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ICT in Business and the Public Sector

The adoption and acceptance of the FAIR Principles: Digital health in China.

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MASTER'S THESIS

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There have been many disasters in the world this year, but with love, hope, and persistence, we can eventually conquer everything.

Abstract

Thanks to the development and maturity of technologies like big data, cloud computing, and the Internet of Things, the application value of health information has greatly increased. But similar to other data-driven fields, outdated data management stewardship hindered the potential for data reuse, which limited the efficiency of health data reuse in digital health. Therefore, the FAIR Principles, a data management guideline that meets the needs of current data usage, emerged. However, its implementation covers mainly in European and the American regions and is populations mainly of white ethnicity, which affects its effectiveness and diversity as a general principle. Therefore, this study aimed at the attitude and adoption and acceptance intentions of Chinese medical staffs and patients towards the application of the FAIR Principles in digital health.

This research was built on the Theory of Planned Behavioural Control, a case study carried out by interviewing with 30 respondents, half medical staffs and half patients, in a third-class hospital in Miyun District, Beijing. Through the interpretation of the policies, laws and regulations related to digital health and health data protection, this study understood the political and cultural background of the implementation of FAIR in China.

Through the analysis of the interview content and the interpretation of the policy, this study found that although the adoption and acceptance of FAIR were different between medical staffs and patients, young medical staff had a positive intention to adopt. In contrast, older medical staffs and patients had neutral and even negative adoption and acceptance intentions, but the future of FAIR in China is still bright.

Keywords: digital health, the FAIR Principles, Theory of Planned Behavioural Control

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Acronyms

TPB: The Theory of Planned Behavioural Control

SNOMED: Systematized Nomenclature of Medicine

UMLS: Unified Medical Language System

LOINC: Logical Observation Identifiers Names and Codes

STD: Sexually transmitted disease

Chapter 1. Introduction

1.1 Problem Statement

The implementation of big data for health services to operate in a more efficient and accountable manner (World Health Organization, 2008) marks an important step in coping with the existing health challenges. Besides, the development of mobile technology, wearable devices, hi-tech photography, as well as the IoT (Atzori, Iera, and Morabito, 2010) provide people with higher accessibility to healthcare. Big data are being widely used in healthcare to make the most of the huge amount of historically generated data based on historical records, regulatory requirements and compliance, and care of patients to extract insights to make better decisions for the patients to be better taken care of, lives to be saved and costs to be lowered (W. Raghupathi, V. Raghupathi, 2014). With the support of information technology, the level of medical and health service has improved.

At the same time, similar to other data-driven disciplines, digital healthcare is also facing the challenge of unlocking the potential of data. Traditional data stewardship can no longer adapt to current scientific research and need to improve infrastructure to support data reuse (Wilkinson et al., 2016). Therefore, in order to provide a clear goal for good data management and define a simple instruction for data publishers or preserves, as well as scholars and stakeholders in the private sector, certain obstacles concerning the discovery and reuse of data must be conquered. To this end, the guiding principle FAIR Principles provides suitable guidelines, indicating that machines and people both find the research objects easy to be found, accessed, interoperated and reused (ibid).

FAIR Principles are spread all over the world and covers multiple scientific fields. The principles are widely recognized by the European Union, G7, G20, US-based Big Data to Knowledge (BD2K), and the African Research Cloud (van Reisen et al., 2019). The implementation of FAIR is mainly concentrated in the fields of bioscience and nature science; however, it is concentrated in the European region and scattered a lesser extent in the American region (ibid). The implementation of FAIR needs to be extended to other regions with different cultural background and demographic factors to test its credibility as a universal guiding principle.

11th G20 Leaders' summit held in Hangzhou, China, it reached an agreement that, to achieve innovation-driven growth, consistent support should be given to improve the open exchanges in science and enable people to access research findings on FAIR principles under public

funding[1]. However, there are few studies on the actual implementation and acceptance of FAIR in China. Therefore, taking the digital medical field as a breakthrough, it is a good opportunity to understand the adoption and acceptance of FAIR in China and fill the gap for its implementation in the context of Asian culture.

1.2 Research Gap

According to the actual implementation of FAIR, as a general rule for data discovery and reuse, the geographic area and the diversity of the population covered by its implementation have limitations. The concentration of European and American regions and white people affected the diversity of its implementation (van Reisen et al., 2019). It is urgent to create room for diversity in research epistemologies and contextual differences in order to extend global coverage on the acceptance of FAIR (ibid). Therefore, research on the adoption and acceptance of FAIR in China can provide a preliminary survey and reference for its implementation of Asian culture.

1.3 Research Question(s)

This study aims to answer some specific research questions which are listed as follows. The key is to find out how medical staffs and patients, as end-users, view the role of FAIR Principles in the Chinese health industry:

To what extent are the FAIR Principles adopted and accepted by the medical staff and patients in China?

It is followed by a number of sub-questions which hold accountable for better elaborating the main question:

1. How is the FAIR Principles perceived by the medical staffs and their adoption possibility in digital healthcare?
2. How is the FAIR Principles perceived by the patients and their acceptance possibility in digital healthcare?
3. How is accessibility demonstrated in China's digital health arena?
4. How do China's policy and law regulate data protection related to digital health?
5. What is the related policy environment like in Chinese health industry?

[1] http://www.china.org.cn/chinese/2016-09/07/content_39250021.htm

1.4 Research Objectives

This research is aimed at understanding better whether the FAIR Principles can be adopted and accepted by Chinese medical staff and patients. As follows is a more detailed explanation of the purpose of each sub-question.

Table 1 Research Questions Objective

Question ID	Question	Objective
1	How is FAIR Principles perceived by the medical staffs and their adoption possibility in digital healthcare?	To understand end-user medical staffs' intention to adopt the FAIR Principles from three aspects which are medical staffs' attitude and the social attitude to FAIR and objective conditions.
2	How is the FAIR Principles perceived by the patients and their acceptance possibility in digital healthcare?	To understand the end-user patients' intention to accept the FAIR Principles from three aspects which are patients' attitude and the social attitude to FAIR and objective conditions.
3	How is accessibility demonstrated in China's medical institutions?	To understand regulations and technical requirements of the accessibility in Chinese medical institutions.
4	How do China's policies and laws regulate data protection related to digital health?	To understand China's legal environment for protecting health data and personal information used in digital health.
5	How does the policy environment of digital health in China?	To understand the policy environment and cultural background that needs to face when FAIR is implemented in China.

1.5 Research Relevance

This research is aimed at investigating the adoption and acceptance of FAIR Principles in Chinese digital healthcare. Previous research articles related to FAIR principles show that European and American scholars have shown bigger interests in this field than their Chinese counterparts. As a general guideline, understanding its implementation in different political and cultural contexts is conducive to its global coverage. Besides, the implementation of FAIR principles in China helps its digital healthcare system to be more diverse and less biased against that employed in Europe and America. It can understand people's views on data reuse in different cultural backgrounds and opinions on data sharing in different social environments. For China, FAIR data in health will not only contribute domestic, regional healthcare but also

provide access to global health data improving cooperation with the global level when it comes to worldwide pandemic control.

1.6 Ethical Considerations

The research objectives and results of this paper are not for business profitability, and the research conducted under the permission of respondents and research subjects. No harm to stakeholders during the research process. The research protects participants' rights to privacy, confidentiality, and self-determination concerning their information.

1.7 Research Outline

This research is comprised of six parts. In the introduction part, the development of digital health and the FAIR principles are presented, which leads to thesis questions of this paper. The second part is the theoretical framework, which explains in detail the Fair Principles and its implementation in the digital health field. It also elaborates the Theory of Planned Behavior, along with Roger's innovation diffusion model, which are the fundamental guiding principles for the research interview. The third part is the methodology. This section describes the methods adopted in the research and the subjects involved in the study. The fourth part is the literature review which is to figure out the research context. This section describes the policy environment and regulations and laws related to health data and personal information protection of digital healthcare in China. The fifth part is the interview results. This section is to code the interviewees' transcription and find the answers to the relevant questions. The six-part is the conclusion and discussion. In this part, we will answer the questions raised in the first part and propose further research directions for future research or make constructive suggestions based on the research results.

Chapter 2. Theoretical Framework

The chapter contains the theoretical framework, namely the guideline, for this study. There is a total of three parts. The first is the FAIR principles, followed by the implementation of FAIR, and the last is the Theory of Planned Behavior (TPB) by Icek Ajzen and Roger's innovation adoption model. The first section introduces the FAIR principles, including the underlying understanding, context and backdrop of FAIR. The second section focuses on how FAIR implements in digital health and how adoption or acceptance in different context hinders its implementation. The last section is built on the Theory of Planned Behavior (TPB), which give the explanation of the adoption and acceptance of the FAIR Principles used in the Chinese healthcare system in China from three different levels. With Rogers' Innovation-Diffusion model, it provides another angle to demonstrate how attributes of innovation can affect the attitude toward the final adoption. The research questions and interviews are built based on the TPB.

2.1 The FAIR Principles

2.1.1 What Are the FAIR Principles?

The FAIR principles are a minimal series of community-developed guidances for the practices in digital systems, namely Findable, Accessible, Interoperable and Reusable (Wilkinson et al., 2016), and becomes as valuable as is possible (Boeckhout et al., 2018). The principles emphasize it should be applicable to activities that are driven by humans or machines in contemporary data-intensive science (Wilkinson et al., 2016). It aims to unleash the potential of digital data and better manage it to be discoverable, available and reusable through machine and human reading processes (ibid). In this case, digital health, a way of augmenting health service through the use of ICT (East African Health Research Commission, 2017), as a data-based science, should also follow the guide by the FAIR principles.

2.1.2 Context of FAIR

As an indispensable part of contemporary social life and academic research, data can be processed for producing useful references and offering deeper insights. Unfortunately, the existing digital ecosystem around data makes it impossible for us to get the most out of our research investments (Wilkinson et al., 2016). Such obstacles are not only found when people try to discover and reuse the data, but also when it comes to machines; however, these profound and extensive comprehensive analyses that make up the majority of contemporary e-Science.

Therefore, the need to a function that can accurately, properly find, reuse and reference for all stakeholders, both human and mechanical, is imminent (Wilkinson et al., 2016).

In 2014, at the request of the Dutch Electronic Science Centre and the Dutch Institute of Life Sciences (DTL), a series of stakeholder representatives met in the Netherlands for discussing future measures to further strengthen the data ecosystem (Force 11, n.d.). Their common goal is to help third-parties reuse data to enable innovation and knowledge development in a cultured background (Wilkinson et al., 2016). In today's increasingly digital world with rapidly growing data, the Fair Principles create a context and offers a way of promoting scientific development through digital data (Van Reisen et al. 2019).

2.1.3 FAIR Data Principles

Findability Principle

The Findability principle states that data work best when users can identify, describe, register or index them and without any ambiguity (Boeckhout et al., 2018). Under such a principle, data are encouraged to be surrounded by metadata, an umbrella term that includes descriptive information about context, quality and condition or data attributes (Boeckhout et al., 2018). Machine-readable metadata is vital to auto-discovering data sets and services (Go FAIR) and helps to identify the decentralized location of the data (Wilkinson et al., 2016). Metadata are registered as searchable resources and include a unique and persistent locator of the data described (Wilkinson et al., 2016).

Accessibility Principle

The letter "A" in FAIR is not equal to open or free. Instead, it means that you should provide the exact conditions under which you can access the data. For example, the highly sensitive or personally-identifiable data in health and bioscience, like the electronic medical record or genomic library, clear rules regarding the process for accessing and rich metadata should be created to protect the privacy (Wilkinson, 2016). The Accessibility principle aims to help access control by settling on an effective and legitimate method while facilitating data research in the diverse area (Boeckhout et al., 2018). Therefore, even private data that is heavily protected can be FAIR (DTL, 2016). After (meta)data retrieved by its identifier, it needs proper authentication and authorization, i.e. license requirements to access (Wilkinson et al., 2016). This process is to be done by a standardized communication protocol; even though the data no longer existing, metadata should be able to access (Wilkinson et al., 2016).

Interoperability Principle

Interoperability principle, as indicated by the name, helps gain more insight into a subject through data combination that can be legacy and pre-existing data formats or newly generated data (Wilkinson et al., 2016). To achieve that goal, it requires the use of shared vocabularies, e.g. SNOMED, UMLS, LOINC and so on adherent to the FAIR principles, and to cite properly (Wilkinson et al., 2016). It means that, for each computer system, it can be able to understand other system's data exchange formats (GO FAIR).

Reusability Principle

The ultimate goal of FAIR is to optimize the utility of trusted data. Therefore, the Reusability principle stipulates that (meta)data need to be interpreted by a number of precise and relevant attributes and the usage license needs clarity and accessibility (GO FAIR). The (meta)data should be related to specific provenance in line with the community standards of the domain (Wilkinson et al., 2016).

Machine-actionability

In the current large-scale and data-driven research environment, facilitate automation is important. Therefore, in FAIR principle, a crucial factor is the actionability of machines (Wilkinson et al., 2016). Machine-actionability means that there is a "computational data explorer" that can autonomously process the detailed information perceived from a digital object (ibid). The "computational data explorer" requires the completion of the following tasks:

1. Recognize the identity of the object
2. Decide its usability via a test of the (meta)data
3. Determine if it is useful in the respective of accessibility and other use constraints
4. Process human-like action toward the object through the whole data processing process, it needs to record exquisite provenance to ensure that the data it collected can precisely be cited (Wilkinson et al., 2016).

2.1.4 FAIR Metrics and Example of Fairness

Every element in the principles is related but still can work as an independent indication. With the degree of 'FAIR-ness' growing in the entire data publishing environment, these elements may combine freely (Wilkinson et al., 2016). However, the FAIR principles do not have strict descriptions over how the state of "FAIRness" can be achieved, which led to a broad range of

interpretations (Wilkinson et al., 2018). Therefore, a FAIR Metrics group defining the ways to measure FAIRness has established to end this chaos. The gathering viewpoints on FAIRness and FAIR metrics can be summarized as follows:

1. Metrics need to include digital objects of all sorts and deal with the multi-dimensional aspects of the FAIR principles.
2. To complement the universal metrics, additional metrics that are specific to certain resources and that accords with the desire of some communities can be employed.
3. The metrics and the whole process of the application need to accord with the FAIR principle.
4. An enabling ecosystem empowered by FAIR tools for assessment needs to be developed with open standards on the metrics.
5. The FAIR assessment needs to allow for different methods, including but not limited by self-assessment, task force, crowd-sourcing, automation, etc., and the assessment system needs to be able to handle billions, or even trillions, of digital objects.
6. There needs to be an up-to-date FAIRness assessment with public accessibility and time stamps.
7. FAIRness assessment should serve as a capable modality for users to stay informed and digital resources providers to be empowered.
8. The design and method of dissemination of the assessment, the FAIRness assessment included, needs to be able to provide incentives to the digital resources provider. That is to say, the assessment needs to feature fairness and unbiasedness with benefits for the users by encouraging them to notice the room for improvement.
9. The metrics need to be governed and the assessment mechanism be designed in a way that they can evolve gradually and better cope with the potential disagreement (ibid).

A good metrics should display the following qualities: a clear purpose; realistic standards for resources to comply with; measuring discriminating aspects of resources and providing the instruction to maximize the value; a measurable, transparent and processable assessment; universal to all digital objects (ibid).

With the FAIR principles and FAIR Metrics, data stakeholders are able to follow the guide to identify if their implementation makes the data FAIR rather than suggestions for a specific technology, standard, or implementation-solution (Wilkinson et al., 2016) (Wilkinson et al., 2018). There are many repositories that have already applied FAIR into their implementation (Wilkinson et al., 2016); a detailed example can explain what FAIRness is:

> "ISA refers to a framework used to track metadata driven by communities for the purpose of collecting, curating, managing and reusing datasets in life science while complying with relevant standards. From ISA, people can access metadata structured progressively under FAIR principles and sourced from Data Descriptor of Nature Scientific Data, GigaScience data, EBI MetaboLights database and many others. The ISA model is extensible for general purposes. Thanks to technological advances, such a model has evolved from a tabular representation to an RDF-based representation (González-Beltrán, et al.,2014). Empowered by JSON serializations, it further evolved into "FAIR" with data linked as great supplements to other research objects (González-Beltrán, et al.,2015)." (Wilkinson, et al., 2016).

2.1.5 The Origin of the FAIR Principles

The FAIR principles can retrieve to the concept of the Semantic Web and Linked Data. In 2001, Tim Berners-Lee et al. proposed the concept of the Semantic Web that add semantics (metadata) that can be understood by computers on the World Wide Web, making the entire Internet a universal information exchange medium (Berners-Lee et al., 2001). It is as decentralized as possible just like the internet and needs being provided with a language for reasoning (ibid). Two technologies are supporting the idea: eXtensible Markup Language (XML) and the Resource Description Framework (RDF). The former is to allow the user to have their tags created and arbitrary structures added to the documents; the latter is to describe the data with their identity and properties with certain values processed by machines(ibid). By identifying a Universal Resource Identifier (URI), the subject and object can access each other (ibid). This technology assists people in handling data stored on the internet from building up vocabularies and rules (W3C, 2019). The Semantic Web described a future where data could be automatically understood by machines, carrying out tasks related to discovering, blending, and processing on the information available on the internet (Berners-Lee et al., 2001). Linked Data is created to solve the reusability between data from different sources (Bizer et al., 2009). It refers to data that can be read by machines, with clear definitions of meanings and that are linked with external data so that could be retrieved based on the external data sets (ibid). Berners-Lee (2006) defined a series of principles of data publishing online:

1. URIs are used for naming
2. HTTP URIs are used for better looking-up and search

3. Complete information is provided under standards like RDF and SPARQL for more efficiency in looking up URIs
4. Links to other URIs are available for more extensive discovery (ibid)

The FAIR principles proposed based on these two concepts, however, it is far beyond. It is a guide for any format of published (meta)data that may occur in the future application of the Internet of Data and Services and the IoT (Mons, B et al., 2017). It is not subject to any existing framework; any powerful standard or framework may appear in the future should obey the principles as well (ibid).

2.2 Fair Implementation

2.2.1 Implementation Network

The GO FAIR International Support and Coordination Office (GFISCO) was established in 2018 to facilitate the development of global internet of FAIR Data and Services (IFDS) (M. Van Reisen et al., 2019). GO FAIR Implementation Network (IN) is an association that devoted to defining and creating specific resources and instruments to actualize the use of FAIR as a crucial part of the Internet of FAIR Data and Services (IFDS) (GO FAIR). They foster and contribute consistent development of Internet of FAIR Data and Services through group initiatives (ibid). For better supporting the implementation, IN came up with the three activity pillars: Go Change, Go Train and Go Build (ibid).

Go Change relates to socio-cultural change about priorities, policies and incentives; Go Train is for training FAIR-aware data management professionals; Go Build relates to technical standards and infrastructure components realization[2]. Currently, 17 INs are listed as active encompassing all three pillars, while the rest are tagged as either interested or preparatory. GO FAIR operation is built on the hourglass architecture, without centralized governance, to guarantee the maximal room for coordination and international guidance and provide optimal operational freedom to each pillar (GO FAIR).

2.2.2 FAIR Implementation in Digital Health

However, as one research suggests, the global implementation of the FAIR principles is not as what we imagine. It now plays a rather significant role in the fields of biological and natural sciences, and it is mainly in Europe and a lesser extent in the USA, which is carried out in

[2] https://www.go-fair.org/go-fair-initiative/strategy/

western domain (M. Van Reisen et al., 2019). Therefore, these situations lead to the problem that data collected for a specific population in a specific context is not valid enough, for example, in digital health, data is crucial on monitoring and preventing disease, however, without geographic and demographic diversity, the data collected is not representative (ibid). So, it is significant to introduce FAIR principles as a universal tool for the rest of the world. According to the existing researches, in the process of the universal implementation, the problems caused by acceptance should pay explicit attention to. A master thesis conducted by Ochuku (2019) about FAIR-based digital health in Africa, it mentions about the challenges caused by cultural and contextual factors, e.g. trusts and acceptability from local patients, resistance from health professionals, resource shortage and poor infrastructure. Another literature about m-health improvement in Africa (Krah, de Kruijf, 2016) shows that the biggest impediments are general technology problems and intervention inappropriateness caused by inadequate understanding of local participants and specific context of use. Research about introducing digital health to a remote area in Indonesia (Putri, 2019) reveals that there is a certain amount of people express indifference even disfavour toward technological development in health. Their unacceptance comes from unfamiliarity to technology and concerns about being avoided by the digital health system due to low level of education and low rate of accessing to it. Research of FAIR practice in Africa (M. Van Reisen et al., 2019) concludes that prompting public agenda-setting and acceptance of FAIR as the guidelines for data management to all stakeholders, e.g. researchers and practitioners, funders and publishers is important for carrying out the FAIR implementation, which relies on both quality content and sources, and the appropriate context.

The bias of implementation among countries and continents is caused by neglecting the implementation context (ibid). There is a huge difference in socio-cultural context in the world; it should understand and serve the public interests in targeting area and consider the diversity of research participants (M. Van Reisen et al., 2019), in which Go Change should play a key role of motivating the socio-cultural acceptance for introducing FAIR implementation. The approaches used in research, for instance, methodology and method, should consider the participants' needs and objectives; the implementation should be co-designed to fit the value of the local context (ibid).

2.3 The Theory of Planned Behaviour

2.3.1 What Is the Theory of Planned Behaviour?

The Theory of Planned Behaviour (Ajzen, 1991) is a widely adopted sociopsychological theory that can be used to interpret how humans generally make decisions. It has been successfully applied to multiple behavioural areas. Some examples of topics are health-related behaviours (Godin& Kok, 1996), predicting leisure intentions and behaviour (Ajzen& Driver, 1992), as well as people's attitudes on smoking behaviour (MOAN & Rise, 2010).

This theory is built on the preliminary logic that the mankind's intent and behaviours are composed of three agents, namely attitudes on behaviours, subjective norms and perceived behavioural control, all of which are subject to the influence of certain beliefs (Ajzen, 1991).

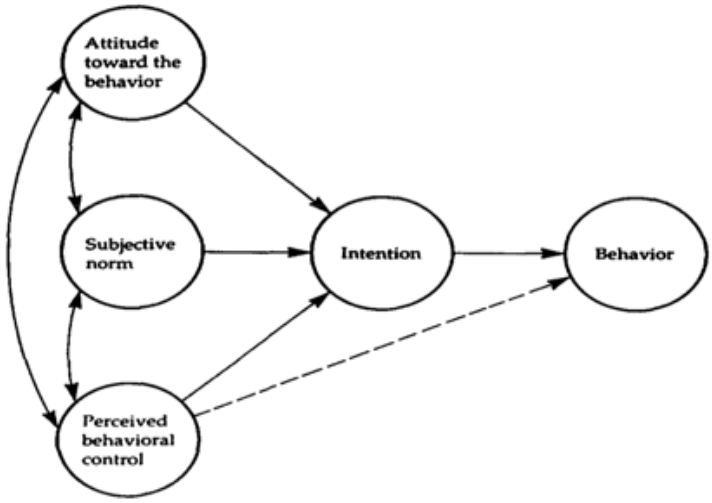

Figure 1 The Theory of Planned Behaviour

In different aspects, behavioural beliefs see behaviours favourably or unfavourably. Normative beliefs lead to perceived social pressure or subjective norms, and control beliefs produce perceived behavioural control. Together, all three aspects help shape the subject's behavioural intentions. Generally speaking, positive attitude and subjective norms tend to bring about better perceived control and thus stronger intention on the part of the subject to act that way.

2.3.2 Where Does the Theory of Planned Behaviour Stem From?

The Theory of Planned Behavior can be traced back to the Theory of Multi-Attribute Attitude by Fishbein (1963). The theory holds that behavioural attitudes determine the intent of certain behaviours and can used to expect behaviours and results and in turn assessing the outcome and also help understand the behavioural attitudes (Fishbein, 1963). later, Fishbein and Ajzen(1975) proposed the Theory of Reasoned Action, which holds the conviction that intent

of behaviours directly determines how humans behave and in turn is subject to the influence of behavioural attitude and subjective norms. In 1985, on the basis of the Theory of Reasoned Action, Ajzen(1985) added the perceived behaviour control and the theory of planned behaviour. In 1991, published by Ajzen (1991), the theory was further enriched by the theory of planned behaviour.

2.3.3 What Is the Content of the Theory of Planned Behaviour?

Figure 1 shows the first determinant, namely attitude towards the behaviours, helps assess how individuals like or dislike a specific behaviour or act. This aspect reveals an individual's beliefs about possible consequences towards certain behaviour, which can also be called behavioural beliefs (Ajzen, 1991). In general, we form beliefs about objects by associating them with certain attributes. Since the attributes associated with the behaviour have been assessed positively or negatively, we automatically obtain an attitude towards the behaviour. In this way, we learn to support behaviours that we believe have great desired outcomes, and we are unfavourable to behaviour associated with the most adverse consequences (Fishbein & Ajzen, 1975). In Innovation-Diffusion Model (Rogers, 1995), it proposes a theory about the adoption process through which a decision-making unit that can be an individual or an organization passes from first awareness of innovation, to form an attitude toward it based on the perception of its characteristics, to adopt or reject the innovation, to implement it, and to confirm the decision. The characteristics of innovation are defined by five attributes: relative advantage relates to how an innovation surpasses the existing one; compatibility refers to how innovation is deemed to be in line with the existing one in terms of outlook, conviction, past experiences and requirements of potential adopters; complexity refers to how innovation is deemed to be hard to interpret or adopt; trialability refers to how users can experiment with the innovation themselves with the changed scale; observability refers to how well an innovation brings clear and visible benefits to the users (Rogers, 2003). These five attributes form a comprehensive attitude toward an innovation, and among them, relative advantage, compatibility and complexity are more important compared with the other two features (Kapoor et al., 2014). With greater benefits the user can perceive from adopting innovation, including economic incentives, the more positive the attitude is so that they are more willing to accept the innovation.

The second determinant is subjective norms which can be defined as concerns with the possibility that an important individual or group favour or disfavour of performing a particular

behaviour (Ajzen, 1991). It is the social pressure felt by an individual when he or she has to decide if a specific behaviour is worthy. Subjective norms come under the influence of normative beliefs and motivation to comply. Normative belief can be interpreted as an individual's expectation of a specific behaviour on the part of another person or organization and the motive to comply with such behaviours (ibid). This kind of pressure affects not only the attitude of an individual but also an organization toward adoption. Organizational adoption can be influenced by external variables, i.e. the environment and social network, and the supplier of the innovation (Frambach, Schillewaert, 2002). Adoption behaviour is affected by the business environment, in which network externalities and competitive pressures play an important role (ibid). A decision on adopting an innovation may be determined according to the number of business partners and competitive rivals within the market environment who have adopted (ibid). With persuasive communication, suppliers are able to provide the targeting adopters with a beneficial vision. Besides, a period time of trial or a lower introducing price can reduce the users' concerns about the risk of innovation adoption (ibid). Therefore, an attitude toward an innovation adoption may get changed by the social environment.

The last determinant is perceived behavioural control that is the degree to which an individual sees the trouble in committing a certain act. It mirrors how an individual perceives the resources and opportunities that could bring progress or obstruction to the execution of the act (ibid). The perceived behaviour is determined by the locus of control and self-efficacy. The former is to what extent individuals perceive their self-control when it comes to a given object, while the latter refers to the subject's performance of required work (Ajzen, 2002). In Rogers' Innovation Adoption Attributes (Rogers, 2003), there is an attribute complexity that hinders the adoption. In a case study of actual adoption and fulfilment of nurses when they employ an EPR conducted in Canada (Maillet et al., 2015), and another case study of nurses' adoption of technology carried out in Taiwan, China (Lee, 2004), despite the different research context, they conclude that when an innovation is adopted mandatorily, the perceived ease of use, can be seen as the opposite of complexity, has a greater effect on the intent of the user compared with the factor perceived usefulness. It also has a significant impact on compatibility. Although as the antecedent of the three key attributes, compatibility is fairly important toward adoption, users show less interest if the complexity is high (Kapoor et al., 2014).

This study uses TPB as the foundation to acquire insightful ideas on the adoption and acceptance of the FAIR Principles used in Chinese digital healthcare. Interviews will be conducted directly with medical staffs and patients to be better informed about their conviction under the framework of TPB. Furthermore, by reading the regulation and policies and in-house

documents of the hospital, we can perceive what policy context the FAIR Principles will face in China.

Chapter 3. Research Methodology

3.1 Research Approach

With the aim to better understand and answer the research questions, both literature review and interviews have been carried out. Literature is helpful to answer the policy questions and provide the contextual understanding. Interviews are useful for gaining the attitude and perception from the perspective of medical staffs and patients toward adoption or acceptance of The FAIR Principles applied in Chinese digital healthcare.

In this study, the independent variable is Findability, Accessibility, Interoperability and Reusability (FAIR), the dependent variable is adoption and acceptance, and the context is in China. This research intends to find the relationship between variables. According to the Planned Behavior Theory, this study considers Findability, Accessibility, Interoperability and Reusability affects the occurrence of adoption and acceptance behaviour through three aspects: 1. Attitude refers to whether medical staffs and patients consider the FAIR important for the data reuse in digital health; 2. Social norms. From the perspective of the family member, the peers and the experts in healthcare, if the FAIR Principles is important for the data to reuse in digital health and what is the social perception of health data sharing and reuse; 3. Perceived behavioural control. In today's policy requirements and hospital atmosphere, what are the factors that encourage and impede the adoption and acceptance of the FAIR Principles.

Overarching question: To what extent are the FAIR Principles adopted and accepted in Chinese digital healthcare from the perspectives of medical staffs and patients in China? The table below explaining the approach taken to answer research questions.

Table 2 Research Questions

Question ID	Data collection	Data analysis	Chapter	Comments
Q1. How is the FAIR Principles perceived by the medical staffs and their adoption possibility in digital healthcare?	Interview	Coding	5	
Q2. How is the FAIR Principles perceived by the patients and their acceptance possibility in digital healthcare?	Interview	Coding	5	
Q3. How is accessibility demonstrated in China's digital health arena?	In-house document	Literature review	4	The in-house document needs to be asked for approval.
Q4. How do China's policies and laws regulate data protection related to digital health?	Literature	Literature review	4	
Q5. How does the policy environment of digital health in China?	Literature	Literature review	4	

3.2 Research Design

This research adopts a case study to explore the qualitative data. After collected, the data goes through evaluation based on the Grounded theory (Glaser & Strauss, 1967) (see Figure 2 below). Then, the interviews are analyzed to examine the behaviours of adoption and acceptance on the part of medical staff and patients towards the FAIR Principles in digital health in China.

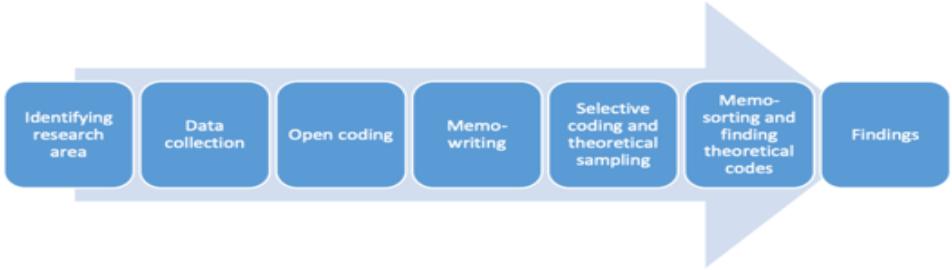

Figure 2 Grounded Theory Method

The Grounded theory (ibid) offers an inductive way for social studies for a better understanding of matters in their given social backdrop for qualitative data analysis. It generates findings and formulates theories from a systemic collection and analysis of data based on the recognition of patterns.

Scott (2009) states that when employing the Grounded theory for data analysis, the following aspects need to be included:

1. Identification of The Research Area

   The first step is to narrow down the research area for targeting the population for research.

2. Data Collection

   Data can be collected outside the substantive area but should be those obtained within the realms of the setting in the research.

3. Open Coding

   Open coding is conducted simultaneously with data collection for the purpose of offering guidance to the researcher over what kind of data is required.

4. Writing Memo

   This step is critical and goes beyond interpreting different categories and labels. For example, ties among different categories or labels can be recorded.

5. Selective Coding and Theoretical Sampling

   After open coding, selective coding needs to perform on primary and relevant categories. By doing so, the theory will develop and obtain in-depth understanding by collecting further data.

