

『互操作性』 从概念到实现



2016 中华医院信息网络大会

陈修



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国际医改Health 2.0协会 大中华区分会执行长
(原)纽约市医管局讯息处长
(原)纽约州卫生厅高级管理顾问

全球医疗信息系统的问题

顶层设计缺乏或不足；

子系统信息孤岛；

信息标准化；

管理指标取得困难；

看病难、看病贵；

科研数据取得不完全与困难；

历史临床与家族史信息不足，影响医疗品质，成为医患纠纷的隐忧；

重复检查，增加成本；

医保与收费问题；

与病人沟通不足。。。等等；

医院信息网络大会

分级诊疗： 解决医疗资源分配不平均

- 让基层医疗机构“治人”，上层医院“治病”。
- 医患纠纷的一个重要导火索是
 - 太多人抢夺上层医疗资源；
 - 上层医护人员超负荷运转。
- 《互操作性》是国际上的标准解决方法
- 解决信息在医疗机构中上下联动，左右支援，前后串通（精准医疗对数据的基本要求）。
- 解决医院子系统间信息交互的问题。

对『互操作性』的需求（1）

- 医院内各个部门对信息实时性、各个科室间信息的交互、互动与类似用药管理5R的强烈要求早已经存在。
- 在1980~1997年期间，医院IT部门的同事横向研讨，希望能够找出一个适当的解决方案。逐渐的形成了共识。

对『互操作性』的需求（2）

- **Clinician Reviews 临床医生期刊** David Scher, MD, Family Practice News Digital Network 论文，引用 Rand Corp. 2016年的调查，临床医生对EHR的不满有6个I，但是，也不愿意回到使用纸质与手工。
- 1. **INTUITIVE 直观**：EHRs are not INTUITIVE，EHR不够直观，不知道在第二、三层屏幕藏着是什麽？AMA要求大修菜单与使用流程。（技术上需要用互操作性无缝链接各个子系统来解决）
- 2. **IMPOSING 推广**：EHRs are not IMPOSING 医生缺乏使用EHR的适当培训，EHR不够具有弹性，让医生使用EHR的时间超过对病人的看诊。影响到病人隐私与信息安全。
- 3. **INTEROPERABILITY 互操作性**：EHRs have limited InterOp，EHR只有有限的互操作性，EHR应该依照ONC对互操作性的要求改善。

对『互操作性』的需求 (3)

- 4. **INSIGHTFUL 洞察力** : EHRs need **INSIGHTFUL** analytics。没有经过良好的统计分析，数据几乎是无用的。CDSS工具结合了分析工具，能够大大的提升EHR的能力与价值（用互操作性HIE数据平台无缝链接各个子系统，整合重要医疗数据来解决）。
- 5. **INCLUDE 包括** : EHRs must **INCLUDE** robust portals , EHR必须包含一个强大的门户网站。网站必须真正的是以“病人为中心”的想法来设计，而不是低成本的由EHR的立场来设计。包括使用视频来与病人沟通。（优秀的门户网站必须透过具备互操作性的HIE数据平台无缝链接各个子系统来解决）
- 6. **IMMOBILE 动弹不得** : 目前EHR版本都能够在智能手机与平板电脑上使用。但是屏幕实在是太小了，医生必须来回的跑回工作站。据调查，只有8%的医生使用移动设备来开处方、搜寻病历、阅读检验报告。（取得互操作性的信息。可折叠屏幕？投影式屏幕？）

Precision Medicine
精准医疗

Personalized
个人化

Predictive
可预测性

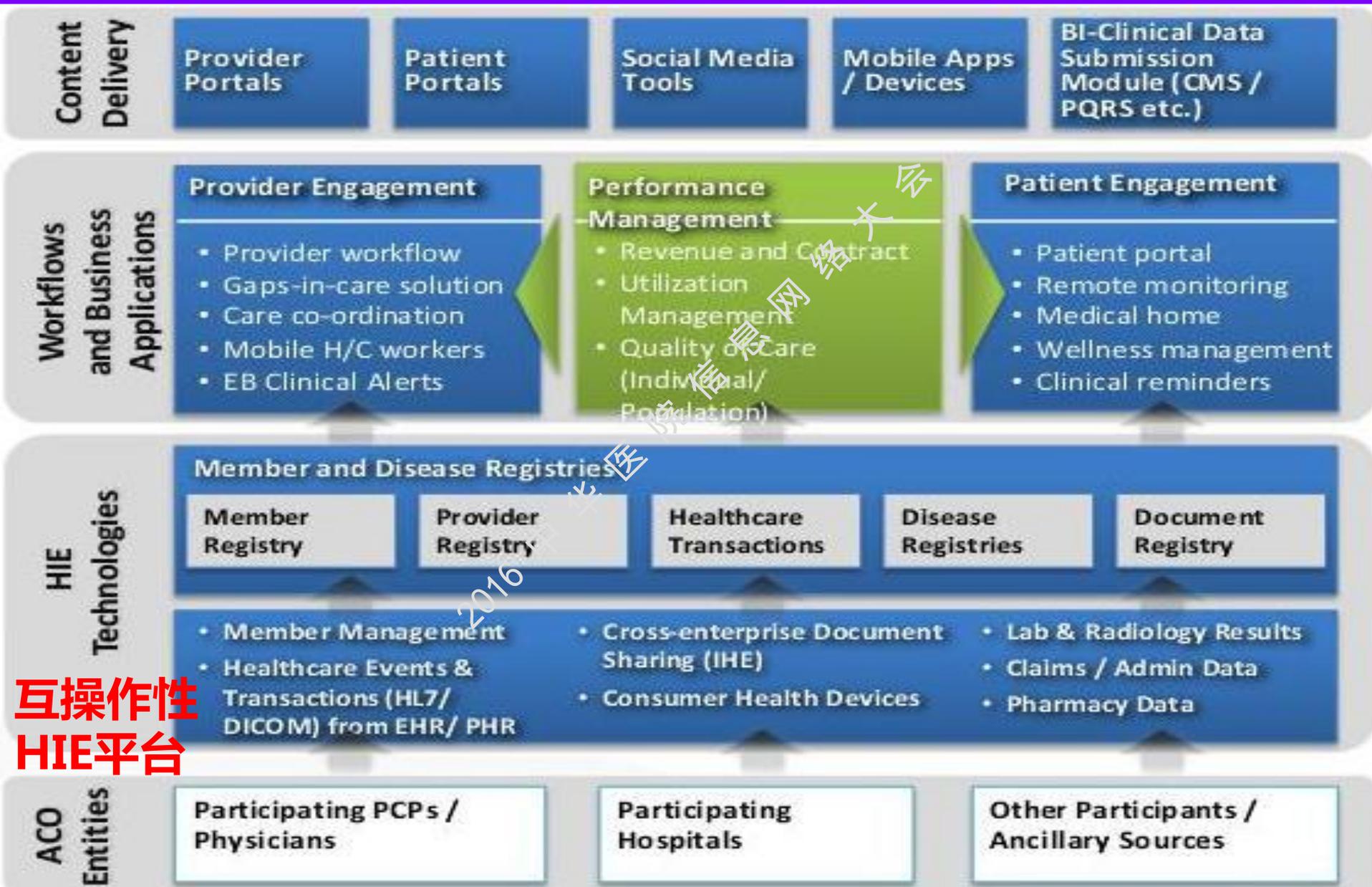
Preventive
可预防性

现代
医疗体系

Participatory
参与性

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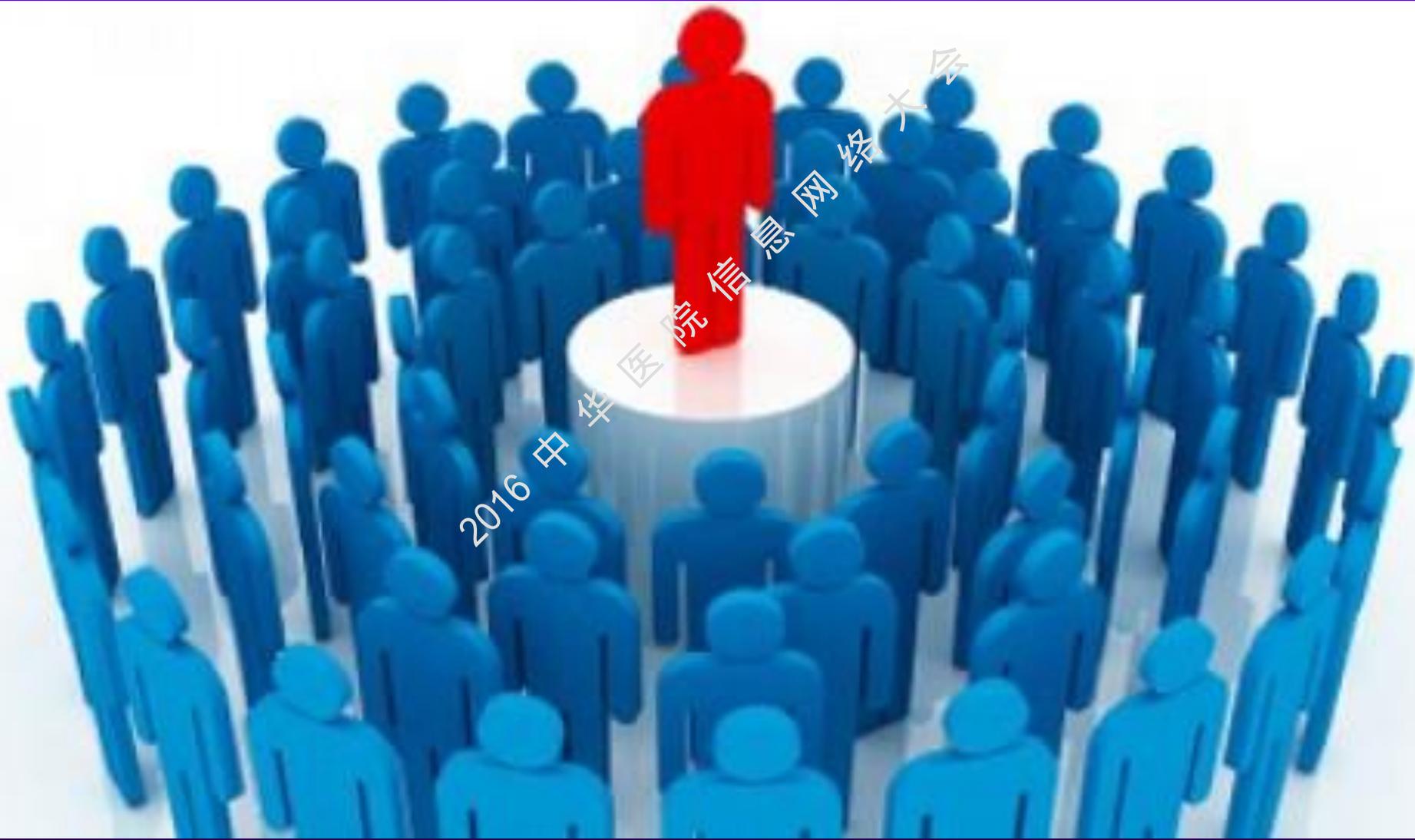
现代医疗体系的架构



互操作性
HIE平台

『互操作性』的定义

天听自我民听，天视自我民视



『互操作性』在物联网时代

INTEROPERABILITY IN THE AGE OF IOT

June 11, 2015 · by itu4u · in IoT, Regulation · 1 Comment



At its most fundamental level in the context of the digital ecosystem, interoperability is the ability to transfer and render useful data and other information across systems, applications, or components. As a concept interoperability is central, and yet often invisible, to many parts of a highly interconnected modern society. The fact that someone can make a seamless international telephone call without thinking about things like “signaling standards” or transoceanic cables, and can send and receive the same e-mail on a phone or in a browser regardless of device manufacturer or ISP, is a tribute to ICT interoperability.

