national health authority
Ministry of Health and Family Welfare
Government of India
सत्यमेव जयते

Consultation Paper

on

Unified Health Interface

National Health Authority
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https://www.nha.gov.in/

Written Comments on the Consultation Paper are invited from stakeholders by 23 August 2021. Comments are to be preferably provided electronically on the NDHM website via form available at https://ndhm.gov.in/publication/consultationpapers. The comments may also be sent to Vikram Pagaria, Joint Director (Coordination), National Health Authority, on the email ID ndhm@nha.gov.in. For any clarification/ information, he may be contacted at Telephone No. 011-23468786.

Acronyms and Abbreviations

API	Application Programming Interface
AYUSH	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy
EUA	End User Application
EHR	Electronic Health Record
EMR	Electronic Medical Record
HFR	Health Facility Registry
HID	Health ID
HIE	Health Information Exchange
HIP	Health Information Provider
HIU	Health Information User
HPR	Healthcare Professionals Registry
HSP	Health Service Provider
HSPA	Health Service Provider Application
MeitY	Ministry of Electronics and Information Technology
MoHFW	Ministry of Health and Family Welfare
MCI	Medical Council of India
NDHB	National Digital Health Blueprint
NDHE	National Digital Health Ecosystem
NDHM	National Digital Health Mission
NHA	National Health Authority
NHP	National Health Policy
NPCI	National Payments Corporation of India
PHR	Personal Health Records
TSP	Technology Service Provider
UHI	Unified Health Interface

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Chapter 1

Introduction and Background

1.1 Objectives

1.1.1. This document has been published to invite stakeholder comments and consultation on certain strategic and functional considerations of the Unified Health Interface (UHI).

1.1.2. In this document, an attempt has been made to frame and contextualize the issues for consultation and provide adequate context for the citizens and concerned stakeholders to weigh in with their comments. A wide range of policy, strategic and technical matters are covered, some of which may depend upon the interpretation of the law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The approaches discussed henceforth are ideas and not decisions. Final decision shall be taken after considering suggestions and feedback received to this paper.

1.1.3. Multiple sources and research studies have been consulted to draft this consultation paper and information presented herein. However, the National Health Authority (NHA) understands that there might still be gaps with respect to practical implementation. Hence, the desired outcome from this process of consultation is clear feedback and answers to the questions posed at the end of each chapter. Additionally, stakeholders are welcome to raise any other issues they deem critical for the development of such a platform.

1.2 Scope of Consultation Paper

1.2.1 This paper only focuses on the Unified Health Interface (UHI) building block within the National Digital Health Ecosystem (NDHE). It describes NHA's current thinking related to the architecture and role UHI would play in the healthcare ecosystem. Further, the functionalities of the proposed UHI building block, potential benefits to various ecosystem stakeholders, the approach to designing the system and the governance for managing the system are covered. Each section has specific open questions where feedback from stakeholders is sought.

1.2.2 The National Digital Health Mission (NDHM) plans to develop the UHI building block as a public good that will enable digital health services in the ecosystem. Inputs from all are sought through this consultation paper to ensure UHI is beneficial to all parties and will help accelerate the adoption of digital health services in India.

1.2.3 Information on other building blocks (Healthcare Professionals Registry, Health Facility Registry, Data Retention, etc) and issues within them have been discussed in the other consultation papers published by NHA.

1.3 Evolution of NDHM

1.3.1 The National Health Policy (NHP), published in 2017, highlights key principles of citizen-centricity, quality of care, better access, universal health coverage and inclusiveness which can be realized principally by leveraging the power of digital technologies. The policy recognizes the importance of digital technologies in the delivery of healthcare and has proposed "Delivery of better health outcomes in terms of access, quality, affordability, lowering of disease burden and efficient monitoring of health entitlements to citizens". The policy suggests establishment of common federated architecture, use of Aadhaar for identification, creation of registries, use of smartphones/tablets for capturing real-time data, scaling teleconsultation services, leveraging digital health solutions for AYUSH, etc.

1.3.2 Subsequently, a document named 'National Health Stack – Strategy and Approach' was released by NITI Aayog in 2018. It describes a set of building blocks as 'common public goods' which are essential for an implementation of digital health initiatives as 'common public goods'. The key components described in the National Health Stack were national health electronic registries, claims platform, federated personal health records framework, national health analytics platform, and other horizontal components.

1.3.3 In 2019, the Ministry of Health and Family Welfare (MoHFW) released the National Digital Health Blueprint (NDHB). The need for creating a framework for the evolution of a 'National Digital Health Ecosystem' (NDHE) – an ecosystem and not a system, was recognized in the NDHB. The NDHB lists out principles, building blocks, applications and digital services, standards, institutional frameworks etc, to create such an ecosystem.

1.3.4 The NDHM will be guided by these documents, developments in the area of digital health and digital technology, and learnings during the implementation. Necessary changes based on learnings and needs shall be made during the implementation.

For more information on the framework and evolution of NDHM, you can refer to the website at https://ndhm.gov.in/.

1.4 Pilot of NDHM Building Blocks

1.4.1 NDHM has been conceptualized as a set of 'digital building blocks'. Each building block is seen as a 'digital public good' that can be used by any entity in the digital health ecosystem and provides key capabilities that enable the NDHM vision.

1.4.2 Some of these building blocks are registries. Registries are secure repositories of data of various types (on health facilities, healthcare professionals etc.) that users (individuals or organizations) may voluntarily enroll in. These registries shall be designed with strong data governance mechanisms, adhering to the principles of verifiability, accessibility, and identity management. In their respective domains, these registries are designed to emerge as nationally recognized and accepted databases. They will be considered successful if they are adopted by ecosystem stakeholders across the private and public sector as sources of truth. Further, in order to drive adoption, these registries must be interoperable with other NDHM building blocks.

1.4.3 Some of the registries in NDHM constitute 'core registries'. These core registries will be developed, owned and managed by the Government of India. Currently, these core registries include:

Health ID: To standardize the process of identification of an individual across healthcare providers, every patient who wishes to have their health records available digitally may avail the facility to create a Health ID. Each Health ID will be linked to a personal health record address (PHR) and health data consent manager. The Health IDs can be presented in e-card format(s) and issued to patients who need them. The Health ID card will also include a QR code that can be scanned to enable seamless patient registration at health facilities.

NHA will publish another consultation paper on the Health ID, personal health records address and health data consent manager for stakeholders to share their comments and suggestions on.

Healthcare Professionals Registry: Healthcare Professionals Registry, referred to as Health Workforce Registry in the NDHB, is the master data of information on doctors, nurses, paramedical staff, ASHAs and other healthcare professionals cadres. NDHM is developing these registries in a phased manner starting with the DigiDoctor platform for doctors, launched as a part of the NDHM pilot in August 2020.

Health Facility Registry: The Health Facility Registry will consist of one record and a unique identifier for each healthcare facility in the country – hospitals, clinics, diagnostic centres, pharmacies etc, across all systems of medicine and covering both public and private health facilities.

1.4.4 Since the announcement of NDHM, the National Health Authority (NHA) has been piloting the following 4 key building blocks of NDHM - Health ID, Healthcare Professionals Registry (HPR) starting with doctors, Health Facility Registry (HFR) and Health Information Exchange & Consent Manager.

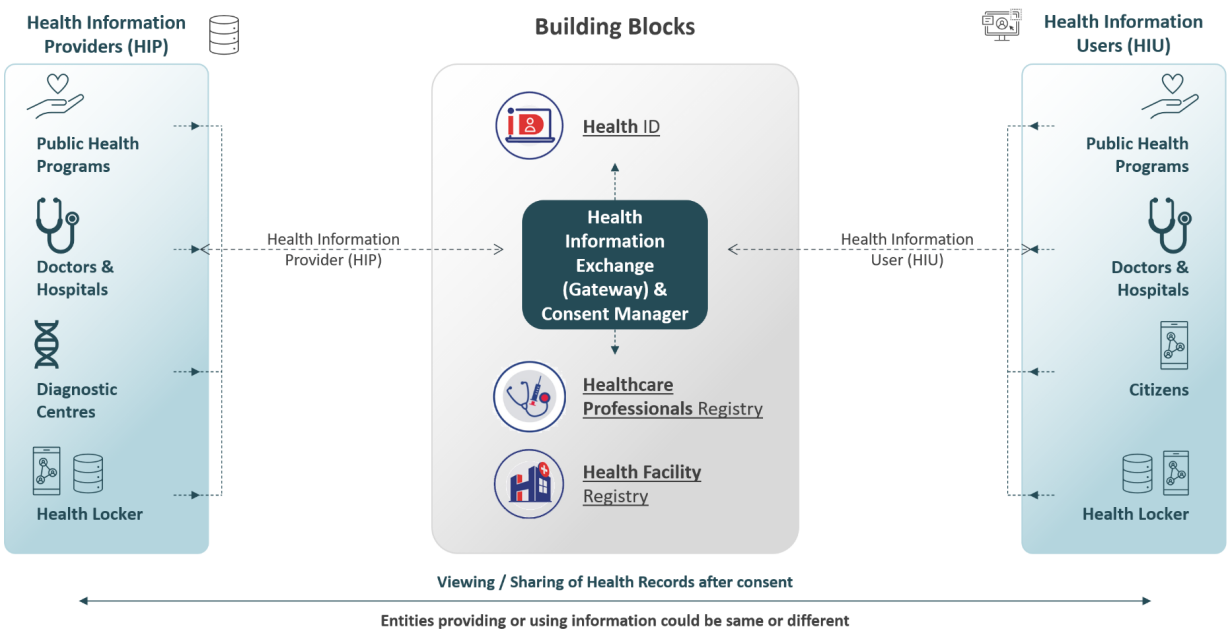


Fig. 1. NDHM Building Blocks

These building blocks are designed to enable identification of participating entities (health care providers, patients and health professionals) and enable exchange of interoperable health data with patient consent. Any entity that wishes to share health information with a patient digitally using the NDHM standards is called a *Health Information Provider (HIP)*. For example, a hospital creating and sharing a health record via the specified standards is an HIP. Similarly, any entity that seeks to access health data with consent is called a *Health Information User (HIU)*. For example, HIUs can be another hospital/ clinic, a mobile application, an insurer, etc. They can get access to the health records of a patient with their consent.

