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NEWCASTLE
AUSTRALIA



SCHIZOPHRENIA
RESEARCH
BANK

An Example of eResearch: The Australian Schizophrenia Research Bank - ASRB

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11 November 2009





Schizophrenia

- A mental illness characterised by
 - Complex clinical symptoms
 - Cognitive deficits
 - Subtle structural brain changes
- Prevalence of 4 per 1,000 sufferers
 - But by its nature the illness it also affects family, friends & acquaintances
- Monetary cost to the community is ~\$40,000 per patient per year
- E.g. the Russell Crowe movie *A Beautiful Mind* (Nash), recent tragic publicity

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Research Into Schizophrenia

- Investigation of life history, environment, etc
- Examination of brain morphology
 - Until recently only possible after subject had died
 - Now possible using MRI and fMRI technology
- Study of genetic characteristics
 - Typically involves analysis of blood samples
- Until recently involved disparate teams individually collecting and studying samples and data

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Support for ASRB

- Initial support for unified study provided by ARC Special Research Initiatives Grant: “A software grid for data-sharing associated with the NISAD/LONI Virtual Brain Bank”, 2005/06
- Major support provided by NHMRC Enabling Grant: “Australian Schizophrenia Research Bank”, 2006-2010
- Several smaller NHMRC grants 2007, 2008, 2009
- Other financial support from The Pratt Foundation, Ramsay Healthcare, and Perpetual Trustees
- Administered and financially supported by Schizophrenia Research Institute (SRI)
- In-kind support INTERSECT: “ASRB – Web Interface and Tools”, 2009-2010
- Many other supporters (including John Singleton & Russell Crowe)

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Purpose of ASRB

- Shortage of patients and case-matched controls, characterised in terms of
 - Clinical
 - Cognitive
 - Neuro-anatomical evaluations
- Will provide a bank of data (initially 2,000 subjects & 2,000 controls):
 - Clinical & cognitive assessments
 - Genetic data
 - MRI brain scansfor use by national and international researchers

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Who Is ASRB?

- Administered by SRI
- Led by scientists based at the University of Newcastle
- Collaboration with scientists at University of Melbourne, University of NSW, University of Queensland, University of Western Australia, Schizophrenia Research Institute

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What Is ASRB Doing?

- Clinical Assessment Officers (CAOs)
 - Conduct a comprehensive clinical assessment of each participant to collect
 - Socio-demographic & clinical history schedule
 - Neurological, personality & cognitive function evaluations
 - Psychosis screening toolrepresenting a combination of the instruments currently used by prominent researchers in the field
- Technicians conduct MRI scan
- Qualified personnel extract blood samples
- *Compliance with multi-level Ethics conditions is essential*

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How is ASRB Data Collected?

- CAOs conduct the (previously paper-based) assessments using purpose-built software on tablet computers
- A web portal allows upload of the data to a central database located in Newcastle
 - The data is then removed from the tablet
 - The ASRB web-site facilitates subsequent access to the data
- MRI data is transported to Newcastle on CD
 - Processed to de-identify and normalised, then stored on the central server
- Blood samples are stored under refrigeration
- Complex rules govern right to access

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Initial Technology

- PostgreSQL RDBMS on server and PCs
- Data described in XML
- CA software written in Java
 - So can execute on Windows-based PCs and Unix-based server
- JSP aligns software screens with database fields
- Transport Layer Security and Secure Socket Layer certificate ensures security of data transfer
- Server access is controlled by Globus 4 grid
- Portal framework is Gridsphere with GridPortlets used to access the grid
- PURSe portlets abstract over certificate management for users

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New INTERSECT-Implemented Application Software & Frameworks

- Java and PostgreSQL (v 8.3) as before
- Apache Tomcat servlet engine (<http://tomcat.apache.org>)
- Liferay enterprise open source portal (<http://www.liferay.com>) - ASRB Server
- Apache Pluto portal (<http://portals.apache.org/pluto>) - CAS Laptop
- Spring JEE application framework (<http://www.springsource.org>)
- Spring Security authentication and security framework (<http://www.springsource.org>)
- Hibernate ORM persistence framework (<http://www.hibernate.org>)
- jQuery JavaScript and Ajax library (<http://jquery.com>)
- Several other Apache and other open source libraries and frameworks

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New INTERSECT-Implemented Technologies & Techniques

- Dependency Injection (Inversion of Control) for run-time deployment
- MVI (Model-View-Controller) pattern for the UI
- Java Persistence API (JPA) for data persistence
- Java Architecture for XML Binding (JAXB) for XML processing

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New INTERSECT-Implemented Products & Technologies for System Construction

- Eclipse IDE (<http://www.eclipse.org>)
- Subversion code revision control system (<http://subversion.tigris.org/>)
- Apache Ant build tool (<http://ant.apache.org>)
- JUnit test framework (<http://www.junit.org>)
- EasyMock mock object library (<http://easymock.org>)
- Hudson continuous build and integration server (<http://hudson-ci.org>)
- Enterprise Architect UML modelling tool (<http://www.sparxsystems.com.au>)
- Atlassian Jira issue tracking system (<http://www.atlassian.com/software/jira/>)
- Atlassian Confluence enterprise Wiki (<http://www.atlassian.com/software/confluence/>)

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Current State of Development

- New INTERSECT system:
 - Testing with (copy of) real data will commence shortly
 - Deployment planned before end of year
- ASRB Data collected as of 6 weeks ago:
 - 434 Cases: 288 male (66.4%); 146 female (33.6%)
 - 248 Controls: 118 male (47.6%); 130 female (52.4%)
 - Average age: 39.8 for cases; 37.7 for controls
 - > 12 years education: 12.9% for cases; 15.4% for controls
 - Average age at onset: 23.0 for males; 25.2 for females
- INTERSECT demonstration follows this session

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Use of ASRB for Research

- Integration of previous SRI Register and ASRB recruits to form ASRB Register
 - Several approved studies currently recruiting using the Register
- From June 2009 CIs started accessing subsets of the data for conduct of studies
- Access will shortly open to other researchers
 - Australian in July 2010
 - International in July 2011

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