But as interconnected as things currently are, they will grow dramatically more so thanks to the emergence of the Internet of Things (IoT). This new technology will not only create new forms of interactions with end-users, but connect devices to one-another. As such, IoT is built primarily on a single concept: interoperability. In order for a car, a jet engine, a parking meter, or a pill bottle to send and receive important data, it needs to be able to seamlessly connect to other systems and networks in

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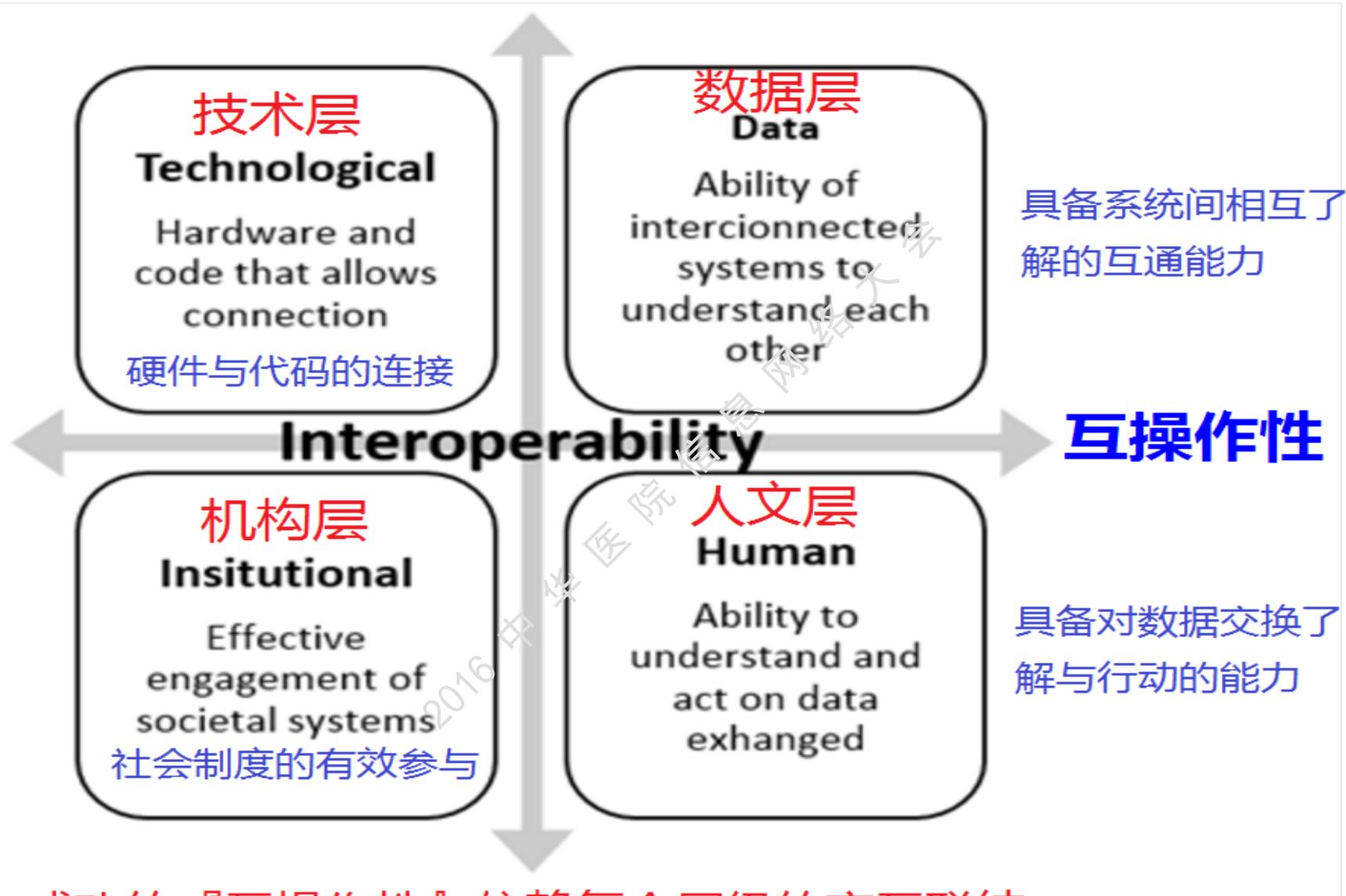
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国际电信联盟 ITU 对『互操作性』的定义



成功的『互操作性』依赖每个层级的交互联结。

Successful interoperability relies on interconnections at every layer. Source: ITU

『互操作性』的定义 (1)

- 欧洲『互操作性』框架 The European Interoperability Framework (EIF)
- 互操作性是指一种在欧洲公共服务的提供上，在各个异构与多元组织间，为了共同的利益与目标，通过业务各自支持的业务流程，在它们各自的 ICT 系统间互相交换信息，包括组织间的分享信息与知识。
 - "Interoperability, within the context of European public service delivery, is the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems."
- 美国国家信息技术标准字典 American National Standard Dictionary of Information Technology
 - 在特定的情况下，不同功能的系统间具备沟通、执行与转移数据的能力
 - the capability to communicate, execute programs, or transfer data among various functional units under specified conditions.

『互操作性』的定义(2)

- 国际标准组织 ISO/IEC Standard , 2011

- 具备特定系统间交互能力的软件属性。
- attributes of software that bear on its ability to interact with specified systems.

- 美国国防部

- 有能力将一个系统、单元、或力量所提供的数据、信息、物质与服务与由其他系统、单元、或力量所提供的数据、信息、物质与服务间发送与接受，使他们有效的一起工作。IT互操作性，包括信息的技术的交互和终端间对完成任务需求的有效率操作。互操作性不仅仅是信息交互。它包括系统，流程，程序，组织和任务的生命周期，同时必须平衡的顾及网络安全（以前称为 信息安全保障 Information Assurance (IA))。
- The ability of systems, units, or forces to provide data, information, materiel, and services to, and accept the same from, other systems, units, or forces, and to use the data, information, materiel, and services exchanged to enable them to operate effectively together. IT interoperability includes both the technical exchange of information and the end-to-end operational effectiveness of that exchange of information as required for mission accomplishment. Interoperability is more than just information exchange. It includes systems, processes, procedures, organizations, and missions over the life cycle and must be balanced with cybersecurity (formerly IA).

医疗卫生界的问题

- 一个简单的问题：
 - 我要从 EHR 中读到各个子系统、设备的实时数据。
- 一个简单的答案：
 - 在 EHR 与医疗子系统建立『互操作性』。

但是！不是容易做到。。。。

医疗界的『互操作性』

- **HIMSS的定义：**

- 『互操作性』是指各个医疗信息系统能够在机构内与跨机构间有效率的推进、提供个人与社区的医疗服务。
- Interoperability means the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities.

- **问题：**

- 没有太关注医疗设备
- 这是高端的定义，主要专注于HIE，比较没考虑到护士工作站内与床边使用的各种医疗设备。

AAMI的『互操作性』定义：

医疗设备的『互操作性』是指医疗设备与临床系统及其模组能够沟通，并且安全的完成预期目的。

- Medical device interoperability is the ability of medical devices, clinical systems, or their components to communicate in order to safely fulfill an intended purpose.
- 这个定义包括了安全与预期目的。
- AAMI - Association for the Advancement of Medical Instrumentation

美国卫生部认可的 『互操作性』定义

- IEEE Standard Computer Dictionary, IEEE 1990
 - Ability of two or more systems or components to exchange information and predictably use information that has been exchanged.
 - 2个或更多系统或模组间，有能力交换信息，及将交换来的信息做可预见的使用。
- exchange information: Syntactic interoperability. Systems recognize the structure of the data.
- 交换信息: 语法(结构)互操作性，包括HL7 message, XML, X12
- predictably use information: Semantic interoperability. Systems understand the meaning of the information.
- 可预见的使用信息: 语义互操作性，包括ICD, CPT, Snomed-CT.

IEEE有关『互操作性』的说明

- 『互操作性』最大的挑战是物联网 Internet of Things (IoT)将移动、可穿戴、传感器、云等的信息整合交互起来。
- 『互操作性』要达成的功能是：系统(组织)在不理解其他系统(组织)的内在特性与如何工作的情况下，有能力在有需要的时候、安全与精准的交换信息与使用交换来的信息。

『互操作性』建设应该达到的目标：

- 1. 最小化 "复制" - 交换数据，不是复制；是信息交互，不是信息集成。
- 2. 最小化 "数据流程" - 创建数据源与目标之间的最短路径。
- 3. 最小化 "工作量" - 自动共享数据。
- 4. 最小化 "数据接口" - 创建灵活、通用、满足多种用途的接口。
- 5. 保持模块化。

『互操作性』被全球重视

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欧盟《互操作性》文件

EIRA

EUROPEAN
INTEROPERABILITY
REFERENCE
ARCHITECTURE

Version 1.0.0

欧洲互操作性
参考架构

ISA Action 2.1:
European Interoperability Architecture

Specific Contract N.289

Framework contract N.DI/07172

European Interoperability Framework (EIF)
for European Public Services

EIF REVISION

DRAFT INTERMEDIATE VERSION

欧洲互操作性框架 (EIF)