1.4.5 These NDHM building blocks have enabled new foundational capabilities including:

1. A Health ID for every resident who wishes to obtain their health records digitally.
2. Registered Health facilities can link health records with Health IDs. This helps create a *longitudinal Personal Health Record (PHR)* for the individual, i.e., a medical record across multiple patient encounters in different health facilities.
3. A consent mechanism to empower patients to access and share their PHR data. This mechanism is fully aligned with the Draft Personal Data Protection Bill of India.
4. Standardization of the formatting of health records like diagnostic reports, discharge summaries, prescriptions, consultation notes and immunization records to make them interoperable.
5. Digital identity for every verified health professional and health facility who participates in NDHM.

Additional information on these building blocks and the pilot is available at https://ndhm.gov.in/. Names and classification of building blocks, and architecture, may be changed as per the evolving needs of NDHM.

1.4.6 The current NDHM building blocks have been built with the primary goal of ensuring the seamless interoperability of health-related data. Stakeholders in the ecosystem may use the NDHM APIs to access, share and verify health records, healthcare professionals and healthcare facilities.

1.5 Envisioned NDHM Architecture

1.5.1 Going forward, NDHM aims to transform the way digital health services are rendered in India. In order to achieve both goals a revised representation of the NDHM architecture is represented below. The aim of this architecture is to allow for interoperability of both health data and health services.

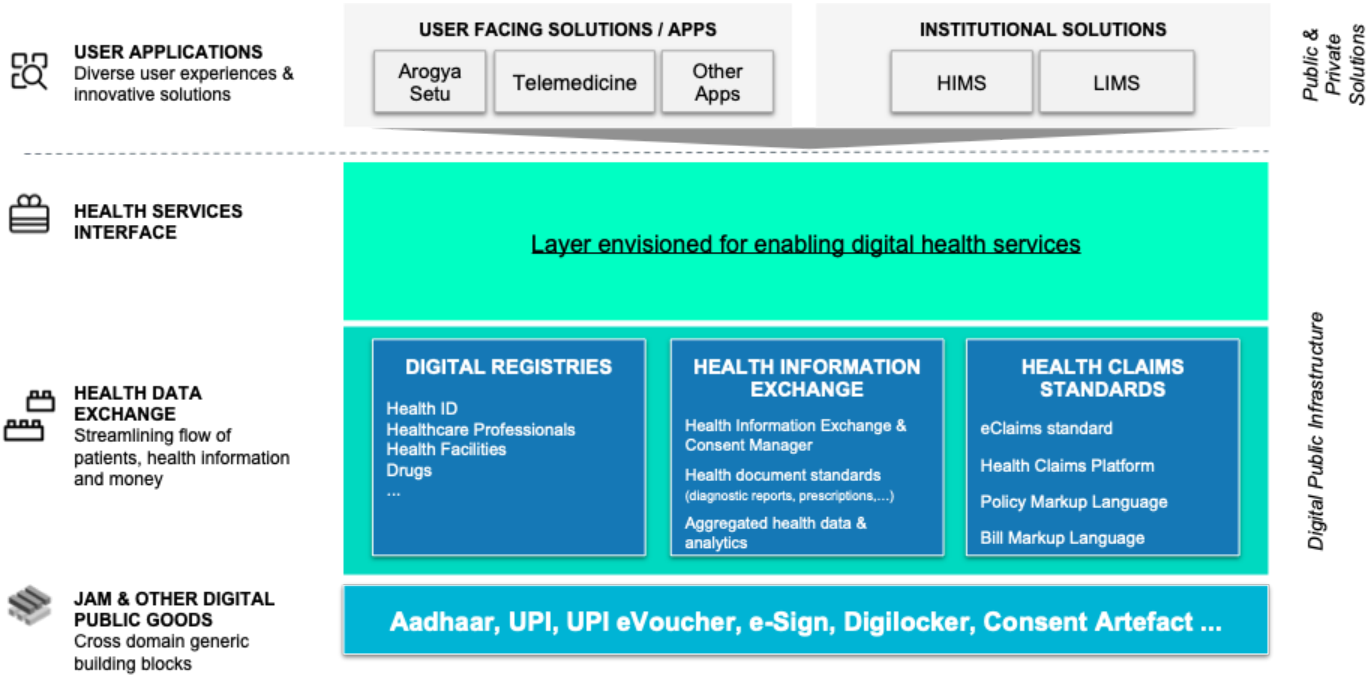


Fig. 2. NDHM Architecture

1.5.2 The definitions and the envisioned functions of each of the layers is as mentioned below (the layers are described bottom-up).

1. **JAM and Existing Digital Public Goods:** NDHM has been designed to operate effectively with and leverage India's extant digital public goods, such as Aadhaar, Jan Dhan Bank Accounts, and Mobile (JAM), UPI, eSign, Digilocker, etc. These are horizontal usage goods

that form the foundational layer in digital health services and enable functionalities on almost any digital platform.

These cross-domain capabilities are specifically leveraged in NDHM to enable key functionalities. For example, the creation of a Health ID for patients avails of the Aadhaar authentication service to verify identity, and doctors can pull in their digitally issued certificates through DigiLocker when enrolling in the Healthcare Professionals Registry. Similarly, Jan Dhan accounts ensure that the transfer of subsidies under different programmes is enabled. NDHM is built with other such integrations in mind in a modular, scalable manner.

2. **Health Data Exchange Layer:** This layer encompasses the core digital infrastructure modules needed to ensure the interoperability of various kinds of health data. These building blocks include core registries - the Health ID, the Healthcare Professionals Registry and the Health Facility Registry, Health Information Exchange and Consent Manager, Health Data Standards (based on FHIR), coding terminology and data aggregation specifications that drive trust and shareability of health data between patients and healthcare providers. The layer also standardizes health claims to digitize the information flow between providers and payers.

3. **Health Services Interface:** Building blocks in this layer are envisioned to enable interoperable and seamless interactions between the patients and providers of digital health services. The design of this layer is the main subject of this paper and is discussed in detail in the upcoming sections.

4. **User Applications:** This is the end-user layer of the NDHM ecosystem. It comprises the applications and platforms developed by the government or private sector through which patients, healthcare providers, insurers, researchers, policy makers, etc., access trusted health and health services The application layer will interact with the health services layer and the health data layer to enable a wide range of digital health services and health data interchange. It is crucial to note that this layer is envisioned as the hotbed for market innovation. While NDHM may create certain reference applications to demonstrate the capabilities of these layers, it is expected that ecosystem participants from the private and public sector will take a lead in providing diverse user experiences and developing innovative solutions.

1.6 Need for Standards in Digital Health Interactions

1.6.1 Healthcare providers across India are rapidly digitizing their services to offer better patient experiences. It is now possible, for example, to go to a hospital / clinic's website, book an appointment and consult with a doctor digitally.

1.6.2 As per the 75th Round NSS survey[1] conducted in June 2017 across all districts of India on a representative sample of population, Indian patients engaged in ~6 million per day of out-patient (OP) consultations and nearly all of these were physical consultations. It is estimated that only 100,000 to 200,000 consultations per day have happened digitally in 2020 despite the increased adoption due to COVID-19.

1.6.3 The Telemedicine Guidelines issued by The Board of Governors of the Medical Council of India (MCI) in March 2020 enable any Registered Medical Practitioner (RMP) to provide telemedicine consultation to patients from any part of India[2]. Easier access to teleconsultations will significantly improve access to health as most of India's health service providers are significantly concentrated in urban areas.

1.6.4 Digital services, like telemedicine, have lower adoption in India than is otherwise expected. Discussions with doctors show that they are consulting with their existing patients using simple chat/ video call platforms. The experience leaves a lot of room for improvement. In physical consultations tasks like booking an appointment, making payments, accessing medical records etc. have been streamlined. Doctors can avail these features digitally by adopting one of several platform solutions available in the market, but hesitate to do so as they usually do not want to promote any one platform to all their patients. Using simple chat / video platforms for digital consultations means spending significant amounts of time and energy in resolving administrative tasks like bookings, payments, confirmations, reconciliations etc.

Similar challenges across the consultation lifecycle exist even on the patient side. There are no standard ways for patients to reach out to their existing doctors, seek online appointments or share their medical reports / history. In addition, patients also worry about the authenticity and credentials of the doctor. As a result, several platform operators have put in place their own doctor credential verification systems to reassure patients but the standards used by these operators are not scrutinized by any regulatory body.

1.6.5 Beyond workflows, technical challenges hinder the quality of care given. Most patients have their reports in *fragmented paper documents* which are not easy to share digitally – except perhaps as photos. Lack of standardized sharing methodologies may not render a clear picture for a doctor being consulted through digital means which may affect the quality of care given to the patient. In addition, doctors have resorted to the practice of writing prescriptions on a paper pad and taking pictures to share with patients as e-prescriptions. These pictures are frequently lost, making the desired attempts towards the *continuity of care* very challenging for both doctors and patients.