6. Sorting Memos and Identifying Theoretical Codes

   By sorting the memos, the data gap can be filled in so as to form the theoretical framework. The process is to identify the relationship and decide the location of the memo according to the underlying theory.

7. Writing the Theory

   Under the Grounded theory, the final step is to write about the theory. It can be presented in such visual forms as a table, flowchart to completely describe how each category is related to one another (ibid).

3.3 Research Setting

In China, officially, hospitals fall into three categories according to their level ratings. Level III hospitals are on the highest echelon, which are small in number but possess the largest amount of medical resources. Level II hospitals, on the other hand, are of medium size and level I hospitals are basically small, a good example of which is community hospitals and those township hospitals in rural areas. (Institute of Medical Informatics, 2010). In this case, choose a secondary or first-level general hospital that implements digital medical technology and has a complete hospital discipline to represent a realistic average medical level in China. Beijing, as a representative city in the regional collaborative medical service project, has gained strong support from diverse institutions, business, universities and government departments at any levels. (Institute of Medical Informatics, 2010). Therefore, this paper selects the Level II general hospital in Miyun District of Beijing as the object of our research.

The Miyun District Hospital has incorporated medical services, education, research and rehabilitation, and preventive health care, with comprehensive disciplines and coordinated development. It implements computer network management, and the hospital digitalization is at the forefront of the same level hospitals.

3.4 Target Population

There are different systems within the hospital, including inpatient systems, outpatient systems. Therefore, the research participants in this paper are involved in the outpatient, inpatient departments. The choice of medical staff and patients is guaranteed to be random.

3.5 Sample Selection

The random sampling method is conducted in this research for medical staffs and patients. Thirty interviewees, half of the medical staffs and half of the patients, are picked up from six departments in the outpatient and inpatient system. By choosing this method, insights are expected to be obtained from the hospital at multiple levels.

Table 3 and Table 4 show the characteristics of the respondents' demography.

Table 3 Medical Staffs' Demographic Characteristics

Respondent ID	Gender	Age	Educational Level	Occupation
1	Male	33	Master's degree	Attending Neurological surgeon
2	Male	37	Master's degree	Attending Urologist
3	Male	40	Master's degree	Attending Urologist
4	Male	50	Collage degree	Deputy Chief Physician
5	Male	50	Collage degree	Chief Physician
6	Male	50	Bachelor's degree	Director of Thoracic Surgery
7	Male	55	Bachelor's degree	Director of the Neurosurgery
8	Female	24	Secondary school education	Neurosurgery nurse
9	Female	22	Collage degree	Orthopaedic nurse
10	Female	24	Collage degree	Orthopaedic nurse
11	Female	26	Master's degree	Cardiology Resident
12	Female	31	Bachelor's Degree	Neurosurgery nurse
13	Female	31	Master's degree	Thoracic Surgery Resident
14	Female	37	Bachelor's degree	Orthopaedic nurse
15	Female	52	Collage degree	Physiotherapist

Table 4 Patients' Demographic Characteristics

Respondent ID	Gender	Age	Educational Level	Occupation
1	Male	26	Master's degree	Student
2	Male	51	Junior high school education	Driver
3	Male	55	High school graduation	Nursing home staff
4	Male	79	Primary school graduation	Retired police
5	Male	58	Collage degree	Corporate management personnel
6	Male	52	Bachelor's degree	Government officer
7	Female	24	Master's degree	Student
8	Female	26	Master's degree	Product operations officer
9	Female	47	Junior high school graduation	Farmer
10	Female	50	High school graduation	Farmer
11	Female	51	High school graduation	Worker
12	Female	44	Collage degree	Sale
13	Female	50	Collage degree	Retired government officer
14	Female	52	Collage degree	Junior high school teacher
15	Female	45	Bachelor's degree	High school teacher

3.6 Literature Review

For the sake of a better understanding of the previous research on accessibility in digital healthcare about sensitive data and policy related to data protection and of the context for the research, it is of necessity to conduct a literature review. Systematic method and snowballing approach are adopted in retrieving literature, including primary research articles like regulations issued by the government, in-house documents provided by research respondents. Digital tools, including Leiden University Catalogue, Google Scholar, and Baidu browser, are also employed. This paper has also screened the representative publications related to the theory in question for detailed review and analysis. The following keywords are employed for the review:

- electronic sensitive data
- digital sensitive data

- digital healthcare
- e-health
- mHealth
- telemedicine
- digital health policy in China
- e-health policy in China

3.7 Semi-structured Interviews

For the part of the semi-structured interview, priority is given to the core questions. However, meanwhile, the interviewer would pay attention to building on the interesting elements for eliciting more insights in the course of the interviews. All the interviews are carried face to face which allows the interviewer to have the vantage point of detecting less direct signals from the interviewees, including their body language, intonation and stress, so as not to miss out on any critical information (Opdenakker, 2006). The language used in the interview is Chinese, and the presented English version is based on the translation.

Before the interview officially starts, the respondent is presented with a statement as follows:

> "Your participation in the interview is highly appreciated. I am Mingyue Huo, a student majoring in ICT in Business, Leiden University, the Netherlands. This interview is used in my master's thesis.
>
> The general objective of this research is to find out what is the role of the FAIR Principles in digital health adoption and acceptance process for medical staffs and patients in China. This interview and related analyses are of great help to form a better understanding of how the medical staffs and patients view the relation between FAIR and digital health adoption and acceptance.
>
> This interview is conducted in the case of voluntary participation. During the interview, if you feel uncomfortable, you are free to refuse or stop at any moment. The whole process is treated anonymously, and the content will be recorded. The recording is only for transcription; after it is completed, the recording will be destroyed. This interview and transcription will remain confidential. All the findings will also be sent to respondents as needed. "

All the questions fall into a total of five categories in line with the Theory of Planned Behaviour (Ajzen, 1991) and are represented by the five different colours.

General questions

Attitude-related questions

Subjective Norm-related questions

Perceived Control Behavior-related questions

Intention-related questions

Figure 3 Colour Codes

Table 5 Medical Staffs' Interview Questions

No.	Questions
1	Do you give consent to my recording of the interview for analyzing the content? (For respondents who refuse to give consent, the interviewer would take notes instead)
2	Could you please introduce yourself briefly?
3	Could you talk about your daily work routine?
4	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used.
5	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision-maker in this process?
6	When the hospital chooses to use these digital health innovations, what characteristics do you think to play the important roles in the final decision?
7	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
8	Even for those mandatory adoptions, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
9	Do you think that digital data help improve health care?
10	Does your family think that digital health is good for health care?
11	Do your friends think that digital data will help improve the care provided in the clinic?
12	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?
13	Do you think that data use and data analytics for health could be improved and would that be good?
14	how is access authorization of doctors arranged in the hospital, who is responsible for assigning access?
15	Can patients access their personal health data?

No.	Questions
16	Who, do you think, outside the hospital can access and use the data?
17	Are you concerned about data privacy?
18	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?
19	Do health professionals promote the use of digital tools in health care?
20	Do you feel safe when you use digital health tools?
21	Is the use of digital data an important criterium for you to select a health clinic for work?
22	Are you willing to work in another clinic, if that clinic used more digital data tools?
23	Are you willing to work in another clinic where they are using traditional health methods without digital tools?
24	Are there any other comments or information you would like to mention related to this study?
25	Would you consent to a follow-up question? If you do, please leave your mobile number or other contact means for keeping in touch?

Table 6 Patients' Interview Questions

No.	Questions
1	Do you give consent to my recording of the interview for analyzing the content? (For respondents who refuse to give consent, the interviewer would take notes instead)
2	Could you please introduce yourself briefly?
3	Did you use any digital health when you need healthcare?
4	Do you think that digital data help improve health care?
5	When you choose to use these digital health innovations, what characteristics do you use to make the final decision?
6	Does your family think that digital health is good for health care?
7	Do your friends think that digital data will help improve the care provided in the clinic?
8	Do your doctors think that they can give better care if they work with digital data and can access your health data?
9	Do you think that data use and data analytics for health could be improved and would that be good?
10	Are you informed that how is access authorization of doctors arranged in the hospital and who is responsible for assigning access?
11	Can you access your own personal health data?
12	Are you concerned about data privacy?
13	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?
14	Do you feel safe when you use digital health tools?
15	Is the use of digital data an important criterium for you to select a health clinic for treatment?
16	Are you willing to go to another clinic, if that clinic used more digital data tools?
17	Are you willing to go to another clinic where they are using traditional health methods without digital tools?
18	Are there any other comments or information you would like to mention related to this study?
19	Would you consent to a follow-up question? If you do, please leave your mobile number or other contact means for keeping in touch?

Chapter 4. Literature Review

This chapter studies the Chinese policy environment that needs to be faced when adopting and accepting The FAIR Principles. It describes the existing policy background from four aspects, namely: Internet plus Health Care policy; laws and regulations related to data security protection; medical laws and regulations related to patient information protection and existing rules of accessibility in hospital information construction. One of the major challenges in the implementation of The FAIR Principles is how to adapt to the local policy and culture. This chapter summarizes the challenges and opportunities for the adoption and acceptance of The FAIR Principles in the context of China.

4.1 Internet plus Health Care policy

By improving the level of equalization and convenience of public services, accelerating the construction of health care consortia and developing "Internet plus Health Care" policy, so that people can enjoy high-quality medical services at their doorsteps, the National Health Commission and relevant departments have drafted the Opinions of the General Office of the State Council on Promoting the Development of “Internet plus Health Care”[3].

The series of policy measures clarified a clear attitude to support the development of "Internet plus health care", the key areas and support systems for integrated development and also outlined supervision and bottom line. The promulgation of policies is conducive to deepening the “decentralization of service” and structural reforms on the supply side, alleviating the imbalances in the service levels in medicine and health, meeting the increasingly diverse needs put forward by people at different levels[3].

The specific requirements related to the FAIR Principles are as follows:

1) Refining the Internet plus Health Care Service System.
    a) Developing Internet plus Health Care Services.
        i) Medical institutions are encouraged to utilize the Internet and other information technologies to expand the space and content of medical services and build an online and offline integrated medical service model that covers the whole process of health care, where they can provide an online review of some common and chronic diseases, and doctors are allowed to prescribe common and chronic diseases after grasping the patient's medical records. Medical institutions and licensed third-party

[3] http://www.gov.cn/zhengce/2018-04/28/content_5286786.htm

companies are supported to develop Internet information platforms, where provide health services such as telemedicine, health consultation, and health management, and promote the effective information exchange among hospitals, medical personnel, and patients[4].

ii) The medical consortia should actively use Internet technology to realize medical resources connection, information exchange and business collaboration from bottom to top, and facilitate the development of diagnosis and treatment appointment, two-way referrals, and telemedicine services, and enhance the norm of "primary check-up and higher-level diagnosis," and refine the pattern of hierarchical diagnosis and treatment. The higher-level medical institutions are encouraged to provide services, such as remote consultation, remote electrocardiograph diagnosis, remote imaging diagnosis and other services aimed to the primary level clinics with the help of artificial intelligence and other technical methods. Medical institutions are encouraged to promote real-time access to, mutual recognition, and sharing of examination and diagnostic analysis results[4].

b) Innovating Internet plus Public Health Services.

The online access to and authorized usage of the electronic medical records of residents should be boosted. Medical institutions are encouraged to collaborate with Internet corporations to strengthen the integration of regional health information resources and explore the use of big data technology analysis methods on crowd flow and climate change to predict and monitor the epidemic diseases trends and infectious diseases and other diseases to enhance the capabilities to prevent and control major diseases and tackle outbreaks of public health events[4].

c) Strengthening Internet plus Medical Education and Science Dissemination Services.

The establishment of health education and training cloud platforms should be encouraged to provide diverse online medical courses and medical education. With the help of the Internet, online science education platforms should be created to provide authentic education on health science in order to advocate a healthful lifestyle and boost residents' capability of self-management of health and awareness of health[4].

[4] http://www.gov.cn/zhengce/content/2018-04/28/content_5286645.htm

d) Forwarding Internet plus Artificial Intelligence Application Services.

Based on artificial intelligence technology, a decision-making support system for clinical diagnosis and treatment should be researched and developed. Traditional Chinese medicine should be supported by the intelligence assistance system for syndrome identification and treatment to enhance the primary-level ability of traditional Chinese medicine diagnosis and treatment services. The integration, sharing, and use of clinical and scientific research data should be strengthened[4].

2) Improving the Support Systems for Internet Plus Health Care.

a) Accelerating the Achievement of Sharing of Health Care Information.

i) All regions and relevant departments should coordinate and promote the construction of a unified, authorized and interconnected national health information platform, and gradually realize the connection with the National Data Sharing and Exchange Platform, and strengthen the collection of population, public health, medical services, health insurance, drug supply and comprehensive management, and unlock data sharing channel among departments, regions, and industries, so as to enhance the sharing and application of health information of all the people[4].

ii) The construction of basic resources information databases should be accelerated, and databases such as the whole population, electronic health archives, electronic medical records should be refined. The application of information technologies in medical institutions should be vigorously improved, and the functions of hospital information platforms should be improved, and various in-house system resources should be integrated, so as to raise the efficiency of hospital management[4].

iii) Based on the Internet and big data technology, the hierarchical diagnosis and treatment information system should be refined, and hospitals at all levels should be promoted in gradually realizing the sharing and the authorized use of electronic medical records, diagnostic analysis and examination results among various institutions[4].

b) Refining the Internet plus Health Care Standard System.

i) The consolidated and standardized National Medical Data Resource Catalog and the standard system should be improved. The standard management of "Internet plus health care" should be strengthened, other basic standards such as medical services, data security, personal information protection, information sharing should be developed, and standardize writing rules for the frontpage of medical records, disease classifications and codes, operative procedures classifications and codes, and medical terminology should be comprehensive promoted[4].

ii) The application of national hospital information construction standards and specializations should be accelerated. The promotion and application of functional guidelines and data standards for the province-coordinated regional platforms and hospital information platforms, and data interfaces should be unified, so as to provide support for information exchange and sharing[4].

c) Improving the Capability of the Infrastructure of Heath Care Institutions.

The construction of the medical service system should be promoted, and the standardization and the capability of the basic equipment of primary-level medical institutions should be guaranteed. Priority should be given to making high-speed broadband networks available at the medical institutions of all levels in downtown and rustic areas, the construction of pilot program of inclusive telecommunications services should be carried out in-depth, and the extension of fiber-optic broadband networks to rural medical institutions should be boosted[4].

3) Tightening Industry Regulation and Safety Guarantees.

a) Tightening the Regulation of Health Care Quality.

Administrative measures to govern Internet diagnosis and treatment should be issued to interpret the bottom line of regulation. In order to guarantee the quality and safety of health services, the access standards for relevant access should be improved, and access restrictions should be minimized, interim and ex-post regulation should be tightened. The establishment of an online credibility system should be achieved, and the building of information systems recording health care personnel and health care institutions credible medical digital identities, electronic real-name verification, and data access control with unified signs across the country should be accelerated,

regulatory mechanisms and regulatory capabilities should be enhanced. A health care responsibility division mechanism with online notice and consent should be established so as to prevent and resolve health care risks[4]

b) Defending Data and Information Security.

i) Laws and regulations on health care related to big data on right recognition, openness, circulation, trading, and property rights protection should be developed. The provisions of information security and health data confidentiality should be strictly implemented. The construction of an information protection regime for information privacy should be established and improved. The management of patient information, user data, and genetic data, among others, should be stringently implemented, and illegally trading and disclosing information should be punished in accordance with the laws and regulations[4].

ii) The information protection of medical institutions, Internet health service platforms, smart health devices, key information infrastructure, and data application services should be strengthened, and the investigating, monitoring and advance warning of hidden information security risks should be regularly conducted. Patient information and other sensitive data should be stored in the territory of China, and if outbound supply is necessary, safety assessment should be conducted in accordance with relevant regulations[4].

4.2 Digital law or regulation about information security in China

4.2.1 Cyber Security Law of the People's Republic of China

In order to guarantee cyber security, protect the sovereignty on cyberspace, safeguard security at the national, social and public level, safeguard the citizens' legitimate rights and interests, as well as those of the legal persons and organizations for the sake of sound growth of economic and social digitalization, "Cyber Security Law of the People's Republic of China" was passed at the 24th Standing Committee of the 12th National People's Congress. This law, for the first time, provides comprehensive and systematic stipulations on protecting personal information and upgrading individuals' right of control over their privacy[5].

[5] http://www.cac.gov.cn/2016-11/07/c_1119867116.htm

It defines "network data" and "personal information" respectively. "network data" can be used to mean electronic data of all sorts that are sourced from, recorded, spread and processed on the network; "personal information" includes information of all sorts as long as it reveals or contributes to the identification of the personal identity of a natural person, such as name, birth date, identification number, biometric information, personal address, mobile number, to name just a few[5]. This Law is applicable for constructing, operating, maintaining and using the network, as well as when cyber security is supervised and administered within bounds the People's Republic of China.

The Cyber Security Law clarifies the legal responsibilities of the subjects concerning personal privacy protection:

1. When collecting and utilizing personal information, network operators are required to abide by related principles. The act should be lawful, legitimate and made out of necessary needs. There must be a clear purpose, and consent must be acquired before committing the act. Besides, the involved party or parties' information must be protected and kept as confidential information, subject to the leak reporting systems[5].
2. When it comes to operators who are responsible for the information infrastructure, they should save the citizens' information domestically, and if there is the need to disclose such information to an overseas party, correspondent security assessment requires to be conducted in advance. Online service and product providers are supposed to gain users' informed consent before collecting their personal information while complying with the related laws and regulations for protecting citizens' personal information[5].
3. Measures of punishment need to be clarified and practiced on offenders of citizens' personal information[5].

4.2.2 Information Technology – Personal Information Security Specification

As information technology continues to develop with great momentum and Internet applications grow increasingly popular, a mounting number of organizations now collect and use personal information in wider areas, which brings convenience to people's lives. At the same time, there have also been more cases in which information is illegally collected, abused and even leaked for commercial purposes. This has put personal information and interest under grave risks. Therefore, the National Information Security Standardization Technical

Committee organized and centrally managed the national standard GB/T 35273-2017 Information Security Technology Personal Information Security Specification[6].

This specification is applicable to the regulation of personal information processing activities of various organizations, and the supervision, administration and evaluation of activities concerning the processing of personal information by organizations such as supervisory authorities and third-party review agencies. It regulates the principles and security requirements that should be followed for collecting, storing, using, publicizing, transmitting and disclosing personal information[6].

Personal information is defined as a variety of electronic information on Cloud, used to determine the identity information or refer to the activities of a specific natural person, in addition to other information[6]. When it comes to sensitive personal information, it is basic information whose leakage, illegal use or transmission would cause harm to the individual and the property, including but not limited to damaged personal reputation, health problems in body or mind or victim of discrimination[6].

There are the following provisions on the rights of personal information, that is, the natural person identified by personal information:

1. Informed Consent.

   Under legal circumstances, consent of the personal information's subject must be obtained before the controller collects the personal information. There are two types of consent: authorized consent and express consent. When collecting general personal information, the controller only needs to obtain authorized consent, that is, when collecting personally sensitive information, the controller needs to obtain express consent, which means that the words "I agree" are clearly written for users to click or drag[6].

2. Restriction on The Use of Personal Information.

   The personal information subject has the right to limit the scope of personal information controller's use of personal information[6].

3. Personal Information Access.

   The subject of the personal information not only has the right to access all personal information or types held by the personal information controller about the subject but also can access the source of the above personal information, the purpose used and the identity or type of the third party who has obtained the above personal information[6].

[6] https://www.tc260.org.cn/upload/2018-01-24/1516799764389090333.pdf

4. Personal Information Rectification.

   The personal information subject may request the personal information controller to correct the wrong or incomplete personal information held by the subject[6].

5. Personal Information Deletion.

   When the personal information controller violates the law or the previous agreement, the personal information subject is legally allowed to demand the deletion of the information. If the information has been shared, transferred or publicly disclosed, the party taking the personal information in custody should request the third party to delete the relevant information in a timely manner[6].

6. Withdrawal of Consent.

   The personal information subject has the right to withdraw the previous authorized or express consent[6].

7. Account Cancellation.

   The personal information subject is legally allowed to cancel their registered accounts, and the personal information controller should delete or anonymize their personal information after cancellation[6].

8. Obtaining Copies of Personal Information.

   For basic personal information, identity information, health information, and education information, the personal information subject is legally allowed to request the personal information controller to offer a copy or directly transmit it to a third party[6].

4.3 Health law or clinic regulation mentions about personal information protection

The current laws and regulations governing and protecting personal information in the health care field are relatively fragmented, not systematic and comprehensive, and mainly aimed at traditional health care scenarios. Innovative participants, such as mobile medical service providers, health care data storage and platforms operator, in the health care field, cannot be fully included. The applicable scope is still mainly for the information in the hospital, and the ownership of health information cannot be clearly defined, and patients are restricted from obtaining personal health information.

The summary of the legal documents and relevant provisions on personal health information protection are listed and showed in Table 7:

Table 7 List of Health Law or Clinic Regulation Related to Personal Information Protection

ID	Name	Content	Effective Region
1	Measures for the Administration of Population Health Information (for Trial Implementation)[7]	• It defines population health information as basic information related to the population, their health conditions and medical history originating in the service and administration process of medical, health and family planning service agencies at various levels in line with the related regulations stipulated by the government and their functions and duties[7]. • Medical, health and family planning service agencies (including institutions of traditional Chinese medicine, here and below) at different levels should be held accountable for collecting, using, administering and leakage prevention of the population's health-related information and they are entities in charge of the administration of population health information[7].	National
2	Law on Practicing Doctors of the People's Republic of China[8]	Doctors should protect the privacy of patients during their practice activities, and disclosure of patients' privacy will result in administrative penalties and even criminal penalties[8].	National

[7] http://www.cac.gov.cn/2014-08/20/c_1112064075.htm.
[8] http://www.gov.cn/banshi/2005-08/01/content_18970.htm.

ID	Name	Content	Effective Region
3	Nurses Regulation[9]	Nurses should take care of patients and protect their privacy. Those who disclose their privacy will be subject to administrative penalties, including revocation of practice certificates[9].	National
4	Provisions on the Administration of Medical Records in Medical Institutions[10]	• It clearly prescribes the obligation on the part of health care organizations and staff in protecting their patients' private information and prohibiting the disclosure of patient medical records for non-medical, teaching, and research purposes[10]. • It also stipulates the storage and preservation of medical records and the borrowing and copying of medical records, including medical institutions should strictly manage medical records, no one can alter medical records at will, and no one can either engage in activities of forging, concealing, destroying, snatching or stealing medical documents; the inpatient medical documents are taken custody by the responsible health care organization. After the patient is discharged from the hospital, the inpatient medical records are kept and managed by the medical record management department or full-time (part-time) personnel, the	National

[9] http://www.gov.cn/zwgk/2008-02/04/content_882178.htm.

[10] http://www.nhc.gov.cn/yzygj/s3593/201312/a84f3666d1be49f7a959d7912a978db7.shtml.

ID	Name	Content	Effective Region
		patient must not take the inpatient medical records; except for specific personnel and departments, no other organization or individual can check the patients' health records unless authorized; patients or his entrusted agent, the legal heir of the deceased patient, or his agent have the right to apply for copying or reviewing the medical records, and the application materials should be reviewed when accepting applications for copying medical records[10].	
5	the Basic Norms for Electronic Medical Records (for Trial Implementation)[11]	• Set a confidentiality level for electronic medical records; implement hierarchical authorization management of operators; set user access control based on corresponding confidentiality levels according to the authorization; when authorized user accessing the electronic medical history, the data whose security level runs higher than the authorized range of the applicant will be concealed automatically[11]. • When medical personnel need to view electronic medical records of patients who are not directly related to work, a warning to them to use electronic medical records of patients in accordance with regulations[11].	National

[11] https://www.51mch.com/uploadfiles/2016/11/201611150959115911.pdf.

ID	Name	Content	Effective Region
6	The Regulation on the Handling of Medical Accidents[12]	Patients have the right of photocopying or reproducing their outpatient care records, hospital admission history, previously taken temperature data, medical advice, test records (testing reports), medical imaging test results, letters of consent to certain special tests and operations, records of past medical operations and anaesthesia, pathological tests, nursing care, in addition to other relevant documents and information legally sourced from the health-governing administrative department under the State Council[12].	National

4.4 National Hospital Information Construction Standards and Norms (Trial)

In order to promote and standardize the construction of hospital informatization across the country, and to clarify the basic content and construction requirements of hospital informatization, the Planning and Information Department of the National Health and Health Commission organized relevant domestic units to study and formulate the National Hospital Information Construction Standards and Norms (Trial)[13] .

This specification stipulates clear regulations on accessibility in hospitals:

1. Data Center Identity Authentication System

   1.1 Identity Management

   i) Obtain functions of single sign-on, user identity information management, user management rule base, user access permission setting, permission rule base, user and permission adaptation management, system audit, and permission acquisition via the third-party application system interface[13].

   ii) Realizes authentication of multi-service systems and supports authentication methods such as digital certificates, dynamic passwords, static passwords, Windows domain authentication, passcode authentication, fingerprint authentication, and face recognition[13].

[12] http://www.gov.cn/banshi/2005-08/02/content_19167.htm.

[13] http://www.nhc.gov.cn/ewebeditor/uploadfile/2018/04/20180413162542120.pdf

iii) Level II hospitals need to have 5 functions and support two authentication methods. Level III hospitals need to have 6 functions and support 4 authentication methods[13].

1.2 User Authentication

i) Support controlled passwords or other mechanisms with corresponding security strength for user identity authentication and protect confidentiality and integrity of authentication data[13].

ii) Support two or more combined mechanisms for user identity authentication and protect confidentiality and integrity of authentication data[13].

iii) Level II hospitals and Level III hospitals need to fulfill all the requirements.[13]

2. Data Center Access Control System

2.1 Internet Behaviour Management.

i) Obtain functions of internet personnel management, internet browsing management, internet outgoing management, internet application management, internet traffic management, internet behaviour analysis, internet privacy protection, and risk concentration alarm[13].

ii) Support Internet/person identification management methods such as IP/MAC identification method, username/password authentication method, joint single sign-on method with existing authentication system[13].

iii) Support keyword identification, recording, blocking and other operations on the outgoing content of mainstream instant messaging software[13].

iv) Level II hospitals need to have 5 functions, support 2 identity management methods and 2 operations for outgoing content management. Level III hospitals need to have 6 functions, support 2 identity management methods and 3 operations for outgoing content management.[13]

4.5 Conclusion

Overall, China's current policy environment is conducive to the implementation of the FAIR Principles. The Internet plus medical policy coincides with it, emphasizing that the sharing and reusing of health data within hierarchical medical institutions to boost the performance and quality of medical services. By establishing infrastructure, refining standard systems, and improving safety supervision to assure that health data can be safely and effectively reused in

medical institutions of different levels, and maximize the role of data. In China, the legal provisions related to information security are mainly scattered in the Cyber Security Law and other laws. Compared with foreign legal provisions, the provisions of the terms are slightly rough. The laws and regulations governing personal privacy protection in the health care field are relatively fragmented, not systematic, comprehensive, and mainly aimed at traditional health care scenarios. However, it is still required to ensure the security of information privacy when using health data.

Chapter 5. Result and Finding

The study aims to facilitate a better understanding of the intention of adoption and acceptance of the FAIR Principles in the context of the digital healthcare system in China from the perspective of medical staffs and patients. The research was conducted under the instruction of the Theory of Planned Behavior; thus, this chapter would demonstrate the results of the research under the four dimensions of the theory of Planned Behavior which are, respectively, attitude, social norms, perceived behavioural control and intention.

5.1 Attitude

It formed attitude of the medical staffs and patients from four constructions which are, namely, Findability, Accessibility, Interoperability and Reusability.

5.1.1 Medical Staffs

This chapter analyzed the medical staffs' attitude to FAIR Principles from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn an attitude towards its overall rules.

Findability

Existing hospital data sharing methods are being employed based on Findability. The personal privacy of the patient, such as name, gender, date of birth, address and etc., is stored in a searchable database in local and regional health information database, in which the ID number or the inpatient number regards as the unique and persistent identifier. Most medical staffs, regardless of demographic factors, expressed a preference for Findability. Because through the method of "*the patient register*", medical staffs can "*check the patient's previous medical records*", which allowed them to have a more comprehensive understanding of the patient's situation. However, three medical staffs expressed their concerns about this. Both medical staff and patients mentioned anonymous processing in the process of health data sharing and data reuse. *"However, unless the patient consents, private information should be properly processed, such as anonymous processing and cannot be traced directly to the individual from the existing information,"* a resident in thoracic surgery department said. (Medical staff 13, face-to-face interview, Beijing, 11 November 2019, female, between 30 to 40 years old, high educational level). Medical staffs who had concerns about Findability were characterized by young age (between 30 to 40 years old) and high education. Except being used for personal

treatment, health information cannot be used to determine the personal identity of a person, and it cannot be used with other information without previous consent. An attending surgeon of urology department said, *"Current insurance card is bonded with too much significant personal information, for example, the ID number that is pointed to a specific person, which is quite insecure."* (Medical staff 2, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). This can be seen as an aversion to Findability because Findability requires data to be accompanied by a relatively large amount of metadata for description. Here it can be seen as the use of more descriptive words such as ID number, sex, age, home address, mobile number and other personal information, which is what respondents are worried about.

Accessibility

The interviewees gave rich comments on Accessibility, and the majority of them are supporters. Medical staff who are conscious of information security protection understood the importance of accessibility. This group of people had the characteristics of young age (younger than 40 years old), and for very few older medical staffs, they held important positions in the department in intermediate educational level. The director of neurosurgery department said, *"What needs to be considered is the establishment of more rigorous and effective regulatory systems and access procedures at the national level."* (Medical staff 7, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, high educational level). A nurse in the neurosurgery department proposed, *"I think this trend (wide data sharing in healthcare) is beneficial. But at the same time, we need to set data access authentication more strictly and set authorization categories more clearly."* (Medical staff 12, face-to-face interview, Beijing, 21 October 2019, female, between 30 to 40 years old, high educational level). They mentioned that for sensitive data such as health data, concerned authorities should establish clear and strict rules and regulations, and hospitals should establish effective access control models and adopt appropriate graded authorization and authentication systems. What's more, another nurse in the neurosurgery department said, *"Paper information I think it's easier to leak privacy, because outsiders can read the paper information while the doctor is not in the duty room."* (Medical staff 8, face-to-face interview, Beijing, 21 October 2019, female, 30 years old and below, low educational level). Medical staffs mentioned that traditional health methods are more likely to face the problem of information leakage due to improper data processing or backward authentication. They also mentioned that as medical staffs, in addition to worrying about the privacy of patients, they also worried that the leakage of health data. An attending surgeon of

urology department explained, *"The medical cure and nursing process relies on the objective results of the diagnosis and the subjective reasoning of the doctor. A patient's healing process is likely to go through different stages of reasoning. The reasoning and treatment directions at the beginning and the final diagnosis and treatment methods are likely to be inconsistent. When it comes to medical disputes, it is very harmful to the doctor."* (Medical staff 3, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). Especially for young doctors, they were more afraid of the leakage of cases, because it would hurt their reputation.

However, during the interview, many disadvantages also emerged. Due to misunderstanding toward health data, they believed that *"I do not think the health data is valuable to others except the patients themselves."* Thanks to a lack of awareness of information security, such arguments were heard most often *"Once an innovation is introduced, the problems mentioned must be solved; otherwise, the innovation cannot be used for clinical treatment"* and *"As I mentioned before, the risk brought by it should be considered and solved by specialized institutions, not medical staffs."* Although older doctors (older than 40 years old) were more prone to misunderstandings, the appearance of stereotypes can exist in almost all age groups and in other groups of demographic factors. *"I'm worried. Because I don't know who will use the data and where they use to,"* a nurse in the neurosurgery department said. (Medical staff 12, face-to-face interview, Beijing, 21 October 2019, female, between 30 to 40 years old, high educational level). Medical staff also expressed concern about the authorization assignments. Because health data is sensitive and accompanied by a lot of personal information, the assignment of access authorization is crucial for data protection. Therefore, there must be careful and clear regulations guiding on the assignment.