欧洲公共服务

FEBRUARY 2016

hscic Health & Social Care
Information Centre

Directorate of
adass
adult social services

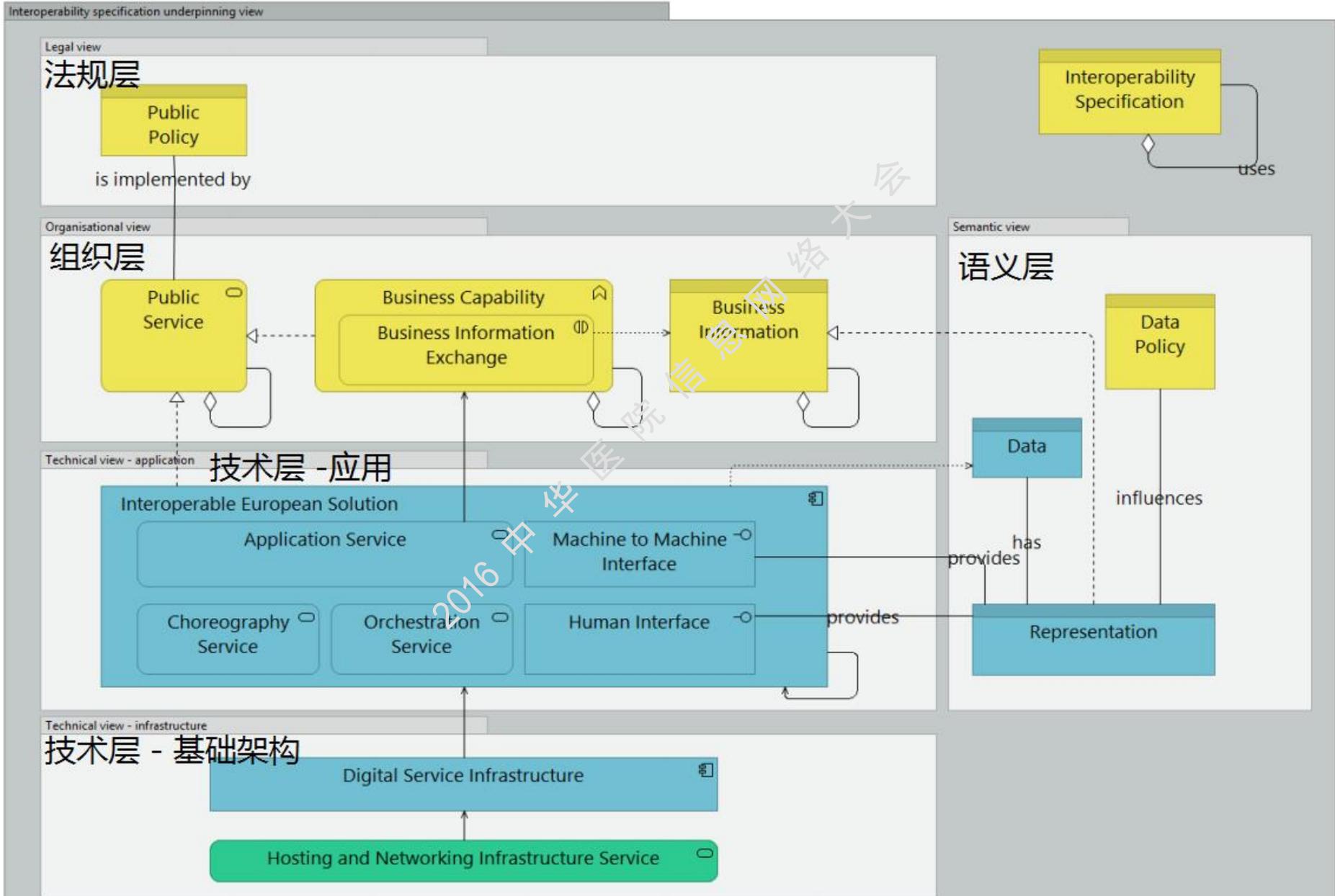
NHS
England

Interoperability
Handbook

互操作性
手册

欧洲『互操作性』参考架构

EIRA high-level overview





Our ISA solutions for you

- Document exchange
- Semantics
- Security
- Cross border collaboration services
- e-Participation
- Collections of software, standards and specifications**



EFIR

The European Federated Interoperability Repository (EFIR)

欧洲联合互操作性信息库

When is this solution for you?

You are working in a public administration of a Member State of the European Union, a standardisation body or the industry.

You are looking for **already operational freely reusable means** to seamlessly exchange information and/or to interconnect databases and systems beyond the boundaries of your organisation. You do not want to redevelop anything from scratch.

You wish to **share your collections of interoperability assets** and to receive user feedback through a repository of reusable solutions.



欧洲公共行政互操作性方案

ISA http://ec.europa.eu/isa/about-isa/index_en.htm

Interoperability Solutions for European Public Administrations

Search the ISA website

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About ISA

Administrative procedures have the reputation of being lengthy, time-consuming and costly. Electronic collaboration between Public administrations can make these procedures quicker, simpler and cheaper for all parties concerned, in particular when transactions need to be done cross-border and/or cross-sector. The ISA programme of the European Commission facilitates such transactions through more than 40 actions with a budget of some EUR 160 million.



Helping Europe move towards a digital single market

The internal market is arguably the European Union's biggest success story. By making it possible for people and goods to move freely across borders, Europe has been able to generate economic growth while providing citizens with

new opportunities to improve their quality of life. Establishing a digital single market would mean that information can be exchanged easily and swiftly across borders, helping citizens and businesses to fully benefit from the freedoms of the single market.

Currently, moving countries for work, study or retirement brings about certain administrative requirements. When moving across borders, a person has to provide information and documentation – often issued by their home country's administration – to public administrations, both national and local, in their new place of residence. Businesses also have a certain amount of document transmission and 'form filling' to do when establishing themselves in other EU Member States.

Member State administrations need to exchange information efficiently and effectively across borders if they are to discharge their responsibilities and provide services to people and businesses. If public administrations are able to access and exchange information about citizens and businesses directly, it could alleviate the administrative burden placed on all parties.

But this exchange of information poses a challenge. European public administrations are not

Read more

- [Communication: Towards interoperability for European public services](#) (57 kB)
- [Annex I to the Commission communication on interoperability – European Interoperability Strategy \(EIS\)](#) (2 MB)
- [Annex II to the Commission communication on interoperability – European Interoperability Framework \(EIF\)](#) (2 MB)
- [Towards interoperability for European public services](#) (51 kB)
- [Citizens' summary on the Commission communication on interoperability](#) (21 kB)
- [Questions and answers to the Commission communication on interoperability](#) (21 kB)

国家ICT『互操作性』框架

National ICT Interoperability Framework

In defining a formal National ICT Interoperability Framework (NIF), MITA formulated a number of guiding principles and directions that take the Public Sector a step further in increasing interoperability among Public services.

The first version of the NIF mostly focuses on the identification of technical enablers for the exchange of meaningful information and the ability to reuse existing ICT resources. It also considers organisational challenges, but does not directly take into consideration the legal perspective of Public Services.

The NIF also serves as a complimentary document to initiatives developed by MITA that specifically deal with the development and support of Public Services including, but not limited to, the [Information Systems Framework](#) and the Information Technology Strategic Plan.

美国国防部 国防信息系统署DISA



DEFENSE INFORMATION SYSTEMS AGENCY
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ADDITIONAL RESOURCES

- + JITC Website
- + System Tracking Program
- + Joint Interoperability Tool



JOINT INTEROPERABILITY TOOL

The JITC Joint Interoperability Tool (JIT) provides high speed access to key interoperability information. The heart of the system is an extensive data repository featuring the JITC Lessons Learned Reports, JITC Test Reports, the NATO Interface Guide, Joint Interoperability Certification Letters, and other interoperability documents and references; as well as a high speed search engine to quickly access data. This tool gives a quick and easy on-line capability which identifies system/equipment characteristics, tested configurations and practical "how-to" information to facilitate interoperability.

STANDARD FEATURES

To see the features and capabilities of the JIT please go to: <http://jitc.fhu.disa.mil/brochure/jit.pdf>.

HOW TO ACCESS THE JIT

To access the JIT you will require access to either a NIPRNet/Internet or SIPRNet workstation and a web browser.



Department of Defense INSTRUCTION

NUMBER 8330.01

May 21, 2014

DoD CIO

SUBJECT: Interoperability of Information Technology (IT), Including National Security Systems (NSS) **主旨：信息技术的互操作性，包括国家安全系统**

References: See Enclosure 1

1. PURPOSE. This instruction:

a. In accordance with the authority in DoD Directive (DoDD) 5144.02 (Reference (a)) and the guidance in DoDD 8000.01 (Reference (b)):

(1) Establishes policy, assigns responsibilities, and provides direction for certifying the interoperability of IT and NSS pursuant to sections 2222, 2223, and 2224 of Title 10, United States Code (Reference (c)).

(2) Establishes a capability-focused, architecture-based approach for interoperability analysis. **建立基于能力，基于架构方式的互操作性分析**

(3) Establishes the governing policy and responsibilities for interoperability requirements development, test, certification and prerequisite for connection of IT, including NSS (referred to in this instruction as "IT"). **建立互操作性开发需求，测试，认证及与IT连接前的要求，包括国安系统等管理政策与责任归属。**

(4) Defines a doctrine, organization, training, materiel, leadership and education,

『互操作性』在各个领域的应用

- 图书馆，电子政府eGovernment，交通，海关、国安(三军、国安、警察).....

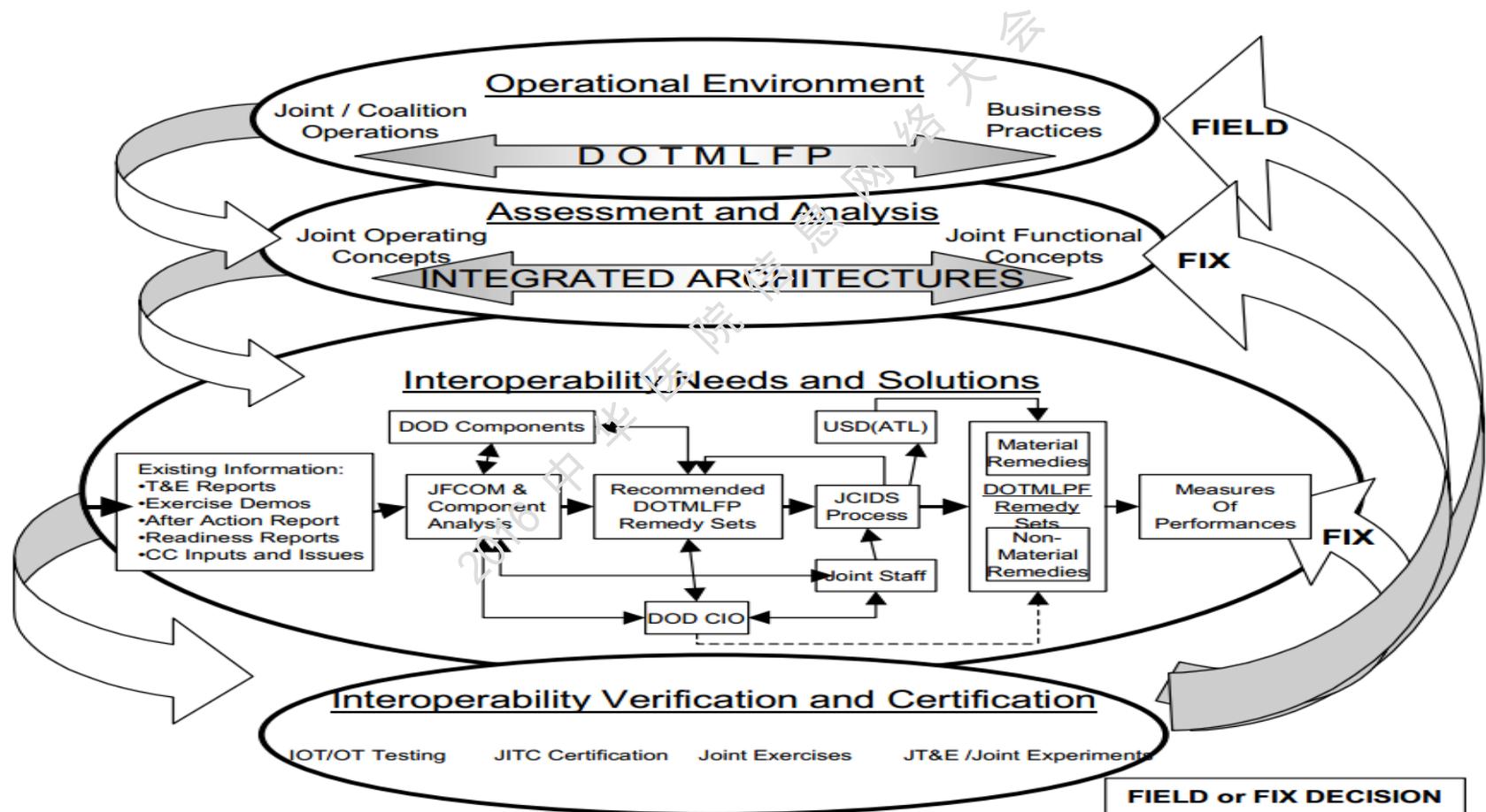


Figure A-5. Fielded (Legacy Systems) IT and NSS Interoperability Process

欧盟对医疗『互操作性』的重视

• 欧盟理事会 Council 2009年12月做成总结：强烈政治要求(a strong political mandate)，要求欧盟各国在eHealth上必需达成以下四点『互操作性』：