[1] NSS 75th Round: http://mospi.nic.in/sites/default/files/publication_reports/KI_Health_75th_Final.pdf
[2] https://www.mohfw.gov.in/pdf/Telemedicine.pdf

1.6.6 The COVID pandemic has brought to light the importance of digital health services like *booking appointments* at hospitals for a vaccination or regular treatment, finding the *availability of a critical care bed*, booking of *home sample collection for lab tests*, *ordering medicines*, etc. The proposed *Health Services Layer* along with other NDHM building blocks is envisioned to solve challenges in delivering healthcare services digitally by creating an ecosystem that benefits both the patients and the Health Service Providers.

1.7 Questions for Consultation

1.7.1 Please refer to section 1.6.3. The Telemedicine Guidelines were issued by The Board of Governors of the Medical Council of India (MCI) in March 2020. Stakeholders are requested to go through them and suggest changes to the policy, if any, to ensure adoption of telemedicine and e-pharmacy.

Chapter 2

Creating an Open Network for Digital Health Services

2.1 Introduction to Open Networks

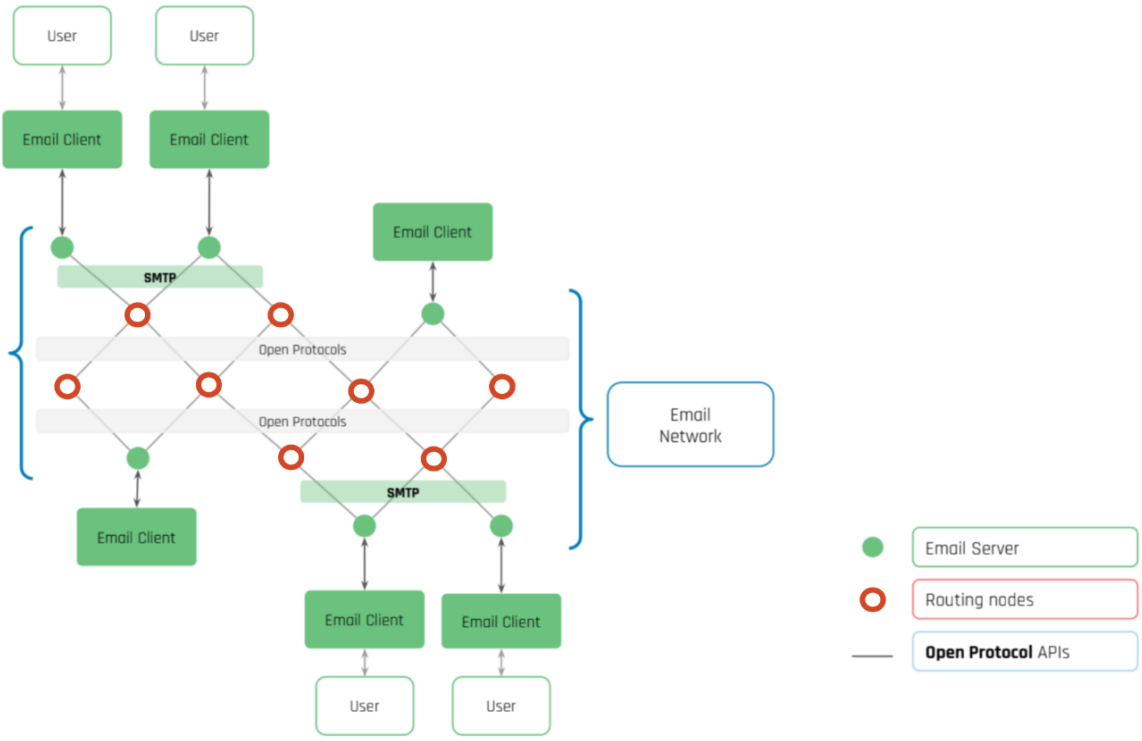
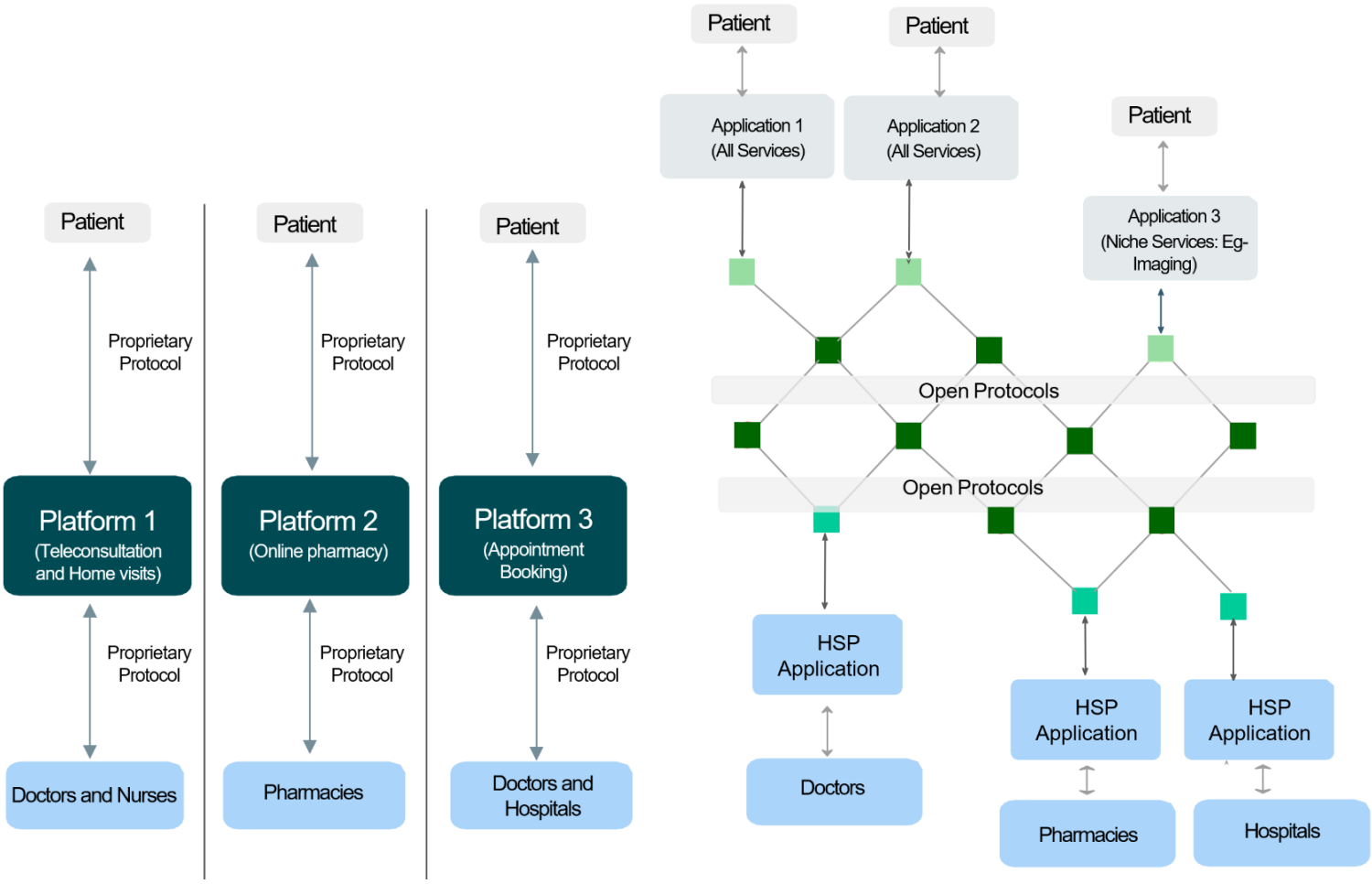


Fig. 3. Email as an example of an Open Network

2.1.1 Open protocols are a set of shared technical standards accessible to everyone. An open (nonproprietary) protocol is one that is not owned by any particular entity and not limited to a particular entity's products. Email is an example of an Open Network that is built on an Open Protocol called Simple Mail Transfer Protocol (SMTP). SMTP allows someone using an email client (for e.g. Gmail) to send an email to any other email id even if the email client is not the same as the sender's. Open Networks allow all email addresses globally to be reachable and Open Protocols ensure the email will be delivered and rendered in a readable format by any email client.

2.1.2 There are efforts to create Open Protocols in several segments across the world. For example, Beckn[3], a non-profit organisation that builds interoperable open protocol specifications as a public good, provides an open protocol for distributed commerce. Currently, there are no Open Protocols defined for delivery of digital health services. This results in the several fragmented, non-interoperable platforms providing health services in the market. In order to obtain a digital health service (say tele-consultation or booking an appointment) the platform approach requires both patients and health service providers to use the same platform.

2.2 An Open Network for Digital Health Services



Platform-Centric Model ***Open Network-Centric Model***

Fig. 4. Platform-Centric Model vs Open Network-Centric Model

3 https://beckn.org/

Open networks and Open Protocols for digital health services would enable interoperable connections *over a nationwide, decentralized, open, secure and inclusive network.* Enabling Open access across diverse health service providers and patients can drastically expand demand-supply ecosystems.

2.2.1 Open Networks may also allow greater control for each participant in the network. Health service providers can decide on the price for their health services, be discoverable by any patient in the Open network and deliver the health service using any Health Service Provider software application of their choice.

2.2.2 The open network has the potential to increase the number of providers a patient can choose from. The open network can be designed such that the patients can choose any application of their choice, discover, and obtain services from any doctor or health provider of their choice in such an ecosystem, regardless of the application being used by the health provider.

2.2.3 Adopting an open network approach may also benefit existing platform providers. It may lower their costs of onboarding verified health service providers and increase the market size as open protocols may lead to larger demand from both patients / health service providers.