Interoperability

Although there were few responses to Interoperability, only one medical staff expressed disgust, and the rest were all approvers. Due to the lack of shared standardization among hospitals, the effectiveness and efficiency of digital health are impeded especially for referral and emergency condition. Therefore, doctors called for strengthening the standardization among hospitals to reduce the waste of resources and time brought by repeated tests. A resident in cardiology department explained, *"Because right now, the different hospital has its own standard. As a result, medical staffs cannot understand the test reports of referral patients from other clinics. So, I think standardization should be established."* (Medical staff 11, face-to-face interview, Beijing, 11 November 2019, female, 30 years old and below, high educational level). However,

a attending surgeon in neurosurgery department worried that standardization could bring about a lack of flexibility in benchmark and said, *"The current data is not only numerical data but also gives some diagnostic suggestions. We will refer to such data but do not necessarily believe it completely, because sometimes it is possible that there is a slight discrepancy, and there is actually no problem."* (Medical staff 1, face-to-face interview, Beijing, 21 October 2019, male, between 30 to 40 years old, high educational level). Medical personnel who thought about interoperability were young and highly educated, and all have the experience of further education in advanced hospitals.

Reusability

Reusability received the most responses and rave reviews from respondents no matter with the demographic factors. They believed that reusability improved the efficiency and accuracy of treatment. A nurse in the orthopaedics department said, *"I think it has improved. Because many patients and their families do not know their condition well, they cannot provide comprehensive and accurate information. And traditional cases are not conducive to preservation, and it is easy to lose or damage. Therefore, digital data can effectively solve the problem of preserving traditional cases and provide comprehensive information to our medical staff to better understand the situation of patients and make a more accurate diagnosis."* (Medical staff 10, face-to-face interview, Beijing, 25 October 2019, female, 30 years old and below, intermediate educational level). What's more, "*I think this is very helpful for inter-provincial medical treatment. In the future, the mobility of the population will be greater. With such a system, the medical problems of non-local personnel can be solved"* a chief physician in Traditional Chinese Medicine department said, *"It can facilitate the communication between hospitals in different levels so as to alleviate the problems of unbalanced resources. And it is time-saving for patients when there needs a referral because they don't have to do the repeat testing. A comprehensive understanding can be obtained by medical records sharing."* (Medical staff 5, face-to-face interview, Beijing, 4 November 2019, male, 50 years old and above, intermediate educational level). The improvement of data integrity gave doctors the ability to draw on past health data to get a comprehensive understanding of the condition, which reduced the unnecessary duplicate test and made the referral, emergency and non-local patients profitable and helped cross-regional medical care, so as to alleviate the problem of imbalances in the medical resources allocation and information discrepancy. Apart from reducing human error and improving the accuracy of lesion detection, it can also ensure that the treatment process is controlled. The medical staff also mentioned that reusability brings perceived convenience to

their daily work and diagnosis and treatment. The chief also brought forward that *"With the use of the big data technology, it could help to solve demographic health problems, which needs enormous numbers of samples to be tested and researched."* (Medical staff 5, face-to-face interview, Beijing, 4 November 2019, male, 50 years old and above, intermediate educational level). They believed that data reuse provided a basic guarantee for the realization of regional medical treatment.

However, due to the low level of digitization in the subject hospital, *"Current data use and analysis method in our hospital are rough and ready in comparison with the advanced hospitals in downtown,"* a attending surgeon of urology department said, *"We don't have a lot of advanced assistant tools compared with advanced hospitals. Therefore, the effects of digital data are not fully realized."* (Medical staff 3, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). Some doctors indicated that the effectiveness of reusability was not so obvious. In Chinese hospitals, the traditional Chinese medicine department is an indispensable department. For medical personnel engaged in traditional Chinese medicine, the help was not sizable. The concern about the actual use of data reuse occurred frequently. *"I'm worried. Because I don't know who will use the data and where they use to,"* a nurse in the neurosurgery department said. (Medical staff 12, face-to-face interview, Beijing, 21 October 2019, female, between 30 to 40 years old, high educational level). Although the health data reuse was proposed to improve the accuracy and efficiency of treatment and to facilitate both the doctor and the patient, it was unclear whether the original intention can be achieved during actual implementation. Medical personnel were concerned about whether the data reuse can be in line with its authentic purpose without misuse.

Conclusion of Medical Staffs' Attitude

Medical staffs generally had a positive attitude towards the FAIR Principles, and they were particularly interested in the benefits that find and reuse of health data can bring. Young medical staffs had a more comprehensive understanding of health data protection, which also caused them to know more about accessibility than other demographic groups. Among them, young and highly educated medical personnel had a more comprehensive understanding of the standardization of regional medical institutions, which caused them to know more about Interoperability. Conversely, older medical staff had misunderstandings about the protection of health data, and those with a high position and a moderate education can reduce the impact of older age on this. But the stereotype of accessibility that once an innovation is adopted, it is

secure and safe to use will surely appear among all groups of medical personnel regardless of demographic factors.

5.1.2 Patients

This chapter analyzed the patients' attitude to FAIR Principles from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn an attitude towards its overall rules.

Findability

This term was rarely mentioned by the patients. But from their positive attitude towards data reuse, it can be seen that they agree with the way of registering patient information and storing personal health data in a searchable shared database. There was a government officer who showed his affection with it, *"For patients, we can check our health data in real-time, which gives us a sense of control."* (Patient 6, face-to-face interview, Beijing, 6 November 2019, male, 50 years old and above, high educational level). By searching for personal health data, he can gain a sense of control. However, they still had concerns about storing too much personal information such as ID number, sex, age, home address, mobile number and other personal information besides. Besides, they also worried about the use of ID number as the identifier, since the ID number is unique and bonded with other significant personal information, for instance, the bank account. A student said, *"The medical insurance card is bonded with too much personal information. Our ID number is used as the one and only identification code. If it is leaked, the consequence is unimaginable."* (Patient 1, face-to-face interview, Beijing, 4 November 2019, male, 30 years old and below, high educational level). This concern existed in different age groups and genders, and two other female patients (one 26-year-old and the other 52-year-old) also expressed the same concern. Their common feature was that their education was not low.

Accessibility

The term obtained rich comments, and the majority of them were positive. On the one hand, patients, without obvious demographic factors, who were aware of information security protection, understood the importance of accessibility. *"In the future, with wide data sharing, there must establish a rigorous data protection system ahead,"* and, *"I think data sharing is beneficial. But what data can be shared and what data cannot be shared, there need to be clear*

criteria for this classification." Responses like these came up several times during the process of interviews. They believed that concerned authorities should establish clear and strict rules and regulations, and hospitals should establish effective access control models and adopt appropriate graded authorization and authentication systems to protect sensitive data, for instance, health data. Patients believed that access to their health data would give them a sense of control. A high school teacher said, *"I think it is beneficial. And what I consider is that even if it is not working as well as we imagined, we can still change and refine to a better version. And I think this kind of reform must launch pilot projects at an early stage, therefore, when it can promote national-wide usage, it has been verified."* (Patient 15, face-to-face interview, Beijing, 1 November 2019, female, between 40 to 50 years old, high educational level). They also showed trust in the government and hospitals and believed that even if data sharing is more extensive in the future, the government will definitely adopt pilot improvements to ensure that such improvements are secure before vigorously promoting nation-wide.

On the other hand, due to misunderstanding toward health data and lack of common awareness of information security, patients, as the most direct potential victims, showed indifference for health data. *"I have no idea why people are interested about those health data, except the patients or their family, cos those data are meaningless not like a bank account, and they cannot transfer to money eventually,"* and *"I'm not worried. Because for this time, my illness is not sensitive like cancer or STD."* What's more, they said, *"I don't think this issue should be considered by individuals, but the hospital or government should consider how to ensure the security of data."* They cannot attach the significance of health data because they were unable to directly see the economic value, and they paid less attention to common diseases. Although it was personal health data, they did not understand the personal responsibility of data protection and believed that data protection was only the responsibility of relevant departments and had nothing to do with the patients themselves.

Interoperability

Although there were few responses to interoperability, patients showed their affection with it. It is fairly common that patients may need to be transferred to advanced hospital for further treatment because of the insufficient capacity of the current clinic. However, due to the lack of shared standardization among hospitals, they need to carry out the duplicate test after referring to the new clinic, which is inefficient and wasting of resources. Therefore, patients held the same view with the medical staffs that it is time that standardization among hospitals should be established. *"I think it should improve. Because there is room for technology improving.*

And I think the standardization should be improved. For example, my grandma is hospitalized and need to be transferred to another clinic. But we need to do the basic tests again because of the inconsistency between these two hospitals, which is actually time-consuming and costly," an internet product operations officer said. (Patient 8, face-to-face interview, Beijing, 28 October 2019, female, 30 years old and below, high educational level). Patients who have considered this item generally have experienced referrals and other experiences that need to be seen in different medical institutions, for those who were treated within a single clinic, they did not have much thought about it.

Reusability

The advantages of reusability have been recognized by both doctors and patients no matter with the demographic factors. The patient also expressed affection with it because they believed that it could improve the efficiency and accuracy of treatment and integrity of health data. *"I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can check my previous medical records to get a comprehensive understanding about my condition so that they can provide accurate treatment for me,"* the internet product operations officer said, *"and it is beneficial especially for emergency and referral situation."* (Patient 8, face-to-face interview, Beijing, 28 October 2019, female, 30 years old and below, high educational level). A sale woman said, *"I think it (wide health data sharing) is beneficial. I hope one day there is a health file about every patient and every previous medical record store in there. The file belongs to a system that uses in national scope so that I do not need to worry about medical care in different places. And it can give the doctor a complete understanding of my condition comparing to the current method. Therefore, it is complete time saving and efficient."* (Patient 12, face-to-face interview, Beijing, 8 November 2019, female, between 40 to 50 years old, intermediate educational level). With the help of health information reuse, they thought it could give doctors the ability to get a comprehensive understanding of the condition so as to reduce the unnecessary duplicate test and facilitate to referral, emergency and non-local patients and cross-regional medical care, which alleviated the problem of imbalances in the medical resources allocation and information discrepancy. In addition to reducing human error and improving the accuracy of lesion detection, it can also ensure that the treatment process is controlled. A worker also said *"Doctors do not have to spend time on tedious work such as measuring physical data, they are more flexible to study medical records and improve themselves. And this method can reduce human error, which is also good for patients."* She also mentioned that *"Doctors in lower-*

level hospital can use treatment method in higher-level hospital as a reference or an inspiration if the condition is quite similar under the data-sharing system. And they can exchange ideas and learn from each other regardless of a physical meeting. I think It is quite helpful to reduce medical resources distributed unevenly." (Patient 11, face-to-face interview, Beijing, 1 November 2019, female, 50 years old and above, low educational level). The patients obtained a mental comfort and relief because of the efficiency the data reuse brought. *"We don't need to wait in line to register and get the test report. All of this can be done on the phone or a self-service machine which is convenient and time-saving. With high efficiency, it is quite relief for patients and reduces the possibility that has a dispute between both sides. And it is easy to keep, and I do not need to worry about the loss,"* the sale women said. (Patient 12, face-to-face interview, Beijing, 8 November 2019, female, between 40 to 50 years old, intermediate educational level). More than one patient said that the efficiency improvement brought by data reuse could alleviate the anxiety of patients at the time of medical treatment, and through the reuse of data can avoid the physical and economic burden of repeated testing.

However, a nursing home staff said, *"I don't think it makes much difference. Because the hospital's existing digitalization is not mature enough, it cannot realize the effectiveness of digital data. So, I feel almost the same."* (Patient 3, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, low educational level). Due to the low level of digitization in the subject hospital, some patients indicated that the effectiveness of reusability was not so obvious. Part of the interviewees were not concerned about effectiveness. In addition, similar to the medical staff's concerns, patients also worried that data reuse might be misused. *"I think it is not strange that almost everyone gets upset by telephone harassment. How can they obtain our personal information? I am untrusted in the data protection in the hospital. I am afraid my health data will be misused,"* a government officer said. (Patient 6, face-to-face interview, Beijing, 6 November 2019, male, 50 years old and above, high educational level). Patients were uncertain whether the practical use of health data reuse would not be abused.

Conclusion of Patients' Attitude

Patients generally had a positive attitude towards the FAIR Principles. In particular, for the improvement of medical efficiency brought by the reuse of health data, the patients believed it could reduce not only the psychological and physical burden but also the financial burden caused by repeated testing. However, they also showed uncertainty about the actual use of Reusability. Referral patients were more supportive of the establishment of shared vocabularies advocated by Interoperability and the standardization construction among different medical

institutions, which was convenient for the consultation between different institutions. Although some patients had misunderstandings about Accessibility, on the whole, patients understood the necessity of setting access control on health data. However, it was uneasy about the persistent and unique identifier that was used for searching personal health data and its storage of too much personal information.

5.1.3 Conclusion of Attitude

Medical staffs and patients still had a positive attitude towards the reuse of health data, and Reusability was the most discussed of these four items. Although the effect of data reuse in the subject hospital was not obvious due to the low level of digitization, the interviewees expressed their preference for the possible future vision. However, the discussion of Findability and Interpretability was quite less than Reusability, which may be caused by less understanding of non-technical personnel toward the specific implementation process of data reuse. But, at the same time, they concerned about the actual use of health data reuse because of the uncertainty of authorization assignment and review of data reuse. Even though a small number of patients thought that Findability could bring them a sense of control and the medical staffs expressed a basic approval for efficiency improvement by searching health data in a shared database, the interviewees still expressed concern about this term regardless of doctors and patients. This was due to the fact that the existing search and storage methods included special identification information (ID number) and excessive personal information and the sensitive information made the respondent upset about possible data leakage. Unlike Findability, the evaluation of Interoperability was more positive. Except one medical staff mentioned that it may bring the withdraw of lack of flexibility, the remains believed that the establishment of inter-hospital standardization was conducive to improving the efficiency of data reuse so as to improve the efficiency of transfer, emergency, and cross-regional treatment. Perhaps due to the occurrence of data breaches and the introduction of national data protection standards in recent years, responses to Accessibility were second only to Reusability. However, the attitude distribution of this item was very polarized, and people who had a certain and correct understanding of information and data protection can perceive the importance of Accessibility. They understood the need to establish reasonable and effective regulations, authorization models and authentication systems. Contrary to this, respondents who misunderstood health data and data protection responsibilities lead to an illusion of overconfidence in the degree of data security

or indifference of data privacy. But overall, the interviewees understood the need for access control to protect health data.

5.2 Social Norms

This paragraph explained the formation of social norms from four constructions which are, namely, Findability, Accessibility, Interoperability and Reusability. Before further explanations, it is necessary to illustrate the current general situation.

Under the calling of Internet Plus policy, all industries in China are undergoing digital reforms, and the medical industry is no exception. The digital development of top hospitals is already quite mature, and experts in the industry have also called for the use of digital data tools. For supporting the advocation, professionals hold seminars to share the latest industry information and technology and call for digital healthcare to penetrate into basic healthcare. For patients, the use of digital data has become a part of daily life. *"By seeing increasing digital equipment are used in the hospital, it makes me feel safe and professional,"* A retired police said. (Patient 4, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, low educational level). Due to the policy call and the proficient use of digital data and tools by top hospitals, the use of digital tools and digital data in the treatment process will bring psychological comfort to patients, for which it is considered to be a symbol of the professionalism.

But what cannot be ignored is that the ubiquity of digital health in China is still in the beginning. Responses like this showed up frequently, *"We never talked about this topic before, but I think It should be helpful."* People are not paying too much attention to such topics, and it is not a hit subject between social networking. And it is not user friendly to the elderly, no matter for medical staffs or patients.

5.2.1 Medical Staffs

This chapter analyzed the social evaluations of the FAIR Principles around the medical staffs from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn a social attitude towards its overall rules.

Findability

There were not many replies related to this term, and all came from the positive responses of the medical staffs. Their colleagues believed that by storing health data of patients in a local

searchable database and regional health information database, in which the ID number or the inpatient number regards as the unique and persistent identifier, it can realize data reuse and optimize the effectiveness. A resident in thoracic surgery department said, "*As long as registered and bringing the medical insurance card, the patient can consult his previous condition with the doctor by searching his medical records. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage."* (Medical staff 13, face-to-face interview, Beijing, 11 November 2019, female, between 30 to 40 years old, high educational level). Medical staffs, regardless of the type of demographic factor, expressed their preference for the way in which health data is stored in a searchable database. Because it solved the problem that traditional data is difficult to save and easy to damage, and it is by no means easy to reach maximum utilization of health data. Although most of the respondents did not directly offer relevant responses, it can be understood from the hint that the above data search method is still considered beneficial.

Accessibility

Almost all replies related to this term were positive. They were satisfied with the data protection measures adopted by the hospital and have unconditional trust. There was a stereotype that as long as the innovations were used in clinical treatment, security and safety can be guaranteed. 11 out of 15 respondents claimed regardless of their gender, age or other demographic factors, *"Overall, I still feel quite safe. Because I think when the equipment or system is introduced into the hospital for our medical staff to use, the preliminary preparations are already made. Safety considerations and guarantees are certified."* Although this kind of stereotype may have an impact on the actual implementation of the FAIR Principles and the final effectiveness of data protection, the medical personnel had a group identity about setting up protection measures for the use of health data and had a basic understanding and recognition of establishing access control.

Interoperability

There was very little discussion about this term, and only four interviewees under 40 years old put forward their views. Their colleagues believed that there was a lack of data standards between clinics, which affects the efficiency of data reuse and treatment. A 26-year-old resident in cardiology department said, *"The entire industry hopes that through the digital reform advocated by the government, the behaviour of medical care can be penetrated to a lower level. In addition, as mentioned above, because of the shortage of standardization*

between hospitals, the treatment for referral and emergency situation is in low efficiency. Therefore, the experts are advocating to establish standardization about the objective results, for example, test report among clinics." (Medical staff 11, face-to-face interview, Beijing, 11 November 2019, female, 30 years old and below, high educational level). In addition to the medical staff of the interviewed hospital, health professionals also called for the establishment of standardization of objective results among different hospitals to improve efficiency. However, a 24-year-old nurse in orthopaedics department said, *"But older nurses find it difficult to use the computer or other advanced equipment to record their disease because they are not used to this digital way of working."* (Medical staff 10, face-to-face interview, Beijing, 25 October 2019, female, 30 years old and below, intermediate educational level). Young medical staffs perceived that it was hard to adapt new style brought about by this standardization reform for older medical staffs.

Reusability

Reusability was the most discussed item and obtained full of praise from their colleagues, friends, families and health professionals for the benefits of it. In addition to the advantages mentioned in Attitude, they also believed that Reusability could provide a variety of choices for medical scenarios, not necessarily completed in hospitals but at home. However, the director of neurosurgery department purposed a suggestion, *"For example, before seeing a doctor, they (patients) will consult online to learn about the condition and then discuss their suspicions with the doctor. However, I think too much medical assistance is not good. Because the patient thinks that he knows his situation very well and has a mindset that the doctors always fool him, in that case, he must test the doctors' professional skills."* (Medical staff 7, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, high educational level). The medical staffs expressed a concern that the patients would gain a false belief that they are well-knowledge about the illness due to exposure to online information and they would like to challenge and verify the professional capabilities of the medical staffs, which was quite harmful to not only the relationship and trust between patients and medical staffs but also the treatment.

Conclusion of Social Norms in Medical Staffs

Although it does not yet form a social atmosphere to discuss health topics and digital health, it is not difficult to find in the limited discussion that the social acknowledgement of the FAIR Principles around the medical staff was still positive. The medical staffs agreed with the

registration and storage of the patient's health data and the search of the patient's past related health data through the searchable database for which it could solve the problem that traditional data is difficult to save and easy to damage, and it is by no means easy to reach maximum utilization of health data. They had a group identity about setting up protection measures for the use of health data and had a basic understanding and recognition of establishing access control. Experts in the industry also called for the establishment of standardization of different medical institutions in the region to improve the efficiency of referrals, emergency or regional medical treatment. Support for data reuse not only came from clinical medical staffs and professionals in the medical industry, but also from family members and friends of the medical staffs. However, it may be hard to adapt new style brought about by this standardization reform for older medical staffs. The popularization of health information can bring patients and their families a sense of control of the disease and increase the understanding of the health knowledge to non-professionals. However, exposure to excessive health information to non-professionals may also have a negative impact, increasing the mistrust and confrontation between doctors and patients.

5.2.2 Patients

This chapter analyzed the social evaluations of the FAIR Principles around the patients from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn a social attitude towards its overall rules.

Findability

There were not many replies related to this term, but from their positive attitude towards data reuse, it can be seen that they agree with the way of registering patient information and storing personal health data in a searchable shared database and checking their previous medical records and objective test results in the system. They commented that *"The integrity of digital data storage provides comprehensive understandings of patients' condition, which helps further treatment. In this case, I don't need to make repeat or redundant tests, and it is efficient."* Although patients knew less about the views of their family and friends, they almost believed that doctors thought highly of the use of digital data. By checking the patient's past medical history, doctors can understand the condition more comprehensively, which is helpful for diagnosis and treatment. Even though the relevant responses came up like this, *"We (with family and friends) never talked about this topic before, but I think It should be helpful."* The

patients generally believed that people agreed that the digital method provided convenience for healthcare. Although most of the respondents did not directly offer relevant responses, it can be understood from the hint that the above data search method is still considered beneficial.

Accessibility

The responses obtained from the patients were fairly similar to these obtained from the medical staffs. Patients expressed their affections with the data protection measures adopted by the hospital and have unconditional trust. But there was a bigger trap behind this trust. *"Expect myself, no one else would be interested in my health data,"* a 52-year-old government officer said. (Patient 6, face-to-face interview, Beijing, 6 November 2019, male, 50 years old and above, high educational level). Besides the stereotype that once a digital tool or method are used widely in the hospital, the security problems must be solved, and it was safe enough to use, patients even misunderstood that their health data was not meaningful to others. Furthermore, the interviewees generally revealed that they did not understand the basic knowledge about data security. *"I feel safe because I never consider this kind of question before. It is too far beyond from my knowledge,"* a 51-year-old worker said. (Patient 11, face-to-face interview, Beijing, 1 November 2019, female, 50 years old and above, low educational level). This kind of lack of common sense is universal and representative.

Reusability

The patients believed that Reusability had a good evaluation among their family, friends and their doctors, and they achieved an agreement that this method was helpful for healthcare. They believed that data reuse brought perceived convenience. It improved the efficiency and accuracy of treatment and provided medical staff with the ability to understand the patient's situation in all aspects due to data integrity increasing. *"We never talked about this topic before, but I think It should be helpful,"* a retired government officer said, *"All works of life are going through digitalization reform. We seldom pay by cash but with Alipay or WeChat Pay. By advocating by the policy, I think people have an awareness of how convenient life it is when everything can be done in mobile, even though for the elder, it is hard to operate, their children will help with them to adapt the new lifestyle."* (Patient 13, face-to-face interview, Beijing, 6 November 2019, female, 50 years old and above, intermediate educational level). Due to the penetration of the use of digital data in daily life, patients believed that the use of digital data in healthcare was in line with the trend. However, this will cause inconvenience to the elderly. They also believed that doctors had great benefits in reusing health data. Responses showed up

frequently, *"It should be helpful. For instance, they (doctors) can view the patients' previous prescription and medical records which is helpful to understand the condition comprehensively."* The patient believed that the doctor could reuse the patient's health data to understand the condition more comprehensively and diagnose and treat it more accurately.

Conclusion of Social Norms in Patients

Although the social atmosphere of discussion on health and digital health has not been formed, the recognition of the FAIR Principles as a whole around the patient can be viewed as positive. Patients particularly believed that doctors held a high recognition of this. Because by checking and reusing patient health data, integrating the previous and current data, doctors can better understand the condition and make more accurate treatment and plan adjustments. Although there was a comment like this, *"People accept different things according to their education level and social experience. Some friends are more against this novel approach."* Patients believed that personal acceptance of novel methods is different, but in this study, there was no obvious tendency and aggregation among different demographic groups, except unfriendly for the elderly.

5.2.3 Conclusion of Social Norms

Replies for Findability and Interoperability were few. But doctors and patients expressed their affectional of both. They believed that the way of registering patient information in a regional database and searching for past medical history had helped health care. Medical staffs also showed their approvals to interoperability. Both experts and their colleagues believed that it was necessary to establish standardization between hospitals to improve the efficiency of current regional medical care. As for the accessibility and reusability, the two most discussed items, opinions from doctors and patients were very similar. They all felt quite safe about the digital tools used in healthcare due to their trust in the data protection measures adopted by the hospital. But the sense of safety came from overconfidence for the lack of common sense in data protection. Regardless of the patients and the medical staffs, they claimed that almost the whole of the important people around them expressed a supportive attitude toward health data reuse, except unfriendly to the elderly. However, a doctor has suggested that too much health data information is exposed to the patients may damage the relationship between doctors and patients.

5.3 Perceived Behavioural Control

This paragraph explained what external factors influence the adoption and acceptance of the FAIR Principle in the current medical scene in China. The perceived behavioural control affected by four constructions which are, namely, Findability, Accessibility, Interoperability and Reusability. Before the in-depth analysis, it is necessary to describe the current general condition.

As mentioned in social norms, under the advocation of Internet Plus policy, China's various industries are now completing digital reforms. Security issues in subsequent also receiving attention, the government issued regulations to stipulate different levels of security protection requirements for organizations with different security levels. In accordance with the regulations, the hospital in this study carried out the following protection measures on the health data:

i) Authorization is assigned by the functional scope of medical staffs, and its arrangement is decided by the hospital committee according to the stipulations.
ii) Authentication is completed by Login/password combined with a digital certificate.
iii) The patients can access to objective health result and expense data restrictedly for a given period of time by using a dedicated self-service machine in the hospital.
iv) Legal administrative institutions and patients with their clients outside the hospital can review and use the data when permission approved.

5.3.1 Medical Staffs

This chapter analyzed the external factors influence the adoption of the FAIR Principle around the medical staffs from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn a conclusion towards its overall rules.

Findability

During the interview, the medical staffs were appreciative of archiving the patient's health data and personal information and accessing the patient's previous medical data by looking up their identification number or medical card number. However, the scope of such search behaviour is very limited. Only the outpatient department has completed the networking and sharing of data throughout Beijing, and information of the inpatient department solely circulates within the hospital, which resulted in the patient's diagnosis and treatment information in different medical institutions cannot be fully shared and searched.

Accessibility

This term was the only directly mentioned term in this section. A small number of medical personnel, young and well educated, had basic information security protection awareness. *"I will consider this factor (Accessibility). Because when using these innovations, the operator will sign and be responsible for it, and the operation can be traced. Therefore, accountability is required when problems arise,"* a 24-year-old nurse in the orthopaedics department said. (Medical staff 10, face-to-face interview, Beijing, 25 October 2019, female, 30 years old and below, intermediate educational level). This group of people knew that their operations are traceable, and operators would be accountable if problems arise. However, more medical personnel did not have comprehensive information security protection knowledge, and a 37-year-old attending urologist told me after the interview that *"Even if we know that USB Key is an important component of identity authentication and data protection, we often do not remove it from the computer in our daily work even if we are not next to the computer because it is very troublesome."* (Medical staff 2, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). Even with basic data protection awareness, due to the complex authentication method, medical personnel were reluctantly applying the measures used to protect health data in their daily work. *"I won't consider it (Accessibility). Because our hospital is running on an internal LAN, which is eased the risk of being attacked by outsiders,"* a 40-year-old attending surgeon of the urology department said. (Medical staff 3, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). The lack of knowledge led to their excessive trust in the protection capabilities of the internal LAN and lack of correct awareness of the responsibility for data protection as medical personnel. *"However, such behaviour (patients access to their health data) is not allowed during hospitalization. Unless medical disputes are involved in the treatment process, otherwise, it is not possible. Because the healing process relies on the objective results of the diagnosis and the subjective reasoning of the doctor which is doctors' privacy and not allowed to be seen by others,"* the director of neurosurgery department explained. (Medical staff 7, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, high educational level). The medical staffs held a belief that medical records information belongs to the privacy of the medical staffs rather than the patients themselves.

Interoperability

The biggest obstacle to Interoperability now is the inconsistency of standards between different medical institutions. *"I hope the digital health can be standardized by the government. If so,*

the data sharing could be more meaningful because every hospital has its own standard for some clinical application currently. This is disturbing for medical staffs to deal with referral patients since the reports or test results could represent totally different meaning among hospitals," the director in thoracic surgery department said. (Medical staff 6, face-to-face interview, Beijing, 11 November 2019, male, 50 years old and above, high educational level). Because of the lack of standards, even if the referral patient carries the examination reports from the previous clinic, the new hospital cannot use them as references and have to conduct the tests all over again, which greatly affects the efficiency of treatment and increases the financial burden of patients.

Reusability

The problem with Reusability is that the popularity and penetration of digital health are not enough. Except for the advanced hospitals, other hospitals have not yet fully completed digital reform. *"I think there are advantages and disadvantages to both ways. Except for the advanced hospitals, the ubiquity of digital health is still not widespread, and the coverage rate is not enough,"* the director of the neurosurgery department said. (Medical staff 7, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, high educational level). Due to the lack and backwardness of equipment, the effectiveness of Reusability is limited. *"In our hospital, the digitalization is not penetrated in every aspect, and we don't have a lot of advanced assistant tools compared with level three hospitals. Therefore, the effects of digital data are not fully realized,"* an attending surgeon of the urology department said. (Medical staff 3, face-to-face interview, Beijing, 30 October 2019, male, between 30 to 40 years old, high educational level). This phenomenon is universal, and the subject hospital is representative. The level of digitalization of other hospitals at the same level as the researched hospitals are not mature enough.

Conclusion of Perceived Behavioural Control in Medical Staffs

For medical staffs, the adoption of the FAIR Principles is mainly affected by the following points: the inconvenience of searching for corresponding health data caused by lack of the patient information sharing in the inpatient department; the data protection awareness of medical personnel is incomplete, and the education of relevant knowledge is lacking; the attribution of health data also hindered hospitals from opening access authorization of health data to others; Irregular use caused by complex authentication methods; inefficiency caused by lack of standardization among different medical institutions; inadequate coverage and weak

penetration of digitalization reforms in medical institutions and resulting in ineffective use of digital data.

5.3.2 Patients

This chapter analyzed the external factors influence the acceptance of the FAIR Principle around the patients from four aspects which are, namely, Findability, Accessibility, Interoperability and Reusability, and drawn a conclusion towards its overall rules.

Findability

Although patients' personal information and health data are archived, they do not have an effective platform to search their own health information at any time. Even if they can register online, check the test report through a dedicated machine. The search of their own health data mainly depended on paper media. According to the responses from medical staffs, the patient can search the expense information in real-time through the self-service machine. Although health data such as test results can be checked by the machine, there are time and frequency limits. Within a given time, patients receive one number based on their medical insurance card or a visiting card for a one-time query, and this is called "*one card one number*".

Accessibility

This term is one of the few terms mentioned directly in this section. The majority of patients (9 out of 15) understood that medical personnel access to the patient's health data according to their functional scope, and three of them understood that such authorization is implemented by the administrative department of the hospital according to regulations. The government officer said, *"The doctor will not inform this information proactively. But I think there should be an administrative department within the hospital which is responsible for this. And their authorization should be assigned based on the regulation and policy."* (Patient 6, face-to-face interview, Beijing, 6 November 2019, male, 50 years old and above, high educational level). These three patients had the same characteristic of working within the system, either in the education industry or government departments, and they are familiar with such operations. The patients were faced with the situation that they cannot access their health data and not actively informed of their data use during treatment. However, there were still three patients who mistakenly believed that the restricted access to the objective examination results could be seen as gaining access to personal health data. *"I think I can (access to personal health data). My*

family members will find a doctor to inquire about my condition. The doctor will review my data and explain it to my family on his computer," a farmer with a junior high school education said. (Patient 9, face-to-face interview, Beijing, 28 October 2019, female, between 40 to 50 years old, low educational level). The three interviewees showed similar characteristics that they are older than 45 years old and have low education and are engaged in traditional work.

Interoperability

Although only a few patients mentioned Interoperability, and all had referral treatment experience. However, the situation they mentioned is similar to that mentioned by medical staff, that is, the lack of consistent standards among different medical institutions leads to repeat collect the examination data, which greatly affects the efficiency of treatment and increases the financial burden of patients.

Reusability

From the perspective of patients, similar to those of medical personnel, the factor that affects Reusability is the digitalization reform of medical institutions is not mature enough, resulting in unsatisfying effectiveness of digital data reuse. *"I don't think it makes much difference. Because the hospital's existing digitalization is not mature enough, it cannot realize the effectiveness of digital data. So, I feel almost the same,"* a nursing home staff said. (Patient 3, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, low educational level). Therefore, even if the patients understood the benefits brought by health data reuse, it cannot be realized at the moment.

