Experiences in enabling digital pathology for research in Victoria

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What is this talk about?

Digital Pathology
Digital Radiology
E-Health initiatives/Linkages
Electronic Medical Record
Digital Cardiology

UC Berkeley, School of Information Management and Systems
From a “research” facilitator’s view

- VPAC
  - Victoria’s “MARC”
  - State HPC centre
  - Research facilitation to academia, industry in science and engineering

- VPAC Health
  - Health & health informatics
  - Differentiating point: know all the CIOs & “Directors of research” at the hospitals (not just Universities)

Outline

- Pathology & biobanking
- Digital biobanking
- Victorian Cancer Biobank initiative
- Going forward: key needs
Pathology & biomarkers

1. From biopsy to ribbon

2. Stain for purpose

3. Identification of biomarkers

4. Comparison to control sample with known clinical outcomes

What is biobanking?

- Biobanking is maintaining an inventory of biospecimens, and providing a service to this inventory
- Ultimately needed for providing control samples for research and clinical use
Why digital pathology?

**Data analysis**
- Multi stain quantification
- Nuclear quantification
- Membrane quantification
- Cytoplasm quantification

**Data correlation**
- Molecular profiling
  - Hierarchical cluster analysis
  - IHC characterisation
- Clinical data
  - Treatment
  - Recurrence
  - Survival
- Pathology data
  - Diagnosis
  - Stage
  - Grade

**Potential benefits**
- Development of targeted therapies
- Identification of prognostic indicators
- Improved clinical management

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Tissue micro-arrays

**Slides stained**
- H&E
- IHC

**Slides scanned**
- 120 slides per rack
- <1 min per slide

**Slide images saved**
- 750 Mb per slide

**Separate “spot images” viewed**
The Victorian Cancer Biobank (Biobank) is a not-for-profit large-scale tissue-banking facility built on the expertise of four Consortium member tissue banks located at Austin Health, Melbourne Health, Peter MacCallum Cancer Centre and Southern Health.

The Biobank aims to provide high quality clinically annotated biospecimens to researchers in academia and industry within Australia and internationally.

Enabling digital Biobanking
Unfortunately...

- 20mm x 15mm at 20X (.5micron/pixel) requires 1.2Gpixels ... 3.6GB
- Compressed: 200-200MB
- 1 years worth: 55,000 images... 30TB\(^1\)


Problem

Because of network bandwidth issues...
- Each site stores their own data locally
- Images partaking in Biobank’s QA practices: by transporting hard-disks

Meaning...
- Researchers cannot share across sites
- Researchers are multi-homed: cannot send to Universities
The data of digital pathology

Need for cheap broadband!

Victorian Cancer BioBank

Proposed Interconnections for Victorian Cancer BioBank Project
Engaged with AARNet

- Established in 1989 – The Internet in Australia
- A “not for profit” community carrier – wholly owned by the Public R&E sector
- Tight eligibility restrictions available to researchers and educators regardless of their sector.

BUT...

Able to enter in partnerships on infrastructure
Next steps...

- Linking of inventory data to digital pathology data
- Linking of pathology & clinical data for research
  - E.g. Engagement with BioGrid
- National accessibility of data
  - i.e. Inventory mgt, pathology, clinical & ethical

Thankyou