2.2.4 Open Networks require establishment of Registries that keep a list of the entities participating in the network and Gateways that enable entities to communicate using the standard protocols. The standardization of protocols would allow for the network to support a wide range of digital health services. Figure 5 provides examples of digital health services that could benefit from the development of open protocols.

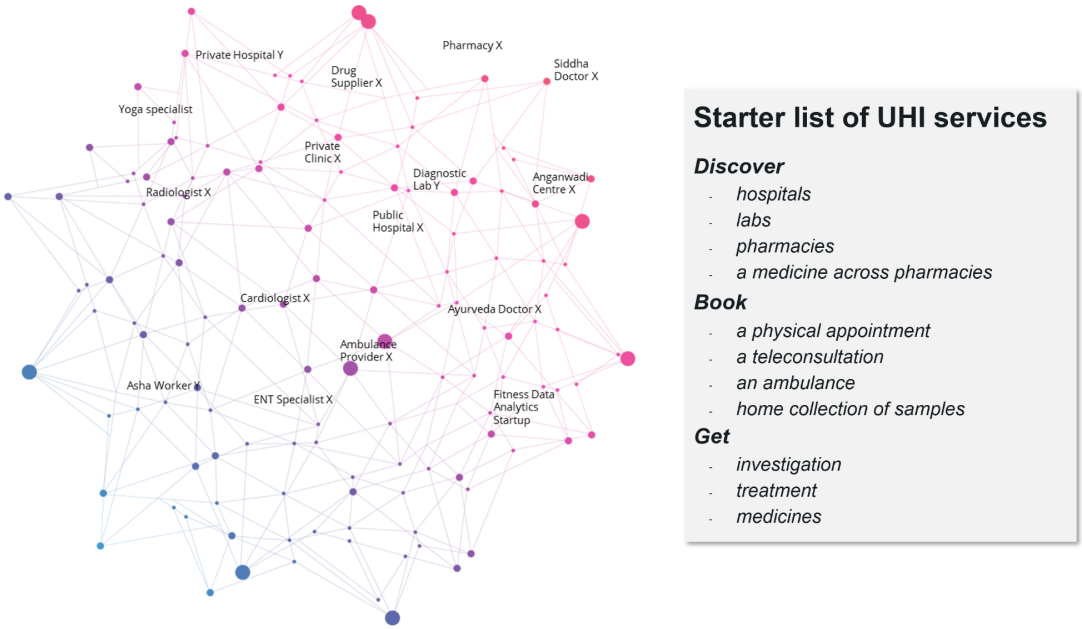


Fig. 5. Potential Digital Health Services on an Open Network

2.2.5 For the patient, the open network should enable easy discoverability, booking, fulfillment and payment of digital health services from across the open network. In an open network, the patient's set of options for Health Service Providers (HSPs) is no longer restricted by their choice of software platform or geography. This is similar to how users can use any mobile app in the UPI ecosystem to make payments to any other party.

2.2.6 By enabling such journeys, an open network for digital health services, in conjunction with the other NDHM building blocks, democratizes access to digital health services. It can lay the foundation of a more open, efficient marketplace, where demand and supply for these services can be matched seamlessly with minimal information asymmetry.

2.3 Community and Governance for Open Networks

Apart from open protocols, open networks require a clear model for engagement with the community (of stakeholders) and Governance of the ecosystem to be successful.

2.3.1 The concept of open networks is well aligned with the strategy paper on National Open Digital Ecosystems (NODE) by MeitY that defines open digital networks as "open and secure delivery platforms anchored by transparent governance mechanisms, which enable a community of partners to unlock innovative solutions, to transform societal outcomes". The paper identifies three important pillars of open digital networks - digital platforms, community, and governance.

2.3.1.1 **Digital Platforms**, which is the first layer, comprises technology infrastructure (gateways, registries, etc.), that is open, modular, and extensible to enable interoperability, on which end-user solutions can be co-created.

2.3.1.2 **Community**, which is the second layer, comprises stakeholders who create digital platforms on top (for example, businesses, start-ups, developers, government etc.), end-users who access services and enable feedback loops (for example, individuals, public or private sector entities), and facilitators who play important roles like financing, research, providing on-ground user feedback, and holding the government accountable (for example, Civil Society Organizations [CSOs], think tanks, foundations, etc.). These actors transact and collaborate via the platform to create shared value, drive greater adoption, and ensure accountability.

2.3.1.3 A robust **Governance** pillar is the third layer, which comprises the laws and rules that govern the ecosystem. It should address stakeholder roles, accountabilities, and liabilities, and mitigate any risks related to privacy, security, and exclusion. The Governance framework makes the open nature of such networks stronger so that it upholds the objective it was set up for.

2.4 Questions for Consultation

2.4.1 As a stakeholder in the health ecosystem, what benefits and risks do you see if an open network approach to digital health services is implemented? Please respond with details.

Chapter 3

Creating an Open Network for Services in NDHM

3.1 Unified Health Interface (UHI) as a part of NDHM Architecture

3.1.1 The NDHM pilot phase focused on enabling the interoperability of health data and the setting up of core registries of professionals and facilities. The building blocks built and launched till date are part of the **Health Data Exchange layer**. NDHM aims to develop several additional building blocks in this layer that further improve data interoperability related to drugs, health claims, aggregated / anonymized health data, etc.

3.1.2 The National Digital Health Mission now proposes to expand interoperability to **health services** by the creation of **Unified Health Interface (UHI)** as another foundational layer. UHI will be an open protocol for digital health services.

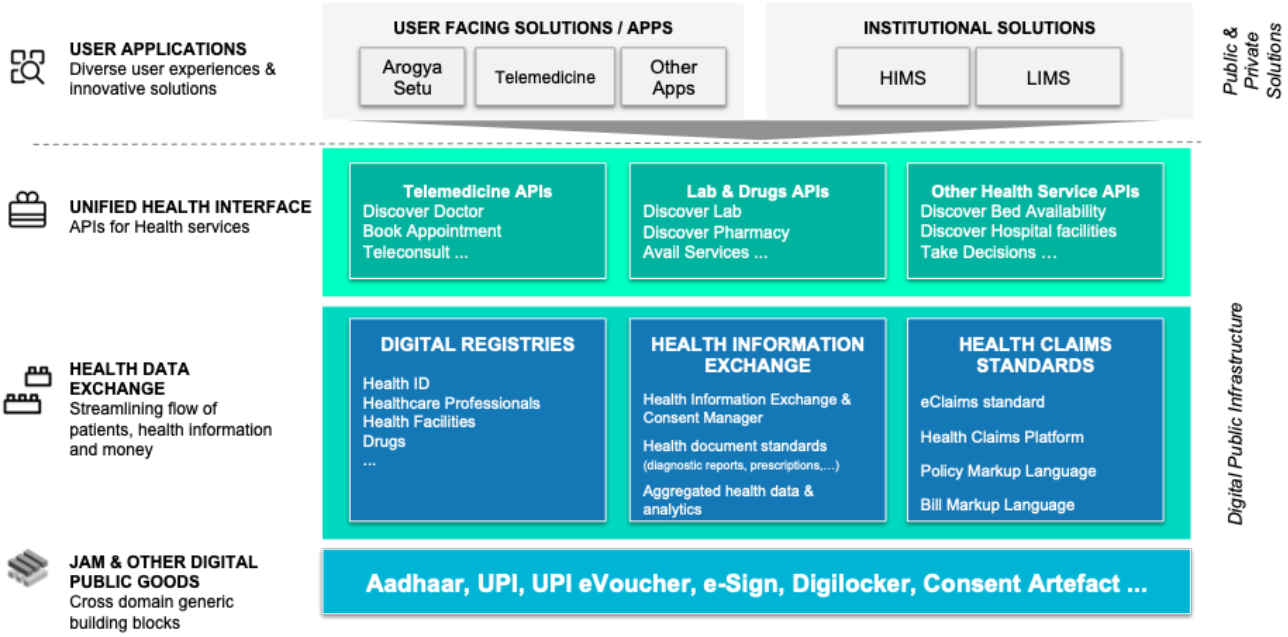


Fig. 6. UHI Layer in the NDHM Architecture

3.1.3 Open networks consist of one or more gateways that implement the open protocols. These gateways are used by various participants in the open network to deliver services. NDHM will implement and operate the **UHI Gateway** that will be part of this network. UHI enabled health services will leverage the health data layer as many digital health services also require the exchange of health data as part of the interaction. **Registries** already established for the health data layer will also support the services layer to help identify entities that participate in the ecosystem.

3.2 Introduction to UHI and UHI Network

3.2.1 UHI is envisioned as an open protocol for various digital health services. UHI Network will be an open network of *End User Applications (EUAs)* and *participating Health Service Provider (HSP) applications. UHI* will enable a wide variety of digital health services between *patients* and *health service providers (HSPs)* including, but not limited to:

- Booking OPD appointments at hospitals / clinics
- Booking Tele-Consultation
- Discovering availability of critical care beds
- Discovery of lab and diagnostic services
- Booking of home visits for lab sample collections
- Booking an ambulance
- Discovery of nearby pharmacies

3.2.2 End user application (EUA) is any application chosen by the service consumer (frequently referred to as user) to access Health services. EUAs can be of diverse forms like mobile apps, interactive voice response systems (IVRS), virtual assistants in English and local languages, etc.

3.2.3 Health service providers may be individual doctors, hospitals, labs, pharmacies, companies that aggregate health services, etc. They provide digital health services using Health Service Provider Applications (HSPA) that support UHI.

3.2.4 UHI ensures that a digital health service can be delivered between any EUA with any HSP in this ecosystem. The best example of a similar inter-operable model is from the financial services domain - the Unified Payment Interface (UPI). Today, users can choose any end user application (eg: BHIM app, PayTM, PhonePe, etc) to make seamless payments from their bank account or wallet to any other bank account.

