

**Your Amazing CIO –
Prioritizing Health Care Technology Challenges**

John D. Halamka MD

**International Healthcare Innovation Professor, Harvard
Medical School**

PRE-MCLEAN

Global economy held back by the expense of ocean-going freight.

- ☑ **1937** Trucker Malcom McLean fumes at slow cargo loading - "There has to be a better way."

1970s-1980s

Fully Cellular Ships
🏠 1K-2.5K | 215x20x10m

By 1973, container ships carry 4 million TEUs annually, with most ocean cargo containerized.

- ☑ **1970** ISO regulations stimulate international container shipping.
- ☑ **1972** Registered East Coast longshoremen have fallen by in the 20 years since 1952.
- ☑ **1977** U.S. transport deregulation enables intermodal companies (owning more than one transport mode).
- ☑ **1984** Carriers operate round-the-world services with larger ships.
- ☑ **1985** Sea-Docs, the first electronic Bill of Lading Registry pilot, speeds up container movements with better information flow.
- ☑ **1985** The first double-stack train service begins.

2000s

Post Panamax Plus
🏠 6K-8K TEUs | 200x43x14.5 m

International supply chains grow more intricate and inclusive, supporting the growth of ecommerce.

- ☑ **2001** First residential container complex opens. Other re-purposing includes agriculture, open

THE EARLY YEARS

Early Cargo Ship
🏠 500-800 TEUs

Containers go international, rapidly expanding after 1968.

- ☑ **1950** US Army uses containers for supply movements during Korean War.
- ☑ **1956** Maiden voyage of McLean's Ideal X. McLean's fitting system improves security and loading times.
- ☑ **1959** The first quayside container crane is developed, slashing costs.

1990s

Post Panamax
🏠 4K-5K TEUs | 200x43x14.5 m

Chinese manufacturing takes off.

- ☑ **1991** Six of the world's ten largest ports are now in Asia.
- ☑ **1991** London's Docklands opens, an example of urban rejuvenation re-using vacant dock land (as ports get fewer and larger).
- ☑ **1959** The first quayside container crane is developed, slashing costs.

2010s

Triple E
🏠 18K TEUs | 400x59x15.5 m

By 2013, 90% of global trade is seaborne, shipped in 700 million containers every year.

- ☑ **2017** Remote tracking systems are predicted to reach over 1 million containers.

HL7 version 2, invented in 1989

MSH|^~\&|MegaReg|XYZHospC|SuperOE|XYZImgCtr|20060529090131-0500||ADT^A01^ADT_A01|01052901|P|2.5

EVN||200605290901||||200605290900

PID|||56782445^^^UReg^PI||KLEINSAMPLE^BARRY^Q^JR||19620910|M||2028-9^^HL70005^RA99113^^XYZ|260 GOODWIN
CREST DRIVE^^BIRMINGHAM^AL^35209^^M~NICKELL'S PICKLES^10000 W 100TH
AVE^BIRMINGHAM^AL^35200^^O|||||0105I30001^^^99DEF^AN

PV1||I|W^389^1^UABH^^^3||||12345^MORGAN^REX^J^^MD^0010^UAMC^L||67890^GRAINGER^LUCY^X^^MD^0010^UAMC^L|M
ED|||||A0||13579^POTTER^SHERMAN^T^^MD^0010^UAMC^L|||||||||||||||||||||200605290900

OBX|1|NM|^Body Height||1.80|m^Meter^ISO+|||||F

OBX|2|NM|^Body Weight||79|kg^Kilogram^ISO+|||||F

AL1|1|^ASPIRIN

DG1|1||786.50^CHEST PAIN, UNSPECIFIED^I9|||A

Clinical Document Architecture (2000) Continuity of Care Document (2009)

```
<dataEnterer>
  <assignedEntity>
    <id root="2.16.840.1.113883.19.5" extension="43252"/>
    <addr>
      <streetAddressLine>21 North Ave.</streetAddressLine>
      <city>Burlington</city>
      <state>MA</state>
      <postalCode>02368</postalCode>
      <country>USA</country>
    </addr>
    <telecom use="WP" value="tel:(555)555-1003"/>
    <assignedPerson>
      <name>
        <given>Henry</given>
        <family>Seven</family>
      </name>
    </assignedPerson>
  </assignedEntity>
</dataEnterer>
```

FHIR and Argonaut Implementation Guides (2015)

```
"name" : [  
  {  
    "use" : "official",  
    "family" : [  
      "Shaw"  
    ],  
    "given" : [  
      "Amy",  
      "V."  
    ]  
  }  
]
```



A photograph of two men in conversation. The man on the right is speaking and gesturing with his hands. He is wearing glasses and a dark jacket. The man on the left is listening. They are both wearing lanyards with 'NIVERSAL' on them. The background is a dark stage with spotlights and a wall of greenery.

Well, I of course don't know the politics of Norway.
But the issue is never technology.





ONE OF THE MOST RESPECTED AND EXPERIENCED DIGITAL HEALTH EXPERTS IN THE WORLD LAST WEEK CALLED ON THE AUSTRALIAN DIGITAL HEALTH AGENCY (ADHA) TO STOP THE CURRENT TRAJECTORY OF THE MY HEALTH RECORD (MHR) PROJECT IMMEDIATELY AND REFOCUS AND PRIORITISE INVESTMENT WHERE IT WILL HAVE REAL AND NEAR-TERM BENEFIT FOR THE AUSTRALIAN HEALTH SYSTEM.

Challenges We Still Face

- Medical/legal precedent with storage, use, and alerts/reminders for patient generated healthcare data
- Data provenance
- Turning data into information, knowledge and wisdom
- Understanding normal variation
- Security and privacy concerns

What New Data Sources are Emerging?

- Internet of things and connected health devices are exploding
- Artificial Intelligence and Machine Learning are mainstream tools available from multiple platform providers
- The era of apps and cloud hosted services has arrived
- Application Programming Interfaces are increasing in number and - sophistication
- Policy drivers including value-based purchasing, promoting interoperability program and telemedicine friendly reforms

Closing Thoughts

- The future for the app and cloud economy is very bright
- Although government has a role as convener and catalyst, the real acceleration will happen in the private sector and from foundations
- The technology we need is already in place
- API standards are rapidly maturing
- Watch the big players (Google, Amazon etc) to offer toolkits we all can embrace

