

# Healthcare Records Management

A Blockchain-Based Solution for Patient Data Sovereignty



# Current Healthcare Data Challenges

## Centralized Control

Patients have limited control over their medical data, with institutions controlling access.

## Security Vulnerabilities

Centralized systems are targets for cyber attacks, exposing sensitive information.

## Interoperability Issues

Different systems cannot communicate, leading to fragmented patient records.

## Access Delays

Critical medical information is often unavailable when needed, especially in emergencies.

# Empowering Digital Healthcare Sovereignty

Our personal mission aligns with empowering individuals with digital sovereignty while improving healthcare accessibility and security.



## Patient Ownership

Patients own and control their medical data.



## Enhanced Security

Decentralization improves data security.



## Transparency

Interactions are transparent and auditable.



## Improved Access

Better healthcare accessibility for all.

# Blockchain-Based Healthcare Records Management

A decentralized medical records system where patients control their data.



## Patient Registration

Self-sovereign identity.



## Provider Registry

Authorized healthcare providers.



## Access Control

Granular permission management.



## Record Management

Secure, immutable medical records.



## Audit Trail

Complete transparency and compliance.

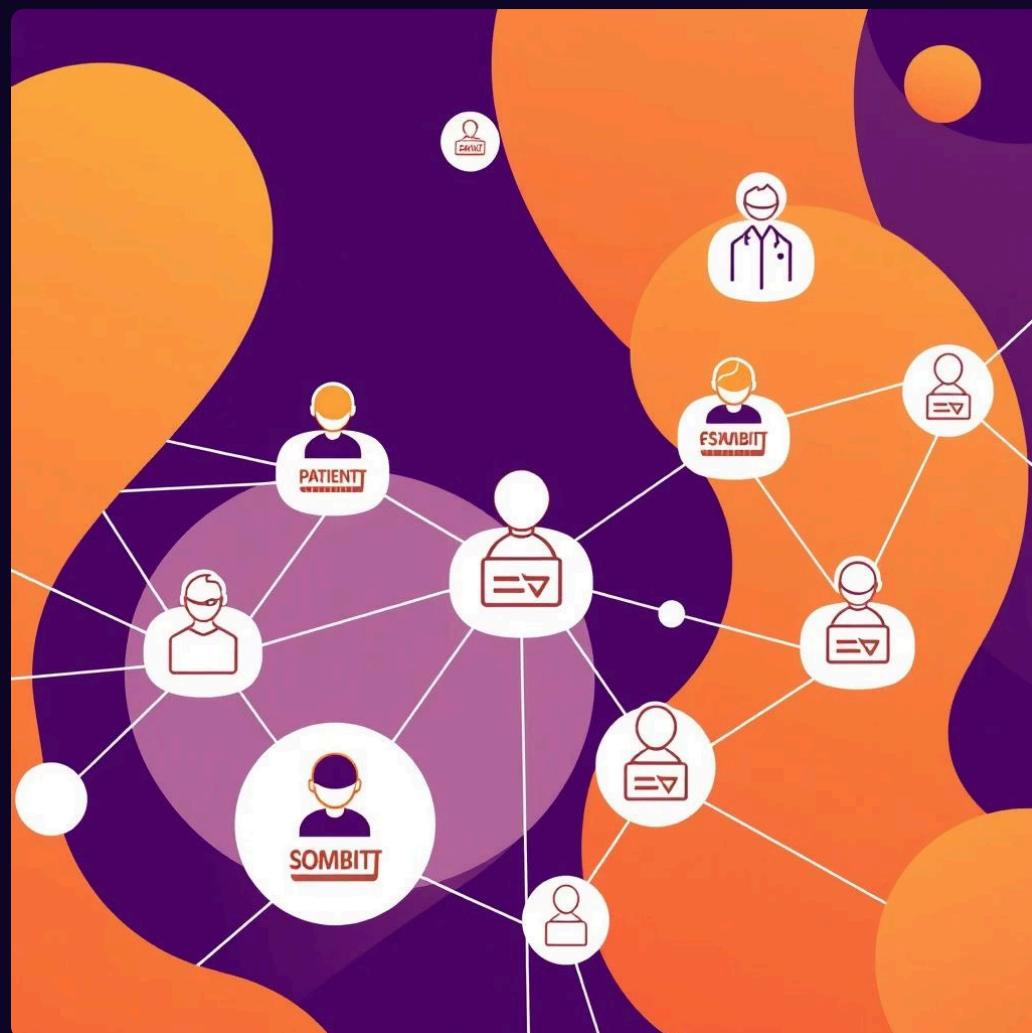
# System Architecture & Technology Stack

## Technical Design

Patients ↔ Healthcare Providers ↔ System Admin

↓ HealthcareRecords.sol (Smart Contract)

↓ Ethereum Blockchain



## Technology Stack

- **Blockchain:** Ethereum (Sepolia Testnet)
- **Smart Contract:** Solidity ^0.8.19
- **Development:** Hardhat Framework
- **Storage:** IPFS for large files
- **Testing:** Comprehensive test suite

# Smart Contract Core Functionality

## Patient Functions

- Register with encrypted info
- Grant/revoke provider access
- View own medical records

## Provider Functions

- Add records for authorized patients
- Access patient records with permission
- Maintain professional accountability

## Admin Functions

- Register legitimate providers
- Ensure system integrity

# Key Innovations



## Patient-Centric Design

Patients control their data with self-sovereign identity.



## Advanced Security

Blockchain immutability, multi-layer access, encrypted data.



## Complete Transparency

All actions logged on blockchain for immutable audit trail.



## Efficient Operations

Instant permission updates, global accessibility, reduced overhead.

# Implementation Highlights

## Smart Contract Development

- 200+ lines of Solidity code
- Comprehensive input validation
- Gas-optimized operations

## Testing Coverage

- 25 test cases with 100% pass rate
- Security scenarios validated
- Edge cases handled

## Deployment Success

- Compiled without errors
- Deployed to Sepolia testnet
- All functions operational

# Live Smart Contract Interaction

## Demo Scenario

1. **Register Patient:** John Doe signs up
2. **Register Provider:** Dr. Smith gets authorized
3. **Grant Access:** John gives Dr. Smith permission
4. **Add Record:** Dr. Smith adds blood test results
5. **View Records:** John accesses his medical history
6. **Audit Trail:** Review all access logs

## Key Metrics

- **Gas cost:** ~50,000-100,000 gas
- **Transaction time:** 12-15 seconds on testnet
- **Storage efficiency:** Minimal on-chain footprint



# Benefits and Impact

## For Patients

- Complete data control
- Enhanced privacy & security
- Portable records

## For Healthcare Providers

- Efficient data access
- Reduced liability
- Improved patient care

## For Healthcare System

- Reduced data breach risks
- Lower admin costs
- Enhanced interoperability