3.3 Stakeholders in UHI Network

3.3.1 End-Users/ Patients

UHI will enable end users / patients to access multiple digital health services from any platform of their choice, improving accessibility, quality and efficiency. Patients shall also be able to access their medical and health records such as medical reports, lab results, clinical records, etc, electronically, and share them with chosen healthcare providers.

3.3.2 Health Service Providers (HSPs)

Health service providers are expected to adopt UHI. HSPs include, but are not limited to:

- Doctors of any system of medicine
- Hospitals
- Labs
- Pharmacies
- health service aggregators (platform players that partner with various health organisations to offer services to end users)
- Home care providers (including home nursing care, teleconsultations, and labs offering home sample collection services)

UHI protocols will allow these HSPs to offer their services digitally. Their services will be discoverable across the UHI Network. They can control the price, service availability and service delivery using any UHI compatible HSP application of their choice.

3.3.3 Technology Service Providers (TSPs):

The third primary stakeholder in the UHI ecosystem, technology service providers are organisations that provide software interfaces that are compatible with UHI to health service providers and patients. These applications implement the UHI protocols to enable delivery of a digital health service. TSPs need to satisfy all protocols, certifications or policies as defined for UHI. Only certified applications can be registered and access services on the UHI network.

3.4 Objectives of UHI and UHI Network

- **Fair discoverability**: Ensure **every HSP** who wishes to provide a digital health service has an opportunity to participate and have their services be discovered in an unbiased manner
- **Verification of entities:** Ensure only **genuine** doctors and healthcare providers are able to participate in the UHI Network. This is important to build and retain trust of health service users
- **Interoperability of services:** Patients and Doctors will be able to use software of their choice to seek or provide care. Interoperability should be available for **health services, health service providers,** and associated **health data**
- **Service fulfilment:** All parties in a transaction must have access to the current status of a service that was committed by a HSP to a EUA. This should include relevant details of the transaction and ability to track status updates till the service is fulfilled
- **Financial settlements:** UHI will offer flexibility of payments for HSPs and EAUs on methods of payments, on when and how the payments are collected and settled across parties in a secure and transparent manner

- **Post fulfilment:** The open protocols must cover post service fulfilment requirements like collecting feedback on the service rendered and enable any grievance to be addressed
- **Open protocols:** UHI will ensure adoption of open interoperable specification that allows an open API ecosystem where any player can participate. This will enable them to create innovative new solutions for patients or health service providers
- **Technology Agnostic**: The application developers can choose any technology for the development of EUA and HSP applications that can become part of the UHI Network. Applications can be mobile apps, web applications, IVRS, voice interfaces, wearables or any other format or technology desired by the developer

3.5 Trust and Privacy in UHI and UHI Network

Enabling digital health transactions across entities in a decentralized network requires building trust across the ecosystem. UHI Network will try to enable this using

- A well-defined UHI Policy that all network participants abide by
- Verification of all entities as a prerequisite for participation
- A rating / reputation system for entities and services
- Support grievance redressal mechanisms

As services go digital, it is important that all entities in the UHI network feel secure that information about their services, patients and others are private and in their control.

UHI is proposed to be guided on the principles laid out in the National Digital Health Blueprint (NDHB) and will adhere to all applicable clauses laid out in the Health Data Management Policy published by NDHM. UHI Protocols will be designed to be privacy preserving and ensure both personal data and business data will not be available to any entity without the explicit consent of the party. It would not have access to any data on which HSPs / which patients participated in such tele-consultations and ensure privacy is preserved for both Health service providers and patients at all times.

Additionally, as has also been laid out in the National Digital Health Blueprint, aggregated and anonymised data may be made available to the policy makers and programme managers to ensure more informed decision making by the Government.

3.6 Role of NDHM in Building UHI and UHI Network

NDHM will play the role of orchestrator to build UHI and the UHI network by collaborating with all willing participants. NDHM will govern the process of defining UHI protocols and manage the UHI gateway (see section 5.1.1) and will work with the ecosystem to develop UHI open protocol specifications. The development, governance and management of UHI is explored further in section 6.

3.7 Re-Thinking Digital Health Services with UHI

UHI has the potential to help India leapfrog in how health services are delivered. A few possibilities are listed below:

Current Scenario	*In the Future (with UHI)*
Doctors and patients need to use the same application for a good digital experience Doctors do not have an easy way to let patients know how to reach them digitally Discovery of a specific Health Provider is difficult as transactions & data get fragmented across apps	Patients will be able to use any app of their choice to find a doctor, book an appointment, make payments, receive prescriptions and store their data digitally. Doctors will be able to use any app of their choice to manage their availability for online consultations, set their price, see their patients records (after consent) and give e-prescriptions. Doctors can be discovered by patients easily across any apps on the UHI Network. Doctors will be able to share a universally recognized ID, their Health professional ID, with their patients.
Patients with serious illnesses who seek a second opinion take CDs of their MRI / CT / X-Ray scans and organize their own medical records. They then have to either visit another physician physically for a second opinion or upload records on websites	Patients can obtain a Health ID (or PHR Address) and share the HID with health care providers. The Healthcare Provides can share images of the patient's MRI / CT / X-Ray scans digitally available through their PHR address. The patient can save the records into their Health Lockers. The patients can share these medical records with any doctor easily by providing consent to the doctors to view the records. Doctors will be able to view the health records of the patient across all hospitals/ doctors (longitudinal health records). Doctors can get access to full resolution MRI / CT / X-Ray scans to provide a detailed second opinion for any patient from anywhere in the country.
Ambulance services are fragmented across the country with no standard to call for an an Ambulance quickly when required or to reach independent ambulance service providers	Ambulance operators can list their service via Health Facility Registry and be discoverable on UHI. When a patient requests an ambulance they will be able to find the closest one that can respond the quickest.

Patients with multiple disorders (e.g. Diabetes, heart disease and knee replacement) need consultations with multiple doctors- integrating all medical advice & records is difficult and may be error prone.	“Group Consult” will emerge as a common feature in UHI, where doctors can come together in challenging cases and discuss the best treatment option for a patient.
Chronic patients who require regular care, reminders and review of their medical condition spend an outsized amount of time attending to their chronic condition.	Patients can sign up with Health Bots that will look at their medical history, send reminders, provide advice based on their trends and support doctors in managing chronic care.
Patients may not be able to find a drug prescribed by the Doctor. Patients may have to visit multiple pharmacists or online pharmacies to purchase these drugs.	Patients can check if drugs that they require are available in pharmacies near their location. They can even place the order and have it home delivered if the local pharmacy provides such services.
In order to find the best price for a service like MRI, patients need to call individual labs to identify rates and book appointments	UHI will make prices and the rating for services transparent. Patients can discover the rates for tests like MRI / CT scans from labs near them easily. Further, they can book the appointment online.

3.8 Questions for Consultation

This chapter outlines the NDHM architecture being envisioned to develop UHI, the participating stakeholders in the UHI ecosystem as well as the objectives and goals it aims to fulfill. The following questions and issues are open for comments from concerned stakeholders in this regard.

3.8.1 The primary stakeholders in the UHI ecosystem are mentioned in section 3.3. While the list is more indicative than exhaustive, are there any other primary or secondary stakeholders that should be considered while building the interface? If yes, please outline their role in the UHI ecosystem.

3.8.2 The proposed objectives of UHI and UHI Network have been detailed in sector 3.4. Please share your comments on the comprehensiveness of these objectives, methods to ensure these objectives are adhered to. Please comment if there are other objectives which must be included in section 3.4.

3.8.3 UHI will support a range of digital health services and is expected to evolve with time. How should the digital health services be phased in the upcoming versions of UHI?

Chapter 4

Ecosystem Adoption

An indicative list of stakeholders proposed to be in the UHI ecosystem has been mentioned in section 3.3. In this chapter, we discuss the potential incentives and disincentives for these stakeholders to participate in UHI.

4.1 Potential Incentives for Stakeholders

4.1.1 End-Users/ Patients

Users of digital health services will be significantly benefited from UHI's interoperability. They will be able to contact the doctor of their choice via any application that is UHI compatible. UHI will also enable a large segment of Indian users who do not have physical access to doctors to be able to connect with them digitally - regardless of location. Users will also be able to share their health information with their health service providers and receive prescriptions, lab reports and doctor notes digitally on their devices.

UHI will enable discovery of a wide choice of health services with full transparency on the price for the health service.

4.1.2 Health Service Providers (HSPs)

The definitions of a HSP and who can be one in the UHI ecosystem has been laid out in Clause 3.3.2. Participation in UHI offers ease of doing business to all of these entities, along with some specific advantages as mentioned below.

- **Discoverability** – By participating in UHI, HSPs get immediate access to demand being generated across all EUAs. This means that irrespective of the app / site that a user decides to use, the Health Service provider will be able to list and make their service available to the User.
- **Ability to decide their service price** – UHI allows HSPs to set the price they require for the service and get the full amount with no commissions.
- **Connect with their existing customers digitally –** HSPs like doctors, labs, hospitals can provide their Health professional ID or Health Facility ID that will allow their existing patients to connect with them for services like appointment, teleconsultations etc using any End User Application that customers prefer

The following table briefly summarises the various entities who can be HSPs and what services they could offer to benefit from UHI. This list is not exhaustive.