- 1.法律（包括法规、职业道德）
- 2.标准化、技术
- 3.语义
- 4.识别和认证

• 欧盟 Commission 信息部 2010年12月提出电子卫生eHealth互操作性的四大支柱：

- 1.电子识别
- 2.技术的『互操作性』
- 3.语义『互操作性』
- 4.法律、法规的『互操作性』

• **There is no sustainable eHealth without interoperable eHealth. 没有『互操作性』就没有可持续性的eHealth**.**

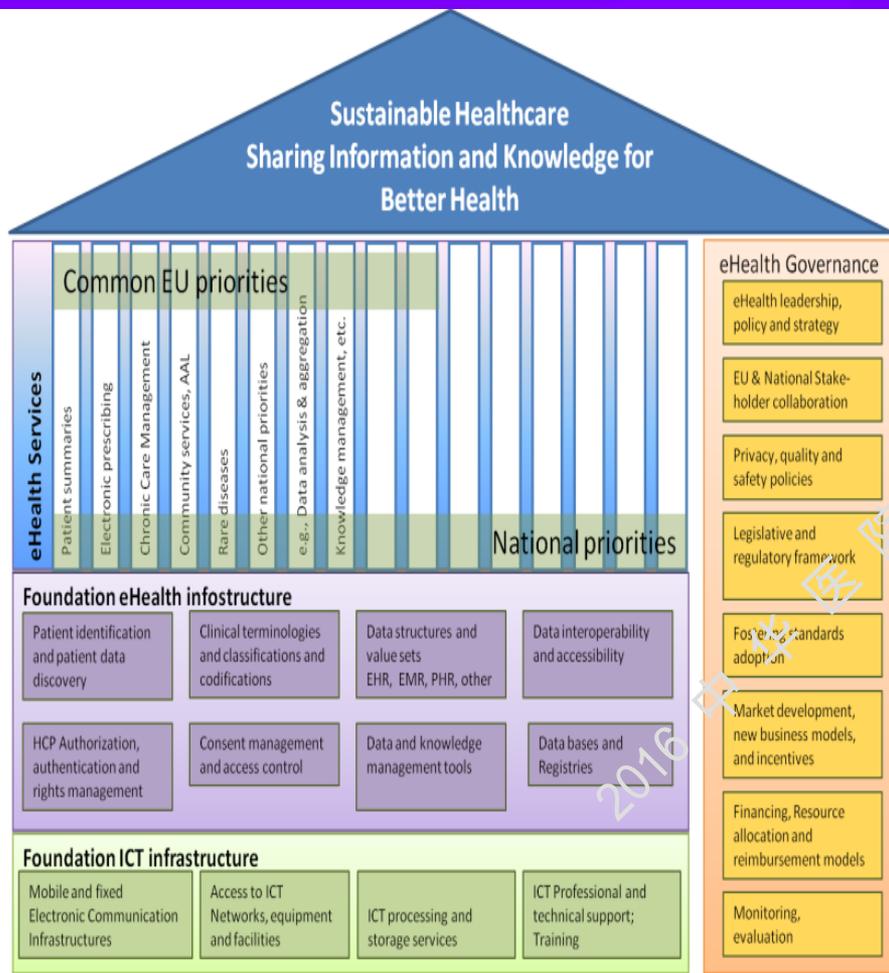
• 与世界卫生组织(WHO)、国际卫生术语标准开发组织International Health Terminology Standards Development Organisation (IHTSDO)、HL7、IHE等组织合作达成互操作性

* European eHealth Interoperability Roadmap, Information Society and Media Directorate General,p15

** European eHealth Interoperability Roadmap, Information Society and Media Directorate General,p28



欧盟医疗卫生体系架构



可持续发展的医疗卫生系统
为了更健康而分享信息和知识

欧盟一般的优先性

病人摘要
电子处方
慢病管理
社区服务, 环境辅助生活
罕见病
其它国家优先项目
数据分析与整合
知识管理

eHealth Services 电子医疗卫生服务

Ambient Assisted Living for aging society

国家优先项目

基础电子健康信息结构

病人ID与病人数据发现
临床术语和分类和编纂
数据结构和值设置EHR, EMR, PHR
与其他
数据互操作和可访问性

医师与医院的授权认证和权限管理
同意书管理和访问控制
数据和知识管理工具
数据库和登记册

基础信息和通信技术基础设施

移动和固定电子通信基础设施
获取信息通信技术网络, 设备和设施
信息和通信技术的处理和存储服务
ICT专业技术支持, 培训

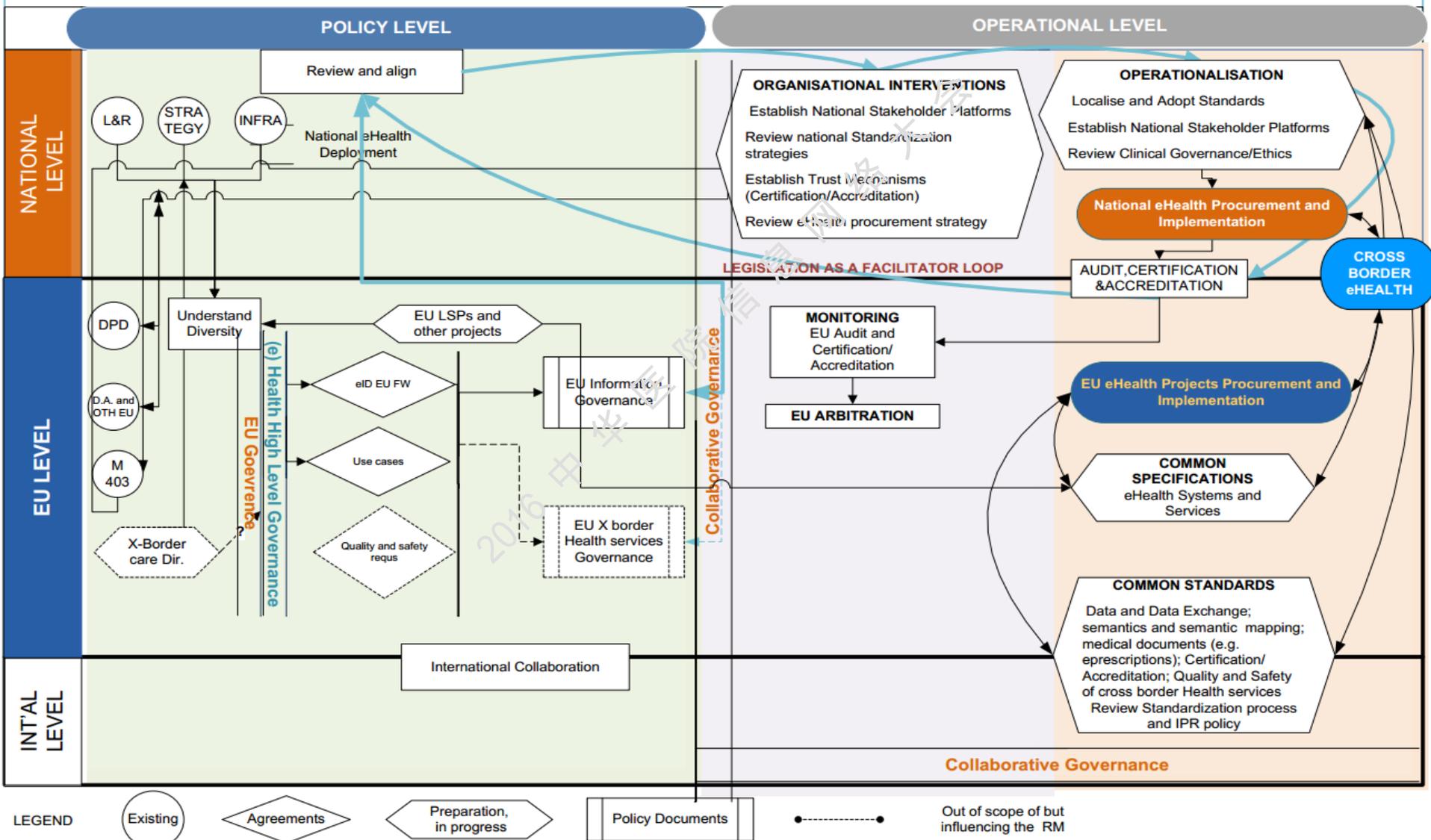
电子健康管理

电子卫生保健领导, 政策和战略
欧盟与国家的利益相关者合作
隐私保护, 质量和安全政策
立法和监管框架
推动标准的采用
市场的发展, 新的商业模式和激励机制

融资, 资源配置和报销模式监测, 评价

欧盟eHealth『互操作性』路线图

Figure 2. EU eHealth Interoperability Roadmap: Main Highways



Local Digital Roadmaps

Digital Maturity
Assessment

Interoperability

The Open API Policy

Transfer of Care –
eDischarge

Digital Primary Care

Integrated Digital Care
Technology Fund

Wachter Review

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[Interoperability](#)

数字技术 >> 管理信息革命 >> 互操作性

Interoperability 互操作性

Further information on the recently launched [Code4Health Interoperability Community](#) can be found below.

Newly released  [Interoperability Handbook](#) to help create your local digital roadmap.

With new models of care emerging and evolving, there is a clear need for more effective information sharing between care settings, organisations and geographies, as well as between professionals and citizens, to optimise patient outcomes and quality of care. This is reliant on the ability of IT systems across health and care to be interoperable with one another, and is key to the delivery of the future vision of care in England, as described in the National Information Board's '[Personalised Health and Care 2020 – A Framework for Action](#)'.

search the site



In this section

- [Harnessing the Information Revolution](#)
- [Digital Technology Events](#)
- [Resources](#)
- [Contacting Digital Technology](#)



Twitter

What is your vision of a compassionate healthcare organisation? Tweet your views

英国卫生部『互操作性』社区群 Interoperability Groups

Interoperability Groups

- Interoperability
- Accreditation
- API Developers
- Capabilities
- Design Principles
- Project Board
- Publication
- Requirements Group
- Tooling & Testing
- Underpinning Architecture

Apply to form a new community



This section contains the interoperability groups. Click on the different groups for more information.

CODE4HEALTH INTEROPERABILITY COMMUNITY

Creating a common and open set of APIs to support information sharing across health and care

Requirements Action Group

- Defining the key clinical information sharing needs.
- Prioritising the key APIs.
- Group members e.g. CCIOs, CIOs, Vanguard, Pioneers, PMCFs, NHS England.

需求行动群

API Developers Group

- Establishing and creating the required APIs based on clinical information sharing needs.
- Group members e.g. suppliers, innovators, CCIOs, CIOs, NHS England, HSCIC.

API开发群

Underpinning Architecture Group

- Defining the key underpinning components and policies, e.g. security and authentication.
- Group members e.g. HSCIC, suppliers, CIOs, TechUK, NHS England.

