34th Annual Plenary & Working Group Meeting

Policy, Standards and Technology in the Time of COVID 19: A Case Study of Brazil

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- Professor of Health Informatics in three medical schools since 1983;
- 50 years experience in health information technology research, education and industry;
- Founding member, former president and director of education, Brazilian Society of Health Informatics (1986-);
- Founding member, co-chair and director of education, HL7 Brazil (2011-);
- Founding Fellow of the International Academy of Health Sciences Informatics (IMIA).
Agenda

- Demographics and the health care sector in Brazil
- Overview of the COVID 19 pandemic in Brazil
- Snapshot of technological initiatives
- The National Health Data Network (RNDS)
- The Conecte SUS Project
- Telemedicine during COVID 19
- HL7 Brazil activities
- Summary and conclusions
Demographics of Brazil

- 5th largest country in the world by land area: 8.6 million km²;
- 6th largest population: 210.2 million inhabitants;
- 9th largest economy: GNP 1.9 trillion PPP dollars, 17,000 PPP dollars per capita;
- Largest area, population and economy of Latin America (65-70%);
- Representative federative constitutional republic, democratic US-like presidential model, but direct popular vote throughout;
- HDI: 0.739 (high), Gini 53.9 (high, 10th)
- Language: Brazilian Portuguese.
Healthcare Demographics in Brazil

- 2nd largest healthcare sector in the Western World;
- 6,700 hospitals, 500,000 beds, 45,000 primary care units
- 460,000 physicians, 327 medical schools, 27,000 new graduates/year
- Universal, decentralized, comprehensive public healthcare system (SUS: Unified Health System, created 1990) the largest in the world;
- DATASUS: the MoH data and IT division; new digital health strategic plan;
- Healthcare expenditures: 9.2% GNP
- 75% of the population is dependent on SUS
- 25% uses private health care system, the majority (98%) through health care plans and insurance, group medicine and medical/odontology work cooperatives;
- UNIMED is one of the largest private healthcare systems in the world: 18 million beneficiaries, 115,000 physicians, 142 hospitals;
- General life expectancy: 77.4 years (2020).
COVID-19 statistics in Brazil (Sept 20th 2020)

- Among the 3 largest in the world
- 4,544,990 confirmed cases
- 3,851,227 recovered
- 136,895 attributed deaths
- 2165 cases per 100,000
- 65.1 cases mortality per 100,000
- 3% lethality
- 747 deaths/day
- Decreasing rates
COVID 19
Federal Public Health Initiatives

- 8,923 ventilators
- 11,353 new CTI beds
- 216.6 million PPE units
- 13.3 million COVID tests
- 65,000 intubation kits
- US$ 11.8 billion in funds to states and counties
- 12 million doses of free approved medications through the Popular Pharmacies Network;
- CoV-2 vaccines under testing: Astra-Zeneca/Oxford, China and Russia: 200+ million doses assured by 2021

Ministry of Health, August 3, 2020
HIT Policy Timeline in Brazil

• 1991: Creation of DATASUS: Dept. Informatics of the Ministry of Health
• 1996-8: Creation of CNS, RIPSA and RNIS – Health Information Networks
• 2002: Regulation of telemedicine
• 2004: PNISS: National Policy of Information and Informatics in Health;
• 2009: CIINFO: Committee of Information and Informatics
• 2007: Regulation and certification of EHR-S
• 2011: National adoption of 12 interoperability standards, including HL7;
• 2017: National e-Health Strategic Plan (based on an interoperability concept)
• 2018: LGPD: General Law of Personal Data Protection (in effect August 2020);
• 2018-9: digiSUS, ConecteSUS and RNDS: National Health Data Network
A Snapshot of Technological Initiatives

- Federal government:
  - COVID epidemiological information network and services (ANVISA: FDA/CDC like)
  - RNDS: the National Health Data Network using the HL7® FHIR®
  - eSUS AB: Primary Care EHR
  - Conecte SUS: information access infrastructure and access for the public health services (SUS: Unified Health System);
  - Immediate centralized COVID lab tests mandatory notification;
  - Patient, provider and management portals;
  - Patient-facing apps;
  - TeleCOVID telehealth network, active monitoring calls;
  - COVID patient information app

- State and municipal governments

- Private health
**RNDS: The National Health Data Network**

**Aims:** To promote a nation-wide Electronic Health Record for the exchange of information between the points of the Brazilian healthcare network, allowing the transition and continuity of care in the public and private sectors;

RNDS is meant to be a unified **infoway** for complete health data through **interoperability** health information standards;

It is **NOT** meant to be:
- A front-end system
- A centralized Electronic Health Record for all citizens
- A database
The National Health Data Network Platform
Current model of health data interchange

Information flow

RNDS model of health data interchange

Information generators/consumers

Information generators/consumers
RNDS Main Features

- Incorporates legacy data that have a clinical context;
- Federated: data containers at state level (nodes);
- Native cloud: scalable;
- Open source components: cloud agnostic;
- Mobile friendly: interfaces with BFF and PWA, for all OS;
- Exchange of information based on HL7® FHIR® and JSON;
- Blockchain: security, persistence, traceability, federation, non repudiation;
- Consent and data protection (compliance to the General Law of Data Protection);
- Nationally standardized document templates (CMD: Minimal Health Data Set). etc.)
BFF: Back-End for Front-End Architecture