HSP Entity	Services and Benefits
Doctors	Share their Health Professional ID and allow their patients to use any EUA to connect with them for services. Set the price for services and manage health records and accept financial transactions seamlessly. UHI would enable widespread use of digital technology by doctors for consultations and follow up treatments. This would have a significant positive impact in improving access to care esp for rural populations Digital Group Practices can now emerge to provide multidisciplinary care to patients with complex problems (e.g., Diabetes, Cancer etc.)
Hospitals	Hospitals will be able to promote their digital services including both physical and digital appointments and offer other services. They can create a pool of doctors from their existing team to offer tele-consultations.
Labs	UHI service discovery will allow EUAs to discover service providers closest to the User (e.g., via mapping services). By listing on NDHM, Labs and the services they offer will be discoverable across any EUA. Labs can also offer appointment bookings for services like Home sample collection or Imaging services to a national population pool.
Home care providers	Home care providers will be able to offer discovery and booking for services including nursing care, tele-consultations, home sample collections etc.
Health Service Aggregators	Significant reduction in costs of verification (due to registries) and marketing (as they can tap in demand across EUAs) They offer all features that they currently offer with a common platform approach by operating both an HSP and an EUA with the benefit of interoperability for their transactions

4.1.3 Technology Service Providers (TSPs)

TSPs can leverage UHI's functionalities such as enabling identification and payment transactions without having to build secure networks to ensure high standards of delivery. Further, the existence of common protocols and open APIs allows for easy integration.

Today several Health Service aggregators participate in both sides of the ecosystem. They tie up with doctors, labs, pharmacies, paramedical staff etc and also offer end user applications with excellent user experience. UHI has the potential to drastically reduce cost and expand access. UHI enables their EUA offerings to become broader to include all HSPs in the market. They can continue to offer differentiated services (including pricing) from their own HSP offering across all EUAs.

4.2 Potential Disincentives for Stakeholders

To ensure that the platform is successfully adopted by the ecosystem, it's essential to view the potential disincentives that may result in hesitation on the part of the stakeholders to participate in UHI.

4.2.1 Health Service Providers (HSPs)

A potential disincentive for HSPs may be in the form of conflict of interest between the medical practitioners and the health facilities.

4.2.1.1 As has been iterated in prior sections, UHI allows both medical practitioners and health facilities to participate and offer services as part of the ecosystem. UHI will allow a doctor to be discovered to be part of a Hospital HSP and route requests to that HSP. In such cases the amount for consultations are paid to the Hospital HSP. When hospitals offer services that require these practitioners, they must tie up with them and agree on the financial arrangements for their digital services.

4.2.1.2 Therefore, medical practitioners can participate in UHI both independently and as a part of the staff of one or more health facilities. In the former case, the practitioner can set their own payment charges and the money will be directly transmitted into their individual bank account linked to the interface. However, in the second case where the health facility is participating in UHI, the payment terms will be set by the facility and the money will be transmitted into the facility's bank account. This may be later transferred to the doctor's account as per the contract between the facility and the doctor.

This dual ability for medical practitioners to participate independently and as part of a hospital is part of the existing service delivery today; these administrative and financial relationships will need to be extended to digital services.

4.2.2 Existing Platform Providers

4.2.2.1 Participation in UHI may potentially be seen as a disincentive for existing aggregators in the digital health services market that have existing platform models and ability to exercise control over both the service providers as well the users.

Such aggregators may perceive UHI to be a disruption to their existing business model since UHI aims to be an open, interoperable health services network for patients, doctors and facilities.

4.2.2.2 The open network model provides an potentially unfair market advantage to existing EUAs with a significant captive consumer base. The consultation process is expected to provide inputs for how a more level playing field should be created for UHI.

4.2.2.3 Another disadvantage of open networks is the lack of availability of consumer behavior data with the HSPs. A single platform with both patients and HSPs allows platform players to harness insights from behavior of consumers and HSPs that can be used to optimize / improve the business.

4.3 Questions for Consultation

4.3.1 Have all incentives / disincentives for various stakeholders to participate been covered in chapter 4? If not, please provide the list and mention the role and description of the stakeholder.

4.3.2 For the disincentives mentioned in chapter 4 and the ones provided as an answer to the question above, please provide details on possible mitigating measures that may be taken to minimize the impact of said disincentives.

Chapter 5

Unified Health Interface in Depth

5.1 UHI Architecture

The UHI Network uses several building blocks that are part of NDHM to deliver its objective of an interoperable layer for digital health services.

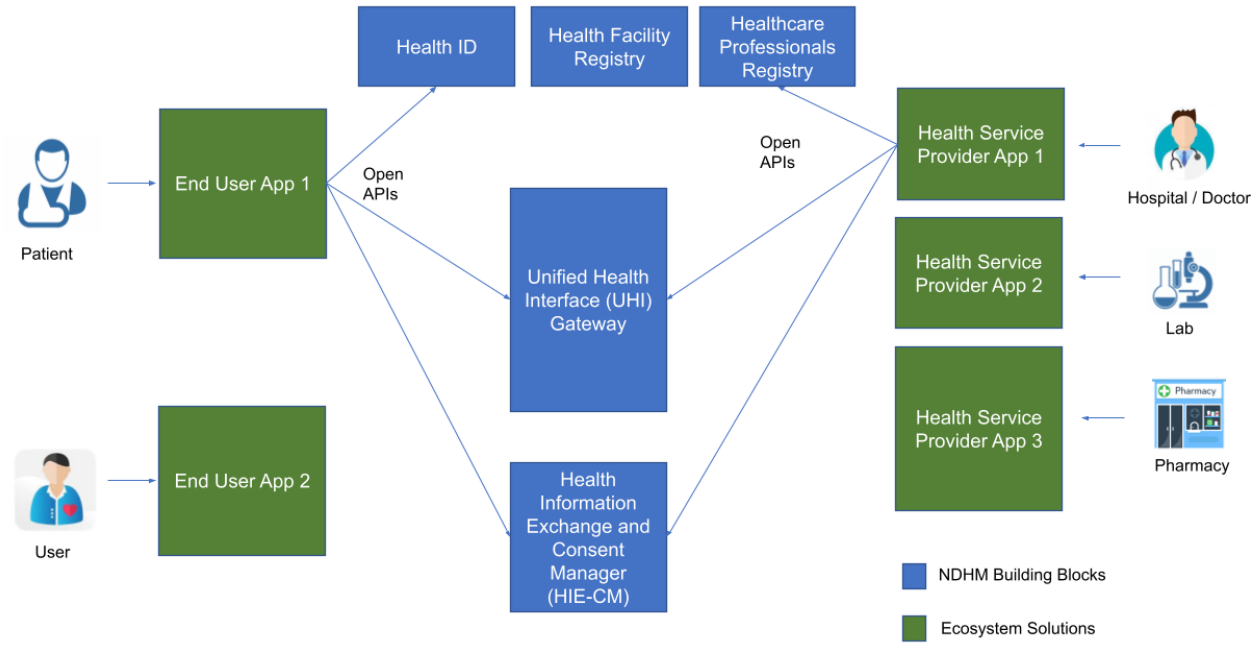


Fig. 7. High Level UHI Architecture

The key building blocks involved as part of UHI protocols include:

1. **Registries**: Like Health ID, Healthcare Professionals Registry (HPR) and Health Facility Registry (HFR) for identification and verification of entities
2. **UHI Gateway:** The UHI Gateway is the building block that implements the open protocols for various health services as part of the open network
3. **Health Information Exchange and Consent Manager (HIE-CM):** The HIE-CM building block enables the exchange of interoperable health records between the patient and care providers.

End User Applications and Health Service Provider applications call APIs on these building blocks to seek and deliver digital health services respectively. We describe the various steps involved in health service open protocols including service pricing, service fulfilment, post fulfilment services including grievance and feedback are expected to be handled in the UHI Open network.

5.1.1 UHI Gateway

The UHI Gateway implements the interoperable digital health service protocols.

There may be one or more UHI gateways that may be operational in the UHI ecosystem. All gateways will support the same open protocols and share registries to ensure interoperability. NDHM is expected to implement and operate the UHI gateway to kick start the ecosystem. This is similar to UPI where the ecosystem started with a single UPI gateway hosted by National Payments Corporation of India (NPCI), which was then followed by implementation of multiple similar gateways by other stakeholders in the payment ecosystem. NDHM may consider the same.

5.1.2 UHI Digital Health Services (Open Protocols and APIs)

5.1.2.1 UHI is designed to support a wide variety of digital health services and evolve over time to add more health services. Some of the potential services to be supported are listed below.

1. Discovery of healthcare providers
2. Booking a Healthcare Appointment – For both physical / digital consultations
3. Discovery of Hospitals and their facilities
4. Discovery of Labs and their services
5. Discovery of Pharmacies
6. Discovery of availability of medicine
7. Discovery of available critical care beds
8. Booking an ambulance service
9. Booking an appointment for home collection of samples
10. Ordering medicines for home delivery

Additional digital health services will be introduced by UHI over time. A robust roadmap of service will be worked out in consultation with the ecosystem

5.1.2.2 UHI is an Open protocol for digital health services. These protocols are implemented as open APIs by the UHI Gateways. These APIs can be invoked by EUAs and HSP Applications as part of delivery of the interoperable digital health service.

Since open protocols require wide agreement by the ecosystem, the governance mechanism to be adopted for designing the UHI Protocols is outlined in Chapter 6.

5.1.2.3 UHI open protocols are expected to evolve based on feedback / suggestions from the ecosystem. Each version of UHI would support more features that are required by the ecosystem. UHI enables an interoperable digital health ecosystem when end user applications and health service provider applications call APIs on the UHI Gateway to deliver a health service.

5.1.3 Inside a UHI Digital Health Service

This section describes the various steps that could be part of the UHI protocol. While there may be variations based on the actual digital health service, these steps provide insight for how UHI would work. The actual protocol will be developed along with the ecosystem as outlined in Chapter 6. The contents of this section merely represent a potential approach.

