The heart of our health system: Data for driving continuous improvement in health service delivery and quality

Health Data Analytics 2019 Conference

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eHealth Queensland
Meeting Queensland’s Healthcare Challenges

**DEMAND**

*Drivers*
- Increasing Burden of Disease
- Growing Consumer Expectations
- Ageing Population
- Spread of Queensland Population

**SUPPLY**

*Constraints*
- Paper based processes
- Limited Budgets

**SERVICE ENABLERS**

- Help to reduce demand
- Help to improve efficiency & quality of care (effectiveness)

**DIGITAL ENABLERS**

- Electronic Medical Records
- Robotics, AI
- Wearables, Remote Monitoring, mHealth Apps
- Drones
- Connectivity Anywhere
- Telemedicine

**Healthcare Service Delivery**
Digital Transformation Agenda
Queensland’s Digital Health Landscape

**Digital Foundations**
- Digital Business systems
  - Financial systems renewal
  - Integrated workforce management

**Digital Readiness**
- Digital worker
- Digital literacy
- Cyber security
- Information Management Strategy and Roadmap

**Digital infrastructure**
- Infrastructure maintenance & uplifts
- Digital Collaboration (O365)
- Windows 10 Migration
- Bring your own device
- Follow Me Desktop
- Clinical and business intelligence platform
- Information interoperability
- Identity access management
- Cloud computing
- Network connectivity

**Promoting wellbeing**
- **Digital consumer**
  - Patient online portal
  - “Healthier. Happier.” website
  - mHealth applications strategy
  - Wearables
  - Gamification

- **Population health**
  - Notifiable conditions system
  - Health literacy

- **Precision medicine**
  - Digital genomics strategy

**Delivering healthcare**
- **High reliability healthcare organisation**
  - Digital hospitals (integrated electronic Medical Records)
  - Electronic health record for regional primary and community care
  - Telehealth (including virtual care)
  - Patient Administration System
  - Rural and Remote digital health strategy
  - Implantables and digestibles
  - Robotics

- **Diagnosis**
  - Laboratory Information System
  - Digital medical imaging

**Connecting healthcare**
- **Enabling integrated healthcare**
  - My Health Record
  - The Viewer (Health provider portal)
  - Queensland Digital Children Redbook
  - Digital pregnancy record
  - Integrated referrals management
  - Mobile enabled Care (MeCare)
  - Information sharing project

**Fostering an intelligent healthcare enterprise**
- Innovation hub
- Innovation proof of concepts and pilots
- Artificial Intelligence
- Internet of Things (IOT)
- Clinical and business intelligence and analytics
- Big Data

**Pursuing innovation**
- Innovation hub
- Innovation proof of concepts and pilots
- Artificial Intelligence
- Internet of Things (IOT)
- Clinical and business intelligence and analytics
- Big Data
Our Digital Plan

Horizon 1 - within 3 years
Building consistent and sustainable capability
- Revitalised systems underway
- Information interoperability
- Best of breed system integration
- Secure health information
- Contemporary ICT platform
- Integrated electronic medical records
- Connected health pathways
- Digital literacy uplift

Horizon 2 - within 5 years
Optimising integrating, growing and expanding digital health and digital workforce capabilities
- Full electronic health record
- Digital hospitals
- Consumer decision support
- Diagnostic images anywhere
- Wearables integration
- Health informatics
- Enhanced business intelligence
- Personalised mobile access
- Greater access to Telehealth

Horizon 3 - within 10 years
Transforming scaled digital health
- Enhanced research and performance
- Portable diagnostics
- Optimised patient record and care planning
- Digital therapies
- Advanced analytics
- Personalised healthcare
Towards a Learning and Knowledge based Health System
“Virtuous Circle”

Adapted from Unleashing the benefits of data presentation, eHealth Expo 2018
Health Informatics Strategy

- **Information Management Strategy and Roadmap**
  - Outlines indicative program of work required across Queensland Health and Hospital and Health Services

- **Data Custodianship - data and application custodianship policy has been developed**
  - Health Informatics Services working to identify and appoint Data and Application custodians

- **Digital Literacy and Capability**
  - 4th cohort of the Certified Health Informatician Australasia (CHIA) program (funded by eHealth) is complete
  - Worked with Clinical Excellence Queensland to develop the Manage4Improvement program to develop leadership around digital innovation and change
  - Currently working on a Digital Readiness Strategy to support multiple upcoming programs
The Queensland Health Information Management Strategy is guiding focus and action towards management of information as a strategic asset for Queensland Health.