基础结构群

Accreditation Group

- Outlining the accreditation approach for APIs.
- Group members e.g. TechUK, CIOs, suppliers, HSCIC.

认证群

Tooling and Testing

- Ripple developer.nhs.uk The Health Developer Network
- Endeavour Health ciao
- Links to existing communities and signposts tools and products.

ASSURANCE AND GOVERNANCE PROCESS



欧盟、美国强调 医疗信息的『互操作性』

- 欧盟副主席与美国卫生部长在 2011年10月1日 于 泛大西洋经济委员会 Transatlantic Economic Council (TEC) 签约 理解备忘录 EU Vice President Kroes and US HHS Secretary Sebelius signed a Memorandum of Understanding (MoU) :
- 医疗卫生IT的『互操作性』是达成更优质、更有竞争力、安全、信任、与更低价格医疗成效的关键。
- 欧盟与美国都将在未来五年中，对医疗卫生IT项目启动大量的投资。以政策鼓励医疗卫生解决方案的创新。
- 我们更重要的长期目标是：建立与执行全球『互操作性』的IT标准。



美国卫生部 ONC 网站

in Partnership with the
National Learning Consortium

Newsroom | FAQs | Multimedia | Implementation Resources



Providers & Professionals

Patients & Families

Policy Researchers & Implementers

Benefits of EHRs

How to Implement EHRs

Privacy & Security

EHR Incentives & Certification

Success Stories & Case Studies

Resource Center

HealthIT.gov > For Providers & Professionals > Frequently Asked Questions

Print | Share

What does "interoperability" mean and why is it important? 互操作性的意义与为何重要？

? What does "interoperability" mean and why is it important?

a The Basics

A complex health care system requires diverse electronic health record (EHR) products. **Interoperability** refers to the architecture or standards that make it possible for diverse EHR systems to work compatibly in a true information network. The Office of Standards and Interoperability at the U.S. Department of Health and Human Services coordinates efforts to facilitate interoperability and information exchange among Federal, State, regional, local, tribal, and private stakeholders.

互操作性是一种架构或标准，在复杂的医疗子系统间达成真实的信息关联与兼容。

卫生部『标准与互操作性办公厅』的工能是协调联邦、州、地区与私有医疗机构互操作性与信息交互。

Policymaking, Regulation, & Strategy

[Health IT Legislation and Regulations](#)

[Behavioral Health](#)

[Health IT Strategic Planning](#)

[Federal-State Healthcare Coordination](#)

[Clinical Decision Support \(CDS\)](#)

Accelerating Health Information Exchange (HIE) 加速推进HIE

The Department of Health and Human Services (HHS) is committed to transforming health care delivery into a system that is patient-centered and value-based. Existing Medicare and Medicaid programs and initiatives, as well as new programs authorized by the Patient Protection and Affordable Care Act (Affordable Care Act), focus on new service delivery and payment models that encourage and facilitate greater coordination of care and improved quality.

Critical to the success of these programs and the ultimate goal of a transformed health care system is real-time interoperable health information exchange (HIE) among a variety of health care stakeholders: clinicians, lab, hospital, pharmacy, health plans, payers and patient. Greater access to patient-level health information is integral to improving the

Related Topics

[Webinar on Accelerating HIE](#)

Accelerate HIE

A number of steps have already been taken across CMS and ONC programs to accelerate HIE, including:

[Guidance to states \[PDF\] 434](#)



Standards Acceleration

- [Draft Interoperability Roadmap](#)
- [Statements of Support](#)
- [Standards Acceleration](#)
 - [Standards & Interoperability \(S&I\) Framework](#)
 - [Standards Advisory](#)
- [Federal Health Architecture \(FHA\)](#)
- [International Efforts](#)
- [Interoperability Portfolio \(Archive\)](#)
- [Interoperability Roadmap Public Comments](#)

Standards & Interoperability (S&I) Framework

The work promoting the adoption and uptake of health information technology is key to ensuring the goals of the HITECH Act. But work being done to ensure that the technical standards and specifications are in place to support this technology is also critical to the development and success of a fully functional nationwide health IT ecosystem.

As with the technology that people use everyday – telephone, email, Internet, mobile technology – interoperable health information exchange is not a “one-size-fits-all” solution. Different providers will have different uses, and the standards and specifications supporting those needs are being developed and harmonized within ONC’s Office of Science & Technology (OST.) We have initiatives underway to standardize *meaning* through the use of standardized healthcare vocabularies, to standardize *structure* by leveraging standards in HL7, to standardize *transport* using secure email protocols, to standardize *security* through NIST-adopted encryption standards, and to standardize *services* through open, and accessible APIs. These are the fundamental building blocks of interoperability.

ONC is working to enable the health IT community to convene and rapidly prioritize health IT challenges and subsequently develop and harmonize standards, specifications and implementation guidance to solve those challenges. ONC is also responsible for curating the set of standards and specifications that support interoperability and ensuring that they can be assembled into solutions for a variety of health information exchange scenarios.

For more information about ONC’s work in standards development and harmonization, please visit www.siframework.org



[Providers & Professionals](#)

[Patients & Families](#)

[Policy Researchers & Implementers](#)

[Policy making, Regulation, & Strategy](#)

[Research & Innovation](#)

[Privacy & Security Policy](#)

[ONC Health IT Certification Program](#)

[Interoperability](#)

[HITECH Programs & Advisory Committees](#)

[HealthIT.gov](#) > [For Policy Researchers & Implementers](#) > [Interoperability](#) > [Standards Acceleration](#) > [Standards Advisory](#) > [Draft 2016 Interoperability Standards Advisory](#)

 Print |  Share

Standards Advisory

Draft Interoperability Roadmap
Statements of Support
Standards Acceleration
Standards & Interoperability (S&I) Framework
Standards Advisory
2015 Interoperability Standards Advisory
Draft 2016 Interoperability Standards Advisory

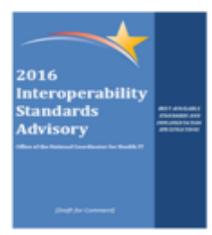
[Federal Health Architecture \(FHA\)](#)

[International Efforts](#)

Draft 2016 Interoperability Standards Advisory

The 2015. The comment period for the Interoperability Standards Advisory (2016 Advisory) is over. Please sign up for our weekly email to receive updates including the final Publication of the 2016 advisory.

The draft 2016 Advisory represents feedback we received from public comment on the 2015 Interoperability Standards Advisory as well as many of the recommendations from the HIT Standards Committee.



2016 INTEROPERABILITY STANDARDS ADVISORY [DOCX - 476 KB] *

2016 INTEROPERABILITY STANDARDS ADVISORY [PDF - 1.3 MB]

美國衛生部 加速部署HIE的戰略與原則



The Office of the National Coordinator for
Health Information Technology



Principles and Strategy for Accelerating Health Information Exchange (HIE)

I. Background

As a nation, we are transforming health care delivery into a system that is patient-centered and value-based. Existing Medicare and Medicaid programs and initiatives, as well as new programs authorized by the Patient Protection and Affordable Care Act (Affordable Care Act), focus on new service delivery and payment models that encourage and facilitate greater coordination of care and improved quality. These new initiatives include accountable care organizations (ACOs),

Physicians/Providers 医师

医院 Hospitals

- View claims and health history
- Improve quality of care
- Process efficiencies

- Better document delivery
- Cost savings
- Process efficiencies

Payors/Health Plans 医疗保险

- Improve population management
- Promote wellness
- Process efficiencies

化验室 Labs

- Automate transmission
- Quicker claims processing

Citizens 人民

- Faster HC delivery
- View claims history
- Improve quality of care

药房 Pharmacies

- Fewer errors
- Quicker claims processing

Federal Agencies 联邦政府

- Ensure compliance with legislation
- Set standards for service
- Provide targeted funding

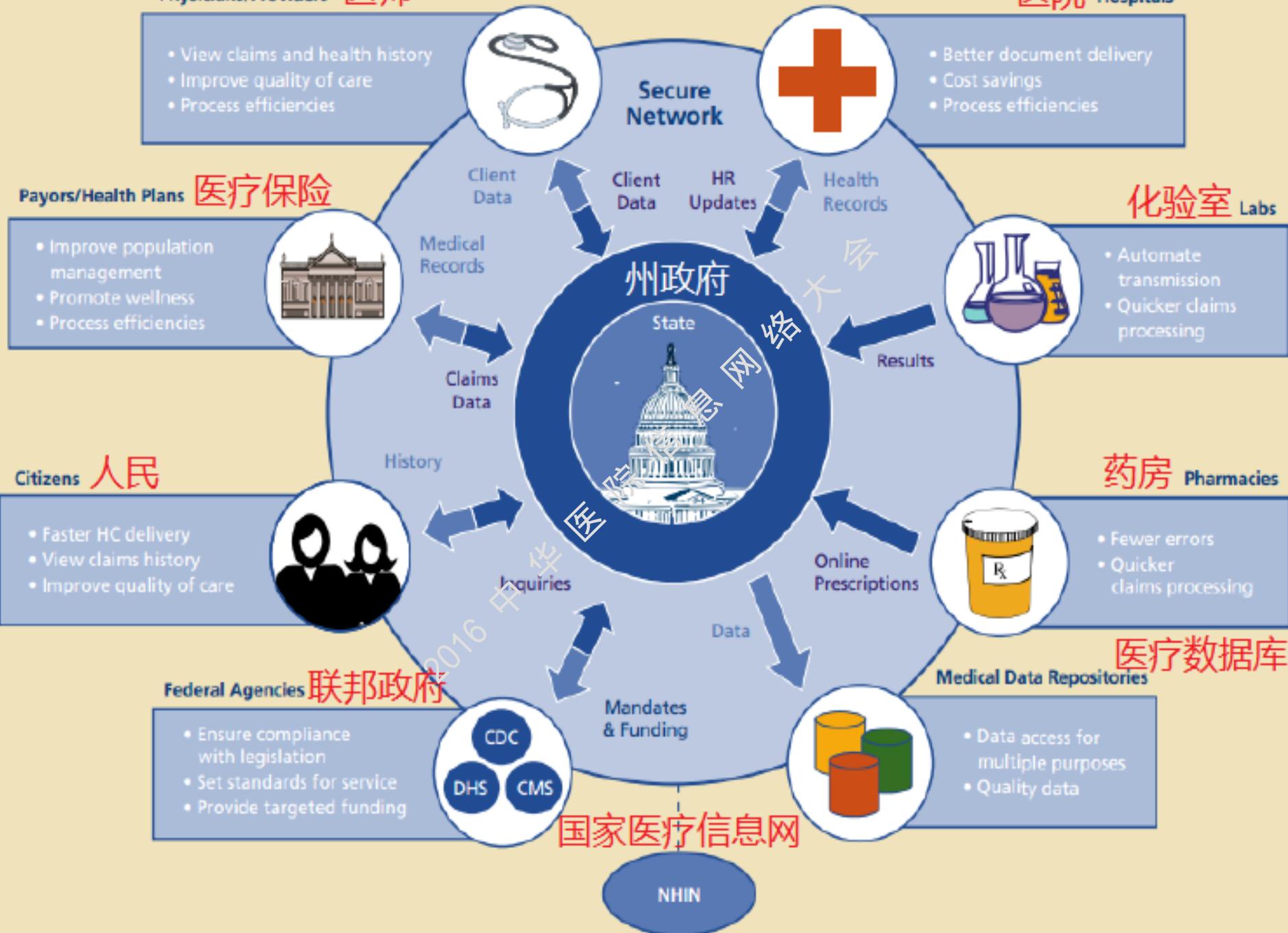
医疗数据库

Medical Data Repositories

- Data access for multiple purposes
- Quality data

国家医疗信息网

NHIN



医疗『互操作性』的推动轨迹（1）

- 政府方面：
 1. 2004年Bush总统建立了副部级的ONC，它的任务是协调全国的HIT。第一个任务就是用Health Information Exchange (HIE) 来交换医疗机构的电子医疗信息规划与设计 National Health Information Network (NHIN)。
 2. ONC拨款给American National Standards Institute (ANSI) 成立 Health Information Technology Standards Panel (HITSP)建立数据交换的标准。
 3. 拨款给 Research Triangle Institute (RTI)，总部设在美国北卡罗莱纳州的三角研究园. 成立Health Information Security and Privacy Collaborative (HISPC) 将州级的医疗卫生参与者集合起来。
 4. 2005年ONC拨款给 American Health Information Management Association (AHIMA), HIMSS , National Alliance for Health Information Technology (NAHIT).成立了 Certification Commission for Health Information Technology (CCHIT)来认证EMR是否具备互操作性。

