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HISTORY OF INTEROPERABILITY

We've come a long way, but we still have a long way to go.

1960s

The first electronic health records (EHRs) appeared in the 1960s. Academic medical centers began to develop their own versions, focused solely on clinical data management.

1965

The **first EHR prototype** emerged when Lockheed Martin began assembling its Medical Information System, which wasn't fully implemented in hospitals until 1972.

Approximately 73 hospital and clinical information projects were underway by 1965, along with 28 projects for the storage and retrieval of medical documents and other clinical info.

1966

The **Massachusetts General Hospital Utility Multi-Programming System (MUMPS)** was created and continues to be a staple of EHR database systems.

1970s

The first EHRs of today emerged, primarily used in government hospitals. Costs limited physician adoption.

Modules for the future **Decentralized Hospital Computer Program (DHCP)** were launched in about 20 Department of Veterans Affairs (VA) Medical Centers. This award-winning health information system was later renamed the **Veterans Health Information System and Technology Architecture (VistA)** in 1994.

1978

The **Accredited Standards Committee X12** (also known as ASC X12) was chartered by the American National Standards Institute (ANSI). It develops and maintains the **X12 Electronic data interchange (EDI)** and **Context Inspired Component Architecture (CICA)** standards along with XML schemas which drive business processes globally.

1979

1980s

1983

The American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) joined forces and formed **a Standards committee to meet the combined needs of radiologists**, physicists and equipment vendors.

1985

The first standard covering point-to-point image communication, **ACR-NEMA 300**, was released. The specified image transmission used a dedicated 16-bit parallel interface.

Health Level 7 International (HL7) was founded to address data standardization issues.

1987

1988

The second version of **ACR-NEMA 300** was released, gaining increasing acceptance among vendors.

The **Object Management Group (OMG)** was founded as a not-for-profit, open membership consortia developing and maintaining computer industry specifications.

1989

1990s

1990

The **Community Health Management Information Systems (CHMIS)** program was formed to foster the creation of a centralized data repository in 7 geographically-defined communities.

1991

The Institute of Medicine set a **goal for all physicians to adopt computers** in their practice by the year 2000.

1993

The third version of the **ACR-NEMA 300** evolved to use local area networks by layering the medical image protocols on top of general networking protocols (TCP/IP). The name was changed to **DICOM** (Digital Imaging and COmmunications in Medicine) and published as NEMA Standard PS3.

1994

The World Health Organization adopted the **ICD-10 coding standard**, expanding the number of codes that can be used in EMRs. (It did not go into effect until 2015.)

LOINC (Logical Observation Identifiers Names and Codes) was initiated by the Regenstrief Institute, to develop a common terminology for laboratory and clinical observations.

1995

The **DICOM Standards Committee** was reorganized to formally represent all medical specialties that use imaging, not just radiology, including the American College of Cardiology (ACC).

1996

The **Healthcare Information Portability & Accountability Act (HIPAA)** became law, providing more data protection for patients but creating new compliance concerns for EHR development. X12 HIPAA transactions were universally adopted with HIPAA.

To establish a common implementation of data interchange standards in healthcare, Hewlett-Packard's Medical Products Group led the formation of the **Andover Working Group (AWG)**.

1998

Integrating the Healthcare Enterprise (IHE) was founded by healthcare professionals and industry to improve the way computer systems in healthcare share information. **IHE Scheduled Workflow** was the first successful specification using multiple standards: HL7, DICOM and terminology (e.g. RADLEX, CPT).

Technical Committee (TC) 215 of the International Standards Organization (ISO) was formed following a decade of increasingly international cooperation among health informatics standards organizations.

1999

"To Err Is Human: Building a Safer Health System" is published by the Institute of Medicine. The report revealed that as many as **98,000 people die in hospitals each year as a result of preventable medical errors**, and that more effective information technology could help.

2000s

2001

Only 18% of physicians were using an EHR system. The Institute of Medicine's goal for all physicians to use computers in their practice by 2000 was not met.

2004

The **Office of the National Coordinator for Health Information Technology (ONC)** was created to drive nationwide implementation of the most advanced health information technology and health information exchange (HIE).

The **Certification Commission for Health Information Technology (CCHIT)** was formed to create health IT product certification for providers and developers.

2005

The **Healthcare Information Technology Standards Panel (HITSP)** was established as a cooperative partnership between the public and private sectors to achieve a widely accepted and useful set of standards that enable and support widespread interoperability among healthcare software applications.