UHI Protocols could consist of the following as part of its workflow:

(a) Service Discovery
(b) Service Booking
(c) Service Fulfilment
(d) Financial Settlement
(e) Post Fulfilment

5.1.3.1 Service Discovery

UHI open protocols enable each HSPs to declare the digital health services they want to offer. End users can discover these health services, their pricing and service availability using any EUA. Users send a service discovery request with a few associated parameters to the UHI gateway. The UHI gateway sends this request to all registered HSP to whom this discovery request is relevant. HSPs can look at the incoming request and decide if they want to respond or not. If a HSPs wants to take up this request, they respond with details of their service, price they expect for the service, how they accept payments and by when they can deliver the service. The gateway collates the results and shares the same with the end user application which presents all the choices to the user.

Some examples for service discovery have been described below:

1. **Discover a doctor for teleconsultation:** The user can search for say an eye specialist in retinal diseases who speaks Hindi. The UHI gateway sends this request to all HSPs registered for teleconsultation service. Interested HSPs respond with the details of their doctor, consultation fee expected, payment methods and doctor availability to the UHI gateway.

2. **Discover availability of your doctor:** In many cases, patients seek a follow-up consultation from their doctors. UHI will enable doctors to share their Health Professional ID with patients. Patients can search using a health professional ID, UHI gateway will help discover the HSPs where the doctor provides digital consultations. For example, the same doctor may provide digital consults from multiple HSPs (e.g. a corporate hospital and an aggregator). The times when the doctor is available, consultation fee from each HSP etc, is presented to the user.

3. **Discover an ambulance:** The user can search for the closest ambulance service. The UHI gateway sends this request to all HSPs registered to provide ambulance services. HSPs respond with details of their closest ambulance, service charges, payment methods and estimated time for the ambulance to reach the user.

4. **Discover the closest lab:** Users can search for a lab looking for a specific test say in a 10 KM radius. The UHI gateway sends this request to all HSPs registered to provide lab services in that area. HSPs respond with details of their lab, price for the test, payment methods and time to complete the test

If the user knows the name of the doctor, hospital or lab that he is looking to obtain services from. UHI Protocols can directly obtain the list of services, prices and availability from that health service provider and display it on the EUA.

5.1.3.2 Service Booking

The EUA is expected to present all the results from the UHI gateway in an order chosen by the user (earliest availability, lowest price, etc), and not an order defined by the HSP. The user can then decide on the right option for their requirement.

Each HSP sets the price they want for their service. EUA will have a right to set their service charges. The total price to the user is computed as:

HSP price for service + UHI Gateway charges (if any) + EUA service charges

When the EUA books the service with the selected HSP, UHI protocol provides choices on who should collect the payment, when to collect the payment (before service delivery, post fulfilment) and what payment methods are allowed. The EUA books a service with the chosen HSP. Price for the service, time for service delivery, cancellation charges and any other relevant parameters for service fulfilment are shared by the HSP with the EUA when they accept the booking.

On successful booking, a UHI transaction ID with the details of the transaction is created at the UHI Gateway.

Enabling a new ecosystem requires that costs of the Gateway be kept very low to encourage adoption. Even in UPI, transactions below INR 1000 were made free of all gateway charges to encourage adoption.

An example to illustrate how service booking functions is described below.

Service booking for a home sample collection - The user selects a lab service on their EUA for a home sample collection. The app shows the price for the tests and asks the user to select from one of the home visit times shown. This service could offer two choices for payment - pay in advance online (amount is collected by end user app) or pay by cash when the sample is being collected at home. Once the user confirms the options, a UHI transaction ID is created which captures the details for the selected service.

5.1.3.3 Service Fulfilment

Once a user has booked a service, it is the responsibility of the HSP to deliver the service as per the commitments of time, price and any other parameters shared with the user during service booking. The HSP must report completion of service fulfilment and this would be confirmed by the EUA. HSPs must take accountability for the 'quality' of service delivered. Over a period of time various HSPs will build their reputation depending on how well they have provided various services.

UHI will be responsible for providing logs of the transaction including the time of booking, fulfilment, and payment settlement to both the EUA and HSPs. This information can be used in any dispute arbitration. UHI gateway does not participate in service fulfilment.

5.1.3.4 Financial Settlement

Services on UHI may be free or priced as per the needs of the ecosystem participants. UHI provides flexibility on who should collect the amount, when it should be collected and what payment methods are supported.

Each party needs to settle transactions as per the agreed amounts that were established at the time of service booking.

An example to illustrate how financial settlement functions is described below.

1. **Teleconsultation settlement where EUA collects money from the user:** Once the service is booked, it is the responsibility of the EUA to collect the agreed amount from the user. The EUA could use any payment methods of its choice like credit cards, wallets, UPI, etc, to collect the payment. On service fulfilment, the EUA must transfer the amount that was agreed with the teleconsultation HSP (minus any TDS) within a stipulated SLA. The EUA must also transfer any network usage charges to the UHI gateway.

2. **Lab collects payment from the end user during the home visit**: In this scenario, the Lab (HSP) would need to ensure the amount collected includes the HSP + EUA + any gateway charges. The Lab must settle with all parties within the stipulated SLA.

The UHI gateway will be aware of the transaction details and confirmation of financial transfers between EUA and HSP. The UHI gateway will not participate in any collection or movement of money from the end user. The UHI gateway will be able to provide details of every transaction to all parties involved in case of any disputes. The level of detail on the transaction available with the gateway will be decided as part of the design of the protocol in consultation with the ecosystem.

5.1.3.5 Post Fulfilment

Post fulfilment covers two functions - rating/ reputation management and grievances redressal.

Rating/ Reputation Management

UHI Protocols may support a rating/ reputation system that allows users, providers, services etc to be rated. The UHI gateway may make these ratings available to all ecosystem participants for their use to improve trust in the system.

NDHM acknowledges that rating of healthcare providers by patients/ consumers may not truly reflect the quality of service provided by the healthcare professional or the facility. But certain platforms, such as Google and Practo, already display publicly sourced ratings and merits and demerits of publicly accessible rating systems are to be assessed. Further, UHI may implement a system with checks and balances such as mandatory disclosure of the name of the person providing such feedback and chance of rebuttal to be given by the healthcare provider, to ensure authenticity of ratings and feedback provided on the platform.

Ratings may be provided to various players at various levels. For example, a doctor within a hospital, hospital itself, or platform through which hospital/ doctor was accessed.

Grievance Redressal

Consumers can raise a grievance for digital health services using the same methods as for regular health services. It is proposed that NDHM UHI will take responsibility for handling grievances related to digital open platforms only. For this purpose, NDHM will work to digitize the process related to grievance management and ensure that users have a clear path for grievance redressal. Other grievances such as those pertaining to quality of healthcare shall continue to be addressed through existing mechanisms used in non-digital interactions.

The UHI gateway may suspend all new service discovery requests / bookings for a HSP / EUA in cases the participant is in breach of UHI Policies. The UHI Policy and rules for such suspension will be established for each type of service in discussion with the ecosystem.

5.2 UHI Protocols in Action - An example

An interoperable UHI protocol for teleconsultation can be visualized as follows:

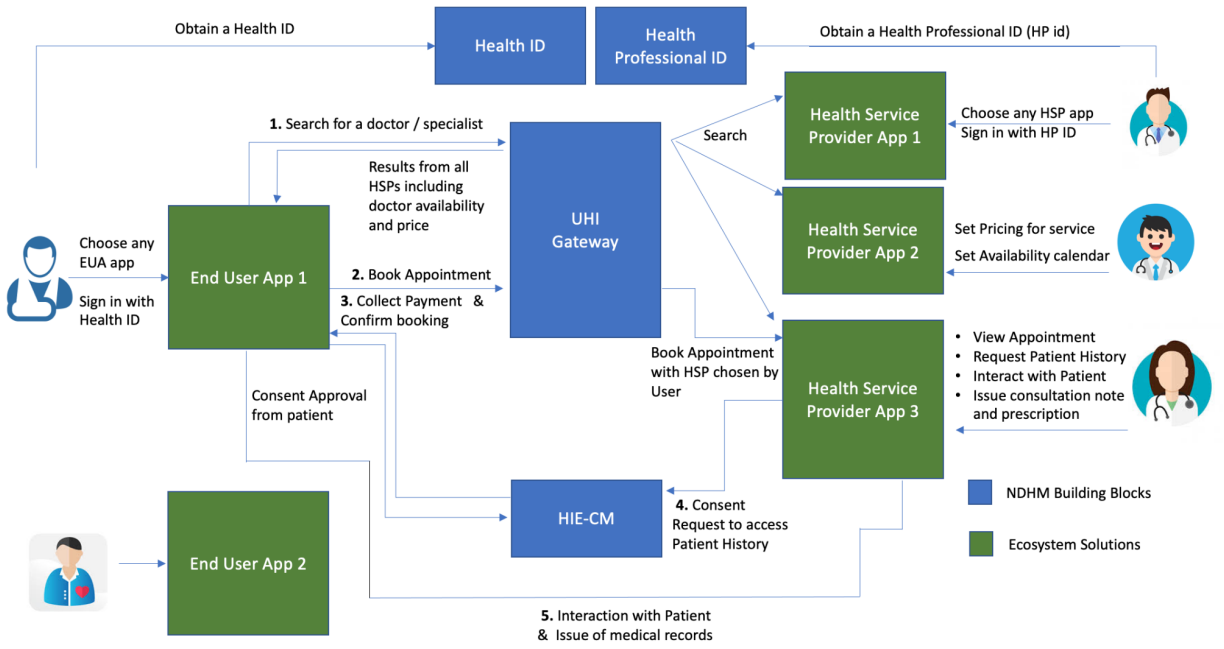


Fig. 8. UHI Protocol for Teleconsultation

5.2.1 Patient Experience

Patient experience can be visualized as follows:

1. The patient logs into an EUA of their choice using their Health ID. This also enables their EUA to get access to the medical history associated with the Health ID, if consented by the patient.
2. The patient searches for a dermatologist. Additional parameters can be specified including languages spoken, years of experience , price range for consultation, etc.
3. The patient is shown a list of search results. The result could be a department at a hospital (without a specific doctor name) or could be the name of the specialist who will conduct the consultation. The time slots available and price for the consultation is shown.
4. Patient picks a suitable dermatologist and requests to book an appointment.