Digital Health Themes

- Integrated care
- Population health
- Precision medicine
- Reliable healthcare
- Intelligent enterprise

Information Management areas of focus

1. Governance of data
2. Data standards and infrastructure
3. Consent and privacy – use and disclosure of data
4. Transition of information to digital
5. Data quality
6. Storage of data / digital continuity
7. Security of data / data breaches
8. Information sharing
9. Health intelligence and data analytics
10. Knowledge management
# Information Management Strategy Implementation Roadmap

<table>
<thead>
<tr>
<th>Horizon 1: Building (within three years)</th>
<th>Horizon 2: Optimising (within five years)</th>
<th>Horizon 3: Transforming (within seven years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Drive the Information Management Strategy and Roadmap; that are resourced for implementation</td>
<td>• Action plan for shared data with strategic external partnership established</td>
<td>• Future strategy and roadmap is planned against strategic priorities</td>
</tr>
<tr>
<td>• Strategic use cases for data and information are developed and used statewide</td>
<td>• Queensland Legislation in line with requirements from strategic use cases, privacy and security has been refreshed</td>
<td>• Information Management Strategy updated</td>
</tr>
<tr>
<td>• Processes, standards, policies for strategic use cases for data and information are developed</td>
<td>• Assessment of information management technology 'smart' tools to assist Queensland Health undertaken</td>
<td>• Tools, processes and policies to enable sharing of appropriate information across whole of government established</td>
</tr>
<tr>
<td>• Maturity models for information management and health intelligence developed for local division and HHS use</td>
<td>• Resources for digital workers and digital citizens available</td>
<td>• Processes to adapt smart technologies for information management established</td>
</tr>
<tr>
<td>• Data and information custodians in place</td>
<td>• Lead the development of standards and processes reflect current privacy / security processes and legislation</td>
<td>• Coaching and training for digital workers established across Queensland Health</td>
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<tr>
<td>• Lead the development of standards and processes reflect current privacy / security processes and legislation</td>
<td>• Coaching and training for digital workers established across Queensland Health</td>
<td>• Governance structures align with strategy and roadmap with strong sponsorship implemented</td>
</tr>
<tr>
<td>• Coaching and training for digital workers established across Queensland Health</td>
<td>• Metrics and reporting structures are integrated statewide allowing practical management and action</td>
<td>• Support agile governance for strategic use cases of data and information that have been developed and are in use</td>
</tr>
<tr>
<td>• Drive the progression of governance for data, information, and records</td>
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<td>• Localised governance is well established and escalation processes are in place (where required)</td>
<td>• Govern, monitor and control information management across the state; including sub-working groups</td>
<td>• Localised governance is well established and escalation processes are in place (where required)</td>
</tr>
<tr>
<td>• Maturity plans of information management and health intelligence are known and actioned</td>
<td>• Maturity models are well established and known through data, information and records managers</td>
<td>• Maturity plans of information management and health intelligence are known and actioned</td>
</tr>
<tr>
<td>• Sharing of knowledge across the network is established</td>
<td>• Continual review and alignment to strategy and roadmap</td>
<td>• Sharing of knowledge across the network is established</td>
</tr>
<tr>
<td>• Statewide processes, standards, tools are leveraged locally</td>
<td>• Monitor and control at the local level with recommendations on information management locally or across the network</td>
<td>• Statewide processes, standards, tools are leveraged locally</td>
</tr>
<tr>
<td>• Maturity models are well established and known through data, information and records management</td>
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<td>• The culture promotes innovation and leading practice for information management, that support data as a strategic asset</td>
</tr>
<tr>
<td>• Statewide processes and standards have been localised</td>
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<td>• Local use cases for data and information for current and future use are known at the statewide level, for inclusion in the Information Management Strategy</td>
</tr>
</tbody>
</table>
A six year roadmap to provide the technology to empower clinicians to use genomic information

- Strategy outlines how eHealth Queensland will provide digital tools and technology for:
  - ordering genomics tests
  - reporting on results
  - updating a patient’s electronic medical record
  - supporting analysis of data and clinical decision making

- Strategy developed in collaboration with key Queensland Health and external stakeholders including Queensland Genomic Health Alliance, Genetic Health Queensland, Health Support Queensland and Clinical Excellence Queensland
Digital Strategy for Rural and Remote Healthcare in Queensland

**VISION**

A digital strategy to support better health outcomes for Queensland’s rural and remote communities.