2006

President George W. Bush issued an **executive order mandating federal government use of interoperable standards**, defining the word "interoperability" as it relates to healthcare.

2007

One of the first cloud-based EHRs was built and deployed, citing improved cost-effectiveness, accessibility and flexibility for growing practices.

The International Health Terminology Standards Development Organisation, a not-for-profit Danish association formed in 2007, purchased **SNOMED CT** from the College of American Pathologists (CAP).

2008

The term **'integration Platform as a Service' (iPaaS)** was coined to address the evolving environments in which software is delivered.

2009

President Barack Obama signed the **Health Information Technology for Economic and Clinical Health (HITECH) Act**. The bill allocated $27 billion to encourage EHR adoption among hospitals and providers, with the goal of 70% of patient care providers adopting EHRs by 2014.

2010s

2011

Registration for the **CMS EHR Incentive Programs** began. **Meaningful Use Stage 1** attestation was now required, calling for the electronic capturing of health information.

The **FHIR Conceptual first draft** was published.

2013

The **second generation RESTful web services** were defined to retrieve, store and query DICOM images. The suite of web services was re-branded **DICOMweb**, and was aligned with upcoming HL7 FHIR web services.

2015

Meaningful Use, Modified Stage 2, introduced new requirements for the electronic capture of health information, with an emphasis on health information exchange (HIE) for care coordination.

The **Medicare Access and CHIP Reauthorization Act (MACRA)** created the Quality Payment Program, which repealed the Sustainable Growth Rate formula, changed the way Medicare rewards clinicians for value over volume, streamlined multiple quality programs under the new **Merit Based Incentive Payments System (MIPS)**, and, gave bonus payments for participation in eligible alternative payment models (APMs).

The **second FHIR DSTU** was published, followed by **FHIR R3 and R4**. FHIR specifications for querying a common clinical data set were refined and piloted. Data provenance specifications were published. **Consolidated-Clinical Document Architecture (C-CDA)** 2.0 was released to public. **SMART CDS Hooks**, a decision support specification, was launched.

ONC began publishing an annual list of best available standards for interoperability.

2019

CMS and ONC released proposed rules that add criteria for APIs to ensure uniform deployment and further define **"information blocking"** and the increased penalties for regulation violators.

BPM+ Health was launched as a community of practice by OMG. The second version of the **'Field Guide for Clinical Pathways'** was published.

2020s

2021

Last year to receive **Medicaid EHR Incentive Payment**.

2010

The Centers for Medicare & Medicaid Services (CMS) announced its final rule with incentive payments for the adoption and **Meaningful Use** of certified EHR technology. The **Affordable Care Act (ACA)** was passed, driving EHR adoption due to reporting of Clinical Quality Measures, Comparative Effectiveness Research, and other data.

ONC granted funds for the development of **SMART**. Draft SMART API was released.

IHE USA was founded to coordinate localization of IHE International specifications.

2014

The **first FHIR Draft Standard for Trial Use (DSTU) was published, along with the SMART on FHIR API**. **HL7's Argonaut project** was launched to implement SMART in EHRs.

Business Process Modeling Notation (BPMN) 2.0 was released.

2016

The **21st Century Cures Ac**t was passed by Congress, making APIs a requirement for certified HIT. ONC estimated that 98% of hospitals now demonstrate Meaningful Use.

OMG Healthcare **Business Process Modeling (BPM) Project** started. **Case Management Model and Notation (CMMN)** 1.1 was released.

The **CARIN Alliance**, a bipartisan, multi-sector collaborative, is launched to advance consumer-directed exchange of health information.

2018

Meaningful Use, Stage 3, introduced new requirements, focusing on using Certified Electronic Health Record Technology (CEHRT) to improve health outcomes and encouraging the use of APIs to facilitate data exchange and provide patients with timely access to their health data. CMS rebranded Meaningful Use to "Promoting Interoperability."

SMART on FHIR was published as an HL7 standard. CMS launched **Blue Button 2.0** using SMART for API access to Medicare claims.

OMG published the first version of the **'Field Guide for Clinical Pathways.'**

2020

Year by which **CMS aimed for 25 million patients to have "free electronic access" to their personal health data**, including all medical claims.

ONC Information blocking rules were published.

Decision Model and Notation (DMN) 1.3 was released.

2022

Year by which the **global market for iPaaS is estimated to reach US $1.2 billion valuation**, with healthcare being one of two industries forecasted to spur this growth.

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