医疗『互操作性』的推动轨迹（2）

- 5. 2009年，奥巴马总统依据Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 向ONC注入了大量的预算，让 HIT 开展了繁荣的时代。
- 6. HITSP 与 HISPC被新成立的HIT Policy Committee与 HIT Standards Committee 这两个联邦顾问委员会所取代。这两个委员会加强了推进与执行『互操作性』与MU的力量。
- 7. NHIN改名为NwHIN (Nationwide Health Information Exchange)他的功能是将各州的HIE，Regional Extension Centers(REC), and Beacon Communities连接起来。
- 8. 2011年，ONC成立 Standards and Interoperability (S&I) Framework 办公厅。提供工具、服务与指南将各个层级的医疗信息连接起来。纳入了 Direct Project，改名为Direct。

医疗『互操作性』的推动轨迹（3）

- 在民间方面：
 1. 1997年，由HIMSS与 Radiological Society of North America(RSNA) 成立了 Integrating the Healthcare Enterprise (IHE)来开发医疗信息交换的框架与profiles准则。
 2. 2011年，纽约的 New York eHealth Collaborative (NYeC)牵头成立了 EHR/HIE Interoperability Workgroup (IWG)，会员是各州政府与HIT厂商。协议以HL7与IHE框架，共同推动具有互操作性的信息交互能力的EHR与HIE。
 3. 2011年Mayo Clinic, Geisinger, Kaiser Permanente, Intermountain Healthcare and Group Health 成立了 the Care Connectivity Consortium (CCC)推进“使用最新的国家IT标准，让异构系统在不同的安全环境与地理区域中，有效率与实时的医疗信息交换”。

医疗『互操作性』的推动轨迹（4）

- 4. 2012年5月，ONC召开医疗信息在NwHIN交换的管理策略的听证会，设定了Network Validated Entities (NVEs)这是类似于用Direct，Health Internet Service Providers (HISPs)用来建立与规范信息交换。
- 5. 2012年10月，ONC将NwHIN社区的管理移交到公-私合营的单位Healthway 重新命名为 eHealth Exchange。
- 同时，Healthway 与纽约 NyeC 催生了 IWG 将标准与市场份额和谐起来。这个联盟决定采用 CCHIT 来认证 HIT 与 HIE，让在各个州的系统具有一致性。
- 6. 2013年HIMSS大会上，IWG联盟宣布与CCC合作，CCHIT也宣布了三种认证业务：EHR与HIE连接，HIE与HIE连接，Direct连接。

医疗『互操作性』的推动轨迹（5）

- 7. DirectTrust 与 Electronic Healthcare Network Accreditation Commission (EHNAC), 合作, 成立 DirectTrusted Agent Accreditation Program (DTAAP)。
- DTAAP 为 HISPs, EHR, HIE, electronic healthcare networks (EHN), ePrescribing networks 电子处方网, third party administrators (TPA) 第三方管理, financial services organizations 财务服务组织, managed service organizations (MSO) 管理服务组织, medical billers 收款单位, health information exchanges (HIE/HIO/ACO) 医疗信息交换, outsourcers (data center, printing, scanning etc.) 外包单位, Practice Management Systems vendors and HISPs 执业管理与信息厂商, (CA & RA) Certificate Authorities, and Registration Authorities 认证与注册当局等等, 做认证。
- 使用的标准是 HL7, ANSI 核准的 National Council for Prescription Drug Programs (NCPDP) 与 Accredited Standards Committee ASC X12。

美国加速推广医疗卫生 『互操作性』的单位

- 民间行业协会

- HL7
- WEDI - Workgroup for Electronic Data Interchange
- IHE
- HIMSS
- AAMI - Association for the Advancement of Medical Instrumentation
- CE-IT - Clinical Engineering/ IT Collaboration
- ACCE - American College of Clinical Engineering

- 美国卫生部



医疗卫生系统 达成互操作性的要求

- 国际HL7的标准系列

- 应用标准 CCOW
- 知识表达标准 Arden语法
- 概念标准 RIM
- 文档标准 CDA
- 结构标准 XML
- 信息交换标准 messaging

- 国际IHE 标准框架

- XDS , XDS-I , XDS-SD , XDS-MS , XDS-Lab

Essential Aspects of Interoperability

Aspect	Standards (not exhaustive)
Workflow / Interaction <i>supporting one or more use cases</i>	IHE, DICOM, HL7, Continua, CIMIT ...
Messaging / Data Flow <ul style="list-style-type: none">• Vocabulary (semantics)• Format (syntax)• Encoding	SNOMED-CT, LOINC, IEEE 11073, ... HL7, IEEE 11073, DICOM, ... XML, HL7 V2 ER, text, binary, ...
Message/Stream Transport and Physical Layers	RS-232, Ethernet, 802.11, Bluetooth, USB, TCP/IP, HL7 MLLP, MIME, ...

On the Road to Interoperability: Standards to Profiles to Implementations

基础标准

Base Standards



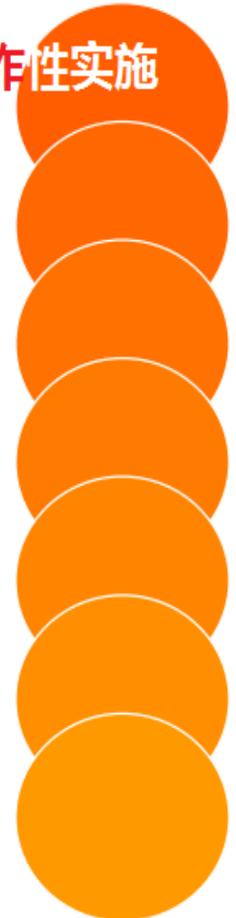
Profile

Development
轮廓架构开发



Interoperable
Implementations

互操作性实施



Specific Extensions

具体扩展

2016 中华医院信息网络

IHE Development Process

IHE Profiles Drafted & Revised

IHE集成模式草案与更新



公示
Published
For Public
Comment

IHE Technical Framework
Developed IHE技术框架开发

6-13 mos.

Trial Implementation
Posted 试安装



Test at IHE Connectathons



14-18 mos.

在Connectathons

上测试

Publish in IHE's
Product Registry

在IHE的产品注册上
发布

Demonstrate at a



HIMSS INTEROPERABILITY
SHOWCASE

在HIMSS互操作性窗口展示

Profile Selection by
Committees

委员会选定架构

IHE Call for Proposals
Opens IHE立项

1-5 mos.

*IHE Improves,
Safety, Quality
and Efficiency in
Clinical Settings.*

Install
Interoperable
products in
Clinical
Settings
worldwide



在全球临床机构安装
具互操作性的产品



Interoperability Showcase™ Events

In collaboration with Integrating the Healthcare Enterprise [IHE]



About Interoperability Showcase

Breaking Barriers to Interoperable Healthcare

Held at HIMSS conferences at locations across the globe, HIMSS Interoperability Showcases™ are unique events where healthcare stakeholders come together to demonstrate the benefits of using standards-based interoperable health IT solutions for effective and secure health data information exchange.

Today's healthcare providers have many important and competing needs and goals. Whether the end goal is to be on a path of continuous improvement, to realize improved patient safety and outcomes, or meeting regional government mandates, HIMSS Interoperability Showcases serve the healthcare community by promoting uptake of standards-based solutions that improve the potential for health information exchange between systems, providers, and organizations in order to optimize clinical care.

Use Case-focused Tours - HIMSS Interoperability Showcases allow visitors to see a clinical continuum of care, demonstrated through multiple clinically-accurate use case scenarios simulating healthcare environments such as Ambulatory, Hospital/Provider, Emergency, Chronic Care, Public Health and more. Showcase visitors witness firsthand how standards-based transactions bring clinical information from multiple care settings and systems together. These use cases also demonstrate how clinical work flow can be improved by decreasing duplicative

Contact Us

For more information about the HIMSS Interoperability Showcase or to find out how you or your organization can get involved, contact us.

[Bronwen Watkins-Pitchford](#)
Associate Manager

Interoperability Initiatives

[Sandra Vance](#)
Sr. Director

Interoperability Initiatives

美国卫生部推行『互操作性』的背景

- 由国家的高度来看，我们正在将医疗服务转化为以“病人为中心”及以“价值为基础”。依照病人保护与可负担医疗法Patient Protection and Affordable Care Act启动这项计划，它包括了医疗集团ACO，医疗保险集团，社区医疗之家等医疗单位，及降低再入院readmissions的支出。
- 要能够成功达成医改与其终极目标的核心是“以实时『互操作性』real-time interoperable”的HIE平台连接不同应用与不同厂商的异构医疗系统（医师，检验，医院药房，医疗计划，保险与病人等系统）；扩展到能够整合个人层级医疗信息，用以改善医疗服务的品质，效率与安全。

美国卫生部 征求到的推广方法

- **1. 以付款模式来加速HIE进程 - Accelerating HIE through Payment Models**

- 急症医院、long-term and post-acute care (LTPAC), behavioral health (BH), rehabilitation hospitals and skilled nursing facilities (SNFs) 全部要加入。包括远程医疗，以服务付费FFS等医疗服务，放射远程报告。给使用HIE与EHR的单位折扣优惠。

- **2. HIT認證 - HIT Certification**

- 建立自愿购买经认证的以价值基础所需功能的HIE的机制
- 开发HIE认证程序来确保病人数据的安全性
- 建立EHR的认证机制来推进标准化，私密性与跨医疗机构的效用
- 要求具备HIE与EHR认证，来减少系统交互标准的单纯性与减少实施成本
- 实现卫生部认定具有LTPAC与BH特色的认证标准
- 为所有医疗单位开发聚焦『互操作性』功能的EHR认证方案