Source: https://philcalcado.com/2015/09/18/the_back_end_for_front_end_pattern_bff.html
Minimal Health Dataset

- **CMD**: Conjunto Mínimo de Dados em Saúde
- **Official Reference Information Model (2018)**
- **Management, financial and clinical datasets**;
- **Unification of dozens of previous documents, forms and interoperability standards**
RNDS Architecture
RNDS Architecture Elements

**Information Services**
- Care services network regulation
- Mandatory epidemiological vigilance
- Birth/death notification
- Clinical documents and images
- Discharge and CCR documents
- Electronic prescription services
- Care episode management
- Immunization/transplants
- Audit tracking
- Data analytics

**Technological Services**
- MPI bus (PIX/PDQ)
- Terminology services (RTS)
- EHR services
- MDS processing
- BFF services
- Consent and eligibility
- Blockchain and digital certificates
- FHIR® messaging
- Clinical decision support
- Telehealth services
Citizen consents to the access to his/her private data

Consent term is validated and stored

Controlled access to identification and clinical data

“All information can only be accessed by the citizen or by users authorized by him”

Citizen is able to access his/her data

LGPD
Digital Certificates and Signature for Health

- Brazil has one of the best, long standing, mandatory Public Key Infrastructure and standards for digital certificates;
- Mandatory digital authentication and signature of all healthcare-related electronic documents;
- Three media types: USB tokens, smartcards and cloud-based;
- Physicians are issued digital license IDs;
- Permits paperless and fully digital EHR-S;
- Allow for physical media discard after scanning and digital signature
- Included into EHR-S certification requirements.
- Allows access to any citizen to his/her personal and health information;
- As recorded in public or private health entities, pharmacies, labs, etc.;
- Unique ID (National Health Card Number – CNS) our IRS Fiscal Number (CPF);
- Connected to SOA-SUS (Service Oriented Architecture using IHE PIX and PDQ standards) for identification and demographic data;
- Connected to the National Health Data Network (RNDS) bus for healthcare data.
- Secure access and data protection using blockchain, digital certificates and encryption;
- In construction: so far COVID lab tests results, and soon, immunizations.
Olá, seja bem-vindo!

O Conecte SUS está de visual novo. A plataforma oficial de comunicação entre o cidadão e o SUS foi reformulada.
Conecte SUS Professional

- Promotes access to information among professionals from different points of the Health Care Network, allowing the transition and continuity of care in the public and private sectors;
- ID through a central record of all healthcare entities and professionals (CNES).
RNDS Benefits

- Access to health information
- Greater transparency
- Complete recording of health services and data
- Better offer of health services
- Documentation and followup of the patient’s trajectory
- Greater diagnostic accuracy
- Higher resolution of cases
- Better continuity of care

- Organization of information
- Needs and requirements mapping
- Action planning
- Expanded monitoring
- Fraud detection
- Telehealth deployment
- Artificial Intelligence deployment
- Enhanced data quality
- Integration with IoT and other advanced technologies
Telemedicine during COVID

- Brazil has since 2005 two large federal-sponsored telehealth programs in all its states: the Brazilian Telehealth in Primary Care Network, and the University Telemedicine Network (RUTE), with more than 30 hubs and 2,000 remote sites: it has increased its activity a lot during the pandemic;
- Exceptional legislation by several agencies has been passed since March, allowing for emergency teleconsultation and electronic prescribing for all healthcare specialties;
- The private sector has expanded its telemedicine activities enormously; numerous (50+) new companies offering platforms.
The HL7 Brazil Activities

- Working Groups: Education, Interoperability, Certification, Terminologies, Continuity of Care and Electronic Prescription
- Development of FHIR® BR Core and Implementation Guide
- Brazil page at HL7 Confluence
- FHIR® resources, profiles, bundles, etc. at Simplicity
- FHIR® Connectathon for patient and lab results (December 2020), other planned for 2021
- Promotion of Arden, CDS Hooks & Cards and Infobutton: consortia
- Integration with other standards: openEHR, LOINC, SNOMED CT, ICD-11, etc.
HL7 Brazil Educational Program

- The Education WG has organized 33 courses since 2011;
- Own LMS platform and services;
- HL7 Official ELC Course (17 weeks);
- HL7 FHIR® Fundamentals On-Line Course (5 weeks);
- Introduction to Health Information Standards;
- CDS HL7 Standards Workshop;
- Other courses: openEHR, LOINC, SNOMED-CT, DICOM;
- More than 600 graduates.
National and International Cycles of Webinars
Summary and Conclusions

- As elsewhere, Brazil has experienced a large growth in digital health due to the pandemic needs, particularly in the public private and public data interchange, EHR and telemedicine usage, regulatory activities, etc.;
- A tremendous boost to HL7 and interoperability standards is occurring, without any historical parallel, in large part due the federal government adoption of FHIR® and other standards;
- The changes have a high chance to persist and to expand after the COVID 19 pandemic, due to its perceived benefits;
- The digital and network infrastructure of Brazil is the most advanced of Latin America, including 4G LTE, wireless, optic, as well as digital certificates;
- The National Strategic Plan for Digital Health is accelerating its pace of implementation.
Thank you!

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