Conclusion of Perceived Behavioural Control in Patients

For patients, the factors that affected their acceptance of the FAIR Principle included the following: lack of a platform for patients to search and access their personal health data; lack of data privacy instructions for collecting and using their health data at the time of consultation; Duplicate test among different medical institutions due to lack of consistent standards; inadequate coverage and weak penetration of digitalization reforms in medical institutions and resulting in ineffective use of digital data.

5.3.3 Conclusion of Perceived Behavioural Control

Although Findability and Interoperability were not directly mentioned in this chapter, it can be known from the content of the previous interviews that under the current regional medical system, the treatment process of the outpatient department has completed the city-wide data sharing, but the data of the inpatient departments have not realized it, and the absence of standardization among clinics have impeded the effectiveness and efficiency of data reuse. This has hindered the adoption and acceptance of FAIR Principles because the existing information infrastructure has not been able to support such a data search. For patients, they do not have an effective platform to search their own health information at any time. In addition, the attribution of health data also hindered hospitals from opening access authorization of health data to others. Medical personnel had poor awareness of health data protection and low perception of daily risk. They were overconfident in basic data protection provided by hospitals. The irregular use of data protection measures occurred due to complex authentication methods. All of these were hidden dangers. But unexpectedly, patients had a basic understanding of the assignment of access authorizations in hospital, even if they were not informed in advance.

5.4 Intention

Through the attitude towards the FAIR Principle, the society's evaluation of it and the constraints of the existing conditions, the interviewees formed an intention to adopt or accept it. Among the constructions of FAIR, there were two constructions that played a role in adoption or acceptance, which were Interoperability and Reusability, especially the latter, and the comments of the interviewees focused on this aspect. In addition, there were a lot of considerations about the general situation.

The use of digital data has become a part of life, and a majority of doctors and patients showed dissatisfaction with traditional data use and health methods. *"Young doctors will become more dependent on digital health because they don't have the opportunity to experience traditional health methods, plus they are generally growing in the digital age and are more sensitive to these,"* the director of neurosurgery department explained. (Medical staff 7, face-to-face interview, Beijing, 23 October 2019, male, 50 years old and above, high educational level). Besides the fact that few traditional medical clinics existing, medical staffs also showed that it was too difficult for young medical staff who have no experience and haven't experienced traditional medical methods to adapt the old work style. *"If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this (traditional method clinic)"*, responses

liked this showed up frequently among the patients when the question was asking about their intention to a traditional method clinic. The patients also expressed reluctance to go to the clinic with ageing equipment.

5.4.1 Medical Staffs

This chapter analyzed the adoption intention of the FAIR Principle of the medical staffs from two aspects which are, namely, Interoperability and Reusability, and drawn a conclusion towards its overall rules.

Interoperability

This term was mentioned many times by medical staffs. They perceived that the interoperability of digital data simplified their workflow and improved work and treatment efficiency and was easy to use. *"I personally like working in such a hospital. Because I think these digital tools can make our daily work easier and more efficient,"* a 31-year-old nurse in the neurosurgery department added. (Medical staff 12, face-to-face interview, Beijing, 21 October 2019, female, between 30 to 40 years old, high educational level). When they attempted to choose a more preferred way of working, this term has played a positive role in choosing digital methods.

Reusability

Reusability played a strong role in the choice of digital methods. There was a disagreement among medical staffs whether to use digital data as an important indicator when choosing a job. Most male medical staffs stated that it is a plus point to have additional digital data, but it is not all indispensable for job determinants. On the contrary, most young female medical staffs said that the use of digital data is an important criterion for determining work. However, when asked about the more preferred way of working, except for most of the older medical staffs, the remaining medical staffs expressed their approval of the digital methods. Respondents who preferred digital methods perceived the benefits brought by Reusability. It helped to improve efficiency and accuracy along with data integrity and reduced human errors. On the one hand, they acknowledged that *"advanced hospitals are relatively mature in digital reform, the application scope of digital data is also relatively comprehensive,"* and proficiency in data reuse can be regarded as a symbol of advanced hospitals. On the other hand, they also emphasized that reusability is only a necessary but insufficient measurement. *"Personally, I*

really resist those digital tools which are too complex for me. Because I hadn't been exposed to this environment until the whole industry began digitalization reform, it is a huge challenge for me. However, I have to adapt with this new work style," the chief physician in Traditional Chinese Medicine outpatient department said. (Medical staff 5, face-to-face interview, Beijing, 4 November 2019, male, 50 years old and above, intermediate educational level). For most of the older medical staffs, although they recognized the benefits of data reuse, it was hard for them to adapt to the changes in workstyle brought about by the digitalization reform.

Conclusion of Medical Staffs' Intention

The intention of medical staffs to adopt the FAIR Principles is divided into different situations. Almost all young medical staffs showed affection with digital methods, although they had different opinions on whether to use digital data as an important criterion for choosing a job. The benefits of Reusability and Interoperability made this part of people have a positive intention to adopt the FAIR Principles. But most of the older medical staffs were not used to the new workstyle, and they had a resistance to the digital methods. Therefore, even if the benefits of Reusability and Interoperability were well understood, older medical staffs still held a negative intention to adopt the FAIR Principles, but they would not object it if the adoption is mandatory.

5.4.2 Patients

This chapter analyzed the acceptance intention of the FAIR Principles of the patients from Reusability and drawn a conclusion towards its overall rules.

Reusability

The patients who preferred digital methods perceived that the benefits it brought. Most patients disagreed that the use of digital data is an important criterion for their choice of visiting medical institution. They believed that data reusability only makes sense when doctors are skilled, and the overall strength of medical staffs is comparable. In addition, they also showed that when current treatments are effective, and it is a common illness, data reuse is not necessary. Although most patients preferred the digital method to the traditional one by understanding Reusability can bring benefits and improve the efficiency of treatment, the actual adoption intention is different from that of doctors, the majority showed a neutral or even a negative acceptance intention for Reusability. *"I think if the current hospital can cure the illness, then*

it is no need to spend a lot of effort to transfer to another clinic just because of those tools. Spending the least effort, including human and time and money resources, to cure the illness is what I value the most," responses liked this occurred frequently. Convenience and cost-effectiveness are factors that need to be considered. Unlike medical staffs, patients need to bear financial pressure to receive treatment, therefore, they understood the benefits of Reusability and had a positive attitude, but they were not willing to pay extra cost for it. So, in terms of acceptance intention, they believed that, for common diseases and uncomplicated treatments, it was unnecessary to require excessive digital tools to assist treatment.

Conclusion of Patients' Intention

The overall attitude of patients to the FAIR Principles is positive, but their intention to accept it is neutral or even negative. They understood that, after introducing the FAIR Principles, it could bring a lot of convenience to treatment and had a preference for digital methods. However, due to the different roles played by patients and medical staff, patients had to spend financial and material resources to take these benefits brought by the FAIR Principles. In addition, they believed that the overall level of medical personnel is the most important and digital data is only an assistant tool.

5.4.3 Conclusion of Intention

Even though the attitude of medical staffs and patients and the society's overall view on it were relatively positive, the intention to adopt and accept the FAIR Principle was varied. In addition to being restricted by the existing conditions, refer to perceived behavioural control, but also related to their views on digital data and digital medicine. Although doctors and patients recognized the benefits of health data reuse, healthcare professionals also approved the standardization brought by Interoperability, but they still believed that digital data and digital data tools played an assistant role rather than a decisive factor in healthcare. Young medical staffs were more willing to accept it, while older medical staff held the opposite view. Although patients preferred digital methods, they were unwilling to pay economic and material resources for the benefits it brought. And for the treatment of common diseases, they did not need to use digital methods, thinking that this was a waste of resources such as economic resources. For doctors and patients, the overall level of the hospital, that is, hardware equipment and medical personnel capabilities, need to be considered. And for medical staff, career development, preferred work style, and other factors, for instance, preferred lifestyle need to be considered

as well. For the application of digital methods in healthcare, medical staffs also proposed that this was an irresistible trend. Hospitals must go through these and eventually become a part of regional healthcare, so they would not choose preferred working place just because of the use of digital methods.

5.5 Conclusion

Although the current implementation of the FAIR Principles faced the restrain of lack of platforms for patients to directly access their health data, the lack of network infrastructure and standardization of information sharing among medical institutions, and rough legislation on medical health data protection, the future implementation of FAIR are still very optimistic. Because it coincides with the Internet plus Health Care policy, which is strongly advocated by the Chinese government. The policy also observed the difficulties encountered in the development of digital healthcare today. The above-mentioned problems had corresponding solutions in the policy. The cultural background of social sharing, health data sharing and reuse is the future trend and recognized by the people.

Chapter 6. Discussion and Conclusion

6.1 Conclusion

With the rise and maturity of big data, cloud computing, artificial intelligence, IoT, sensors and other technologies, the value of health information is strengthened in the management of the health industry by assisting public health monitoring and evaluation and decision management and improving medical research and clinical diseases. The quality of diagnosis and treatment and the ability to promote personal self-health management have been more manifested (Open Medical and Healthcare Alliance, 2017). At the same time, outdated data management inhibits the potential for health data reuse. Therefore, the introduction of the FAIR Principles is to guide good data stewardship that meets current research needs and unlock the potential for data reuse (Wilkinson et al., 2016).

However, as a general guiding principle, the implementation of FAIR mainly focuses on European and the American region and is mainly for white people (van Reisen et al., 2019). Hence, what this study offers is a rather novel angle at issue, namely the adoption and acceptance of the FAIR Principles on digital health of medical staffs and patients in China.

This research attempts to innovate on the current research by narrowing down the subject to the adoption and acceptance of the FAIR Principles on digital health of medical staffs and patients in China via qualitative research from the perspective of the Theory of Planned Behavior. By studying the FAIR Principles and its implementation, this study further understood the opportunities and challenges FAIR faced as a general guiding principle in different political and cultural contexts. Through the interpretation of policies, regulations and laws related to digital healthcare and health data, this study further understood the policy and cultural environment that implementation of FAIR will face in China. Finally, through interviews with end-users, medical staffs and patients, this study understood the authentic user attitude and adoption and acceptance intention of FAIR applied in digital health.

This chapter summarizes and answers the research questions raised in the first chapter. The answers are as follows:

1. How is the FAIR Principles perceived by the medical staffs and their adoption possibility in digital healthcare?

In the course of analysis, under the three elements of attitude, subjective norms and perceived behavioural control under the Theory of Planned Behavior, six related categories have been identified (for more details, see Table 8). Appendix 5 offers more details about the theory.

Table 8 TPB Framework on Medical Staffs' Analysis

Attitude	Positive feeling/ advantages: Findability: • Search and check patients' previous health data Accessibility: • Protect sensitive data by establishing policy and regulations, setting up access control mode and authentication system • Prevent ruining medical staffs' career and patients' mental health from medical records breach • Effective health data protection measures than traditional methods Interoperability: • Reduce the waste of resources and time brought by repeated tests • Improve the efficiency of inter-clinic treatment Reusability: • Improve health data integrity and provide medical staffs with a comprehensive understanding of patients' condition • Reduce human errors and unnecessary duplicate tests • Alleviate the problem of uneven distribution of medical resources and information discrepancy • Benefit for referral, emergency and non-local patients and cross-regional healthcare • improve the efficiency and accuracy of treatment Negative feeling/disadvantages: Findability: • Use ID number as identifier and bond with too much personal information Accessibility: • Users lack of awareness of information security and misunderstand the value of health data • Unclear authorization assignment Interoperability: • Lack of flexibility in benchmark Reusability: • Effectiveness is not obvious due to low level of digitization and inadequate penetration of digital health • Less helpful for Traditional Chinese Medical treatment • Worry about the abuse of health data reuse

Social Norms	People who response/might response positively: Findability: • Medical personnel Accessibility: • Medical personnel Interoperability: • Young medical personnel • Health industry professionals Reusability: • Medical personnel particularly young ones • Health industry professionals • Non-local patients or people live far from • Referral and emergency patients People who response/might response negatively: Findability: • Patients with sensitive disease • People who worry about information privacy Accessibility: • People who distrust the hospitals' data protection systems Interoperability: • Older medical personnel Reusability: • The elderly • Older medical personnel • People who concern about abuse of data reuse
Perceived Behavioral Controls	Factors that facilitate: Findability: • Internet plus Health Care policy Accessibility: • Internet plus Health Care policy • Cyber Security Law of the People's Republic of China • Information Technology – Personal Information Security Specification • Other policies or regulations Interoperability: • Internet plus Health Care policy Reusability:

	• Internet plus Health Care policy Factors that impede: Findability: • Only the outpatient department has completed the networking and sharing of data and the inpatient department solely circulates within the hospital Accessibility: • The data protection awareness of medical personnel is incomplete • The education of relevant knowledge is lacking • The attribution of health data also hindered hospitals from opening access authorization of health data to others • Irregular use caused by complex authentication methods Interoperability: • Lack of standardization among different medical institutions Reusability: • Inadequate coverage and weak penetration of digitalization reforms in medical institutions

In the medical staff group, the behavioural intentions of young medical staffs and older medical staffs were not the same. The young medical staffs' intention to adopt FAIR were positive while the older showed neutral or even negative intention, which was affected in more extent by Attitude and Social Norms. Young medical staffs valued the benefits of health data reuse, and they believed that this method could improve efficiency and accuracy, thereby improving the level of medical treatment and medical services. Between the two different workstyles, the traditional method and digital one, they generally agreed with the latter workstyle. This was related to the fact that most young medical staff have not experienced traditional working method and lack of experience. Most of the young medical staff are exposed to the digital environment from study to work and are more sensitive to the digital method.

Although the older medical staffs also recognized the benefits of health data reuse and the efficiency and convenience brought by digital method, they generally have experienced traditional workstyle, so they have no obvious preference to these two methods. In addition, although the use of digital data has penetrated into daily life, for the elderly people, they are not good at this novel way of life and work style and even have obvious resistance. The introduction of digital methods is a relatively big challenge to them, which is not compatible with their previous behavioural patterns. According to the statistical report on the development of the Internet in China released by Cyberspace Administration of China in 2019, in the age

structure of netizens in China, netizens in 50 years old and above account for only 13.6% of the overall netizen group, which takes up the least percentage except for the age group under 10 years old.[14] And the scale of non-netizens in China is 541 million, of which the proportion of non-netizens who do not go online due to age accounts for 14.2%, ranking fourth, and other reasons for the high ranking are ignorant of computers/internet, limited education level, and no internet access.[14] So, this group of medical staffs have a negative intention to adopt FAIR, and they clearly stated that they prefer the traditional way of working.

2. How is the FAIR Principles perceived by the patients and their acceptance possibility in digital healthcare?

In the course of analysis, under the three elements of attitude, subjective norms and perceived behavioural control under the Theory of Planned Behavior, six related categories have been identified (for more details, see Table 9). Appendix 6 offers more details about the theory.

[14] http://www.cac.gov.cn/pdf/20190829/44.pdf

Table 9 TPB Framework on Patients' Analysis

Attitude	Positive feeling/ advantages: Findability: • Obtain a sense of control Accessibility: • Protect sensitive data by establishing policy and regulations, setting up access control mode and authentication system Interoperability: • Reduce the waste of resources and time brought by repeated tests • Improve the efficiency of inter-clinic treatment Reusability: • Improve health data integrity and provide medical staffs with a comprehensive understanding of patients' condition • Reduce human errors and unnecessary duplicate tests • Alleviate the problem of uneven distribution of medical resources and information discrepancy • Benefit for referral, emergency and non-local patients and cross-regional healthcare • improve the efficiency and accuracy of treatment • Provide patients with mental comfort and relief by improving the healthcare efficiency • Reduce physical and economic burden brought by repeated tests Negative feeling/disadvantages: Findability: • Use ID number as identifier and bond with too much personal information Accessibility: • Users lack of awareness of information security and misunderstand the value of health data • Distrust in the hospitals' ability of data protection Reusability: • Effectiveness is not obvious due to low level of digitization and inadequate penetration of digital health • Worry about the abuse of health data reuse
Social Norms	People who response/might response positively: Findability: • Medical personnel

	• Patients Accessibility: • People who trust the hospitals' data protection systems and government • People who are aware of information privacy Interoperability: • Patients who need inter-clinic treatment Reusability: • Medical personnel • Non-local patients or people live far from • Referral and emergency patients People who response/might response negatively: Findability: • Patients with sensitive disease • People who worry about information privacy Accessibility: • People who distrust the hospitals' data protection systems • People who feel indifferent about privacy Reusability: • The elderly • People who concern about abuse of data reuse
Perceived Behavioral Controls	Factors that facilitate: Findability: • Internet plus Health Care policy Accessibility: • Internet plus Health Care policy • Cyber Security Law of the People's Republic of China • Information Technology – Personal Information Security Specification • Other policies or regulations Interoperability: • Internet plus Health Care policy Reusability: • Internet plus Health Care policy Factors that impede: Findability: • Lack of a platform for patients to search and access their personal health data Accessibility:

	• Lack of data privacy instructions for the collection and use of their health data at the time of consultation Interoperability: • Lack of standardization among different medical institutions Reusability: • Inadequate coverage and weak penetration of digitalization reforms in medical institutions

Unlike medical staffs' adoption intention, the patients' intention to accept the FAIR Principles had little to do with age and other demographic factors, showing a generally neutral or even negative intention. The most influential factor leading to this result came from the Perceived Behavioral Control. Although both medical staffs and patients mentioned that the digitalization of the researched hospitals is not mature enough and lack of standardization among different medical institutions, which leads to inefficient data reuse and low effectiveness, the objective conditions faced by patients are more severely restricted. In terms of medical staffs, the data has basically been circulated within the hospital, and the outpatient department has even realized the city-wide health information sharing. Almost all the interviewed medical staffs mentioned the electronic medical record system, and most doctors mentioned the medical imaging and clinical testing systems in hospitals, for instance, the electronic imaging system, which means that medical staffs can realize basic in-house health data finding, sharing and reusing under authorization. Except for the four patients who misunderstood accessibility as they could view their own health data with the help of a doctor, the remaining patients said that they could not access their health data. Although the patients mentioned that they could check the results or pay the fee through the self-service machine, except to payment information, the query of objective results is limited in time and frequency. For patients, there is no platform in the hospital that can query their own health information in real-time. There is no accessible channel for patients to find and reuse health data, therefore, even though they understood the benefits of health data reuse under the guide of FAIR and efficiency brought by the digital method, the actual acceptance intentions are influenced by factors other than Attitude. In addition, the patients also mentioned cost performance. They believed that curing diseases at the least cost is their core appeal. Unlike medical staff, patients need to provide resources to enjoy these benefits, for instance, monetary resource. Therefore, the patient expressed that if the traditional method can meet the requirements of curing the disease, they will not seek the help of the digital one.

3. How is accessibility demonstrated in China's digital health arena?

According to the provisions of Measures for the Administration of Population Health Information (for Trial Implementation)[7], accessibility in the digital health field can be defined as follows:

1) Institutions or individuals should not use and publish population health information beyond the authorized scope defined by the population health information management system established by authorized institutions.
2) Through a trace management system, any user who establishes, modifies and accesses population health information should pass strict real-name identity authentication and authorization control to ensure that the behaviour is manageable, controllable and traceable.

In addition, in order to support the clinical business and hospital management, National Hospital Information Construction Standards and Norms (Trial)[13] standardized the main contents and requirements of hospital information construction. In order to ensure the security of the management data and clinical data in the hospital, it makes specific technical requirements on the identity authentication and access control of the data centre (for more details, see Chapter 4).

4. How do China's policy and law regulate data protection related to digital health?

China has completed the basic framework for the construction of laws and regulations and has made a lot of progress in the relevant legislation and policy layout in the field of health care, including a series of policies and guidelines issued at the national and local levels. The launch of the Cyber Security Law and the implementation of Information Technology – Personal Information Security Specification enforce China's personal information protection legislation system. However, China has no independent legislation for digital health information protection. The legal provisions for personal health and medical information still have problems of unstructured laws and regulations, insufficient penalties and general and lack detailed stipulations. Although the Cyber Security Law[5] clarifies that network products and services that have the function of collecting user information should be clear to the user and obtain consent; Provisions on the Administration of Medical Records in Medical Institutions[10] and The Regulation on the Handling of Medical Accidents[12] also clarifies the patients have the right to borrow and copy medical records, but the scope of such right to know is too narrow.

5. What is the related policy environment like in Chinese health industry?

The future vision of the FAIR Principles in digital health in China is quite bright. The most important reasons are the policy factors and the shared culture social environment. First, FAIR coincides with the Internet Plus Health Care policy advocated by the Chinese government. The purpose of the Internet Plus Health Care policy is that people can enjoy good medical and health services without leaving home and complete a regional and national medical system. In order to accomplish this mission and provide an achievable foundation for data reuse, the government needs to establish network infrastructure and require medical institutions at all levels to build data-sharing network for information exchange and improve the standardization system. In addition, the government will improve Internet access and a well-regulated adoption of online health documents of residents and the construction of a national health information platform. For the sake of ensuring the residents' information security and the compliant use of health data, the policy requires the establishment of laws related to big data on health care and the supervision of platform construction and information protection (for more details, see Chapter 4). The implementation of this policy means that objective factors that affect the acceptance of patients will be solved in the future. Although the older medical staffs' preference will not change, they mentioned that if it is required by the policy, they will obey the arrangement of the supervisor and the organization.

Secondly, Chinese society has a shared culture. During the interview process, the interviewees expressed a positive attitude towards the wider sharing and using health data in the future regardless of doctors and patients. Despite concerns about data security, most respondents expressed their trust in the government and hospitals. They believed that the reuse of health data sharing has great benefits for personal and regional medical care. In addition, the State Council declared that big data on medical and health is an important essential strategic resource[15]. In China, health data is not only an individual belonging but also an important national strategic resource. This year, in order to effectively control the outbreak of coronavirus, the Chinese government implemented epidemic information management, and a health code was born. The primary function of the health code is to report it to the public through self-examination to help the government understand the epidemic situation. As of May 20, the cumulative number of visits to health codes reached 26 billion, and the number of bright codes

[15] http://www.gov.cn/zhengce/content/2016-06/24/content_5085091.htm

was 9 billion, covering a total of 1 billion people in the country, more than 400 cities and counties, and more than 5,100 villages[16].

However, for the elderly, those who are not adapted to new technologies, and those who cannot access digital methods, it is not easy to enjoy the fruits of implementing FAIR principles in the digital healthcare system. How FAIR organically combines digital and traditional medical methods to provide new potential for medical services is also worth pondering and studying.

6.2 Limitation and Recommendation for Future research

This section explains the limitation of this research and provides the interested researcher with the recommendation for further study.

The first point is that due to the impact of the covid-19 epidemic, the later research process was disrupted. Discussions with supervisors about data analysis and finding were forced to be online, and it took time to adapt to the new research method.

The second is the incomplete coverage of the target population. Due to the limited ability of data analysis, although the interviewed medical staffs covered the main departments of the outpatient and inpatient departments, there are still many other departments that have not to be interviewed such as the medical imaging department, the medical testing department, etc. This has led to a certain bias. Future research can cover all the essential departments of the hospital and better understand the attitudes and adoption intentions of medical staffs in different departments on the application of FAIR in digital health.

The third point is the deviation of data collection of the four constructions in FAIR. In the process of data analysis, Reusability and Accessibility were made the most mentioned in the four FAIR constructions. As non-insiders, the interviewees did not understand the technical support and implementation process of data reuse, but only had a direct understanding of the results. Due to the emergence of data security issues and the implementation of legislation in recent years, their understanding of accessibility has improved. Therefore, the interviewees did not have a good understanding of Findability and Interoperability. The direction of future research can focus on the interviewees' attitudes toward technology-related constructions which are Findability and Interoperability and their adoption and acceptance intentions.

[16] http://www.199it.com/archives/1052214.html

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Appendix 1 TPB Framework on medical staffs

Purpose	Construction	Category	Sub-Category	Labeling	No.
The Planned Behavioral Control	Attitude	Positive Responses/ Advantages	Findability	#Findability_search_patients'_health_data.	1
			Accessibility	#Accessbility_establish_access_control_model.	2
				#Accessbility_effective_date_protection_compared_with_traditional_methods.	3
				#Accessbility_set_clear_and_strict_regulations_and_policies.	4
				#Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health.	5
				#Accessbility_sentive_health_information_protection.	6
				#Accessbility_secure_and_effective_authentication_system.	7
			Interoperability	#Interoprability_advocate_standardazation_between_hospitals.	8
				#Interoperability_effciency_improvement.	9
			Reusability	#Reusability_develop_the_ability_of_medical_staffs_in_remote_area.	10

				#Reusability_efficiency_improvement.	11
				#Reusability_can_alleviate_medical_resources_assignment_unevenly.	12
				#Reusability_accuracy_improvement.	13
				#Reusability_human_error_reducement.	14
				#Reusebility_faciliate_demographic_health_research.	15
				#Reusability_Data_integrity_improvement.	16
				#Reusability_providing_comphrehensive_information_about_patient's_condition.	17
				#Reusability_disease_development_in_better_control.	18
				#Reusability_Perceived_convenience.	19
				#Reusability_accuracy_of_lesion_detection_improving.	20
				#Reusability_benefits_for_referral_condition.	21
				#Reusability_benefits_for_emergency_condition.	22
				#Reusability_Alleviate_the_information_discrepency_between_clinics.	23

				#Reusability_benefit_for_cross_regional_healthcare_and_non_native_patients.	24
			General Condition	#Digital_method_is_more_useful_for_young_and_less_experienced_doctors.	25
				#Technology_improvement_is_trend.	26
		Negative Responses/ Disadvantages	Findability	#Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	27
			Accessibility	#Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.	28
				#Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.	29
				#Accessbility_data_breach_hasn't_ocurred_so_far.	30
				#Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.	31
				#Accessibility_unclear_authorization_assignments.	32

			Interoperability	#Interoperability_benchmark_lacks_of_flexibility.	33
			Reusability	#Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_object_hospital_is_still_in_low_level.	34
				#Reusability_less_helpful_for_traditional_chiese_medical_treatment.	35
				#Reusability_concern_about_misuse_of_health_data.	36
			General Condition	#Low_ubiquity_of_digital_health_impedes_the_effectiveness.	37
		Adoption Preference	General Condition	#Favourable_factors_individual_adoption_Disease_spectrum_and_demographic_of_the_department.	38
				#Favourable_factors_individual_adoption_Efficiency_and_ease_to_use.	39
				#Favourable_factors_individual_adoption_Supervisor's_instruction.	40
				#Favourable_factors_individual_adoption_Cutting_edge_innovations.	41

				#Favourable_factors_individual_adoption_Preceived_effectiveness	42
				#Favourable_factors_individual_adoption_Safety_and_reliability.	43
				#Favourable_factors_individual_adoption_Benefits_for_patients.	44
				#Favourable_factors_individual_adoption_Preferred_workstyle.	45
				#Favourable_factors_individual_adoption_High_accuracy.	46
				#Favourable_factors_individual_adoption_Providing_comprehensive_conditional_information.	47
	Social Norms	Positive Responses/ Advantages	Findability	#Findability_patients_register_in_local_and_regional_healthcare_system.	48
			Accessibility	#Accessability_trust_in_current_protection_method_built_up_in_the_hospital.	49
			Interoperability	#Interoperability_experts_advocate_establish_data_standardization_between_clinics_for_objective_results.	50
				#Interoperability_effciency_improvement.	51

			Reusability	#Reusability_provide_diversity_of_healthcare_occasion.	52
				#Reusability_efficiency_improvement.	53
				#Reusability_accurecy_improvement.	54
				#Reusability_providing_comphrehensive_information_about_patient's_condition.	55
				#Reusability_is_helpful_for_emergency_and_referral_condition.	56
				#Reusability_Data_integrity_improvement.	57
				#Reusability_disease_development_in_better_control.	58
				#Reusebility_faciliate_regional_disease_resreach.	59
			General Condition	#Experts_host_academic_events_and_share_latest_information_and_techniques.	60
				#Digitalization_reform_is_advoacted_by_the_policy	61
				#Experts_advocate_digital_health_penetrating_into_lower_level_of_healthcare.	62

				#The_advanced_hospitals_have_been_through_coutinuous_digitalization_reform.	63
		Negative Responses/ Disadvantages	Accessibility	#Accessability_A_steroty pe_that_safety_and_security_problems_are_solved_before_clinical_use.	64
			Interoperability	#Interoperability_it_is_hard_to_adapt_new_work_style_for_the_older_medical_staffs.	65
			Reusability	#Reusability_it_is_hamrful_for_relationship_between_doctors_and_patients_when_patients_obtain_too_much_medical_information.	66
			General Condition	#People_do_not_pay_attention_to_health_issues.	67
				#Low_ubiquity_of_digital_health.	68
				#Digital_method_is_unfriendly_to_the_elderly.	69
				#Not_sensetive_with_indurty_changes.	70
		Organizational Adoption Preference	General Condition	#Favourable_factors_for_organizational_adoption_Cost-effectivess.	71
				#Favourable_factors_for_organizational_adoption_Scope_of_functions.	72

				#Favourable_factors_for_organizational_adoption_Preceived_ease_of_use.	73
				#Favourable_factors_for_organizational_adoption_Preceived_benefits_for_both_medical_staffs_and_patients.	74
				#Favourable_factors_for_organizational_adoption_Diverse_needs_of_different_departments.	75
				#Favourable_factors_for_organizational_adoption_Policy_stipulation.	76
				#Organizational_adoption_do_not_inform_clinical_staffs_the_adoption_standards.	77
	Perceived Behavioral Control	Factor That Support or Encourage	Accessibility	#Accessability_medical_staffs_have_awareness_of_information_protection.	78
				#Accessability_Operation_can_be_traced_back_and_operator_take_accountability_for_it.	79
			General Condition	#Digitalization_reform_is_advoacted_by_the_policy	80
		Current Capability	Accessibility	#Accessbility_authorization_assign_by_functional_scope	81

				#Accessbility_the_hospital_committee_arranges_the_authorization.	82
				#Accessbility_authentication_sysytem_Login/password_combined_with_a_digital_certificate.	83
				#Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	84
				#Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.	85
		Factor That Impede	Findability	#Findability_lack_of_data_sharing_among_inpatient_department.	86
			Accessibility	#Accessability_medical_staffs_have_no_knowledge_of_information_security.	87
				#Accessibility_fully_trust_in_the_protection_from_internal_LAN.	88
				#Acessability_medical_staffs_are_unconsicious_about_security_responsibility.	89

				#Accessability_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.	90
				#Accessbility_medical_records_belong_to_doctors'_privacy_not_patients'.	91
			interoperability	#Interoprability_lack_of_standardazation_between_clinics.	92
	Intention	Positive Intention	Interoperability	#Interoperability_efficiency_improvement.	93
			Reusability	#Reusability_is_a_symbol_of_an_advanced_hospital.	94
				#Reusability_perceived_convinence.	95
				#Reusability_efficiency_improvement.	96
				#Reusability_human_error_reducement.	97
				#Reusability_Data_integrity_improvement.	98
			General Condition	#Data_using_is_part_of_daily_work.	99
				#The_young_and_less_experienced_medical_staffs_can_hardly_accept_traditional_methods.	100
				#Few_of_traditional_clinics_exist.	101
		Neutral Intention	Reusability	#Reusability_is_an_necessary_but_not_sufficient	102

				_measurement_of_an_advanced_hospital.	
			General Condition	#Focus_on_the_overall_strength_of_a_hospital.	103
				#Self_development_and_career_devlopment_are_the_key_points.	104
				#Obey_assignment.	105
				#Digitalization_is_trend_and_eventually_acheived_in_all_clinics.	106
				#Older_and_experienced_medical_staffs_can_handle_both_ways.	107
				#Place_for_living_preferred_lifestyle_and_workstyle_matter.	108
		Negative Intention	General Condition	#Unwilling_to_change_work_style.	109

Appendix 2 TPB Framework on patients

Purpose	Construction	Category	Sub-Category	Labeling	No.
The Planned Behavioral Control	Attitude	Positive responses/ advantages	Findability	#Findability_obtain_a_sense_of_control.	1
			Accessibility	#Accessbility_data_protection_regulation_establishement.	2
				#Accessbility_establish_effective_access_control_model.	3
				#Accessbility_proper_graded_authorization_and_authentication_system_establish.	4
				#Accessbility_trust_in_system_built_up_by_government.	5
				#Accessbility_trust_in_data_protection_built_up_by_hospital.	6
				#Accessbility_verfied_before_national_promotion.	7
				#Accessbility_access_to_health_data_in_real_time_can_obtain_a_sense_of_control.	8
			Interoperability	#Interoprability_advocate_standardazation_between_hospitals.	9
				#Interoperability_efficiency_improvement.	10

