the International Patient Summary (IPS) and technological tools like DID Documents, SMART-On-FHIR API, and FHIR Contracts, the UIP establishes a holistic framework. This system addresses the historical challenges of telehealth and global healthcare collaborations, emphasizing interoperability, data security, and user-centric data control.

Further amplifying its transformative potential, UIP also facilitates certification of health courses and competences achieved by patients, caregivers, and practitioners. This fosters a deeper comprehension and management of healthcare, enabling individuals to navigate their health journeys with greater insight and confidence, ultimately leading to improved health outcomes.

Moreover, the integration of blockchain, verifiable credentials, and standardized APIs paints a promising trajectory for the healthcare sector. It foresees an environment where patients and their authorized representatives can securely access, control, and share health information across borders. Concurrently, healthcare professionals can provide top-tier care, unhindered by technological or geographical barriers.

In essence, the UIP and its associated technologies sketch the blueprint for an innovative global healthcare landscape. Here, every individual, whether a patient, guardian, or authorized representative, plays an active role, ensuring an optimized, transparent, and efficient healthcare experience for all.

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