- **3. 标准与电子交换 - Standards and Electronic Exchange**
- CMS与ONC政策上鼓励更多的双向信息交换及减少影响互交换性的多重接口。
- **4. 医疗单位目录 - Provider Directories**
- 建立全国医疗单位与医生的数据库包括Universal Provider Datasource , NwHIN并与National Plan and Provider Enumeration System (NPPES)连接。
- **5. 病人参与 - Patient Engagement**
- 建立病人对医疗单位的评估系统Consumer Assessment of Health Care Providers and Systems (CAHPS)
- **6. 检验报告交换 - Laboratory Tests/Results Exchange**
- 将HIT认证计划加入检验结果接口 Laboratory Results Interface (LRI)的要求，透过HIE确保 临床检验改进法案的实施 “Clinical Laboratory Improvement mendments (CLIA)”
- **7. 隐私，安全与潜在的解决方案 - Privacy and Security Issues and Potential Solutions**
- 使用HIE可以增强病人数据的隐私与安全性，因为更关注于病人匹配，手术同意文件与技术要求，将降低数据交换的潜在风险。

美国卫生部的推广『互操作性』方案

- **A. 加速推进HIE - Accelerating HIE**
 - 1. HHS寻求确保对所有现有项目订立新的法规与指南，来保障以“病人为中心”的医疗服务。
 - 2. HHS将加强鼓励与激励实施HIE的政策，最终达到HIE成为所有医疗卫生相关单位标准的行业配备。
 - 3. 与州政府主导的改革措施合作推广HIE。
 - 4. HHS透过州政府的贫民医保、州医疗单位及其他联邦资助的医疗单位来鼓励他们『互操作性』布满全州。
 - 5. HHS联合其他联邦政府部门使用HHS的『互操作性』与HIT标准。
 - 6. HHS將從不同的文化、社會、經濟背景，教育使用者了解HIE的价值。
 - 7. HHS將支持HIE病人的健康狀況的保密性，安全性和完整性。

美国卫生部的推广『互操作性』方案

- **B. 推行标准和互操作性 - ad initio vs. de facto**
 - 1. HHS将通过『标准和互操作性框架办公室』及标准开发组织如HL7和WEDI等协调，推进标准的多方利益相关者开发。
 - 2. HHS将通过各种政策与项目计划包括HIT政策委员会，HIT标准委员会，来执行HIT的标准化，用以加速推广『互操作性』。
 - 3. HHS在适当时候，使用HIT的标准来检测与改进老人与贫民保险部门。
 - 4. HHS将加快调整和实现电子临床的质量测量，电子决策支持干预和电子报告机制。
 - 5. HHS将制定标准和政策，在各个医疗单位中使用HIE来确保心理健康HIV艾滋病等敏感医疗信息的电子化病人同意管理系统。
 - 6. HHS将强化数据的来源，以提高医疗单位对他们接收到的数据的原始来源信心。

美国卫生部的推广『互操作性』方案

- **C. 消費者/病人參與 - Consumer/Patient Engagement**
 - 1. HHS 的政策和项目將支持病人适当的接触其医疗信息。
 - 2. HHS 將支持给家庭医疗照顾者適當的接触病人医疗信息。
 - 3. HHS 將提供病人在任何地方都可以使用HHS標準化的數據。

美国卫生部推广『互操作性』 已经做的工作

- HHS已在今年加速推进HIE，做为改善医疗品质与支付的大策略。最近的行动包括：
 1. CMS向各州发布“贫民医保计划与实施超级效用计划指南”，这个指南对HIE给予的财政补助，用来改善医疗品质与降低成本。
 2. CMS的创新中心设立“CMS国家创新示范奖”，给予长期疗养院、行为医疗BH、联邦合格的卫生中心(FQHC)、社区卫生站等医疗单位使用HIE与EHR奖励与激励。让他们接受多种保险给付与给付模式。
 3. CMS和检察长办公室协商，延长医生自我推荐使用具有『互操作性』的EHR软件、信息技术与培训免除收受回扣刑事责任的有效期限(Stark Law)。
 4. 第二轮“CMS医疗创新奖”将提供10亿美元奖金给使用HIE老支撑医疗协调，增进品质，降低成本的新型医疗服务与以价值为基础的付费系统。

美国卫生部推广『互操作性』 已经做的工作

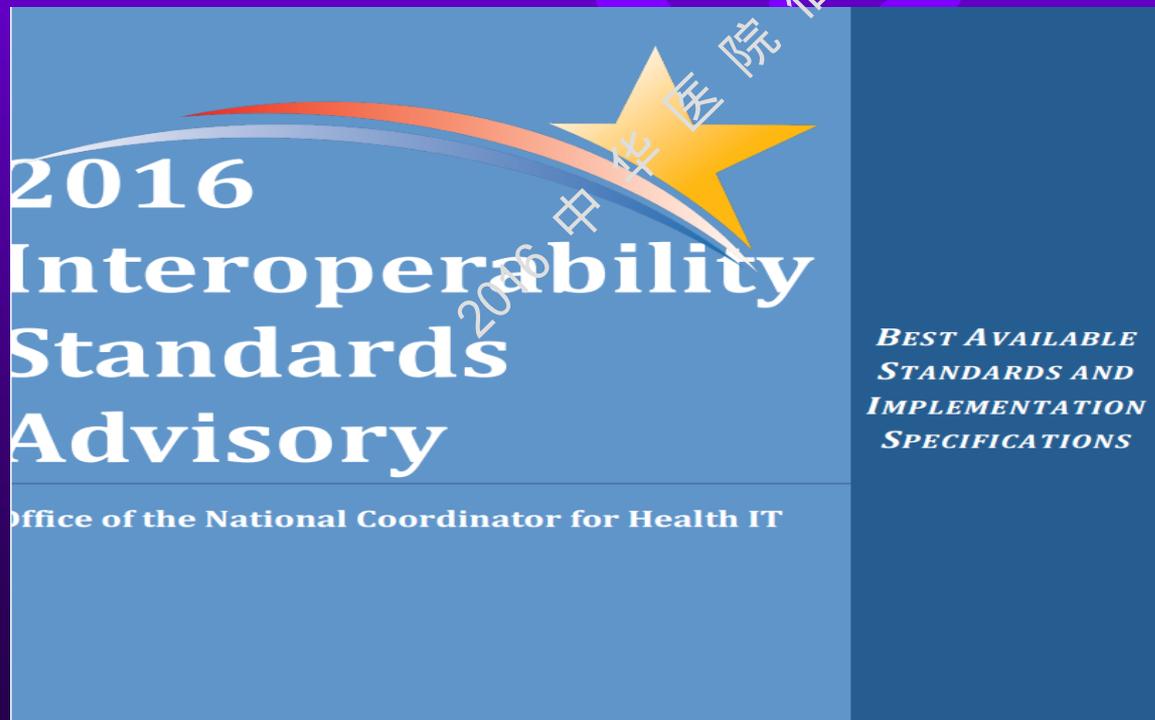
- 5. 由2015年起对于符合使用HHS的“EHR激励计划（符合『互操作性』要求）”使用EHR软件的医生与其他医务人员支付较高的付费标准。
- 6. HHS “继续支持医疗受益人能够获得自己的医疗信息，其中包括：
 - a. CMS的老人医保提供病人能够按“蓝色按钮”获得自己的医疗信息。
 - b. ONC “蓝色按钮实施指南”是进入MU 第二阶段的必需条件，病人通过平台能够浏览、下载与传送自己的各种医疗信息。
- 7. 在贫民保险方面，利用现有的管理机关在各州推广HIE来增进各州不同的FFS与管理医疗组织（MCO）模式的数据品质。
- 8. CMS组织和计划的推出的“电子卫生大学e-health University”，以提供有针对性的宣传，教育和技术援助，以促进电子健康（如，优先考虑小型与农村医疗机构），最佳利用整个HHS和行业现有资源。

美国卫生部推广『互操作性』 已经做的工作

- 9. ONC通过“HHS企业计划”，正在开发有针对性的，开放源码的工具包（“健康信息服务提供商（HISP）工具包”和“入院、出院和转院（ADT）警告工具包”），可以让厂商快速、经济地在广大的医疗机构，包括那些没有资格接受EHR激励计划的医疗机构（例如，SNFS，手术中心，以及家庭保健机构）。
- 10. ONC拨款资助了两个HIE的管理单位，并且制定了符合国家优先性的政策，符合『互操作性』的要求和操作流程，减少实施成本；并确保医疗信息的私密性和安全性。ONC还推出了“可信医疗信息交换管理框架”，这包括HIE管理的指导原则和成果治理。
- 11. HHS发行消费者参与指导材料，指出个人获取及与第三方分享电子医疗信息必须符合HIPAA法案的隐私法规。
- 在战略行动上未来的数年中，HHS将制定各种计划法案与政策，期待与继续和各个相关单位合作，加速在医疗机构与病人间推广HIE。我们都认同一个目标，就是以电子连接的医疗系统是真正的以“病人为中心”及以“价值驱动”的。

『互操作性』标准咨询会 (ISA) 代表着一种模式，它由 ONC 协调、评估与确定“最好的”『互操作性』标准和实施规范 给行业使用，以满足特定的临床医疗信息技术对『互操作性』的需求。

The Interoperability Standards Advisory (ISA) process represents the model by which the Office of the National Coordinator for Health Information Technology (ONC) will coordinate the identification, assessment, and determination of the “best available” interoperability standards and implementation specifications for industry use to fulfill specific clinical health IT interoperability needs.



IEEE有关『互操作性』的说明

- 『互操作性』最大的挑战是物联网 Internet of Things (IoT)将移动、可穿戴、传感器、云等的信息整合交互起来。
- 『互操作性』要达成的功能是：系统(组织)在不理解其他系统(组织)的内在特性与如何工作的情况下，有能力在有需要的时候、安全与精准的交换信息与使用交换来的信息。

『互操作性』建设应该达到的目标：

- 1. 最小化 "复制" - 交换数据，不是复制；是信息交互，不是信息集成。
- 2. 最小化 "数据流程" - 创建数据源与目标之间的最短路径。
- 3. 最小化 "工作量" - 自动共享数据。
- 4. 最小化 "数据接口" - 创建灵活、通用、满足多种用途的接口。
- 5. 保持模块化。