			Reusability	#Reusability_can_alleviate_medical_resources_assignment_unevenly.	11
				#Reusability_efficiency_improvement.	12
				#Reusability_accuracy_improvement.	13
				#Reusability_human_error_reducement.	14
				#Reusability_providing_comphrehensive_information_about_patient's_condition.	15
				#Reusability_disease_development_in_better_control.	16
				#Reusability_Data_integrity_improvement.	17
				#Reusability_accuracy_of_lesion_detection_improving.	18
				#Reusability_benefits_for_referral_condition.	19
				#Reusability_benefits_for_emergency_condition.	20
				#Reusability_duplicate_test_decease.	21
				#Reusability_benefits_for_cross_regional_healthcare.	22
			General Condition	#Think_highly_of_digital_data_and_tool.	23

				#Data_using_is_part_of_healthcare.	24
				#Digital_data_and_tools_use_makes_patients_mental_relief.	25
				#Technology_improvement_is_trend.	26
				#Health_data_sharing_is_promoted_by_government.	27
			Reusability	#Reusability_not_paying_attention_to_the_effectiveness.	28
		Negative responses/ disadvantages	Findability	#Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	29
			Accessibility	#Accessibility_beyond_knowledge.	30
				#Accessbility_distrust_in_the_ability_of_data_protection_for_sensitive_inforamtion_in_hospital.	31
				#Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.	32
				#Accessbility_indiffference_to_privacy_issues.	33
				#Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher	34

				_administrative_depaert ment.	
				#Accessbility_optimistic _about_commom_illness _information.	35
				#Accessbility_A_stereoty pe_that_security_and_saf ety_issues_must_be_solv ed_before_adoption.	36
			Reusability	#Reusability_the_effectiv eness_is_not_obvious_be cause_digitalization_dev elopment_of_objective_h ospital_is_still_in_low_le vel.	37
				#Reusability_not_paying _attention_to_the_effecti veness.	38
				#Reusability_concern_ab out_misuse_of_health_da ta.	39
			General Condition	#Low_ubiquity_impede_ the_effectiveness.	40
				#Lack_of_interaction_bet ween_patients_and_doct ors.	41
				#Concern_about_medical _staffs_rely_on_digital_ methods_in_excess.	42
				#People_not_paying_atte ntion_to_data_sharing_is sues.	43

				#Have_to_accept_the_unstoppable_technology_development.	44
		Acceptance Preference	General Condition	#Favourable_factors_individual_adoption_Doctor's_order.	45
				#Favourable_factors_individual_adoption_Doctor's_order.	46
				#Favourable_factors_individual_adoption_Affordable_price.	47
				#Favourable_factors_individual_adoption_Efficiency.	48
				#Favourable_factors_individual_adoption_Perceived_effectiveness.	49
				#Favourable_factors_individual_adoption_Ease_to_use.	50
	Social Norms	Positive responses/ advantages	Reusability	#Reusability_accuracy_improvement.	51
				#Reusability_efficiency_improvement.	52
				#Reusability_Perceived_convenience.	53
				#Reusability_providing_comphrehensive_information_about_patient's_condition.	54
			General Condition	#People_think_highly_of_digital_health.	55

				#The_government_would_not_invest_resources_in_useless_things.	56
				#Data_using_is_part_of_daily_life.	57
				#Digitalization_promoted_by_government.	58
				#Digital_data_and_tools_use_makes_patients_mental_relief.	59
		Negative responses/ disadvantages	Accessibility	#Accessbility_A_steroty pe_that_an_effective_access_control_system_must_be_applied_in_hospital.	60
				#Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.	61
				#Accessibility_beyond_knowledge.	62
			Interoperability	#Interoperability_complex_to_use.	63
			General Condition	#Lack_of_health_issues_communications.	64
				#Unfriendly_to_the_elderly.	65
				#Have_to_accept_the_unstoppable_technology_development.	66
			Accessibility	#Accessbility_authorizations_of_medical_staffs_a	67

	Perceived Behavioral Control	Factor that support or encourage		ssign_by_functional_scope.	
				#Accessbility_authorization_assignment_is_based_on_regulation_and_policy.	68
				#Accessbility_authorization_assignment_by_administrative_department.	69
		Factor that impede	Accessibility	#Accessbility_patients_are_not_informed_proactively.	70
				#Accessbility_patients_can_not_access_their_own_health_data.	71
				#Accessbility_false_perception.	72
	Intention	Positive intention	Reusability	#Reusability_efficiency_improvement.	73
				#Reusability_accuracy_improvement.	74
				#Reusability_Relief_anxiety.	75
				#Reusability_is_a_symbol_of_an_advanced_hospital.	76
			General Condition	#Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.	77
				#Negative_intention_to_visit_a_clinic_with_aging_tools.	78

		Neutral Intention	Reusability	#Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital	79
			General Condition	#Focus_on_the_overall_strength_of_a_hospital.	80
		Negative intention	Reusability	#Reusability_is_unnecessary_when_it_is_common_illness.	81
				#Reusability_Convenienve_priority.	82
				#Reusability_is_meaningful_when_professional_proficiency_of_medical_staffs_is_high.	83
				#Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	84
				#Reusability_is_unnecessary_when_current_methods_is_working.	85
				#Reusability_Cost_effectiveness_priority.	86

Appendix 3 Colour labelling for patients

Grey is labeled under general situation. Orange is labeled under Findability (in which light orange is positive factor and dark orange is negative factor). Red is labeled under Accessibility (in which light pink is positive factor and dark red is negative factor). Blue is labeled under Interoperability (in which light blue is positive factor and navy is negative factor). Green is labeled under Reusability (in which light green is positive factor and dark green is negative factor).

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Did you use any digital health when you need healthcare?	Do you have any comments or information you want to share regarding this study?
1	Male	26	Master's degree	Student	I am a student and I am 26 years old with a master's degree. #Demographic_composition_Male_between_20_to_30_year_old_with_high_education_level.	Yes. For example, online registration. And the doctors can check my previous medical records through my medical insurance card, then they can change my prescription and provide further treatment for me. #Digital_health_innovation_Online_registration.	No.
2	Male	51	Junior high school education	Driver	I have been a driver for 20 years and I am 51 years old with a junior high school education. #Demographic_composition_Male_older_than_50_year_old_with_lower_education_level.	Yes. Like self-service registration, online consultation and CT, MRI, etc. And I can check my result with the medical insurance card on a self-service machine after testing. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Online_consultation. #Digital_health_innovation_Self_service_result_inquiry. #Digital_health_innovation_CT. #Digital_health_innovation_MRI.	No.
3	Male	55	High school graduation	Nursing home staff	I am a nursing home staff and I am 55 years old with a high school education. #Demographic_composition_Male_older_than_50_year_old_with_lower_education_level.	Yes. I have used the central monitoring. Nothing else has ever been used. #Digital_health_innovation_central_monitoring.	No.
4	Male	79	Primary school graduation	Retired police	I am a retired policeman and I am 79 years old. Because the fourth cerebral infarction required a carotid artery bypass surgery, I was admitted to the neurosurgery ward. #Demographic_composition_Male_older_than_50_year_old_with_lower_education_level.	Yes. I used MRI during this treatment. But I did not ask for it. I just followed the doctor's order and use any equipment the doctor asked me to use. #Digital_health_innovation_MRI.	No. I think in the process of seeing a doctor, I listened to the doctor, and the rest I didn't think too much, and I didn't care too much. #Follow_doctors'_order_unconditionally.
5	Male	58	Collage degree	Corporate management personnel	I am a corporate management personnel and I am 58 years old with a college education. #Demographic_composition_Male_older_than_50_year_old_with_intermediate_education_level.	Yes. Self-service registration, online consultation and CT, MRI, etc. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Online_consultation. #Digital_health_innovation_CT. #Digital_health_innovation_MRI.	I think digital data and tools are helpful, but they are concentrated in level third hospital. The Popularity is too low. It should be dispersed to lower-level hospitals so as to truly reflect their role. And I think telemedicine should be conducted in rural area so that medical resources can be distributed evenly. #Think_highly_of_digital_data_and_tool. #Low_ubiquity_impede_the_e

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Did you use any digital health when you need healthcare?	Do you have any comments or information you want to share regarding this study?
							ffectiveness. #Reusability_can_alleviate_medical_resources_assignment_unevenly.
6	Male	52	Bachelor's degree	Government officer	I am a government officer and I am 52 years old with a bachelor's education. #Demographic_composition_Male_older_than_50_year_old_with_high_education_level.	Yes. I used self-service machine to check my test report and expense balance. #Digital_health_innovation_Self_service_result_inquiry.	No.
7	Female	24	Master's degree	Student	I am a student, and I am 24 years old with a master's degree. #Demographic_composition_Female_between_20_to_30_year_old_with_high_education_level.	Yes. For this time, I used online registration, after this, I used ultrasound image to check my lesion. And I can check my hospitalization condition like fee or objective results through self-service machines. Actually, I feel quite efficient and happy about this treatment process. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Self_service_result_inquiry. #Digital_health_innovation_US.	No.
8	Female	26	Master's degree	Product operations officer	I am a internet product operations officer, and I am 26 years old with a master's degree. #Demographic_composition_Female_between_20_to_30_year_old_with_high_education_level.	Yes. I used online registration and I can check my hospitalization condition like fee or objective results through self-service machines. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Self_service_result_inquiry.	No.
9	Female	47	Junior high school graduation	Farmer	I am a farmer and I am 47 years old with a junior high school education. #Demographic_composition_Female_between_40_to_50_year_old_with_lower_education_level.	Yes. I have used the central monitoring. Nothing else has ever been used. #Digital_health_innovation_central_monitoring.	No.
10	Female	50	High school graduation	Farmer	I am a farmer and I am 50 years old. I have a low level of education and graduated from high school. I was hospitalized because of a car accident. #Demographic_composition_Female_between_40_to_50_year_old_with_lower_education_level.	Yes. For example, the central monitoring I use now. If my body is abnormal, it will automatically call the nurse at the nurse station. #Digital_health_innovation_central_monitoring.	No.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Did you use any digital health when you need healthcare?	Do you have any comments or information you want to share regarding this study?
11	Female	51	High school graduation	Worker	I am a worker and I am 51 years old with a high school education. #Demographic_composition_Female_older_than_50_year_old_with_lower_education_level.	Yes. I have used the central monitoring. And I know that the electronic imaging system because I experienced it once when I was hospitalized. After testing, I do not need to wait for the film but directly went to the doctor he can view my result through his computer. #Digital_health_innovation_central_monitoring. #Digital_health_innovation_electronic_imaging_system.	I think digital data and tools are helpful, but they are concentrated in level third hospital. The Popularity is too low. It should be dispersed to lower-level hospitals so as to truly reflect their role. I think the government should establish more rigorous regulatory and protection system if the data sharing is widely used. #Low_ubiquity_impede_the_effectiveness. #Accessbility_data_protection_regulation_establishement. #Accessbility_establish_effective_access_control_model.
12	Female	44	Collage degree	Sale	I am a sale woman and I am44 years old with a college education. #Demographic_composition_Female_between_40_to_50_year_old_with_intermediate_education_level.	Yes. Like self-service registration, online consultation and CT, MRI, etc. And I can check my result with the medical insurance card on a self-service machine after testing. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Online_consultation. #Digital_health_innovation_Self_service_result_inquiry. #Digital_health_innovation_CT. #Digital_health_innovation_MRI.	No.
13	Female	50	Collage degree	Retired government officer	I am a retired government officer and I am 50 years old with a college education. #Demographic_composition_Female_between_40_to_50_year_old_with_intermediate_education_level.	Yes. Self-service registration, online consultation and CT, MRI, etc. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Online_consultation. #Digital_health_innovation_CT. #Digital_health_innovation_MRI.	I think digital data and tools are helpful, but they are concentrated in level third hospital. The Popularity is too low. It should be dispersed to lower-level hospitals so as to truly reflect their role. And I think telemedicine should be conducted in rural area so that medical resources can be distributed evenly. #Think_highly_of_digital_data_and_tool. #Low_ubiquity_impede_the_effectiveness. #Reusability_can_alleviate_medical_resources_assignment_unevenly. But, as a patient, I do not really like this style. It doesn't feel like there is an interaction between me and the doctor, and it is not the doctor who make the diagnosis and cure my illness but a machine. The machine gives me a test and creates a result and gives a suggestion about what should the doctor do with my illness. #Negetive_feeling_about_digital_health_lack_of_interaction_between_patients_and_doctors.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Did you use any digital health when you need healthcare?	Do you have any comments or information you want to share regarding this study?
14	Female	52	Collage degree	Junior high school teacher	I am a teacher and I am 52 years old with a college education. #Demographic_composition_Female_older_than_50_year_old_with_intermediate_education_level.	Yes. When I need a medical care, I will register it online. And I can print my test report by authenticating my insurance card on self-service machines. I can pay my consultation fee and other expense on self-service machines as well. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Self_service_result_inquiry.	No.
15	Female	45	Bachelor's degree	High school teacher	I am a teacher in high school, and I am 45 years old with a bachelor's degree. #Demographic_composition_Female_between_40_to_50_year_old_with_high_education_level.	Yes. When I need a medical care, I will register it online. And I can print my test report by authenticating my insurance card on self-service machines. I can pay my consultation fee and other expense on self-service machines as well. #Digital_health_innovation_Online_registration. #Digital_health_innovation_Self_service_result_inquiry.	No.

Respondent ID	When you need to use the digital health innovations to assist your treatment, what characteristics matter in your final decision?	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
1	I don't think I have autonomy to choose those innovations. I just follow the doctor's order. #Favourable_factors_individual_adoption_Doctor's_order.	I think so. I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can escape from tedious workflow to focus on the treatment itself. What's more, they can check my previous medical records to get a comprehensive understanding about my condition so that they can provide accurate treatment for me. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think it should be improved. But I have no idea what kind of change it should be. I just think it is a trend and it will change eventually. But I don't know if it is good or not. Because our medical insurance card is bonded with our personal information such as ID, address, and bank account. When the data use is improved in the hospital, I am afraid my personal information may face a bigger risk. #Technology_improvement_is_trend. #Accessbility_access_control.	I'm worried. As I mentioned before, the medical insurance card we used as a visit card is bonded with too much personal information such as ID, address and bank account. it is a huge disaster when the data is leaked. And hospital is just a health institution, it is not a technology company, which means they cannot have a strong ability of data protection. #Accessbility_distrust_in_the_ability_of_data_protection_for_sensitive_inforamtion_in_hospital.
2	My choice is made based on the doctor's order. #Favourable_factors_individual_adoption_Doctor's_order.	I have no idea. Because it seems like a complete process. Using digital data is part of the treatment when we need to consultation. #Data_using_is_part_of_healthcare. #Reusability_not_paying_attention_to_the_effectiveness.	I think it should improve. Because if the analysis and data use are improved and accurate than before, I may not need to conduct a bunch of tests and some of them are repeat test, which can help to reduce my pain for taking those tests. #Reusability_accuracy_improvement_and_duplicate_test_decease.	I'm not worried. Expect myself, no one else would be interested in my health data. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.

Respondent ID	When you need to use the digital health innovations to assist your treatment, what characteristics matter in your final decision?	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
3	According to the severity of the illness. It is not necessary to spend extra money. #Favourable_factors_individual_adoption_the_condition_needs.	I don't think it makes much difference. Because the hospital's existing digitalization is not mature enough so that it cannot realize the effectiveness of digital data. So, I feel almost the same. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level.	I think it will be improved. Because doctors do not have to spend time on tedious work such as measure physical data, they are more flexible to study medical records and improve themselves. And this method can reduce human error, which is also good for patients. #Reusability_efficiency_improvement. #Reusability_human_error_reducement.	I'm not worried. First of all, I can't think of any scenario except information leakage or theft by doctor because I cannot relate this with web security or things with that nature. It is restricted by my knowledge and understanding. And I don't think it is helpful to worry about this situation by individual cos it should be considered by hospital or higher administrative department. #Accessbility_unawareness_about_information_security. #Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.
4	The first is to listen to the doctor's advice. I'll use whatever the doctor suggests, because I don't know about it. #Favourable_factors_individual_adoption_Doctor's_order. The second is to look at the price, after all I want to be able to afford it. #Favourable_factors_individual_adoption_Affordable_price.	I think there is improvement. Increasing instruments are used in clinic and all physical indicators of patients can be clearly displayed, which gives me a psychological feeling that medical care is more professional now. #Digital_data_and_tools_use_makes_patients_mental_relief.	I don't understand because my age and I have not been exposed to this new technology. But I think it has improved. #Beyond_knowlege. #Technology_improvement_is_trend.	I don't understand these, so I don't care too much. #Accessbility_indiffference_to_privacy_issues.
5	My choice is made based on the doctor's order. #Favourable_factors_individual_adoption_Doctor's_order.	I think so. Because the traditional method relies on the medical staff's experience. The novel method with digital data can provide objective results, which is more accurate comparing with the traditional one. #Reusability_accuracy_improvement.	I think it will be improved. From the technology development aspect, it is good to improve current approach to next level. But at the same time, data protection regulation should follow up or a step ahead before that. #Technology_improvement_is_trend. #Accessbility_data_protection_regulation_establishement.	I'm not worried. I don't think it is helpful to worry about this situation by individual cos it should be considered by hospital or higher administrative department. #Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.
6	The first is to listen to the doctor's advice. I'll use whatever the doctor suggests, because I don't know about it. #Favourable_factors_individual_adoption_Doctor's_order. The second is to look at the efficiency, i want to cure myself in the shortest time. #Favourable_factors_individual_adoption_Efficiency.	I think so. It is time saving than traditional methods. I can finish self-registration online and check my results without waiting in line. #Reusability_efficiency_improvement.	I think it will be improved. Because there is room for technology improving. For instance, the test report, I heard that in advanced hospital, they use machine to read the report and draw a diagnosis, which is much more accurate than human, therefore, it can find out the subtle lesion. #Reusability_human_error_reducement. #Reusability_accuracy_of_lesion_detection_improving.	Yes. I think it is not strange that almost everyone gets upset by telephone harassment. How can they obtain our personal information? I am untrusted in the data protection in hospital. I am afraid my health data will be miused. #Accessbility_distrust_in_data_protection_used_for_sensitive_inforamtion_in_hospital. #Reusability_concern_about_misuse_of_health_data.

Respondent ID	When you need to use the digital health innovations to assist your treatment, what characteristics matter in your final decision?	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
7	My choice is made based on the following points. First, it should truly help me, and I can perceive it is useful for my condition. Secondly, it is convenient and ease to use. If the operation is too complex for user, then it is not user friendly. #Favourable_factors_individual_adoption_Perceived_effectiveness. #Favourable_factors_individual_adoption_Ease_to_use.	I think so. I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can escape from tedious workflow to focus on the treatment itself. #Reusability_efficiency_improvement.	I think it should be improved. Because this is not my first clinic for my treatment. I am a referral patient, so in there, my test results and other objective results cannot be shared with the current hospital. I think if data use can be wide sharing it is helpful for referral patient. #Reusability_benefits_for_referral_condition.	I'm not worried. Because for this time, my illness is not sensitive like cancer or STD. #Accessbility_optimistic_about_commom_illness_information.
8	The first is to listen to the doctor's advice. I'll use whatever the doctor suggests, because I don't know about it. #Favourable_factors_individual_adoption_Doctor's_order. The second is to look at the price, after all I want to be able to afford it. #Favourable_factors_individual_adoption_Affordable_price.	I think so. I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can check my previous medical records to get a comprehensive understanding about my condition so that they can provide accurate treatment for me. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think it should improve. Because there is room for technology improving. And I think the standardization should be improved. For example, my grandma is hospitalized and need to be transferred to another clinic. But we need to do the basic tests again because of the inconsistent between these two hospitals, which is actually time consuming and costly. #Interoprability_advocate_standardazation_between_hospitals. #Interoperability_efficiency_improvement.	I'm worried. The medical insurance card we used as a visit card is bonded with too much personal information. it is a huge disaster when the data is leaked. I hope they can establish proper graded system to protect my data. #Accessbility_proper_graded_authorization_and_authentication_system_establish.
9	My choice is made based on the condition needs and doctor's order. #Favourable_factors_individual_adoption_Doctor's_order. #Favourable_factors_individual_adoption_the_condition_needs.	I think it definitely improved. I think this way can save time cost of treatment. Results do not need to wait for paper or other physical means to be presented but directly electronically displayed. So, I think it is efficient and timesaving. #Reusability_efficiency_improvement.	I think it will be improved. Because doctors do not have to spend time on tedious work such as measure physical data, they are more flexible to study medical records and improve themselves. And this method can reduce human error, which is also good for patients. #Reusability_efficiency_improvement. #Reusability_human_error_reducement.	I'm not worried. First of all, I can't think of any scenario except information leakage or theft by doctor because I cannot relate this with web security or things with that nature. It is restricted by my knowledge and understanding. Secondly, I have no idea why people are interested about those health data, except the patients or their family, cos those data are meaningless not like bank account, and they cannot transfer to money eventually. #Accessbility_unawareness_about_information_security. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.
10	Since I don't understand, I choose to listen to the doctor's advice. I'll use whatever the doctor suggests. #Favourable_factors_individual_adoption_Doctor's_order.	I think there is improvement. Just like the central monitoring I mentioned above. The nurses can observe my physical data at the nurse station, so that they can provide better care. And it will automatically alert for abnormal conditions, which also helped to secure my life. #Reusability_disease_development_in_better_control.	I don't understand but I think it will be improved. Because science and technology are improving, all walks of life are following the progress of science and technology. #Technology_improvement_is_trend.	I'm not worried. I don't think this issue should be considered by individuals, but the hospital or government should consider how to ensure the security of data. #Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.

Respondent ID	When you need to use the digital health innovations to assist your treatment, what characteristics matter in your final decision?	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
11	My choice is made based on the condition needs and doctor's order. #Favourable_factors_individual_adoption_Doctor's_order. #Favourable_factors_individual_adoption_the_condition_needs.	I don't think it makes much difference. Because the hospital's existing digitalization is not mature enough so that it cannot realize the effectiveness of digital data. So, I feel almost the same. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level.	I think it will be improved. Because doctors do not have to spend time on tedious work such as measure physical data, they are more flexible to study medical records and improve themselves. And this method can reduce human error, which is also good for patients. #Reusability_efficiency_improvement. #Reusability_human_error_reducement.	I'm not worried. I have no idea why people are interested about those health data of normal people, except the patients or their family, cos those data are meaningless not like bank account, and they cannot transfer to money eventually. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.
12	My choice is made based on the doctor's order. #Favourable_factors_individual_adoption_Doctor's_order.	I think so. We don't need to wait in line to register and get test report. All of this can be done in the phone or a self-service machine which is convenient and time saving. With high efficiency, it is a quite relief for patients and reduce the possibility that have a dispute between both sides. And it is easy to keep, I do not need to worry about the loss. #Reusability_efficiency_improvement. #Reusability_Relief_anxiety. #Reusability_Data_integrity_improvement.	I think it will be improved. Because technology improving is an unstoppable trend. #Technology_improvement_is_trend.	I'm not worried. Because I think the hospital should consider the safety and security issues before they introduce the innovation. Once an innovation is introduced, the problems mentioned must be solved, otherwise, the innovation cannot be used for clinical treatment. What's more, I have no idea why people are interested about those health data, except the patients or their family, cos those data are meaningless not like bank account. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.
13	According to the severity of the illness. It is not necessary to spend extra money. #Favourable_factors_individual_adoption_the_condition_needs.	I think so. We don't need to wait in line to register and get test report. All of this can be done in the phone or a self-service machine which is convenient and time saving. #Reusability_efficiency_improvement.	I think it should be improved. With higher accuracy, it can detect the hidden disease that be neglected. #Reusability_accuracy_of_lesion_detection_improving.	I'm not worried. Because I think the hospital should consider the safety and security issues before they introduce the innovation. Once an innovation is introduced, the problems mentioned must be solved, otherwise, the innovation cannot be used for clinical treatment. What's more, our health insurance system is built up by government not personal company, so I totally believed in them. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption. #Accessbility_trust_in_system_built_up_by_government.
14	My choice is made based on convenience. I don't need to wait in line and check with human. So, it can help me save my time and bring convenience, then it is what I need. #Favourable_factors_individual_adoption_Perceived_convenience.	I think so. I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can escape from tedious workflow to focus on the treatment itself. #Reusability_efficiency_improvement.	I think it should be improved.	I'm a bit of worried. But I think the hospital should take the responsibility to protect our personal data. #Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.

Respondent ID	When you need to use the digital health innovations to assist your treatment, what characteristics matter in your final decision?	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
15	My choice is made based on convenience. Because the number of patients in china is huge and everyone is anxious when you are ill. So, if it can help me save my time and bring convenience, then it is what I need. #Favourable_factors_individual_adoption_Perceived_convenience. #Favourable_factors_individual_adoption_Efficiency.	I think so. I don't need to wait in line to register and get my test report. And I think it is convenient for medical staffs as well because they can escape from tedious workflow to focus on the treatment itself. #Reusability_efficiency_improvement.	I think it will be improved. Because technology improving is an unstoppable trend. #Technology_improvement_is_trend.	I'm not worried. Because the leak of health data is less harmful in compared with the bank account. And I can trust the bank to save my money and my account information, why can't I trust the hospital stored with my health data? #Accessbility_misunderstand_about_health_data_considered_it_less_significant. #Accessbility_trust_in_data_protection_built_up_by_hospital.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?	Do your doctors think that they can give better care if they work with digital data and can access your health data?
1	I am afraid. Because the medical insurance card is bonded with too much personal information. Our ID number is used as the one and only identification code. If it is leaked, the consequence is unimaginable. #Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	We never talked about this topic before, but I think It should be helpful compared with the traditional methods. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	We never talked about this topic before, but I think It should be helpful. Just like i mentioned before, it helps the doctors to understand the condition in every aspect. #Lack_of_health_issues_communications. #Reusability_providing_comphrehensive_information_about_patient's_condition.	It should be helpful. The integrity of digital data storage provides comprehensive understanding toward patients' condition, which helps further treatment. In this case, I don't need to make repeat or redundant tests and it is efficient. #Reusability_Data_integrity_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Reusability_efficiency_improvement.
2	I think it is not my business. Whatever it changes in the future, I just follow the rules. #Neutral_response_wide_data_sharing_not_paying_attention_to_this.	We never talked about this topic before, but I think It should be helpful compared with the traditional methods. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	It is quite similar with the previous question. In my daily life, we don't talk about it very often. We are not familiar with this field. But I think it should help. #Lack_of_health_issues_communications. #People_do_not_pay_attention_to_this. #Positive_response_to_digital_data_people_think_highly_of_digital_methods.	I don't know. I just follow their instruction. #Neutral_response_Lack_of_health_issues_communications.
3	To be honest, I am worried. But my worries are very useless in the face of such an unstoppable trend, so it is better not to worry. #Negative_response_to_wide_data_sharing_but_have_to_accept_the_unstoppable_technology_development. #Accessbility_concern_about_the_data_protection_system_used_for_sensitive_inforamtion_in_hospital.	It should be helpful, otherwise why use these new technologies? These reforms cost human and material resources. If there is no benefit, why should the hospital and the government promote for it? #Positive_response_to_digital_health_people_think_highly_of_digital_health. #Positive_response_to_digital_health_the_government_would_not_invest_resources_in_useless_things.	My answer is similar to the previous question.	It definitely helps. For example, the doctor can observe the patient's physical data in real time, without manual measurement, saving time and facilitating the doctor's work. #Reusability_efficiency_improvement.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?	Do your doctors think that they can give better care if they work with digital data and can access your health data?
4	To be honest, I am indifferent to this. Because I'm 80 years old, new things are too far away for me, I don't understand. #Neutral_response_wide_data_sharing_not_paying_attention_to_this.	My family doesn't work in the medical field, so they don't understand. But it is generally believed that the current level of medical care is higher than the traditional medical care. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	My answer is similar to the previous question.	I haven't discussed this with my doctor. But I think it should be improved because it is more efficient and accurate. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.
5	I think it is beneficial. But I am worried about with increasing digital data and tools are used to assist medical staffs to provide better healthcare, it could cause medical staffs rely on those assistance too much that their professional ability could decrease. #Concern_about_medical_staffs_rely_on_digital_methods_in_excess.	We never talked about this topic before, but I think It should be helpful compared with the traditional methods. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	My answer is similar to the previous question. People accept different things according to their education level and social experience. Some friends are more against this novel approach.	It should be helpful. For instance, they can view my previous prescription and medical records which is helpful to understand my condition comprehensively. #Reusability_providing_comphrehensive_information_about_patient's_condition.
6	I think it is beneficial. For patients, we can check our health data in real time, which gives us a sense of control. #Findability_obtain_a_sense_of_control. #Accessbility_access_to_health_data_in_real_time_can_obtain_a_sense_of_control.	Yes, it helps. Machine is doing way better than human in the aspect of accuracy of measure. #Reusability_accuracy_improvement.	Yes. It is more efficient and accurate in comparison with the traditional method. #Reusability_accuracy_improvement. #Reusability_efficiency_improvement.	It should be helpful. For instance, they can view my previous prescription and medical records which is helpful to understand my condition comprehensively. #Reusability_providing_comphrehensive_information_about_patient's_condition.
7	I think it is beneficial. Because the reform is advocated and regulated by government. In the future, with wide data sharing, there must establish a rigorous data protection system ahead. And I think it is helpful to solve the problems caused by cross-regional healthcare. #Positive_about_data_sharing_promoted_by_government. #Accessbility_data_protection_system_establishement. #Reusability_benefits_for_cross_regional_healthcare.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	It should be helpful.
8	I think it is beneficial especially for emergency and referral situation. #Reusability_benefits_for_referral_condition. #Reusability_benefits_for_emergency_condition. But the medical insurance card is bonded with too much personal information. Our ID number is used as the one and only identification code. If it is leaked, the consequence is unimaginable. #Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	It should be helpful. For instance, they can view the patients' previous prescription and medical records which is helpful to understand the condition comprehensively. #Reusability_providing_comphrehensive_information_about_patient's_condition.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?	Do your doctors think that they can give better care if they work with digital data and can access your health data?
9	I have no clue about this data sharing thing, but I think technology improvement is basically beneficial. What I can imagine form your question is that it will facilitate the doctors reduce complex work procedure and save time for both of patients and the doctors. Besides, it helps to save money because we do not need to do repeat testing. Therefore, the whole efficiency is improved. #Technology_improvement_is_trend. #Reusability_efficiency_improvement. #Reusability_duplicate_test_decease_and_money_saving_for_patients.	We never talked about this topic before, but I think It should be helpful. As I mentioned above, it can save time for both of patients and doctors. And machine is doing way better than human in the aspect of accuracy of measure #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.	My answer is similar to the previous question.	It definitely helps. For example, the doctor can observe the patient's physical data in real time, without manual measurement, saving time and facilitating the doctor's work. #Reusability_efficiency_improvement.
10	I think data sharing is beneficial. But what data can be shared and what data cannot be shared, there needs to be clear criteria for this classification. #Accessbility_proper_access_control_should_establish.	My family doesn't work in the medical field, so they don't understand. But it is generally believed that the current level of medical care is higher than the traditional medical care. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	My answer is similar to the previous question. Because the digital data obtained by the machine is more accurate than the data obtained by the doctor's observation. #Reusability_accuracy_improvement.	I haven't discussed this with my doctor. But I think it should be improved because it is more efficient and accurate. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.
11	I think it is beneficial. Because doctors in lower level hospital can use treatment method in higher level hospital as a reference or an inspiration if the condition is quite similar under data-sharing system. And they can exchange ideas and learn from each other regardless of physical meeting. I think It is quite helpful to reduce medical resources distributed unevenly. #Reusability_can_alleviate_medical_resources_assignment_unevenly.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	My answer is similar to the previous question.	It should be helpful. For instance, they can view the patients' previous prescription and medical records which is helpful to understand the condition comprehensively. #Reusability_providing_comphrehensive_information_about_patient's_condition.
12	I think it is beneficial. I hope one day there is a health file about every patient, and every previous medical records store in there. The file belongs to a system that use in national scope so that I do not need to worry about medical care in different places. And it can give doctor a complete understanding about my condition comparing to current method. Therefore, it is complete time saving and efficient. #Reusability_benefits_for_cross_regional_healthcare. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Reusability_efficiency_improvement.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	I think so. Because in my daily life, I can learn some new tricks used within the hospital from my friends. Currently, people are willing to embrace the new lifestyle with digital tools and data. Because using those is becoming part of daily life in every aspect. #Data_using_is_part_of_daily_life.	It should be helpful. It is time saving and help doctor can speed up the treatment process. #Reusability_efficiency_improvement.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?	Do your doctors think that they can give better care if they work with digital data and can access your health data?
13	I think it is beneficial. I think it is helpful for cross-regional healthcare and non-local patients. #Reusability_benefits_for_cross_regional_healthcare.	We never talked about this topic before, but I think It should be helpful. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health.	I think so. All works of life are going through digitalization reform. We seldom pay by cash but with Alipay or WeChat Pay. By advocating by the policy, I think people have the awareness of how convenient life it is when everything can be done in mobile, even though for the elder, it is hard to operate, their children will help with them to adapt the new lifestyle. #Positive_about_digitalization_promoted_by_government. #Data_using_is_part_of_daily_life. #Reusability_Perceived_convenience.	It should be helpful.
14	I am afraid my personal data will face a risky environment. Because the medical insurance card is bonded with too much personal information. Our ID number is used as the one and only identification code. If it is leaked, the consequence is unimaginable. #Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	Yes. We think it's convenient. We can complete the registration and charging process online or through the mobile network, in this case, it is time saving for patient to get treatment. #Reusability_efficiency_improvement.	Yes. All works of life are going through digitalization reform. By advocating by the policy, I think people have the awareness of how convenient life it is when everything can be done in mobile. #Positive_about_digitalization_promoted_by_government. #Data_using_is_part_of_daily_life. #Reusability_Perceived_convenience.	It should be helpful. From my perspective, it sets free to the doctors from tedious work and let them have more energy to focus on researching treatment programs. #Reusability_efficiency_improvement.
15	I think it is beneficial. And what I consider is that even if it is not working as well as we imagined, we can still change and refine to a better version. And I think this kind of reform must launch pilot projects at an early stage, therefore, when it can promote to national-wide usage, it has been verified. #Positive_about_data_sharing_promoted_by_government. #Accessbility_verfied_before_national_promotion.	We never talked about this topic before, but I think It should be helpful. But it is unfriendly to the elder, they are hard to adapt novel thing. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health. #Unfriendly_to_the_elderly.	We never talked about this topic before, but I think It should be helpful. At least, we think it is time saving and efficient compared to the traditional method. We don't have to wait in long line. #Lack_of_health_issues_communications. #Positive_response_to_digital_health_people_think_highly_of_digital_health. #Reusability_efficiency_improvement.	It should be helpful. From my perspective, it sets free to the doctors from tedious work and let them have more energy to focus on researching treatment programs. #Reusability_efficiency_improvement.