**PRINCIPLES**

- Patient centered, clinically led
- Access to services a fundamental right: No-one left behind
- Delivering care closer to home
- Connected services, empowered communities
- Leveraging what’s already in place
- Clinicians are supported with the best digital tools
- Decision support at the point of care
- Tell us once, regardless of provider

**STRATEGIES**

to address the healthcare challenges impacting Queensland’s rural and remote communities

**FOCUS AREAS**

to embrace and leverage digital technologies to deliver better care today and into the future in rural and remote healthcare

**Digital Foundations**
- Fast, secure and reliable connectivity
- Reliable power and digital infrastructure
- Integrated systems at point of care (including EMRs)
- Interoperability
- Mobile enabled
- User friendly digital processes and the ability to use them
- Clinical & business intelligence
- Rural & remote ICT support services

**Personalised Care**
- Mobile health applications
- Patient Online Portal
- Connected monitoring at home
- Wearables
- Digital Health Hub
- Precision medicine and genomics

**Integrated Care**
- Telehealth
- Smart Referrals
- Creating a longitudinal record
- Shared Care Planning
- Information sharing and access

**Virtual Care**
- Virtual Care Centre
- Virtual Critical Care
- Digital point of care devices
- Drone delivery
- Virtual Home-based Care
A MONTH IN THE LIFE OF THE integrated electronic Medical Record (ieMR) (Digital Hospitals)

344,785 patients treated across Outpatient Visits, Inpatient Admissions and Emergency Presentations

221,313 Outpatient Appointments

58,895 Inpatient Admission

64,577 Emergency Presentations

318 million transactions recorded in the system

10.04 million instantaneous interactions with patient records that no longer requiring paper chart requests from Medical Record Departments

46,286 patient allergies recorded Driving improved patient outcomes through reduced adverse drug and food events

46,947 unique users with improved access to patient records at the point of care

5.50 million orders across pharmacy, radiology, pathology and other diagnostic services

75 seconds to search for a patient record

8.54 minutes average electronic documentation time with structured clinical notes and pre populated templates

1.37 million medications administered to patients which required 7 steps of Positive Patient Identification at the point of care

The volume of data is growing at a rapid rate with the introduction of the ieMR solution in 14 fully digital hospitals coupled with the information already being generated by the over 500 other information systems.
Clinical and Business Intelligence
"Better insights, better focus… better health for Queensland"

Implementation of a State-wide Clinical and Business Intelligence Platform is progressively establishing a strong foundation for clinical data and analytics in Queensland.

Statewide integrated data capability enabling:
- Real-time decision support
- Artificial Intelligence
- Robotics & Machine Learning
- Analytics: Predictive & Prescriptive
- Research

Future

Core Information Assets
- Internet of healthcare things
- Clinical data (eMR)
- Genomics data
- Behavioural data
- Corporate data
- Geospatial
- External data

An entanglement of data
CBI: Multi-disciplinary Organisational Collaboration

Note:
- This model is applicable to QH as a whole; as well as DoH and HHSs individually.
- This is a highly generalised model for illustration purposes.
- Variation will exist across domains and organisations.
# Queensland Health Clinical and Business Intelligence Roadmap

<table>
<thead>
<tr>
<th>Initiative areas</th>
<th>Specific initiatives</th>
<th>Outcomes</th>
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</table>
| **1/ Deliver better intelligence**
Gain more value from our data to improve health and system outcomes | Implement shared CBI platform
Identify and deliver new clinical intelligence (starting with surgery, scheduling and emergency)
Identify and deliver new business intelligence use cases
Big data
Advanced analytics, AI/Machine learning
Provide consumer driven intelligence
Value-based care analytics | **Outcomes** |
| **2 / Improve organisational collaboration**
Clear roles, responsibilities and expectations and alignment with strategy | Share knowledge, code and models
Share and scale innovation
Expand and empower commodities of practice | **Outcomes** |
| **3 / Improve processes and services**
Agile, timely, reliable and value-for-money delivery processes and services | Establish agile, collaborative CBI use case delivery teams
Automate CBI platform
Define CBI services
Self-service CBI | **Outcomes** |
| **4 / Modernise our Enterprise Data Platform**
A high performance, integrated, shared platform and supporting tools | Implement statewide data lake and vault
Health information exchange from CBI platform
Migrate from at-risk legacy repositories
Explore AI driven data matching and quality
Automate information management processes | **Outcomes** |
| **5 / Mature data and CBI governance**
Build trusted data and information foundations | Fill critical corporate data collection gaps (from iMRS and clinical reporting, analytics gaps
Standardise data modelling and metadata tools and repository
Establish QH information models
Implement enterprise data catalogue and glossary and improve data quality process
Improve master and reference data services
CBI and data portfolio governance | **Outcomes** |
| **6 / Improve CBI capability across QH**
Build internal skills and partnerships to deliver and leverage CBI effectively | Improve clinical change management capability
Uplift technical, analytical and governance skills | **Outcomes** |
| **7 / Strengthen privacy, confidentiality and security**
Protect the information that we are entrusted with | Modernise CBI privacy, confidentiality and security | **Outcomes** |
Providing High Reliability Healthcare