医疗信息平台的发展

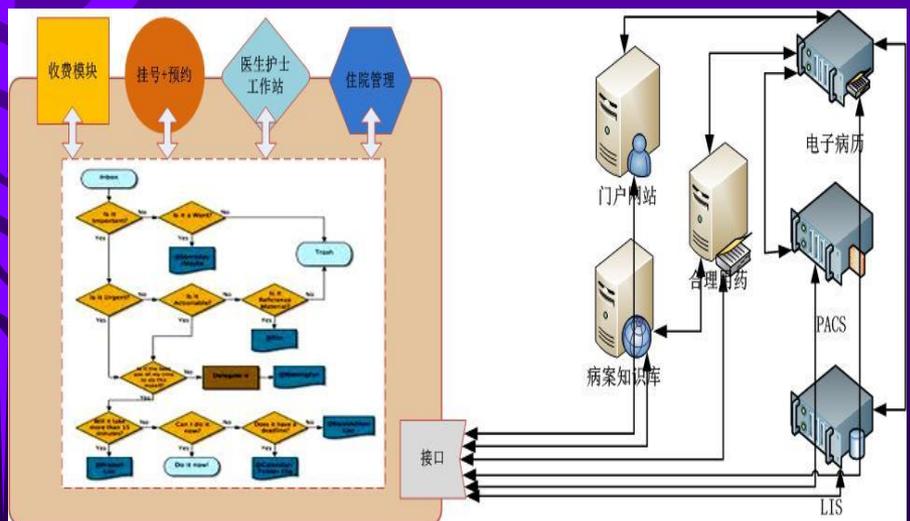
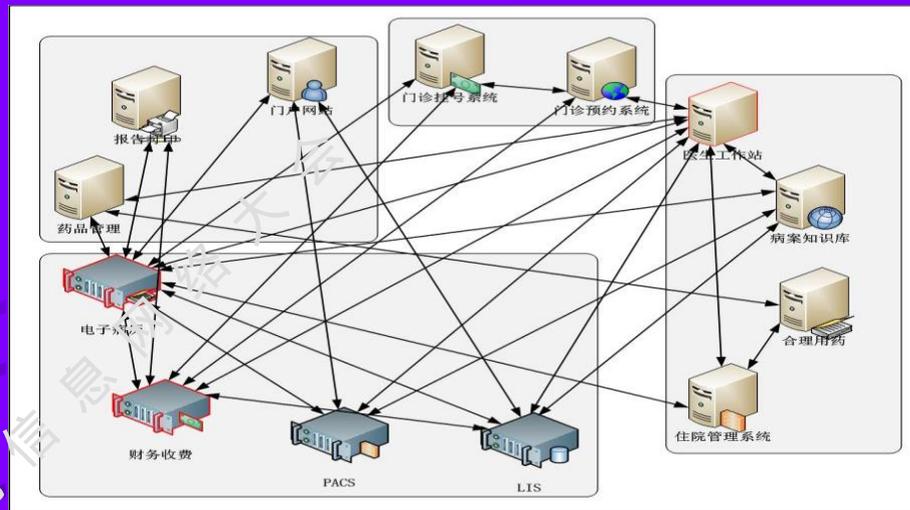
第一类平台的互联互通 模式 (40年前的技术)

点对点系统连接

- 最初的数据集成方法，落后，淘汰。

传统数据库互联互通/数据上传

- 落后的技术，不能满足互操作性，可实施性差
- 国外主流国家已经淘汰，国内正在认识其局限性，卫生部推动淘汰



第二类平台的互联互通模式 (ESB是20年前的技术)

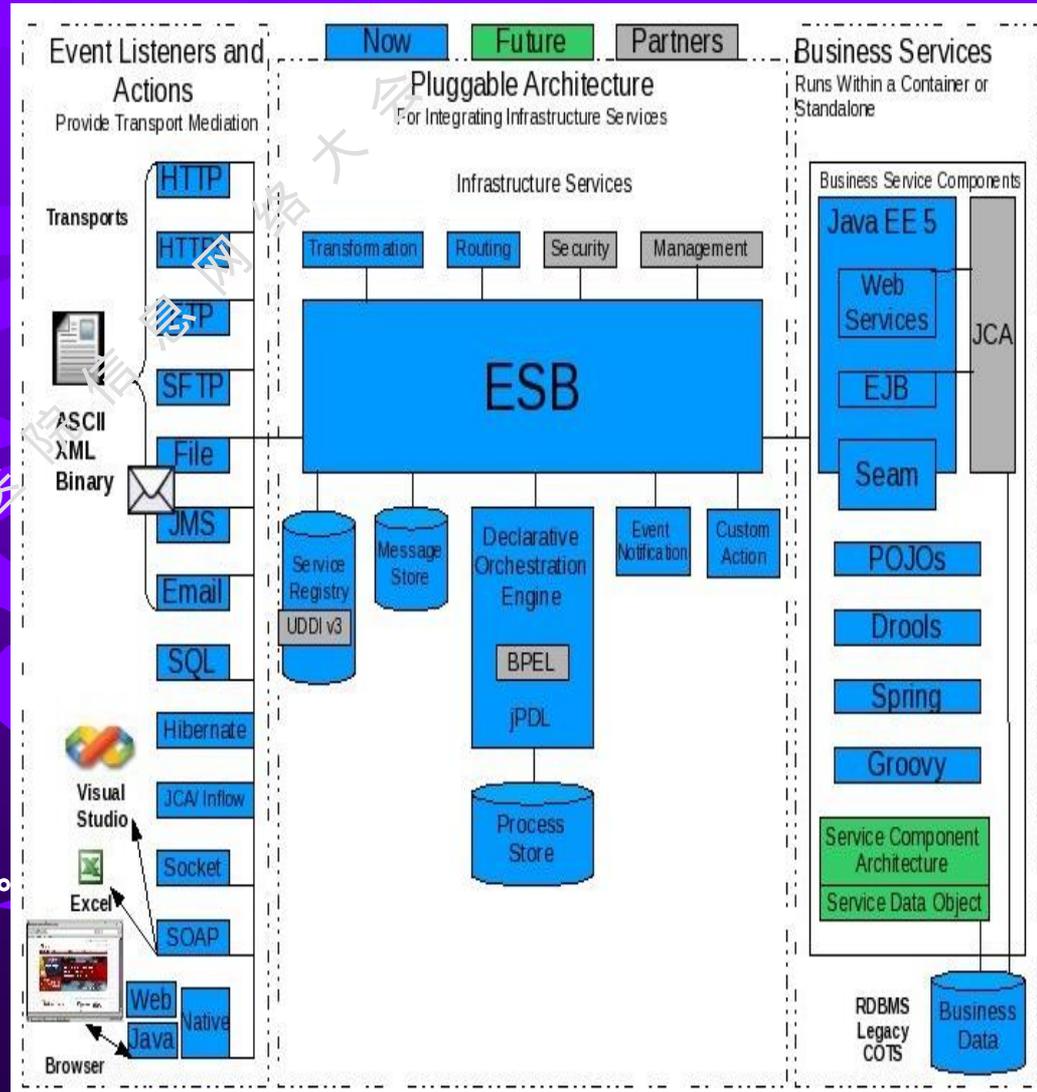
以ESB企业服务总线将各个异构的子系统连接。

ESB是SOA面向服务的一个重要的消息通讯模块。

是传统中间件技术与XML、Web服务等技术结合的产物。

解决了第一类杂乱的连接的问题。

以 ETL 被动的来解决更新问题，对服务器产生极大的压力、另外会产生复杂的数据同步问题及被动。



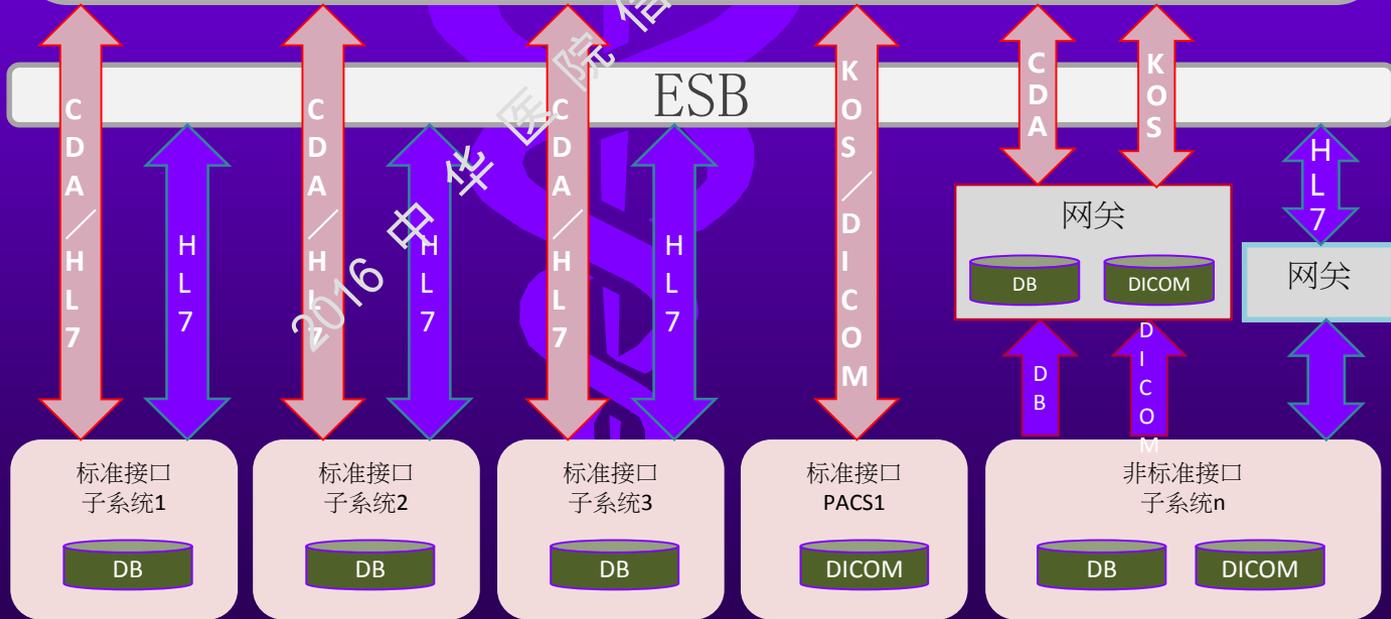
HIE平台基本概念(具互操作性的技术)



完整的平台功能：
注册、通讯、互操作、权限、查询、字典库、主索引、安全 ...



基于标准的存储
基于标准的通讯
集成框架规范



HIE functions used to connect with other practitioners

question: How often do you perform the following functions?

- Results show percentage of physicians that use "routinely."
- Approximately 500 doctors in Spain were surveyed.
- Note: 1=Primary care; 2=Secondary care.
- Violet shows the lowest score, green shows the highest score across all eight countries for each of the functions.

使用何种HIE功能与院外医师交流

澳大利亚 加拿大 英国 法国 德国 新加坡 西班牙 美国

HIE functionalities	Australia		Canada		England		France		Germany		Singapore		Spain		US	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
I communicate electronically with clinicians in other organizations (e.g. secure email) 与其他医生沟通	15%	35%	12%	28%	32%	47%	29%	35%	12%	36%	30%	35%	44%	43%	16%	34%
I am electronically notified of my patients' interactions with other health organizations (e.g. hospital admissions) 与病人互动	24%	6%	14%	11%	41%	9%	11%	13%	11%	12%	21%	25%	36%	22%	21%	18%
I electronically send or receive referrals to/from health professionals in other organizations (e.g. specialist appointments) 分级诊疗-转诊	20%	12%	16%	16%	52%	19%	17%	21%	13%	9%	24%	28%	59%	34%	28%	27%
I have electronic access to clinical data about a patient who has been seen by a different health organization (e.g. hospital, laboratory) 阅读转来病历	24%	28%	27%	34%	51%	31%	23%	36%	20%	24%	26%	38%	56%	42%	38%	31%
I electronically send prescriptions to pharmacies (e-Prescribing) 电子处方	6%	3%	10%	7%	11%	14%	5%	17%	5%	8%	33%	40%	32%	18%	54%	44%
I receive clinical results electronically that populate my patients' electronic medical record 传送病历	84%	40%	35%	37%	90%	38%	61%	43%	48%	48%	30%	39%	66%	62%	47%	53%
I electronically send order requests (e.g. lab, radiology or diagnostic tests) to other health organizations 电子申请单	28%	17%	14%	22%	46%	43%	12%	21%	50%	48%	26%	38%	71%	47%	47%	48%
Health information exchange—average	29%	20%	18%	22%	46%	29%	23%	27%	23%	26%	27%	35%	52%	38%	36%	36%

謝謝光臨

敬請指教

2016 中醫院信息網絡
身體健康
萬事如意