Respondent ID	Do you feel safe when you use of digital health tools?	Are you informed that how is access authorization of doctors arranged in the hospital and who is responsible for assigning access?	Can you access your personal health data?
1	I feel safe.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.

Respondent ID	Do you feel safe when you use of digital health tools?	Are you informed that how is access authorization of doctors arranged in the hospital and who is responsible for assigning access?	Can you access your personal health data?
2	I feel safe. Because they are used by everyone who need a healthcare. What's more, they are applied in clinical occasions by the hospital. If there were problems, they wouldn't be introduced in clinical use. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	No. #Accessbility_patients_can_not_access_their_own_health_data.
3	I feel safe. But behind this feeling is caused by out of choice. For example, if you choose to use MRI to check your body, this thing has radiation, but you can only use this in order to better view the lesion. #Positive_response_but_have_to_accept_the_unstoppable_technology_development.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. However, I know that doctors can't read patient records across departments, but I don't know why. #Accessbility_patients_are_not_informed_proactively.	I think I can. My family members will find a doctor to inquire about my condition. The doctor will review my data and explain it to my family on his computer. #Accessbility_false_perception.
4	I feel safe. Because the equipment that can be used in the hospital means that the safety standards are met, otherwise it will not be applied to patients. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. #Accessbility_patients_are_not_informed_proactively.	I don't think I can. The doctor would tell me the results and I couldn't understand the data myself. #Accessbility_patients_can_not_access_their_own_health_data.
5	I feel safe.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. #Accessbility_patients_are_not_informed_proactively.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
6	Yes. Expect myself, no one else would be interested in my health data. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.	The doctor will not inform this information proactively. But I think there should be a administrative department within the hospital which is responsible for this. And their authorization should be assigned based on the regulationa and policy. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorization_assignment_is_based_on_regulation_and_policy. #Accessbility_authorization_assignment_by_administrative_department.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
7	I feel safe. Because the equipment that can be used in the hospital means that the safety standards are met, otherwise it will not be applied to patients. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.

Respondent ID	Do you feel safe when you use of digital health tools?	Are you informed that how is access authorization of doctors arranged in the hospital and who is responsible for assigning access?	Can you access your personal health data?
8	Yes.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
9	I feel safe. Because the equipment that can be used in the hospital means that the safety standards are met, otherwise it will not be applied to patients. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. #Accessbility_patients_are_not_informed_proactively.	I think I can. My family members will find a doctor to inquire about my condition. The doctor will review my data and explain it to my family on his computer. #Accessbility_false_perception.
10	I feel safe. Because the equipment that can be used in the hospital means that the safety standards are met, otherwise it will not be applied to patients. By seeing increasing equipment are used in the hospital, It makes me feel safe and professional. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital. #Digital_data_and_tools_use_makes_patients_mental_relief.	The doctor will not inform this information proactively. #Accessbility_patients_are_not_informed_proactively.	I think I can. My family members will find a doctor to inquire about my condition. The doctor will review my data and explain it to my family on his computer. #Accessbility_false_perception.
11	I feel safe, because I never consider this kind question before. It is too far beyond from my knowledge. #Positive_response_due_to_unknowing.	The doctor will not inform this information proactively. At the same time, we will not ask anything else except the situation about illness. #Accessbility_patients_are_not_informed_proactively.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
12	Yes.	The doctor will not inform this information proactively. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
13	I feel safe.	The doctor will not inform this information proactively. But I think they cannot access the data that beyond their functional scope. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.
14	I feel safe. Because the equipment that can be used in the hospital means that the safety standards are met, otherwise it will not be applied to patients. #Accessbility_A_sterotype_that_an_effective_access_control_system_must_be_applied_in_hospital.	The doctor will not inform this information proactively. But I think they cannot access the data that beyond their functional scope. I think it should be the administrative department of the hospital to take charge of the assignment. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope. #Accessbility_authorization_assignment_by_administrative_department.	I don't think I can. But I can check my condition with my attending physician. #Accessbility_patients_can_not_access_their_own_health_data.

Respondent ID	Do you feel safe when you use of digital health tools?	Are you informed that how is access authorization of doctors arranged in the hospital and who is responsible for assigning access?	Can you access your personal health data?
15	I feel safe.	The doctor will not inform this information proactively. But I think they cannot access the data that beyond their functional scope. I think it should be the administrative department of the hospital to take charge of the assignment. #Accessbility_patients_are_not_informed_proactively. #Accessbility_authorizations_of_medical_staffs_assign_by_functional_scope. #Accessbility_authorization_assignment_by_administrative_department.	I don't think I can. #Accessbility_patients_can_not_access_their_own_health_data.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for treatment?	Would you seek to go to another clinic, if that clinic used more digital data tools?	Would you prefer to go to another clinic where they are using traditional health methods without digital tools?
1	It is not my decisive criterium. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Yes. But the precondition is the overall strength of medical staffs is comparable. #Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this. #Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.
2	No. According to the type and severity of illness, I will choose the corresponding hospital for treatment. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	No. To be honest, I think it is complex to use these digital tools. #Interopreability_complex_to_use.	It ups to my condition. If it is not severe, then I prefer a traditional method. #Positive_intention_to_traditional_methods. #Reusability_is_unnecessary_when_it_is_common_illness.
3	No. Because I have to choose the corresponding specialist hospital according to my condition. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	I personally prefer hospitals with these tools, but I also refer to the overall level of hospital staff. Without good doctors, advanced equipment is meaningless. #Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	If the condition is not serious, I think it will be fine. Convenience is my priority. #Positive_intention_to_traditional_methods. #Reusability_is_unnecessary_when_it_is_common_illness.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for treatment?	Would you seek to go to another clinic, if that clinic used more digital data tools?	Would you prefer to go to another clinic where they are using traditional health methods without digital tools?
4	No. Because I have to choose the corresponding specialist hospital according to my condition. I am also used to seeing a doctor nearby. So, relying on these two, I will choose the suitable hospital for treatment. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	The answer is similar to my last question. Using digital tools is not an important criterion for me. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	The answer is similar to my last question. Using digital tools is not an important criterion for me. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.
5	No. According to the type and severity of illness, I will choose the corresponding hospital for treatment. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	The answer is similar to my previous question. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	I don't think it is a bad idea. For me, spending the least effort to cure the illness is what I expect no matter what method it used. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.
6	Yes. I am willing to visit a clinic with cutting edge innovations and technique. It is more efficient and accurate than the traditional clinic. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.	Yes.	No. Because with traditional methods, there are too much human factors that can affect the treatment, which is not as accurate as machine. #Reusability_accuracy_improvement.
7	Yes. I would like to visit a more efficient clinic, because I am anxious, and I don't want to intensify the feeling anymore by wasting time and dealing with complex procedure. #Reusability_efficiency_improvement. #Reusability_Relief_anxiety.	Yes.	If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this. #Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.
8	No. Because I have to choose the corresponding specialist hospital according to my condition. I am also used to seeing a doctor nearby. So, relying on these two, I will choose the suitable hospital for treatment. And to be honest, sometimes, i am not clear with my condition, thus it is hard to operate on machine for instance registration. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	Yes. But the precondition is the overall strength of medical staffs is comparable. #Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this. #Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for treatment?	Would you seek to go to another clinic, if that clinic used more digital data tools?	Would you prefer to go to another clinic where they are using traditional health methods without digital tools?
9	It should be. In my perspective, it is a feature of an advanced hospital. #Reusability_is_a_symbol_of_an_advanced_hospital.	I think if current hospital can cure the illness then it is no need to spend a lot of effort to transfer to another clinic just because of those tools. Spending the least effort, including human and time and money resources, to cure the illness is what i value the most. #Reusability_is_unnecessary_when_current_methods_is_working. #Reusability_Cost_effectiveness_priority.	I may not visit a hospital like this. #Negative_intention_to_traditional_methods.
10	No. Because I have to choose the corresponding specialist hospital according to my condition. I am also used to seeing a doctor nearby. So, relying on these two, I will choose the suitable hospital for treatment. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	The answer is similar to my last question. Using digital tools is not an important criterion for me.	The answer is similar to my last question. Using digital tools is not an important criterion for me. But if the equipment is aging, I am not willing to go to such a place for treatment. #Negative_intention_to_visit_a_clinic_with_aging_tools.
11	No. According to the type and severity of illness, I will choose the corresponding hospital for treatment. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	No. Because the overall strength of the hospital are the key point for treatment. #Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	No. Because the overall strength of the hospital is the key point for treatment, not data or tools use.
12	Yes. I would like to visit a more efficient clinic, because I am anxious, and I don't want to intensify the feeling anymore by wasting time and dealing with complex procedure. #Reusability_efficiency_improvement. #Reusability_Relief_anxiety.	Yes.	If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this. #Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.
13	No. According to the type and severity of illness, I will choose the corresponding hospital for treatment. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	No. Spend the least resources to cure the illness is the goal rather than experience advanced tools. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	I am not willing to visit this kind of hospital. Because it is too complex and low-efficient. #Reusability_efficiency_improvement.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for treatment?	Would you seek to go to another clinic, if that clinic used more digital data tools?	Would you prefer to go to another clinic where they are using traditional health methods without digital tools?
14	It is not my decisive criterium. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Yes. But the precondition is the overall strength of medical staffs is comparable. #Reusability_is_meaningful_when_overall_strength_of_medical_staffs_is_comparable.	If the hospital is specialized, then I have to visit it. Otherwise, I won't go to a clinic like this. #Negative_intention_to_traditional_methods_unless_it_is_specalized_and_irreplacable.
15	Not really. The first is to choose the corresponding specialist hospital according to my condition. If it is just common illness, then I just visit a clinic nearby. There is no need to seek digital health. #Reusability_is_unnecessary_when_it_is_common_illness. #Reusability_Convenienve_priority.	Yes. But there is a precondition, the medical staffs can handle these innovations in high degree of professional proficiency. #Reusability_is_meaningful_when_professional_proficiency_of_medical_staffs_is_high.	I am not willing to visit this kind of hospital. Because it is too complex and low-efficient. #Reusability_efficiency_improvement.

Appendix 4 Colour labelling for medical staffs

Grey is labeled under general situation. Orange is labeled under Findability (in which light orange is positive factor and dark orange is negative factor). Red is labeled under Accessibility (in which light pink is positive factor and dark red is negative factor). Blue is labeled under Interoperability (in which light blue is positive factor and navy is negative factor). Green is labeled under Reusability (in which light green is positive factor and dark green is negative factor).

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Could you talk about your daily work routine?	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used
1	Male	33	Master's degree	Attending Neurological surgeon	I am the attending surgeon of Neurosurgery in Miyun District Hospital. I am 33 years old and have a master's degree. #Demographic_composition_Male_between_30_to_40_year_old_with_high_education_level.	When there is no emergency operation, the daily work is probably to take care of the patients, prescribe orders, and write medical records. #Daily_work_Operation. #Daily_work_Care_providing. #Daily_work_Doctor's_order_prescription. #Daily_work_Medical_rocrds_writing.	Quite a lot. In daily work, we will use the electronic medical record system to record the course of the disease, and the electronic reading system to check the results of the radiological examination. This has helped us a lot. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system.
2	Male	37	Master's degree	Attending Urologist	I am the attending surgeon of Urology department in Miyun District Hospital. I am 37 years old and have a master's degree. #Demographic_composition_Male_between_30_to_40_year_old_with_high_education_level.	When there is no emergency operation, the daily work is probably to take care of the patients, prescribe orders, and write medical records. And I will apply operation for patients if their condition need be treated like this. #Daily_work_Operation. #Daily_work_Care_providing. #Daily_work_Doctor's_order_prescription. #Daily_work_Medical_rocrds_writing.	Not very often. In daily work, we will use the electronic medical record system to record the course of the disease, and the electronic reading system to check the results of the radiological examination. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system.
3	Male	40	Master's degree	Attending Urologist	I am the attending surgeon of Urology department in Miyun District Hospital. I am 40 years old and have a master's degree. #Demographic_composition_Male_between_30_to_40_year_oldwith_high_education_level.	My daily work is scheduled. Take care of the patients, prescribe the order and write down the medical records. When there is an emergency situation or a condition change, then I need to apply operation. #Daily_work_Operation. #Daily_work_Care_providing. #Daily_work_Doctor's_order_prescription. #Daily_work_Medical_rocrds_writing.	Not very often. In my daily work, i will use the electronic medical record system to record the course of the disease, and the electronic reading system to check the results of the radiological examination. They have helped us a lot. And I can use an APP to attend online education. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system. #Digital_health_innovation_tele_education_App.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Could you talk about your daily work routine?	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used
4	Male	50	Collage degree	Deputy Chief Physician	I am the Deputy Chief Physician in Traditional Chinese Medicine outpatient department. I am 50 years old and graduated by a college. #Demographic_composition_Male_between_40_to_50_year_old_with_intermediate_education_level.	I give consultations to patients in the outpatient department three days a week and use the outpatient electronic prescription system to prescribe the orders, and for the rest of the working days, I work in the medical section. #Daily_work_Doctor's_order_prescription. #Daily_work_Consultation. #Daily_work_Administrative_affairs.	In fact, the outpatient department is not as good as the inpatient department to have much more opportunities to access to more types of digital health, and I am still in a traditional department, the traditional Chinese medicine department. For daily work, I use this outpatient electronic prescription system, which is part of EMR. #Digital_health_innovation_EMR.
5	Male	50	Collage degree	Chief Physician	I am the Chief Physician in Traditional Chinese Medicine outpatient department. I am 50 years old and graduated by a college. #Demographic_composition_Male_between_40_to_50_year_old_with_intermediate_education_level.	I am responsible for the consultation of traditional Chinese medicine bone injuries. Besides the physiotherapy, I prescript Chinese herb medicine for patients in need. #Daily_work_Doctor's_order_prescription. #Daily_work_Consultation. #Daily_work_Physiotherapy.	For daily work, I use this outpatient electronic prescription system and the imaging system for bone injuries. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system.
6	Male	50	Bachelor's degree	Director of Thoracic Surgery	I am the director in Thoracic Surgery department. I am 50 years old and with a bachelor's degree. And I have 25 years' experience. #Demographic_composition_Male_between_40_to_50_year_old_with_high_education_level.	My daily job is to receive patients from emergency or referrals. According to the treatment plan, conduct operation or conservative treatment. Besides that, I need to consider the development of our department and medical staffs. I also need to participate in research project and attend seminar with experts form other hospitals. #Daily_work_Clinical_work. #Daily_work_Department_and_project_research #Daily_work_Administrative_affairs.	Compared to the level third hospitals in the city, we are still in a developing stage. But we still use some of them such as EMR, electronic imaging system and so on. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system.
7	Male	55	Bachelor's degree	Director of the Neurosurgery	I am the director of neurosurgery department, director of the teaching and research department, and director of major surgery. My education is a bachelor's degree. #Demographic_composition_Male_older_than_50_year_old_with_high_education_level.	As the director of the department, in addition to my daily clinical work, I also need to consider the development of the department, such as personnel training, new technology research, collation and research of clinical data and conducting scientific research projects. #Daily_work_Clinical_work. #Daily_work_Department_and_project_research #Daily_work_Administrative_affairs.	The opportunity to use digital health is not very intensive. When we go out to participate in academic seminars, different hospitals will exchange digital medical technology and make comments through surgical recording and broadcasting. In addition to the electronic medical record system, MRI, CT, etc. that are used throughout the hospital, our department will also use a neuroendoscopic orientation technology for stereotactic orientation. #Digital_health_innovation_EMR. #Digital_health_innovation_MRI. #Digital_health_innovation_CT. #Digital_health_innovation_electronic_imaging_system. #Digital_health_innovation_neuroendoscopic_orientation.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Could you talk about your daily work routine?	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used
8	Female	24	Secondary school education	Neurosurgery nurse	I am a nurse in the neurosurgery department. I am 24 years old and have 4 years of work experience. #Demographic_composition_Female_between_20_to_30_year_old_with_lower_educational_level.	My daily work mainly provides daily care for patients, such as oral care, tracheotomy care, infusion, etc. I need observe and record the patient's condition and inform the doctor of changes in the condition as well. #Daily_work_Care_providing. #Daily_work_Nursing_records_writing.	The electronic medical record system I use the most in my daily work because the records of the patients' medical conditions now need to be entered electronically. There is also small monitoring equipment and central monitoring in nurse stations. The central monitoring equipment can automatically collect the patient's health data in real time, such as heart rate, blood pressure, etc., and display the results on the screen in the nurse station. If the data changes abnormally, it will alarm and inform us to check the situation. #Digital_health_innovation_EMR. #Digital_health_innovation_The_central_monitoring.
9	Female	22	Collage degree	Orthopedic nurse	I am a nurse in the orthopedics department. I am 22 years old with a college degree majoring in nursing. #Demographic_composition_Female_between_20_to_30_year_old_with_intermediate_educational_level.	Provide daily treatment and daily care for patients. And recording condition changes. #Daily_work_Care_providing. #Daily_work_Nursing_records_writing.	The electronic medical record system which I use most in my daily work because the records of the patients' medical conditions now need to be entered electronically. And the central monitoring equipment which can automatically collect the patient's health data in real time and display the results on the screen in the nurse station. If the data changes abnormally, it will alarm and inform us to check the situation. #Digital_health_innovation_EMR. #Digital_health_innovation_The_central_monitoring.
10	Female	24	Collage degree	Orthopedic nurse	I am a nurse in the orthopedics department. I am 24 years old with a college degree majoring in nursing. #Demographic_composition_Female_between_20_to_30_year_old_with_intermediate_educational_level.	Provide daily treatment and daily care for patients. And recording condition changes. #Daily_work_Care_providing. #Daily_work_Nursing_records_writing.	The electronic medical record system which I use most in my daily work because the records of the patients' medical conditions now need to be entered electronically. There is also the lower limb circulation drive instrument, the continuous passive motion, small monitoring equipment and central monitoring in nurse stations. The central monitoring equipment can automatically collect the patient's health data in real time, such as heart rate, blood pressure, etc., and display the results on the screen in the nurse station. If the data changes abnormally, it will alarm and inform us to check the situation. #Digital_health_innovation_EMR. #Digital_health_innovation_lower_limb_circulation_drive. #Digital_health_innovation_The_central_monitoring.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Could you talk about your daily work routine?	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used
11	Female	26	Master's degree	Cardiology Resident	I am a resident in cardiology department. I am 26 years old and with a master's degree. #Demographic_composition_Female_between_20_to_30_year_old_with_high_educational_level.	My daily job is to receive patients from emergency or outpatient referrals. According to the treatment plan, follow the attending physician for surgery, or conservative treatment. I usually need to check the room and record changes in the patient's condition. #Daily_work_Operation. #Daily_work_Care_providing. #Daily_work_Doctor's_order_prescription. #Daily_work_Medical_rocrds_writing.	Yes. For my daily work, I use the ECG monitor, the electronic imaging system, EMR and the CTA. #Digital_health_innovation_EMR. #Digital_health_innovation_electronic_imaging_system. #Digital_health_innovation_the_ECG_monitor. #Digital_health_innovation_the_CTA.
12	Female	31	Bachelor's Degree	Neurosurgery nurse	I am a nurse in the neurosurgery department. I am 31 years old and have 9 years of work experience. #Demographic_composition_Female_between_30_to_40_year_old_with_high_educational_level.	Our daily work is still very tedious. First of all, familiarize with the patients under management, round the room, take over shifts, and finally work reviews. In addition, we need to provide daily care for patients, and observe and record changes in conditions as well as inform the doctor of changes in the condition. Sometimes, we need to deal with preoperative preparations and emergency situations. #Daily_work_Care_providing. #Daily_work_Nursing_records_writing. #Daily_work_Operation_assitance.	The electronic medical record system I use the most in my daily work because the records of the patients' medical conditions now need to be entered electronically. There is also small monitoring equipment and central monitoring in nurse stations. The central monitoring equipment can automatically collect the patient's health data in real time, such as heart rate, blood pressure, etc., and display the results on the screen in the nurse station. If the data changes abnormally, it will alarm and inform us to check the situation. #Digital_health_innovation_EMR. #Digital_health_innovation_The_central_monitoring.
13	Female	31	Master's degree	Thoracic Surgery Resident	I am a resident in Thoracic Surgery department. I am 31 years old and with a master's degree. #Demographic_composition_Female_between_30_to_40_year_old_with_high_educational_level.	My daily job is to receive patients from emergency or outpatient referrals. According to the treatment plan, follow the attending physician for surgery, or conservative treatment. I usually need to check the room and record changes in the patient's condition. #Daily_work_Operation. #Daily_work_Care_providing. #Daily_work_Doctor's_order_prescription. #Daily_work_Medical_rocrds_writing.	Compared to the level third hospitals in the city, we are still in less capability.

Respondent ID	Gender	Age	Educational Level	Occupation	Could you tell me a little bit of yourself?	Could you talk about your daily work routine?	Are there many opportunities to get in touch with digital health in your daily work? It could be any equipment or system that you used
14	Female	37	Bachelor’s degree	Orthopedic nurse	I am a nurse in the orthopedics department. I am 37 years old with a bachelor’s degree majoring in nursing. #Demographic_composition_Female_between_30_to_40_year_old_with_high_educational_level.	Provide daily treatment and daily care for patients and help patients with rehabilitation training. And recording condition changes. #Daily_work_Care_providing. #Daily_work_Nursing_records_writing.	The electronic medical record system which I use most in my daily work because the records of the patients' medical conditions now need to be entered electronically. There is also the lower limb circulation drive instrument, the continuous passive motion, small monitoring equipment and central monitoring in nurse stations. The central monitoring equipment can automatically collect the patient's health data in real time and display the results on the screen in the nurse station. If the data changes abnormally, it will alarm and inform us to check the situation. #Digital_health_innovation_EMR. #Digital_health_innovation_lower_limb_circulation_drive. #Digital_health_innovation_The_central_monitoring.
15	Female	52	Collage degree	Physiotherapist	I am physiotherapist in Rehabilitation department. I am 52 years old with a College education. #Demographic_composition_Female_older_than_50_year_old_with_intermediate_educational_level.	My daily work is providing physio treatment to patent’s based on the attending physician's order. #Daily_work_Physio_treatment_providing.	Yes. It is part of our daily work. As we begin everyday work, the first step is login our account and access to doctor's workstation in which we can check the patients' registrations and their previous medical records. When I end up this shift, I will re-obtain the authorization of prescription and, then, I can use doctor's workstation to prescribe. So, using EMR to check and prescribe is part of our workflow. #Digital_health_innovation_EMR.

Respondent ID	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision maker in this process?	Do you have any comments or information you want to share regarding this study?	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
1	According to the application scope and price of innovation, #Innovation_adoption_procedure_divide_into_two_decision_layer_based_on_the_cost_and_application_range. innovation applied to the entire hospital or multi-department scope is generally determined by the hospital committee; #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee. innovation applied at the department level is determined by the director or head nurse of each department. #Innovation_adoption_procedure_cheap_and_applied_in_single_department_innovation_is_decised_by_director_or_head_nurse. The directors or head nurses can collect the needs in the departments and report to the higher administrative department. After reviewing by the hospital committee, they can decide whether to approve or not. If so, the adoption process is implemented by the hospital's purchasing department and the computer center. However, large and expensive equipment is generally introduced directly into the department from top to bottom. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments_or_innovation_is_introduced_from_top_to_bottom.	I think digital health is very helpful. For our hospitals which are not in high level, the technical level of many aspects needs to be improved. But the daily work and geographical location make it difficult for us to enter a large hospital for further study. So, telemedicine education solved this problem. Now, a group of Neurosurgery experts in Beijing have developed a teaching app. Doctors like us can learn and watch outside work. I'm happy about that. #Reusability_develop_the_ability_of_medical_staffs_in_remote_area.	Personally, I have to choose innovation based on the disease spectrum and scope of patient population of my department. Because the emphasis of different departments in the hospital is different, the choice of innovation depends on the scope of the department. #Favourable_factors_individual_adoption_Disease_spectrum_and_demographic_of_the_department.

Respondent ID	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision maker in this process?	Do you have any comments or information you want to share regarding this study?	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
2	I think basically, it is introduced from top to bottom. #Innovation_adoption_procedure_innovation_is_introduced_from_top_to_bottom. For single department, they don't have to the right to adopt large medical equipment. And the hospital committee is the decision maker for this. #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee.	I think we need to protect the personal information of doctors and patients. In this way, in the future, even if data is leaked, it cannot be traced to individuals. However, current insurance card is bonded with too much significant personal information for example the ID number that is pointed to specific person, which is quite insecuring. #Findability_ID_number_regard_as_identifier_is_bonded_with_too_much_personal_information.	Personally, I have to choose innovation based on the efficiency and convenience. I prefer one system assembled with all necessary functions so that I don't need to change to different platform to implement the operation. Time saving attaches the importance to medical treatment; efficiency is quite significant in our daily work. #Favourable_factors_individual_adoption_Efficiency_and_convenience_for_use.
3	According to the application scope and price of innovation, #Innovation_adoption_procedure_divide_into_two_decision_layer_based_on_the_cost_and_application_range. innovation applied to the entire hospital or multi-department scope is generally determined by the hospital committee; #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee. innovation applied at the department level is determined by the director or head nurse of each department. #Innovation_adoption_procedure_cheap_and_applied_in_single_department_innovation_is_decised_by_director_or_head_nurse. The directors or head nurses can collect the needs in the departments and report to the higher administrative department. After reviewing by the hospital committee, they can decide whether to approve or not. If so, the adoption process is implemented by the hospital's purchasing department and the computer center. However, large and expensive equipment is generally introduced directly into the department from top to bottom. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments_or_innovation_is_introduced_from_top_to_bottom.	No.	Personally, I have to choose innovation based on the efficiency and convenience. I prefer one system assembled with all necessary functions so that I don't need to change to different platform to implement the operation. #Favourable_factors_individual_adoption_Efficiency_and_convenience_for_use.
4	Basically, it is introduced from top to bottom. #Innovation_adoption_procedure_innovation_is_introduced_from_top_to_bottom. The number of digital health innovations in our department is less than other departments due to the treatment methods, and they are literally adopted by the hospital committe. #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee.	No.	Obey the supervisor's instruction. #Favourable_factors_individual_adoption_Supervisor's_instruction.

Respondent ID	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision maker in this process?	Do you have any comments or information you want to share regarding this study?	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
5	Basically, it is introduced from top to bottom. #Innovation_adoption_procedure_innovation_is_introduced_from_top_to_bottom. For single department, they don't have to the right to adopt large medical equipment. And the hospital committee is the decision maker for this. #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee.	No.	I focus on whether potential innovations are more advanced than current methods. #Favourable_factors_individual_adoption_Cutting_edge_innovations.
6	According to the application scope and price of innovation, #Innovation_adoption_procedure_divide_into_two_decision_layer_based_on_the_cost_and_application_range. innovation applied to the entire hospital or multi-department scope is generally determined by the hospital committee; #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee. innovation applied at the department level is determined by the director or head nurse of each department. #Innovation_adoption_procedure_cheap_and_applied_in_single_department_innovation_is_decised_by_director_or_head_nurse. The directors or head nurses collect the requirements in the departments and report to the higher administrative department. After reviewing by the hospital committee, they can decide whether to approve or not. If so, the adoption process is implemented by the dedicated departments. However, large and expensive equipment is generally introduced directly into the department from top to bottom. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments_or_innovation_is_introduced_from_top_to_bottom.	I hope the digital health can be standardized by the government. If so, the data sharing could be more meaningful because every hospital has its own standard for some clinical application currently. This is disturbing for medical staffs to deal with referral patients since the reports or test results could represent totally different meaning among hospitals. #Interoprability_advocate_standardazation_between_hospitals.	For me, the first point is efficiency and convenience. Timesaving is vital for medical treatment. The second is usefulness. By using this innovation, it can really help to better solve patients' problems. #Favourable_factors_individual_adoption_Efficiency_and_convenience_for_use. #Favourable_factors_individual_adoption_Percieved_effectiveness
7	The introduction of innovation is divided into different decision-making levels according to its scope of use and price. #Innovation_adoption_procedure_divide_into_two_decision_layer_based_on_the_cost_and_application_range. Innovations that are applicable to the whole hospital or multiple departments require the consent of the hospital committee, #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee. while innovations that are limited to a single department are decided by the director and head nurse. #Innovation_adoption_procedure_cheap_and_applied_in_single_department_innovation_is_decised_by_director_or_head_nurse. The department submits an application to the procurement center based on clinical needs; the procurement center collects further materials based on the feasibility report submitted by the department. The procurement center will submit the collected materials to the hospital's consumables and equipment procurement committee, including the planned procurement objects, performance indicators and quotations. The committee meets regularly and decides whether to approve applications based on available resources. Finally, based on the results of the committee's discussions and national regulations, the hospital opened its tender to the market. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments_and_implement_by_dedicated_department.	I think there are advantages and disadvantages in both ways. Except for the advanced hospitals, the ubiquity of digital health is still not widespread, and the coverage rate is not enough. #Low_ubiquity_impede_the_effectiveness. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level.	The first criterion is that it is safe and reliable for clinical use, and the second is that it is economical for patients. A small part is based on my personal usage habits. #Favourable_factors_individual_adoption_Safety_and_reliability. #Favourable_factors_individual_adoption_Money_saving_for_patients. #Favourable_factors_individual_adoption_Preferred_workstyle.