5. The EUA app collects the amount for the consultation. The booking is confirmed once the amount has been collected.
6. The patient gets a consent request for access to his medical history on his EUA. The patient can consent to share their history and additionally share scans of any records they may have with the consultant.
7. At the appointed time, the patient gets a call from the doctor.
8. The patient gets a prescription (if given by the doctor) . They can view the prescription on their EUA application and, on consent, the prescription becomes part of their health record.
9. Post consultation the patients can rate the doctor/hospital/EUA and their quality of the service received.

5.2.2 Doctor Experience

Doctors will be able to choose any health service provider software of their choice to provide the teleconsultation. Doctors can choose to participate independently or as part Hospital HSPs or an aggregator HSPs.

Doctor's experience can be visualized as follows:

1. Doctor logs into a Health Service Provider application using their Healthcare Professional ID. This ensures that their verified credentials show up and improves trust in the teleconsultation.
2. The doctor can specify the teleconsultation services he/she is willing to offer along with price for the consultation and times when they are available.
3. The doctor can view all the appointments booked for the day in the HSP application.
4. The HSP application would have already collected the medical history of the user by requesting consent. The same would be available to the doctor for review.
5. The doctor initiates the tele-consultation by calling the patient.
6. The doctor can then fill out their consultation notes, prescriptions, advice and any followup required. The same is shared automatically with the patient and will become part of the patient's health records.
7. Post the completion of the consultation, the doctor can also rate the patient.
8. Payment for their services will be settled automatically. Doctors can view the details of the service in the HSP application.

5.3 Questions for Consultation

This chapter outlines how UHI Open Network and UHI Open protocols would work to enable an interoperable digital health ecosystem. Questions to relevant stakeholders are:

5.3.1 In the proposed discovery model in section 5.1.3.1, EUAs are expected to present all responses returned by the Gateway to the user and allow the user to choose the HSP. Should any alternate models be allowed? If yes, provide details.

5.3.2 Are there any challenges to the proposed approach to pricing of services detailed in section 5.1.3.2? Please suggest other alternate pricing models that must be supported by the Gateway.

5.3.3 Are there any other areas that must be supported by the Gateway for service fulfilment in section 5.1.3.3? If yes, provide details.

5.3.4 Post-fulfilment, as described in section 5.1.3.5, covers ratings and grievances. Are there any other areas that must be supported by the Gateway for post service fulfilment in section 5.1.3.5? If yes, provide details.

5.3.5 The proposed approach for allowing users to share ratings for the HSPs as well as EUAs has been laid out in 5.1.3.5. Please comment on the same and share any other approach that might be adopted.

Chapter 6

UHI Development, Governance and Management

6.1 Development of UHI

6.1.1 UHI consists of UHI Gateways, Registries and UHI Open protocols that need to be adopted across ecosystem players. UHI APIs are expected to be released in versions allowing market players to enable their systems for new capabilities over time.

6.1.2 NDHM plans to adopt the following process for developing an industry acceptable Open Protocols. Each Open protocol will consist of a clear API specification. Every major version change of each UHI Protocol will go through the following process.

- **Design by Specification Committee** – NDHM will appoint a committee of technical experts with in-depth understanding of the domain to formulate, design and publish the initial UHI Open Protocols.
- **Consultation with Experts** – NDHM will invite experts from government, academia, and industry or independent experts to become part of the expert consultation group. The UHI specifications developed by the specification committee will be reviewed by the expert group and revised by the specification committee
- **Consultation with Public** – The UHI specifications will then be published for a public consultation and any additional and relevant feedback will be incorporated by the specifications committee. The final version post public consultation will be submitted to NDHM for adoption
- **Adoption by Ecosystem** – NDHM will notify the final version for adoption by all players in the UHI ecosystem

6.2 Management of UHI Gateway

6.2.1 NDHM plans to implement and operate the first UHI Gateway for a certain period before it considers the need and option for multiple gateways. This is aligned with the learning from the UPI where in the initial stages of development of an ecosystem, a centralized system of coalition of comments and suggestions led to quicker optimization of the system. Scaling to multiple gateways, if deemed necessary, would be easier once the initial versions are stable and proven.

6.2.2 In order to develop the software for the UHI gateway, NDHM will evaluate and adopt one of the following options:

- Engage a software development agency to develop the gateway as per specifications
- Adopt an open source code base for the gateway if contributed by strong industry partners

6.2.3 The following instances of the UHI Gateway are proposed to be managed and operated by NDHM

- **Sandbox instance** – This instance will be used by EUAs and HSP to test and integrate their software with the UHI gateway
- **Production instance –** This instance will be used by EUAs and HSPs with Users and doctors to deliver a wide variety of health services

6.3 Onboarding of Participants

6.3.1 The NDHM sandbox process currently used to onboard entities wanting to be Health repository providers, Health Information Users, Health Lockers, etc will be expanded to support onboarding of UHI compliant EUAs and HSPs.

6.3.2 Technology service providers who want to create UHI compliant software can register in the NDHM sandbox and get access to the UHI APIs. They will then be able to build and test their software. To exit from the sandbox, their software will need to be validated for compliance with the APIs and ensure it meets data security and data privacy related requirements. Once the software has been validated for compliance, the access key to the production instance of the UHI gateway will be provided.

6.3.4 NDHM will actively engage with the ecosystem to encourage doctors, hospitals and labs to onboard themselves on UHI. These HSPs need to use any UHI compliant software to make their services available to consumers.

6.3.5 NDHM will encourage both public (offering like Aarogyasetu, Digilocker, etc) and private players to create EUA applications that can be used by consumers. All EUA applications will also need to be UHI compliant in order to access the production instance.

6.4 Charges for Usage of UHI Gateway

In any open network there will be a cost to development, management and operations of the UHI gateways. The financial model described in Chapter 4 includes a fee for the usage of the UHI gateway. Interested stakeholders are requested to provide models of pricing which could be implemented to maintain the gateway.

6.5 Questions for Consultation

6.5.1 What approaches, other than the ones mentioned in chapter 6, should be considered for managing and governing the UHI gateway? Please provide details.

6.5.2 What should the UHI Gateway charge in the initial few years of operation? How can this model evolve over time?

6.5.3 Please share your views on the duration for which NDHM should manage and govern the UHI gateway, and if NDHM should open the path to multiple gateways. Please provide details on the benefits and risks of the options.

Appendix 1: List of Questions

Chapter 1

1. Please refer to section 1.6.3. The Telemedicine Guidelines were issued by The Board of Governors of the Medical Council of India (MCI) in March 2020. Stakeholders are requested to go through them and suggest changes to the policy, if any, to ensure adoption of telemedicine and e-pharmacy. Please note that NHA will act as a coordinator and only forward these suggestions to the appropriate/ concerned ministry

Chapter 2

2. As a stakeholder in the health ecosystem, what benefits and risks do you see if an open network approach to digital health services is implemented? Please respond with details.

Chapter 3

3. The primary stakeholders in the UHI ecosystem are mentioned in section 3.3. While the list is more indicative than exhaustive, are there any other primary or secondary stakeholders that should be considered while building the interface? If yes, please outline their role in the UHI ecosystem.

4. The proposed objectives of UHI and UHI Network have been detailed in sector 3.4. Please share your comments on the comprehensiveness of these objectives, methods to ensure these objectives are adhered to. Please comment if there are other objectives which must be included in section 3.4.

5. UHI will support a range of digital health services and is expected to evolve with time. What digital health services should the initial version of UHI focus on?

Chapter 4

6. Have all incentives / disincentives for various stakeholders to participate been covered in chapter 4? If not, please provide the list and mention the role and description of the stakeholder.

7. For the disincentives mentioned in chapter 4 and as an answer to Question 1 of chapter 4, please provide possible mitigating measures that may be taken to minimize the impact of said disincentives.

Chapter 5

8. In the proposed discovery model in section 5.1.3.1 EUAs are expected to present all responses returned by the Gateway to the user and allow the user to choose the HSP. Should any alternate models be allowed? If yes, provide details.

9. Are there any challenges to the proposed approach to pricing of services detailed in section 5.1.3.2? Please suggest other alternate pricing models that must be supported by the Gateway.

10. Are there any other areas that must be supported by the Gateway for service fulfilment in section 5.1.3.3? If yes, provide details.

11. Post-fulfilment, as described in section 5.1.3.5, covers ratings and grievances. Are there any other areas that must be supported by the Gateway for post service fulfilment in section 5.1.3.5? If yes, provide details.

12. The proposed approach for allowing users to share ratings for the HSPs as well as EUAs has been laid out in 5.1.3.5. Please comment on the same and share any other approach that might be adopted.

Chapter 6

13. What approaches, other than the ones mentioned in chapter 6, should be considered for managing and governing the UHI gateway? Please provide details.

14. What should the UHI Gateway charge in the initial few years of operation? How can this model evolve over time?

15. Please share your views on the duration for which NDHM should manage and govern the UHI gateway, and if NDHM should open the path to multiple gateways. Please provide details on the benefits and risks of the options.