Enabled by Dashboards and Analytics
Advancing Healthcare Service Delivery with Artificial Intelligence

Heart Rate Variability
Analysis of heart rate variability (HRV) in sepsis, and subarachnoid haemorrhage (SAH)

Eardrum Image Recognition Project
Developing an algorithm to help diagnose chronic suppurative otitis media (CSOM) using images, hearing test, demographics

Text Mining and Automation for Processing of Patient Referrals
This trial is automating the extraction of 'reason for referral' from the received GP referral letter

Key Contact: Dr Brent Richards FRACP FCICM, Medical Director of Innovation, Gold Coast Health
Referral AI - Text Mining GP Referrals
“eHealth Expo 2019 Design Jam Winner”

Current Situation
Referral categorisation is a time-consuming process performed by clinicians in a Hospital and Health Service (HHS) once a referral is received. Gold Coast Hospital and Health Service (GCHHS) gastroenterologists spend approximately 7-8 hours per week to categorise 250 referrals. Additionally, the use of Clinical Prioritisation Criteria (CPCs), a set of guidelines for referral categorisation, varies between individuals.

Potential Future State
The GCHHS Referral AI team led by Dr. Brent Richards suggests the use of artificial intelligence (AI) could save 50% of the time it takes to categorise a referral. In 2016, Queensland Health received nearly 2 million referrals. At a system level saving 15 seconds per referral could free up over 8,000 hours of clinician time per year.

- 15,000 referrals per month
- Referrals scanned at 300dpi, OCR
- R software used to remove non-sensical characters and extract text features and compare against a list of expected text
- Agreed Clinical Prioritisation Criteria now cover ~40% referrals
- Plan to create decision support for referral management
Current Situation
It can take months and considerable consultation for users to work out how to get access to relevant data. The necessary authorisations for specific purposes for the release of data may vary in each area. Better use of health data for secondary purposes – including service evaluation, management, monitoring, reporting, analytics, quality assurance and improvement activities, research and innovation – is recognised as critical to the transformation and improvement of health services. A significant data access barrier relates to the complex, multilayered, opaque, process of obtaining appropriate authorisation for use.

Potential Future State
Will deliver a decision tree algorithm that will provide the following benefits:
- Reduced complexity and time taken to facilitate data access authorisation
- Enhanced fluidity of data for appropriate secondary uses
- Improved standardisation of processes regarding data access and governance
- Reduction of inappropriate data blocking
- Identification of areas for streamlining of the process
Queensland Health and Queensland Ambulance Integration

**Current Situation**
The Queensland Ambulance Service (QAS) operates as a state-wide service across Queensland and is accountable for the delivery of pre-hospital ambulance response services, emergency and non-emergency pre-hospital patient care transport services and inter-facility ambulance transport.

Currently there is limited data integration between QH and QAS. This information is valuable and necessary to improve pre-hospital patient safety and treatment, as well as promote continuous clinical research towards an effective integrated patient care and ensure safe and effective clinical handover to QH clinicians.

**Future State**
1. Providing Emergency Departments with access to the QAS electronic Ambulance Report Form at clinical handover
2. Provide QAS with access to the QH clinical information via the application The Viewer
The Princess Alexandra Hospital is now home to Australia’s first 3D Avatar - a revolutionary skin cancer-detecting system. The system, called the VECTRA Whole Body 360, is the first of its kind in Australia and is revolutionising the fight against skin cancer.

The Universal Health Translator (UHT) provides an application that will assist staff to converse with non-English patients for all languages that meet a measured and acceptable threshold, using the best option available and provide the ability to determine the accuracy of the translations.

TESA, a personal health assistant robot that eHealth Queensland has configured to speak multiple languages is being deployed at the Princess Alexandra Hospital for guiding patients and visitors around hospitals and conducting surveys.

Automated guided vehicles ('intelligent' logistics robots) have been deployed within the Sunshine Coast University Hospital to deliver kitchen meals, linen, consumables, waste and potable gas to dedicated drop off and collection points.
The Future is Digital by Default
Questions?