Respondent ID	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision maker in this process?	Do you have any comments or information you want to share regarding this study?	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
8	In my opinion, the director or the head nurse of each department puts forward a request to the corresponding superior management department, and after the approval of the management department, they submit an application to the hospital committee. After the hospital committee has approved the application, the procurement department and the technical department implement specific procurement. #Innoavtion_adoption_procedure_innovation_adoption_is_decised_by_the_hospital_commitee. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments.	I think there are advantages and disadvantages in both ways. Digital health may have privacy issues, but the tediousness of traditional healthcare is annoying. #Accessbility_acess_control. #Reusability_efficiency_improvement.	For me personally, my standard is that innovation can accurately and quickly reflect changes in patient's condition and assist my daily work to gain efficiently. #Favourable_factors_individual_adoption_Efficiency. #Favourable_factors_individual_adoption_High_accuracy. #Favourable_factors_individual_adoption_Percieved_effectiveness
9	Since this is my first year here, I am unaware of this question.	no.	For me personally, my standard is that innovation can display the results comprehensively and clearly. It can help me generate a clear insight about patient's condition. #Favourable_factors_individual_adoption_Providing_comprehensive_conditional_information.
10	In my opinion, the director or the head nurse of each department puts forward a request to the corresponding superior management department, and after the approval of the management department, they submit an application to the hospital committee. After the hospital committee has approved the application, the procurement department and the technical department implement specific procurement. #Innoavtion_adoption_procedure_innovation_adoption_is_decised_by_the_hospital_commitee. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments.	I think digital data is more secure than traditional paper data. It is inevitable that there are errors occurred and need to be corrected during the medical condition recording. Paper data may need to be rewritten with new case paper, and discarded paper requires a lot of processing, otherwise it is very easy to leak information. For the digital age, due to prudent accessibility control, it has a strong ability to protect personal information compared with the traditional methods. #Accessbility_Prudent_accessbility_control_compared_with_traditional_methods.	For me personally, my standard is that innovation can help me understand the condition comprehensively. It can help me reduce the tedious workflow and make it convenient for me. It can bring benefit to the patient as well. #Favourable_factors_individual_adoption_Providing_comprehensive_conditional_information. #Favourable_factors_individual_adoption_Efficiency_improving_and_convenience_for_use. #Favourable_factors_individual_adoption_Benefits_for_patients.
11	In my opinion, the director or the head nurse of each department puts forward a request to the corresponding superior management department, and after the approval of the management department, they submit an application to the hospital committee. After the hospital committee has approved the application, the procurement department and the technical department implement specific procurement. #Innoavtion_adoption_procedure_innovation_adoption_is_decised_by_the_hospital_commitee. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments.	No.	For me, the first point is accuracy. The innovation can obtain accurate result and the result is useful to further treatment. The second is convenience. And the innovation should be easy to use. #Favourable_factors_individual_adoption_High_accuracy. #Favourable_factors_individual_adoption_Ease_to_use.
12	In my opinion, the director or the head nurse of each department puts forward a request to the corresponding superior management department, and after the approval of the management department, they submit an application to the hospital committee. After the hospital committee has approved the application, the procurement department and the technical department implement specific procurement. #Innoavtion_adoption_procedure_innovation_adoption_is_decised_by_the_hospital_commitee. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments.	No.	For me personally, my standard is that innovation can help me understand the condition comprehensively. It can help me reduce the tedious workflow and make it convenient for me. #Favourable_factors_individual_adoption_Providing_comprehensive_conditional_information. #Favourable_factors_individual_adoption_Efficiency_and_convenience_for_use.
13	According to the application scope and price of innovation, #Innovation_adoption_procedure_divide_into_two_decision_layer_based_on_the_cost_and_application_range. innovation applied to the entire hospital or multi-department scope is generally determined by the hospital committee; #Innoavtion_adoption_procedure_costy_and_applied_in_multiple_departments_innovation_is_decised_by_the_hospital_commitee. innovation applied at the department level is determined by the director or head nurse of each department. #Innovation_adoption_procedure_cheap_and_applied_in_single_department_innovation_is_decised_by_director_or_head_nurse. The directors or head nurses collect the requirements in the departments and report to the higher administrative department. After reviewing by the hospital committee, they can decide whether to approve or not. If so, the adoption process is implemented by the dedicated	I hope the ubiquity of digital health should be increased into the rural or suburb area, which is better for Implementation of graded diagnosis and treatment. #Low_ubiquity_impede_the_effectiveness. #Reusability_can_alleviate_medical_resources_assignment_unevenly.	For me, the first point is safety, #Favourable_factors_individual_adoption_Safety_and_reliability. The privacy of patients is also included in the first point of security. And the second point is that the price is acceptable to the patient. Because many of our patients come from rural areas, the economic conditions are not very good. It is my fancy to save money for patients and to make an effective diagnosis. #Favourable_factors_individual_adoption_Money_saving_for_patients.

Respondent ID	What is the general procedure for hospitals to adopt digital health innovation? Who is the decision maker in this process?	Do you have any comments or information you want to share regarding this study?	When you need to use the digital health innovations to assist your work, what characteristics matter in your final decision?
	departments. However, large and expensive equipment is generally introduced directly into the department from top to bottom. #Innovation_adoption_procedure_requirements_are_collected_from_the_bottom_and_approved_by_the_top_administrative_departments_or_innovation_is_introduced_from_top_to_bottom.		
14	I don't know.	No.	For me personally, my standard is accuracy and convenience. #Favourable_factors_individual_adoption_Efficiency_and_convenience_for_use.
15	I think innovations like EMR system are adopted based on the policy stipulation. The hospital committee adopt innovations and introduce into clinical use. #Innoavtion_adoption_procedure_innovation_adoption_is_decised_by_the_hospital_commitee. #Innovation_adoption_procedure_it_is_based_on_policy_stipulation.	I have no comment.	From my perspective, I have no preference. I will obey the supervisor's instruction. #Favourable_factors_individual_adoption_Supervisor's_instruction.

Respondent ID	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
1	The accuracy and efficiency are improved obviously. The previous black and white film was not clear enough, and it was not possible to zoom in on the area in question, and the overall accuracy was not enough. Now we can read on the electronic reading system, with high fidelity, and can also focus on small details that some people may ignore, and the current electronic report will also give suggestions after autonomous processing. But the current data is not only numerical data but also gives some diagnostic suggestions. For example, which one of the test results is higher or lower? We will refer to such data but do not necessarily believe it completely, because sometimes it is possible that there is a slight discrepancy, and there is actually no problem. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Interoprability_benchmark_in_lack_of_flexibility.	I think this is a trend, and the use and processing of data will definitely go further in the future. I think it's good because it can provide doctors with more comprehensive information. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	Yes. Because the medical cure and nursing process rely on the objective results of the diagnosis and the subjective reasoning of the doctor. A patient's healing process is likely to go through different stages of reasoning. The reasoning and treatment directions at the beginning and the final diagnosis and treatment methods are likely to be inconsistent. When it comes to medical disputes, it is very harmful to the doctor. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health. For patients, the patient's personalities and the illness they get are different. Some people don't think it matters, while others hope that no one knows.

Respondent ID	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
2	The accuracy and efficiency are improved obviously. In the same way, the previous black and white film was not clear enough, and it was not possible to zoom in on the area in question, and the overall accuracy was not enough. Now we can read on the electronic reading system, with high fidelity, and can also focus on small details that some people may ignore, and the current electronic report will also give suggestions after autonomous processing. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.	I think this is a trend. I don't know what the method will become in the end, but one thing for sure, technology improvement will never stop. The use and processing of data, therefore, will definitely go further in the future. I think it's good because it can provide doctors with more comprehensive information. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	Yes. Because the medical cure and nursing process rely on the objective results of the diagnosis and the subjective reasoning of the doctor. A patient's healing process is likely to go through different stages of reasoning. The reasoning and treatment directions at the beginning and the final diagnosis and treatment methods are likely to be inconsistent. When it comes to medical disputes, it is very harmful to the doctor. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health. For patients, the patient's personalities and the illness they get are different. Some people don't think it matters, while others hope that no one knows. And for the patients, sensitive information should be carefully protected such as STD or cancer. #Accessbility_sentive_health_information_protection.
3	I think it should help. But In our hospital, the digitalization is not penetrated in every aspect, and we don't have a lot of advanced assistant tools compared with level three hospitals. Therefore, the effects of digital data are not fully realized. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level.	I think this is a trend, and the data use and analysis method will be definitely developed in the future. I think the improvement is good because it can provide doctors with more comprehensive information. Current data use and analysis method in our hospital is rough and ready in comparison with the advanced hospitals in downtown. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level.	Yes. Because the medical cure and nursing process rely on the objective results of the diagnosis and the subjective reasoning of the doctor. A patient's healing process is likely to go through different stages of reasoning. The reasoning and treatment directions at the beginning and the final diagnosis and treatment methods are likely to be inconsistent. When it comes to medical disputes, it is very harmful to the doctor. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health.
4	For our traditional department, I don't think it helps much. #Reusability_less_helpful_for_traditional_chiese_medical_treatment.	I think this is a trend, and the data use and analysis method will be definitely developed in the future. I think the improvement is good because it can provide doctors with more comprehensive information. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	No. Because I think the hospital should consider the safety and security issues before they introduce the innovation. Once an innovation is introduced, the problems mentioned must be solved, otherwise, the innovation cannot be used for clinical treatment. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.

Respondent ID	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
5	For our traditional department, I don't think it helps much. However, with the use of the big data technology, it could help to solve demographic health problems, which needs enormous numbers of samples to be tested and researched. #Reusability_less_helpful_for_traditional_chiese_medical_treatment. #Reusebility_faciliate_demographic_health_research.	I think this is a trend, and the data use and analysis method will be definitely developed in the future. I think the improvement is good because it can provide doctors with more comprehensive information. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	No. I do not think the health data is valuable to others except the patients themselves. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.
6	Yes, it is. For instance, the electronic imaging system can provide a higher fidelity of the result that is helpful for doctor to find out the subtle disease. And With EMR, it is easy to edit the medical records which is a complex and time-consuming process. It can help to increase the efficiency. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Interoperability_effciency_improvement.	Sure, it will. Because this is a big trend, I have experienced the transformation from traditional methods to digital methods. Innovations will be introduced every year and increasing number of digital data will be used in every aspect of medical care. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	No. Because I think the hospital should consider the safety and security issues before they introduce the innovation. Once an innovation is introduced, the problems mentioned must be solved, otherwise, the innovation cannot be used for clinical treatment. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
7	I think the degree of help varies from person to person. Depending on the doctor's usage habits and clinical experience, everyone's degree of dependence on digital data is different. I personally have experienced the era of traditional medicine, so I don't prefer to watch reports, I am more used to watching original videos. For young doctors, they have not experienced the era of traditional medicine, are more sensitive to high technology, and have little clinical experience. Digital data is more helpful for their diagnosis. #Neutral_response_to_digital_data_it_is_more_useful_for_young_and_less_experienced_doctors_in_comparison_with_older_and_experienced_ones.	Sure, it will. Because this is a big trend, new innovations will be introduced every year, and more and more digital data will be used in daily medical care. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend. And I don't think technology is good or bad. What needs to be considered is the establishment of more rigorous and effective regulatory systems and access procedures at the national level. #Accessbility_set_clear_and_strict_acess_control_models_and_policies_and_authentication_systems.	Not too worried. I think the pros outweigh the cons. Rather than being afraid of privacy being leaked, we should find ways to establish a more comprehensive privacy protection mechanism to avoid this from legal, regulatory, process, etc. #Accessbility_establish_effective_and_strict_access_control_and_data_protect_methods.
8	I think it has improved. For example, now when the patient has finished the MRI or CT test, the doctor can directly review the patient's results through the electronic imaging system. In the era when digital data was not used, doctors had to wait for the patient's film to print out before they could observe the patient's condition on the film. This process took half an hour and sometimes an hour, which was quite time-consuming. Now the results can be viewed on the electronic film reading system of each department, which saves a lot of time. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement.	Sure, it will. Because this is a big trend, new innovations will be introduced every year, and more and more digital data will be used in daily medical care. I personally like it because digital innovations could free medical staff from tedious work, which is efficient, so that we could have more time for disease research. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend. #Reusability_efficiency_improvement.	Not too worried. Because this has never happened. Paper information I think it's easier to leak privacy, because outsiders can read the paper information while the doctor is not in the duty room. However, the current electronic medical records need to be inserted into the doctor's USB Key and entered the correct username and password, by which they can be viewed. #Accessbility_data_breach_never_happen. #Accessbility_secure_and_effective_authentication_system.

Respondent ID	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
9	Since this is my first year here, I haven't had deep understanding toward this industry yet.	Sure, it will. I think this way of data analysis will go one step further. Because the existing data analysis has still room for improvement. This will bring more convenience to our daily diagnosis and treatment. Of course, this will also bring more privacy issues. Therefore, there should be a step forward protection method towards them. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level. #Reusability_Perceived_convenience. #Accessbility_set_clear_and_strict_acess_control_models_and_policies_and_authentication_systems.	I am not worried. I think the hospital should have a rigorous system to provide security protection towards all the data generated inside, otherwise, they should not introduce such a fundamental reform. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
10	I think it has improved. Because many patients and their families do not know their condition well, they cannot provide comprehensive and accurate information. And traditional cases are not conducive to preservation, it is easy to lose or damage. Therefore, digital data can effectively solve the problem of preserving traditional cases and provide comprehensive information to our medical staff to better understand the situation of patients and make more accurate diagnosis. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Reusability_Data_integrity_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition.	Sure, it will. I think this way of data analysis will go one step further. Because the existing data analysis has still room for improvement. This will bring more convenience to our daily diagnosis and treatment. Of course, this will also bring more privacy issues. Therefore, there should be a step forward protection method towards them. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level. #Reusability_Perceived_convenience. #Accessbility_set_clear_and_strict_acess_control_models_and_policies_and_authentication_systems.	I'm worried. Because I am worried that the data of the course care records will be leaked during the treatment of patients. Because this is a deduction process, there may be inconsistencies, but the use by malicious people may cause conflicts between doctors and patients, and cause reputation damage to medical staff. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health.
11	Yes, it is. For instance, the ECG monitor it can detect the condition and provide real-time monitoring, if anything bad happens, the alarm will go off to remind the medical staffs. #Reusability_disease_development_in_better_control.	Yes. Because right now, different hospital has its own standard as a result medical staffs cannot understand the test reports of referral patients from other clinics. So, I think standardization should be established. #Interoperability_lack_of_data_standardization_between_clinics_as_to_hinder_the_reuse_of_health_data.	Yes. Because the content in the medical record is private for the patient and the attending doctor. The course information is not only objective result but also the subjective reasoning process, which can be inconsistent during the treatment. So, I am worried about the leakage could be harmful for both ways. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health.
12	I think it has improved. Because many patients and their families do not know their condition well, they cannot provide comprehensive and accurate information. And traditional cases are not conducive to preservation, it is easy to lose or damage. Therefore, digital data can effectively solve the problem of preserving traditional cases and provide comprehensive information to our medical staff to better understand the situation of patients and make more accurate diagnosis. #Reusability_efficiency_improvement. #Reusability_accuracy_improvement. #Reusability_Data_integrity_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition.	Sure, it will. I think it is good. Because with the further development of data analysis, many detection indicators will be more accurate, which will help find hidden diseases. Even when people may ignore these subtle problems due to physical restrain, the machine can detect them and show suspicious points on the test results through high-precision calculations. I think that's what digital healthcare means. #Reusability_the_effectiveness_is_not_obvious_because_digitalization_development_of_objective_hospital_is_still_in_low_level. #Reusability_accuracy_of_lesion_detection_improving.	I'm worried. Because I don't know who will use the data and where they use to. #Accessbility_Access_control. #Reusability_concern_about_misuse_of_health_data.

Respondent ID	Do you think that digital data help improve health care?	Do you think that data use and data analytics for health could be improved and would that be good?	Are you concerned about data privacy?
13	Yes, it is. For instance, the EMR system we can view the previous records and current treatment have done to the patients so that we can have a comprehensive understanding to the condition. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think this is a trend, and the data use and analysis method will be definitely developed in the future. I think the improvement is good because it can provide doctors with more comprehensive information. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend.	Yes. Because the content in the medical record is private for the patient and the attending doctor. The course information is not only objective result but also the subjective reasoning process, which can be inconsistent during the treatment. So, I am worried about the leakage could be harmful for both ways. #Accessbility_medical_records_breach_can_ruin_medical_staffs'_career_and_patients'_mental_health.
14	I think it has improved. The digital data can show the patient's condition in real time, which greatly improves the control of medical staff on the patient's condition. #Reusability_control_disease_development.	Sure, it will. I think it is good. Because with the further development of data analysis, many detection indicators will be more accurate, which will help find hidden diseases. #Reusability_accuracy_of_lesion_detection_improving.	I am not worried. I think the hospital should have a rigorous system to provide security protection towards all the data generated inside, otherwise, they should not introduce such a fundamental reform. #Accessbility_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
15	Yes. I think with the help of digital data, my daily work is more efficient and convenient in comparison with the traditional method. Because I have experienced the traditional method, it is quite complex. #Reusability_efficiency_improvement. #Reusability_Perceived_convenience.	Sure it will. Because this is a big trend. There is new technique every year and increasing digital data will be used in daily medical care. I personally like it because digital innovations could free medical staff from tedious work, which is efficient. #Positive_attititude_toward_improving_data_use_and_analytics_technology_improvement_is_trend. #Reusability_efficiency_improvement.	No. I do not think the health data is valuable to others except the patients themselves. #Accessbility_misunderstand_about_health_data_considered_worthless_except_to_the_patients_themselves.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	When the hospital chooses to use these digital health innovations, what characteristics do you think play the important roles in the final decision?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?
1	I think that for future sharing, it is only open to share objective content, and subjective content such as course reasoning cannot be shared. #Accessbility_Access_control. I think if we can share objective diagnostic content in the future, it will be good for patients and hospitals. Make the treatment process more efficient and save money for patients.	I think there are two factors. The first is cost performance. At the same level, which innovation is more affordable. #Favourable_factors_for_organizational_adoption_Cost-effectivess. The second is the scope and function of innovation. For example, they are also nuclear magnetic resonance instruments, and some have a wider range of functions. #Favourable_factors_for_organizational_adoption_Scope_of_functions.	I think half and half. Because some people don't pay much attention to health issues. #Neutral_response_to_digital_health_people_do_not_pay_attention_to_this. But we have to say that there are many smart medical devices used in home environments, such as blood glucose meters and blood pressure meters and home health testing, etc. There are also some digital medical apps that help remote registration or remote medical consultation, which ensure that healthcare can not only happen in the hospital, but also in every aspect of life. #Reusability_provide_diversity_of_healthcare_occasion.	I think it's the same as the previous question. Half and half.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	When the hospital chooses to use these digital health innovations, what characteristics do you think play the important roles in the final decision?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?
2	I think it is a good vision. But as I mentioned before, I think the data security should be considered and implemented prudently. The content of medical record is not only crucial for patients but also for medical staffs. For patients, they don't want to leak their sensitive health information; for medical staffs, we don't want to cause unnecessary dispute and harm our reputation. #Accessbility_set_clear_and_strict_acess_control_models_and_policies_and_authentication_systems.	I don't know.	I don't know. Because the popularity is not high, and we don't talk about this subject after work. I am so exhausted, and I just want to escape from my work field. #Neutral_response_to_digital_health_lower_ubiquity.	I think so. Because one of my friends came to the hospital to check his condition, and he was surprised by the electronic imaging system that it can view the result quickly and in high fidelity. #Reusability_efficiency_improvement. #Reusability_accurecy_improvement.
3	I think if we can share objective diagnostic content in the future, it will be good for patients and hospitals. Make the treatment process more efficient and save money for patients. #Reusebility_improving_efficiency_in_treatment. But I think the content of data sharing should be classify and the accessibility should be carefully assigned. Except the expertise in health field, the others should be authorized prudently. #Accessbility_set_clear_and_strict_acess_control_model_and_policies_and_authentication_system.	I don't know. It is beyond my knowledge; the hospital would not inform us the standards of each adoption. #Organizational_adoption_do_not_inform_clinical_staffs_the_adoption_standards.	I don't know. Because people don't pay much attention to health issues. And after work, I would not talk about health topics with my family. #Neutral_response_to_digital_health_people_do_not_pay_attention_to_this.	I think it's the same as the previous question.
4	I think this is very helpful for inter-provincial medical treatment. In the future, the mobility of the population will be greater. With such a system, the medical problems of non-local personnel can be solved. #Reusability_benefit_for_cross_regionalhealthcare_and_non_native_patients.	I think there are two factors. The first is cost performance. At the same level, which innovation is more affordable. #Favourable_factors_for_organizational_adoption_Cost-effectivess. The second is the scope and function of innovation. #Favourable_factors_for_organizational_adoption_Scope_of_functions.	I think half and half. Because some people don't pay much attention to health issues. But we have to say that there are many smart medical devices used in home environments, such as blood glucose meters and blood pressure meters and home health testing, etc. There are also some digital medical apps that help remote registration or remote medical consultation, which ensure that healthcare can not only happen in the hospital, but also in every aspect of life. #Reusability_provide_diversity_of_healthcare_occasion.	I think it's the same as the previous question.
5	I think this is very helpful for inter-provincial medical treatment. In the future, the mobility of the population will be greater. With such a system, the medical problems of non-local personnel can be solved. #Reusability_benefit_for_cross_regionalhealthcare_and_non_native_patients. Besides, with the help of telemedicine, people who need healthcare can learn from each other. However, proper protection is needed for the privacy of patients, such as mosaicking or anonymizing information that can be directed to individuals. #Findability_identity_anonymization.	I think there are two factors. The first is cost performance. At the same level, which innovation is more affordable. #Favourable_factors_for_organizational_adoption_Cost-effectivess. The second is the perceived ease of use. If it is too complex to use, then introduction is meaningless. #Favourable_factors_for_organizational_adoption_Preceived_ease_of_use.	My family are unfamiliar with health issues, so I am not sure. #Neutral_response_to_digital_health_people_do_not_pay_attention_to_this.	I think it's the same as the previous question. #Neutral_response_to_digital_data_people_do_not_pay_attention_to_this.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	When the hospital chooses to use these digital health innovations, what characteristics do you think play the important roles in the final decision?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?
6	I think it is good. It can facilitate the communication between hospitals in different levels so as to alleviate the problems of unbalanced resources. And it is time saving for patients when there needs a referral because they don't have to do the repeat testing. A comprehensive understanding can be obtained by medical records sharing. #Reusability_Alleviate_the_information_discrepency_between_clinics. #Reusebility_efficiency_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think there are two factors. The first is cost performance. At the same level, which innovation is more affordable. And which innovation is cover up more departments. #Favourable_factors_for_organizational_adoption_Cost-effectivess. #Favourable_factors_for_organizational_adoption_Scope_of_functions.	I think so.	I think they feel the same with my family. It is helpful.
7	From the perspective of medical staff, this situation is definitely good for our work. We can understand the situation of patients more comprehensively and reduce the tedious workflow. As i mentioned before, the risk brought by it should be considered and solved by specialized institutions, not medical staffs. #Reusebility_efficiency_improvement. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Accessbility_establish_effective_and_strict_access_control_and_data_protect_methods. #Accessbility_is_not_individual_responsibility_but_the_hospital_or_higher_administrative_depaertment.	I think cost performance is the most basic factor for hospitals. First of all, the hospital chooses innovations with suitable scopes according to clinical needs. The hospital then selects the innovation with the best price within the scope of similar functions. #Favourable_factors_for_organizational_adoption_Cost-effectivess. #Favourable_factors_for_organizational_adoption_Scope_of_functions.	I am not sure. Because the popularity of digital healthcare is not so high, there is no atmosphere to talk about these topics. They don't understand. #Neutral_response_to_digital_health_lower_ubiquity. #Neutral_response_to_digital_health_people_do_not_pay_attention_to_this.	I don't know because we haven't talked about these topics. However, through daily observation, I feel that people in the non-medical industry are relatively dependent on these tools. For example, before seeing a doctor, they will consult online to learn about the condition and then discuss their suspicions with the doctor. However, I think too much medical assistance is not good. Because the patient thinks that he knows his situation very well and has a mindset that the doctors always fool him in that case he must test the doctors' professional skills. #Reusability_it_is_hamrful_for_relationship_between_doctors_and_patients_when_patients_obtain_too_much_medical_information.
8	I think it's good. Because from past work experience, I found that many patients have no family member. They are likely not to carry a medical insurance card or medical card with them when the illness happened accidentally. With wide range of data sharing in the future, even if patients do not carry a card, their relevant health data can be shared in which it could provide comprehensive understanding of their conditions so as to help doctors to provide better treatment. #Reusability_benefits_for_emergency_condition. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I really don't know.	Yes.	Yes. Both family and friends believe that digital health is more convenient than traditional health care. The use of digital data in medical scenarios can frees patients from having to complete all medical procedures within hospital and saves a lot of waiting time. You can now register and pay consultation fee online, there is no need to wait in line or ask a nurse. You can directly check the test results by the card through self-service machine. #Reusability_provide_diversity_of_healthcare_occasion. #Reusability_efficiency_improvement.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	When the hospital chooses to use these digital health innovations, what characteristics do you think play the important roles in the final decision?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?
9	I think it's good. I think this trend is beneficial. And I think sometimes information leaks are not necessarily caused by technology. For example, when a doctor communicates with a patient, someone who knows the patient passing by or someone intentionally eavesdrops. So, this could happen regardless of the tool used. Therefore, we need to establish a secure system to protect them, for instance, set data access authentication more strictly and authorization categories more clearly. #Positive_attititude_toward_wide_data_sharing_digitalization_is_trend. #Positive_attititude_toward_wide_data_sharing_Information_leak_should_not_blame_only_for_digital_tools. #Accessbility_establish_effective_and_strict_access_control_and_data_protect_methods.	Sorry, I don't know.	Yes. What my family members use or understand the most are in-house smart medical tools, such as blood pressure monitors, blood glucose meters, and smart band. They believe that self-monitoring of daily health conditions is very helpful for health care. #Reusability_provide_diversity_of_healthcare_occasion.	Friends of the same age are relatively young, and everyone's awareness of health care is not so high. So, this issue has not been discussed. #Neutral_response_to_digital_data_the_youth_do_not_pay_attention_to_health_issues.
10	I think it's good. I think this trend is beneficial. But at the same time, we need to set data access authentication more strictly and set authorization categories more clearly. #Positive_attititude_toward_wide_data_sharing_digitalization_is_trend. #Accessbility_establish_effective_and_strict_access_control_and_data_protect_methods.	I think they need find out the perceived benefits from the innovation. It should bring convenience for both medical staffs and patients. #Favourable_factors_for_organizational_adoption_Preceived_benefits_for_both_ways.	I think they feel relatively neutral. Because this digital reform does make the medical treatment process more standardized and unified. But the older generations are not sensitive to digital technology. They need a long time to adapt and make them feel troublesome. #Neutral_response_to_digital_health_Unfriendly_to_the_elderly.	Yes. For friends, they find this helpful. First of all, it's really convenient. The use of digital data in medical scenarios can frees patients from having to complete all medical procedures within hospital and saves a lot of waiting time. You can now register and pay consultation fee online, there is no need to wait in line or ask a nurse. You can directly check the test results by the card through self-service machine. #Reusability_provide_diversity_of_healthcare_occasion. #Reusability_efficiency_improvement.
11	I think it is beneficial. It is time saving for referral patients because they don't have to do repeat tests and the results can be used directly by the new clinics. But it brings risks as well. #Reusability_benefits_for_referral_condition.	I think there are two factors. The first is scope of functions. At the same level, which innovation is more affordable. #Favourable_factors_for_organizational_adoption_Cost-effectivess. #Favourable_factors_for_organizational_adoption_Scope_of_functions.	I think so. There is trend about in-house care. People are aware of the daily healthcare is important, therefore, lots of in-house products are seen in my home. #Reusability_provide_diversity_of_healthcare_occasion.	I think it's the same as the previous question.
12	I think it's good. I think this trend is beneficial. But at the same time, we need to set data access authentication more strictly and set authorization categories more clearly. #Positive_attititude_toward_wide_data_sharing_digitalization_is_trend. #Accessbility_establish_effective_and_strict_access_control_and_data_protect_methods.	I really don't know.	I think they feel relatively neutral. The elderly are not sensitive to digital technology. They need a long time to adapt and make them feel troublesome. #Neutral_response_to_digital_health_Unfriendly_to_the_elderly.	Yes. For friends, they find this helpful. First of all, it's really convenient. The use of digital data in medical scenarios can frees patients from having to complete all medical procedures within hospital and saves a lot of waiting time. You can now register and pay consultation fee online, there is no need to wait in line or ask a nurse. You can directly check the test results by the card through self-service machine. #Reusability_provide_diversity_of_healthcare_occasion. #Reusability_efficiency_improvement.

Respondent ID	How do you feel that, in the future, if the data-sharing system in the clinic become opener and more wide-range with the use of digital health?	When the hospital chooses to use these digital health innovations, what characteristics do you think play the important roles in the final decision?	Does your family think that digital health is good for health care?	Do your friends think that digital data will help improve the care provided in the clinic?
13	I think the information sharing can help to improve the treatment of patients, which is good. However, unless the patient consents, private information should be properly processed, such as anonymous processing and cannot be traced directly to the individual from the existing information. #Findability_identity_anonymization.	I think it is cost performance. At the same level, which innovation is more affordable. #Favourable_factors_for_organizational_adoption_Cost-effectivess.	I think so.	I think it's the same as the previous question.
14	I think it's good. I think this trend is beneficial for both sides.	I think the hospital introduces innovation based on the different functional characteristics of the department. #Favourable_factors_for_organizational_adoption_Diverse_needs_of_different_departments.	Yes. What my family members use or understand the most are in-house smart medical tools, such as blood pressure monitors, blood glucose meters, and smart band. They believe that self-monitoring of daily health conditions is very helpful for health care. #Reusability_provide_diversity_of_healthcare_occasion.	I do not know.
15	I have no comment, I just think it should be beneficial for both sides.	I don't know. I think at least it should be considered based on policy stipulation. #Favourable_factors_for_organizational_adoption_Policy_stipulation.	I think so. Because it is time saving. #Reusability_Efficiency_improvement.	I think so. Because it is more efficient. #Reusability_efficiency_improvement.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
1	I think it is helpful. Because the digital data is more durable than the paper data, as long as the patient has been to the doctor, he can consult the previous condition when he sees the doctor again. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage. A comprehensive understanding of the patient's condition will be very helpful for future treatment. #Reusability_providing_comphrehensive_information_about_patient's_condition. In an era without these digitally assisted innovations, if a patient came to the emergency department, the basic examination results of the patient could not be known in advance and discussed with colleagues. Now, the results can be checked in the department before the consultation. When uncertain incurable diseases are encountered, you can discuss it with colleagues and then go to the emergency department. This is more certain for doctors and more accountable to patients and their families. #Reusability_is_helpful_for_emergency_and_referral_condition.	I think so. Under the call of policy Internet plus, the medical industry has been promoting the reform of digital information. The advanced hospitals in downtown, Beijing have more advanced digital tools to assist doctors in diagnosis and other operations. I think that's the future trend. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy. #Positive_response_from_health_professionals_the_advanced_hospitals_have_been_through_coutinuous_digitalization_reform.	Overall, I still feel quite safe. Because I think when the equipment or system is introduced into the hospital for our medical staff to use, the preliminary preparations are already made. Safety considerations and guarantees are certified. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	We will definitely consider it. Not only doctors will consider this issue, but the hospital level is also paying attention to these issues. So, when these innovations are adopted, these security issues will be carefully considered and ensured before It is introduced. #Accessability_the_whole_hospital_personnel_have_awareness_of_information_protection. For example, the electronic medical record systems we use now transmit information through the hospital's internal network, and no computer in the hospital can be connected to the external network. #Accessbility_access_control. And our hospital uses USB key and username and password for authentication. Without this USB key, you cannot log in to the system, even if you know the username and password. And each USB key has its own special identity and is bound to a specific medical staff. So, the hospital's back-end system can track specific operators and operations. #Accessbility_authentication_sysyetem_Login/password_combined_with_a_digital_certificate.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
2	I think it is helpful. Because the digital data is more durable than the paper data. As long as the patient register and bring the medical insurance card, he can consult the previous condition with the doctor by searching his records. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think so. Under the call of policy Internet plus, the medical industry has been promoting the reform of digital information. The advanced hospitals in Beijing have more cutting-edge digital tools to assist doctors in diagnosis and other operations. I think that's the future trend. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy. #Positive_response_from_health_professionals_the_advanced_hospitals_have_been_through_coutinuous_digitalization_reform.	Yes. To be honest, I personally haven't thought about this issue. But I think these tools should be proven safe and secure as long as they are referred to the department. #Accessability_A_sterotype_that_safety_and_security_problems_are_solved_before_clinical_use.	No. I am unaware of this subject until today's interview. #Accessability_medical_staffs_have_no_knowledge_of_information_security.
3	I think it is helpful. Because it is time saving and convenient. We don't have to wait for the physical report, and we can check the result directly after the test is done. #Reusability_efficiency_improvement.	I think so. The application of digital tools can not only assist the clinical work of medical staff, find lesions, improve the accuracy of diagnosis, but also help research on regional health. For example, the use of big data to survey regional epidemics can better understand the regional health issues. #Reusability_efficiency_improvement. #Reusability_accurecy_improvement. #Reusebility_faciliate_regional_disease_resreach.	So far, I feel quite safe. Because I think the hospital wouldn't introduce innovation without safety guarantee. Once it is adopted for clinical use, it must be certified. #Accessability_A_sterotype_that_safety_and_security_problems_are_solved_before_clinical_use.	I won't consider it. Because our hospital is running on an internal LAN, which is eased the risk of being attacked by outsiders. #Accessibility_Fully_trust_in_the_protection_from_internal_LAN.
4	I think it is helpful. Because the digital data is more durable than the paper data. As long as the patient register and bring the medical insurance card, he can consult the previous condition with the doctor by searching his records. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think so. Under the call of policy Internet plus, the medical industry has been promoting the reform of digital information. The advanced hospitals in Beijing have more cutting-edge digital tools to assist doctors in diagnosis and other operations. I think that's the future trend. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy. #Positive_response_from_health_professionals_the_advanced_hospitals_have_been_through_coutinuous_digitalization_reform.	Overall, I still feel quite safe. Because I think when the equipment or system is introduced into the hospital for our medical staff to use, the preliminary preparations are already made. Safety considerations and guarantees are certified. #Accessability_A_sterotype_that_safety_and_security_problems_are_solved_before_clinical_use.	No. Because I don't think this kind of problems are the responsibility of clinical medical staffs. Our hospital has a computer center, who is responsible for technological issues. #Acessability_medical_staffs_are_unconsicious_about_security_responsibility.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
5	I think so. Because the we can check patient's previous medical records through digital data as long as the patient register and bring the medical insurance card, which is helpful to gain comprehensive understanding to patient's conditions. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think so.	So far, I feel quite safe. Because I think the hospital wouldn't introduce innovation without safety guarantee. Once it is adopted for clinical use, it must be certified. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	No. Because I don't think this kind of problems are the responsibility of clinical medical staffs. Our hospital has a computer center, who is responsible for technological issues. #Accessability_medical_staffs_are_unconsicious_about_security_responsibility.
6	I think it is helpful. Because the digital data is more durable than the paper data. As long as the patient register and bring the medical insurance card, he can consult the previous condition with the doctor by searching his records. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think so. Under the call of policy Internet plus, the medical industry has been promoting the reform of digital information. I think that's the future trend. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy.	So far, I feel quite safe. Because I think the hospital wouldn't introduce innovation without safety guarantee. Once it is adopted for clinical use, it must be certified. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	No. Because I don't think this kind of problems are the responsibility of clinical medical staffs. #Accessability_medical_staffs_are_unconsicious_about_security_responsibility.
7	Yes, it helps. Of course, there are benefits. The process of treatment is a combination of personal experience and evidence-based medicine. If you can directly access the health data and know the patient's past medical history and treatment history, the understanding of the disease is more comprehensive. In this case, the diagnosis and treatment will be more accurate. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Reusability_efficiency_improvement. #Reusability_accurecy_improvement.	Yes.	Yes. To be honest, I personally haven't thought about this issue. But I think these tools should be proven safe and secure as long as they are referred to the department. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	I haven't considered this issue. I think this is the responsibility of the hospital's management department during the procurement process, not the responsibility of the clinical medical staffs. I believe that once innovations are adopted and introduced into various departments, which means that they are safe. #Accessability_medical_staffs_are_unconsicious_about_security_responsibility. #Accessability_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
8	Yes, it helps. For example, the hospital stipulates that the course record cannot be modified. Therefore, in the era of handwriting, it is necessary to rewrite the wrong record or modify it in a troublesome way, which is annoying for medical staff. Now through the electronic medical record system, the recording and modification of the medical course are more convenient, simpler and easier. The access to patient health data can solve the problem caused by paper cases that may be missing or incomplete. As long as the patient is hospitalized or outpatient, the treatment process and objective examination results can be found in the system by authenticating the patient medical card, which has provided a great help for the medical staff to grasp the condition. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Interoperability_effciency_improvement.	Yes.	So far, I feel okay.	I haven't considered this issue. Because our hospitals are using internal network so that computers or other equipment in the hospital can not log in to the external network, which is unlikely to cause data leakage or loss or theft. And I think that innovation is introduced into the department, which means that it is safe enough, and it is guaranteed in many aspects, otherwise it cannot be used by our clinical staff. #Accessability_Fully_trust_in_the_protection_from_internal_LAN. #Accessability_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
9	Yes, it helps. Patient's physical indictor can be real-time displayed and monitored, which is helpful for medical staffs to better understand the condition changes and control them. #Reusability_control_disease_development.	Yes.	Yes. To be honest, I personally haven't thought about this issue. But I think these tools should be proven safe and secure as long as they are referred to the department. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	I never consider this question since it should be verified before it was introduced into clinical use. #Acccessability_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
10	Yes, it helps. But older nurses find it difficult to use computer and other advanced equipment to record their disease because they are not used to this digital way of working. #Interoperability_it_is_hard_to_adapt_new_work_style_for_the_older_medical_staffs.	Yes. Because the current digital tools are beneficial to both the doctor and the patient, it provides a lot of convenience for the doctor and the patient, saves time and costs, and improves the accuracy of the test. Therefore, professionals are advocating. When seminars or doctors from higher-level hospitals are invited to visit our hospital, they will also share relevant experience and the latest technology for us to learn. #Reusability_efficiency_improvement. #Reusability_accurecy_improvement. #Positive_response_from_health_professionals_Experts_host_academic_events_and_share_latest_information_and_techniques.	So far, I feel okay.	I will consider this factor. Because when using these innovations, the operator will sign and be responsible for it and the operation can be traced. Therefore, accountability is required when problems arise. #Accessability_Operation_can_be_traced_back_and_operator_take_accountability_for_it.
11	I think it is helpful. It can free medical staffs from tedious workflow and we can concentrate on treatment itself. #Reusability_efficiency_improvement.	I think so. The entire industry hopes that through the digital reform advocated by the government, the behavior of medical care can be penetrated to a lower level. Besides, as i mentioned before, due to lack of standardization between hospitals, the treatment for referral and emergency situation is in low efficiency. Therefore, the experts are advocating to establish standardization about the objective results for example test report among clinics. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy. #Positive_response_from_health_professionals_Experts_prompt_digital_health_penetrating_into_lower_level_of_healthcare. #Interoperability_experts_advocate_establish_data_standardization_between_clinics_for_objective_results.	Overall, I still feel quite safe. Because I think when the equipment or system is introduced into the hospital for our medical staff to use, the preliminary preparations are already made. Safety considerations and guarantees are certified. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	Yes. Because when using these innovations, the operator will sign and be responsible for it and the operation can be traced. Therefore, accountability is required when problems arise. #Accessability_Operation_can_be_traced_back_and_operator_take_accountability_for_it.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
12	Yes, it helps. For example, the hospital stipulates that the course record cannot be modified. Therefore, in the era of handwriting, it is necessary to rewrite the wrong record or modify it in a troublesome way, which is annoying for medical staff. Now through the electronic medical record system, the recording and modification of the medical course are more convenient, simpler and easier. The access to patient health data can solve the problem caused by paper cases that may be missing or incomplete. As long as the patient is hospitalized or outpatient, the treatment process and objective examination results can be found in the system by authenticating the patient medical card, which has provided a great help for the medical staff to grasp the condition. #Reusability_efficiency_improvement. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition. #Interoperability_effciency_improvement.	Yes.	In the present situation, I feel okay. Because the data protection methods of the hospital are quite good. #Accessability_trust_in_current_protection_method_built_up_in_the_hospital.	I haven't considered this issue. I think that innovation is introduced into the department, which means that it is safe enough, and it is guaranteed in many aspects, otherwise it cannot be used by our clinical staffs. #Acccessability_A_stereotype_that_security_and_safety_issues_must_be_solved_before_adoption.
13	I think it is helpful. Because the digital data is more durable than the paper data. As long as the patient register and bring the medical insurance card, he can consult the previous condition with the doctor by searching his records. Although paper data can also be used, it is easier to face the problems of loss and omission caused by improper storage. #Reusability_Data_integrity_improvement. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	I think so. While I was training, some specialists in general surgery worked with IT engineers to create an app that allows patients to inquire directly with doctors through the app. The entire industry still hopes that through the digital reform advocated by the government, the behavior of medical care can be penetrated to a lower level. #Positive_response_from_health_professionals_digitalization_reform_is_advoacted_by_the_policy. #Positive_response_from_health_professionals_Experts_prompt_digital_health_penetrating_into_lower_level_of_healthcare.	Yes. To be honest, I personally haven't thought about this issue. But I think these tools should be proven safe and secure as long as they are referred to the department. #Accessability_A_stereotype_that_safety_and_security_problems_are_solved_before_clinical_use.	No. Because I don't think this kind of problems are the responsibility of clinical medical staffs. #Accessability_medical_staffs_are_unconsicious_about_security_responsibility.
14	Yes, it helps. In addition to making our work more convenient, real-time data monitoring and display makes it easier for us to know the changes in the patient's condition and to better control the condition. #Reusability_control_disease_development.	Yes. Because the current digital tools are beneficial to both the doctor and the patient, it provides a lot of convenience for the doctor and the patient, saves time and costs, and improves the accuracy of the test. Therefore, professionals are advocating. When seminars or doctors from higher-level hospitals are invited to visit our hospital, they will also share relevant experience and the latest technology for us to learn. #Reusability_efficiency_improvement. #Reusability_accurecy_improvement. #Positive_response_from_health_professionals_Experts_host_academic_events_and_share_latest_information_and_techniques.	So far, I feel okay.	I have never realized this could be a problem until you asked this question. #Accessability_medical_staffs_are_unconsicious_about_security_responsibility.

Respondent ID	Do your collogues think that they can give better care if they work with digital data and can access patience's health data?	Do health professionals promote use of digital tools in health care?	Do you feel safe when you use of digital health tools?	Even for those mandatory adoption, will you or your colleagues consider the authentication method to ensure the data security when adopting innovation?
15	I think so. Because the we can check patient's previous medical records through digital data as long as the patient register and bring the medical insurance card, which is helpful to gain comprehensive understanding to patient's conditions. #Findability_patients_register_in_local_and_regional_healthcare_system. #Reusability_providing_comphrehensive_information_about_patient's_condition.	Sorry I don't know. Because I only focus on my clinical work. #Neutral_response_Not_senseti ve_with_indurty_changes.	So far, I feel quite safe. Because I think the hospital wouldn't introduce innovation without safety guarantee. Once it is adopted for clinical use, it must be certified. #Acessability_A_ste rotype_that_safety_a nd_security_proble ms_are_solved_befo re_clinical_use.	No. Because I don't think this kind of problems are the responsibility of clinical medical staffs. #Accessability_medical_staffs_are_u nconsicious_about_security_responsi bility.

Respondent ID	How is access authorization of doctors arranged in the hospital, who is responsible for assigning access?	Can patients access their personal health data?	Who, do you think, outside the hospital can access and use the data?
1	Medical staff's access authority should be assigned by the hospital's administrative department, and the specific operations should be completed by the computer center. Our hospital should be assigned by the medical section. #Accessbility_the_medical_section_arran ges_the_authorization. As far as I know, the authority should be allocated according to the functional scope of the medical staff. #Accessbility_access_control_by_functio nal_scope. If we are in neurosurgery department, we can't see the patients' information in other departments except our own department and emergency department.	No. Health data is not accessible. Disease-related medical information belongs to the privacy of hospitals and medical staff. #Accessbility_medical_records_belong_to_ doctors'_privacy_not_patients. Even patients who want to access their own data are not allowed. Objective test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. #Accessbility_the_patients_can_access_to_ objective_health_and_expense_data_for_a_ given_period_of_time. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization, unless medical disputes involved in the treatment process.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions _and_patients_with_their_clients_outside_can_ review_and_use_the_data_when_permission_a pproved.
2	Medical staff's access authority is assigned by the hospital's administrative department, and the specific operations should be completed by the computer center. Our hospital should be assigned by the medical section. #Accessbility_the_medical_section_arran ges_the_authorization. As far as I know, the authority should be allocated according to the functional scope of the medical staff. #Accessbility_access_control_by_functio nal_scope.	No. Health data is not accessible, but objective information is accessible. Test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. #Accessbility_the_patients_can_access_to_ objective_health_and_expense_data_for_a_ given_period_of_time. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization unless medical disputes are involved in the treatment process, otherwise, it is not possible.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions _and_patients_with_their_clients_outside_can_ review_and_use_the_data_when_permission_a pproved.
3	Medical staff's access authority is assigned by the hospital's administrative department, and the specific operations should be completed by the computer center. Our hospital should be assigned by the medical section. #Accessbility_the_medical_section_arran ges_the_authorization. As far as I know, the authority should be allocated according to the functional scope of the medical staff. #Accessbility_access_control_by_functio nal_scope.	No. Health data is not accessible, but objective information is accessible. Test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. #Accessbility_the_patients_can_access_to_ objective_health_and_expense_data_for_a_ given_period_of_time. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization unless medical disputes are involved in the treatment process, otherwise, it is not possible.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions _and_patients_with_their_clients_outside_can_ review_and_use_the_data_when_permission_a pproved.

Respondent ID	How is access authorization of doctors arranged in the hospital, who is responsible for assigning access?	Can patients access their personal health data?	Who, do you think, outside the hospital can access and use the data?
4	Medical staff's access authority is assigned by the hospital's administrative department, and the specific operations should be completed by the computer center. Our hospital should be assigned by the medical section. #Accessbility_the_medical_section_arranges_the_authorization. As far as I know, the authority should be allocated according to the functional scope of the medical staff. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible. Disease-related medical information belongs to the privacy of hospitals and medical staff. Even patients who want to access their own data are not allowed. #Accessbility_medical_records_belong_to_doctors'_privacy_not_patients.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
5	Medical staff's access authority should be assigned by the hospital's administrative department and the specific operations should be completed by the computer center. Our hospital should be assigned by the hospital committee. #Accessbility_the_hospital_committee_arranges_the_authorization. As far as I know, the authority should be allocated according to the functional scope of the medical staff. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible. But they can check cost-related information and test results through self-service machine. Patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization. Unless medical disputes are involved in the treatment process, otherwise, it is not possible. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
6	The hospital committee decided to authorizations, and the specific implementation process was completed by the medical section and the computer center. #Accessbility_the_hospital_committee_arranges_the_authorization. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible, but cost-related information is accessible. Objective test results and cost-related content will be given to patients in physical form such as paper or film or can be checked through a self_service machine. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization. Unless medical disputes are involved in the treatment process, otherwise, it is not possible. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
7	The hospital committee decided to authorizations, and the specific implementation process was completed by the medical section and the computer center. #Accessbility_the_hospital_committee_arranges_the_authorization. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_access_control_by_functional_scope.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of MRI can be seen by the patient taking their medical insurance card and swiping the card on the machine that takes the results. When discharged, patients can go to the medical record room to duplicate their paper cases. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time. However, such behavior is not allowed during hospitalization. Unless medical disputes are involved in the treatment process, otherwise, it is not possible. Because the healing process relies on the objective results of the diagnosis and the subjective reasoning of the doctor which is doctors' privacy and not allowed to be seen by others. #Accessbility_medical_records_belong_to_doctors'_privacy_not_patients. It is likely to go through different stages of reasoning. The reasoning and treatment directions at the beginning and the final diagnosis and treatment methods are likely to be inconsistent.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.

Respondent ID	How is access authorization of doctors arranged in the hospital, who is responsible for assigning access?	Can patients access their personal health data?	Who, do you think, outside the hospital can access and use the data?
8	The computer center to assign authorizations. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_the_computer_center_arranges_the_authorization. #Accessbility_access_control_by_functional_scope.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of CT or the expense information can be seen by the patient taking their medical insurance card and swiping the card on the self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
9	Sorry, I don't know.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of MRI or the expense information can be seen by the patient taking their medical insurance card and swiping the card on the self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Sorry, I don't know.
10	The medical section assigns authorizations. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_the_medical_section_arranges_the_authorization. #Accessbility_access_control_by_functional_scope.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of test or the expense information can be seen by the patient taking their medical insurance card and swiping the card on the self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
11	The hospital committee decided to authorizations, and the specific implementation process was completed by the medical section and the computer center. #Accessbility_the_hospital_committee_arranges_the_authorization. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible. Objective test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization, unless medical disputes involved in the treatment process.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.

Respondent ID	How is access authorization of doctors arranged in the hospital, who is responsible for assigning access?	Can patients access their personal health data?	Who, do you think, outside the hospital can access and use the data?
12	The medical section assigns authorizations. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_the_medical_section_arranges_the_authorization. #Accessbility_access_control_by_functional_scope.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of image and test or the expense information can be seen by the patient taking their medical insurance card and swiping the card on the self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
13	The computer center assigns authorizations. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_the_computer_center_arranges_the_authorization. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible. Disease-related medical information belongs to the privacy of hospitals and medical staff. #Accessbility_medical_records_belong_to_doctors'_privacy_not_patients. Even patients who want to access their own data are not allowed. Objective test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time. When discharged, patients can go to the medical record room to duplicate their paper cases. However, such behavior is not allowed during hospitalization, unless medical disputes involved in the treatment process.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
14	The medical section assigns authorizations. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_the_medical_section_arranges_the_authorization. #Accessbility_access_control_by_functional_scope.	No. We will inform the patient, but the patient cannot directly access their own health data. Objective results are accessible. For example, the results of image and test or the expense information can be seen by the patient taking their medical insurance card and swiping the card on the self-service machine. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.
15	The hospital committee decided to authorizations, and the specific implementation process was completed by the medical section and the computer center. #Accessbility_the_hospital_committee_arranges_the_authorization. The medical staff in the hospital is authorized according to their functional scope. #Accessbility_access_control_by_functional_scope.	No. Health data is not accessible. Objective test results and cost-related content will be given to patients in physical form such as paper or film and be reviewed through self-service machine. There is no platform for patients to access. #Accessbility_the_patients_can_access_to_objective_health_and_expense_data_for_a_given_period_of_time.	Besides the administrative departments such as the national health commission, the medical insurance office, etc., or the public security organs and legal departments, patients or their clients may come to the medical records room to copy the medical records. However, they need to be certified by the medical section for their identity and intention and can only be inquired after approval. The access operation needs to be performed in the hospital and cannot be accessed directly from the outside. #Accessbility_legal_administrative_instuitions_and_patients_with_their_clients_outside_can_review_and_use_the_data_when_permission_approved.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for work?	Are you willing to work in another clinic, if that clinic used more digital data tools?	Would you prefer to work in another clinic where they are using traditional health methods without digital tools?
1	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. However, good hospitals are now implementing digital reforms. If so, this is an important criterion, but it is not a decisive criterion. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Yes.	No. The point is that there are few such hospitals. #Nagetive_intention_to_traditional_methods_few_exists.
2	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. However, good hospitals are now implementing digital reforms. If so, this is an important criterion, but it is not a decisive criterion. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	For me, I focus on where is suitable for me to develop my career. For example, if Alibaba group built a hospital with advanced digital tools, would the experts in level three hospital give up their current workplace to go to there? I think the answer may be no. #Neutral_intention_to_digital_methods_benefit_self_development_and_career_devlopment_is_the_key_point. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	As I mentioned before, digital data using is not my decisive criterium. I can do both ways as long as it is beneficial to my career development. #Neutral_intention_to_traditional_methods_benefit_self_development_and_career_devlopment_is_the_key_point.
3	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. For me, I think I will consider where is the best place for me to develop myself and facilitate my career development. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital. #Neutral_intention_to_data_using_benefit_self_development_and_career_devlopment_is_the_key_point.	For me, I focus on where is suitable for me to develop my career. #Neutral_intention_to_digital_methods_benefit_self_development_and_career_devlopment_is_the_key_point.	Same as my previous question. #Neutral_intention_to_traditional_methods_benefit_self_development_and_career_devlopment_is_the_key_point.
4	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Not sure. Because for me, it is not a decisive criterion. I will consider other factors such as place for living, preferred lifestyle and workstyle and so on. #Neutral_intention_to_digital_methods_Not_decisive_criterion. #Neutral_intention_to_digital_methods_other_matter_factors_such_as_place_for_living_prefered_lifestyle_and_workstyle.	Same as my previous question. It is not my decisive criterion. #Neutral_intention_to_digital_methods_Not_decisive_criterion. #Neutral_intention_to_digital_methods_other_matter_factors_such_as_place_for_living_prefered_lifestyle_and_workstyle.
5	Not necessarily. My concern is whether the hospital can help my career development. My decision is made based on where is the suitable place to utilize my skills. #Neutral_intention_to_data_using_self_development_and_career_devlopment_is_the_key_point.	No. Personally, I really resist those digital tools which are too complex for me. Because I hadn't been exposed to this environment until the whole industry begun digitalization reform, it is a huge challenge for me, however, I have to adapt with this new workstyle. #Negative_intention_to_digital_methods_unwilling_to_change_work_style.	I would like to work in a traditional hospital. Because I am used to the traditional workstyle. To be honest, it is hard to learn new trick in my age. #Positive_intention_to_traditional_methods_the_older_and_experienced_medical_staffs_are_used_to_trditional_methods_and_unwilling_to_change_workstyle.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for work?	Are you willing to work in another clinic, if that clinic used more digital data tools?	Would you prefer to work in another clinic where they are using traditional health methods without digital tools?
6	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Yes. Because I think these digital tools can make our workflow less tedious. #Interoperability_effciency_improvement.	No. But it is fine for me to work in that environment because I have experienced the traditional methods for decades. I can handle that. But it is hard to be accepted by the young generation. #Negative_intention_to_traditional_methods_the_older_and_experienced_medical_staffs_in_comparison_with_the_young_and_less_experienced_medical_staffs_can_handle_traditional_methods.
7	Yes. Because advanced hospitals are relatively mature in digital reform, the application scope of digital data is also relatively comprehensive. #Reusability_is_a_symbol_of_an_advanced_hospital.	I personally like working on such hospital. Because I think these digital tools can make our daily work easier and more efficient. And for surgeons, digital tools such as surgically assisted robots can also reduce the rate of surgical errors. Because in the dimension of precision, machines have advantages over humans. #Interoperability_effciency_improvement. #Reusability_human_error_reducement.	To be honest I have no obvious preferences. Because I have experienced the era of traditional medicine, these are not my decisive reasons. Young doctors will become more dependent on digital health because they don't have the opportunity to experience traditional health methods, plus they are generally growing in the digital age and are more sensitive to these. #Neutral_intention_to_traditional_methods_No_obvious_perference_for_older_and_experienced_medical_staffs.
8	No. I will obey assignment and go wherever they arrange me to. #Negative_intention_to_data_using_Obey_assignment.	I personally like working on such a hospital. Because I think these digital tools can make our daily work easier and more efficient. #Interoperability_effciency_improvement.	Not willing to. The traditional working method is too complex and low efficient. #Reusability_efficiency_improvement.
9	Yes. It is convenient and efficient for daily work. #Reusability_perceived_convinence.	I may not. Although this is an important criterion for me, I do not choose to work there just because of this condition. I prefer to work in a hospital with a comfortable working environment and a place with a comfortable living environment. #Neutral_intention_to_digital_methods_Not_decisive_criterion. #Neutral_intention_to_digital_methods_other_matter_factors_such_as_place_for_living_prefered_lifestyle_and_workstyle.	Not willing. The traditional working method is too complex. For young generation, it is hard to accept. #Reusability_efficiency_improvement. #Negative_intention_to_traditional_methods_the_young_medical_staffs_hardly_adopt_the_traditional_method.
10	Yes.	I personally like working on such a hospital. Because I think these digital tools can make our daily work easier and more efficient. #Interoperability_effciency_improvement.	No. The traditional method is too complex. It is also easy to cause the loss of file data. #Reusability_efficiency_improvement. #Reusability_Data_integrity_improvement.
11	Yes. Because I can focus on other stuffs like researching or developing myself. I don't have to waste my time on tedious workflow. #Reusability_efficiency_improvement. #Interoperability_effciency_improvement.	Yes. Because I think these digital tools can make our workflow less tedious. #Interoperability_effciency_improvement.	Not willing. I think it is hard to be accepted by the young medical staffs. #Negative_intention_to_traditional_methods_The_young_and_less_experienced_medical_staffs_can_hardly_accept_traditional_methods.

Respondent ID	Is use of digital data an important criterium for you to select a health clinic for work?	Are you willing to work in another clinic, if that clinic used more digital data tools?	Would you prefer to work in another clinic where they are using traditional health methods without digital tools?
12	No. I think this is a big trend. In the future, hospitals will undergo digital reform and become more mature. Therefore, the hospitals that underperform today may do well in the future. #Negative_intention_to_digital_data_Digitalization_is_trend_and_eventually_acheived_in_all_clinics.	I personally like working on such a hospital. Because I think these digital tools can make our daily work easier and more efficient. #Reusability_efficiency_improvement. #Interoperability_effciency_improvement.	No. The traditional method is too complex. #Interoperability_ease_to_use. #Reusability_efficiency_improvement.
13	Not necessarily. Because the use of data is more representative of the hardware level of a hospital, and the overall strength of the hospital also need to be considered. #Neutral_intention_to_data_using_focus_on_the_overall_strength_of_a_hospital. #Reusability_is_an_necessary_but_not_sufficient_measurement_of_an_advanced_hospital.	Yes. Because I think these digital tools can make our workflow less tedious. #Interoperability_effciency_improvement.	Not willing.
14	Yes. I think the testing and examine process using digital data and digital data tools has become a very basic part of daily work. I have no idea how to work without these. #Data_using_is_part_of_daily_work.	I personally like working on such a hospital. Because I think these digital tools can make our daily work easier and more efficient. #Reusability_efficiency_improvement. #Interoperability_effciency_improvement.	Not willing. Because I have experienced the traditional method. The model is too complex. #Interoperability_ease_to_use. #Reusability_efficiency_improvement.
15	No. For me, it is just a job. I will go wherever offers me with a job. And I have experienced the traditional method so I can handle both ways. #Neutral_intention_to_data_using_Not_decisive_criterion. #Neutral_intention_to_data_using_Older_and_experienced_medical_staffs_can_handle_both_ways.	No. Personally, I really resist those digital tools which are too complex for me. Because I hadn't been exposed to this environment until the whole industry begun digitalization reform, it is a huge challenge for me, however, I have to adapt with this new workstyle. #Negative_intention_to_digital_methods_unwilling_to_change_work_style.	No. Personally, I really resist to change work style. I have to adapt with new workstyle. If I went to a new hospital with traditional method, then I need to turn my current work style into the traditional one, which is really annoying for me. #Negative_intention_to_traditional_methods_unwilling_to_change_work_style.

Appendix 5 TPB Figure of medical staffs

Attitude:

<u>Positive feeling/ advantages:</u>

Findability:

- Search and check patients' previous health data

Accessibility:

- Protect sensitive data by establishing policy and regulations, setting up access control mode and authentication system
- Prevent ruining medical staffs' career and patients' mental health from medical records breach
- Effective health data protection measures than traditional methods

Interoperability:

- Reduce waste of resources and time brought by repeated tests
- Improve efficiency of inter-clinic treatment

Reusability:

- Improve health data integrity and provide medical staffs with a comprehensive understanding of patients' condition
- Reduce human errors and unnecessary duplicate tests
- Alleviate the problem of uneven distribution of medical resources and information discrepancy
- Benefit for referral, emergency and non-local patients and cross-regional healthcare
- improve the efficiency and accuracy of treatment

<u>Negative feeling/disadvantages</u>:

Findability:

- Use ID number as identifier and bond with too much personal information

Accessibility:

- Users lack of awareness of information security and misunderstand the value of health data
- Unclear authorization assignment

Interoperability:

- Lack of flexibility in benchmark

Reusability:

- Effectiveness is not obvious due to low level of digitization and inadequate penetration of digital health
- Less helpful for Traditional Chinese Medical treatment
- Worry about the abuse of health data reuse

Social Norms:

<u>People who response/might response positively:</u>

Findability:

- Medical personnel

Accessibility:

- Medical personnel

Interoperability:

- Young medical personnel
- Health industry professionals

Reusability:

- Medical personnel particularly young ones
- Health industry professionals
- Non-local patients or people live far from
- Referral and emergency patients

<u>People who response/might response negatively:</u>

Findability:

- Patients with sensitive disease
- People who worry about information privacy

Accessibility:

- People who distrust the hospitals' data protection systems

Interoperability:

- Older medical personnel

Reusability:

- The elderly
- Older medical personnel
- People who concern about abuse of data reuse

Perceived Behavioral Controls:

<u>Factors that facilitate:</u>

Findability:

- Internet plus Health Care policy

Accessibility:

- Internet plus Health Care policy
- Cyber Security Law of the People's Republic of China
- Information Technology – Personal Information Security Specification
- Other policies or regulations

Interoperability:

- Internet plus Health Care policy

Reusability:

- Internet plus Health Care policy

<u>Factors that impede:</u>

Findability:

- Only the outpatient department has completed the networking and sharing of data and the inpatient department solely circulates within the hospital

Accessibility:

- The data protection awareness of medical personnel is incomplete
- The education of relevant knowledge is lacking
- The attribution of health data also hindered hospitals from opening access authorization of health data to others
- Irregular use caused by complex authentication methods

Interoperability:

- Lack of standardization among different medical institutions

Reusability:

- Inadequate coverage and weak penetration of digitalization reforms in medical institutions

Behavioral Intention

Appendix 6 TPB Figure of patients

Attitude:

<u>Positive feeling/ advantages:</u>

Findability:

- Obtain a sense of control

Accessibility:

- Protect sensitive data by establishing policy and regulations, setting up access control mode and authentication system

Interoperability:

- Reduce waste of resources and time brought by repeated tests
- Improve efficiency of inter-clinic treatment

Reusability:

- Improve health data integrity and provide medical staffs with a comprehensive understanding of patients' condition
- Reduce human errors and unnecessary duplicate tests
- Alleviate the problem of uneven distribution of medical resources and information discrepancy
- Benefit for referral, emergency and non-local patients and cross-regional healthcare
- improve the efficiency and accuracy of treatment
- Provide patients with mental comfort and relief by improving the healthcare efficiency
- Reduce physical and economic burden brought by repeated tests

<u>Negative feeling/disadvantages</u>:

Findability:

- Use ID number as identifier and bond with too much personal information

Accessibility:

- Users lack of awareness of information security and misunderstand the value of health data
- Distrust in the hospitals' ability of data protection

Reusability:

- Effectiveness is not obvious due to low level of digitization and inadequate penetration of digital health
- Worry about the abuse of health data reuse

Social Norms:

<u>People who response/might response positively:</u>

Findability:

- Medical personnel
- Patients

Accessibility:

- People who trust the hospitals' data protection systems and government
- People who are aware of information privacy

Interoperability:

- Patients who need inter-clinic treatment

Reusability:

- Medical personnel
- Non-local patients or people live far from
- Referral and emergency patients

<u>People who response/might response negatively:</u>

Findability:

- Patients with sensitive disease
- People who worry about information privacy

Accessibility:

- People who distrust the hospitals' data protection systems
- People who feel indifferent about privacy

Reusability:

- The elderly
- People who concern about abuse of data reuse

Perceived Behavioral Controls:

<u>Factors that facilitate:</u>

Findability:

- Internet plus Health Care policy

Accessibility:

- Internet plus Health Care policy
- Cyber Security Law of the People's Republic of China
- Information Technology – Personal Information Security Specification
- Other policies or regulations

Interoperability:

- Internet plus Health Care policy

Reusability:

- Internet plus Health Care policy

<u>Factors that impede:</u>

Findability:

- Lack of a platform for patients to search and access their personal health data

Accessibility:

- Lack of data privacy instructions for the collection and use of their health data at the time of consultation

Interoperability:

- Lack of standardization among different medical institutions

Reusability:

- Inadequate coverage and weak penetration of digitalization reforms in medical institutions

Behavioral Intention