PoCT Troponin Improving Patient Outcomes in Rural and Remote Settings

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South Australia

Population: 1.5 million
Capital: Adelaide
1.07 million
SA Country Health Local Health Network

- Acute Care – 66 hospitals
- Total workforce – 7,100
- Nurses – ~3,600
- Salaried Drs - 46
- GPs – 424
- GP registrars – 41
- Allied Health - 620
SA Country Health Services

- Population: 420,000 (28% of total)
- Very low population density
- Age profile: 14% > 65 years
- Catchment populations: 1500 - 30,000 per hospital
- On-site Laboratories (on-call only after-hours) - 10
- Significant shortage of doctors and nurses in primary care and hospitals.
- Significant shortage of Medical Specialists
  - only 3 resident Adult Consultant Physicians
- Tertiary/teaching hospitals highly centralised
Population Outcomes

CHD Mortality Trends Australia 1959-2003

What’s the problem?

- Dietary changes
  - Reduced intake of saturated fats
- Less smoking
- Better detection and treatment of hypertension
- Better treatments for heart problems
Geographic Variation in Coronary Heart Disease in Australia 1986-96

- “more deaths than expected from acute myocardial infarction resulted in mortality rates from CHD up to 30% higher in men and 21% higher in women living outside of capital city statistical divisions”.

- The gap widened between 1986 and 1996 and is greater among younger age groups.

Sexton and Sexton, MJA 2000; 172: 370-4
Geographic Variation (SA)

Deaths per 100,000 pop

- Males Rural
- Females Rural
- Males City
- Female City

Sexton and Sexton, MJA 2000
Evolution of the Network

- 1995-1998 Early Research – Troponin evaluation
- 1997-1998 Short Stay Chest Pain Assessment Unit & Protocols at Flinders Medical Centre
- 1999-2001 Concept development and initial consultation.
- 2002-2003 Expansion to a Regional Network (iCARnet)
- 2004-2008 Expansion to operational statewide network.
- 2006 State Govt funding for Integrated Cardiovascular Clinical Network SA (iCCnet).
- 2007 Statewide Clinical Networks (Statewide Service Strategy - 2007) under SA Health Care Plan
- 2010 iCCnet integrated into CHSA.
Clinical Network Operations: Critical Components

- Workforce
  - Rural generalist doctors and nurses
- Systems of Care
  - Clinical Tools and Clinical Systems
- Education, Training and Skills Maintenance
- Access to Essential Equipment and ICT Services
- Research, Development and Evaluation
Clinical Tools & Systems

- Evidence Based Clinical Pathway for Chest Pain/ACS Presentations Incorporating STEMI Protocols
- Digital ECG Management
- Tenectaplaste and other Critical Formulary Distribution and Stock Rotation systems
- Comprehensive POCT Pathology
- Integrated Consultant Cardiologist Backup and Support
- Comprehensive CV CME for all members of the team
- Robust Communication and Clinical Information Sharing Systems with inbuilt Redundancy
- Clinical Service Integration between all Service Providers
- Electronic Medical Records
- Cardiac Rehabilitation & Secondary prevention (CATCH)
Clinical Resources in All Rural Hospitals for ACS Management

1. Integrated, Evidence-based Clinical Pathways
   - Immediate Steps
   - Initial Diagnosis and Risk stratification
   - Initial Treatment
   - Further Diagnostic Testing and Risk Stratification
   - Triage
     - Chest pain / ACS
     - SOB / CHF
     - AF (in development)
Clinical Resources in Rural Hospitals for ACS Management

2. CHSA Digital ECG Management System

- Generation, distribution, reporting, storage, retrieval and analysis of ECGs in a digital format

- Assists:
  - Recall of old ECGs
  - Serial comparison of current ECGs
  - Distribution of high quality ECGs to multiple providers
  - Integration of ECG into EMR
An Example

ECG FACSIMILE

DIGITAL ECG into INBOX
Clinical Resources in Rural Hospitals for ACS Management

3. Universal Access to Single-Bolus, Fibrin Specific Thrombolytic

- Tenectaplase (Metalyse)
- 24/7 availability in every hospital, RFDS Pt Augusta, other sites
Clinical Resources in Rural Hospitals for ACS Management

4. Extended POCT Pathology

- Troponin T
- Pro BNP
- D-Dimer
- Hb, WCC
- Na, K
- Creatinine
- Glucose
- HbA1c
- Lactate
- ABG (pO2, pCO2, pH)
- LFT
- Lipids
- Coagulation - INR

Cobas
Epoc
Hemocue
Accu-check Inform II
iStat
Clinical Resources in Rural Hospitals for ACS Management

5. Cardiology Consultant Advice
   - 24/7 service
   - aim <10 min response time
   - single statewide telephone number
   - Ph 83781133
   - Or option #1 MedStar Ph 13STAR
   - Built-in redundancy (up to five layers, 5 minute programmed escl cycle)
6. **Seamless Transfer to Tertiary Cardiac Care for High Risk Patients**

- Common clinical pathways
- Shared formulary and medication protocols
  - IV GTN
  - IV Tirofiban
- Integrated care between:
  - Rural hospitals
  - Rural doctors, nurses, allied health
  - Tertiary specialists and cardiology services
  - Ambulance service
  - Aeromedical Evacuation and Medical Retrieval services
Digital TeleHealth Network (DTN) Video-Conferencing

- Low risk (Troponin negative) chest pain assessment
- No doctor on-site
- ED resuscitation assistance
- Complex inpatients not for transfer (palliative care)
- Routine follow-up and urgent new consultations
- Remote support for GP based Exercise ECG testing
- Tele-auscultation
- POCT training, accreditation, technical support
- Continuing Medical Education

How it Works

1. Auscultating clinician auscultates patient
2. Bluetooth technology uniquely sends sound to software
3. Software sends a signal, remote desk device provides vision in real time to a remote consultant in the PC
4. Consultant:
   - Readily shares in real-time
   - Acquire & send imaging of remote auscultoscope
   - Controls their own volume level
   - Guides auscultating clinician using “think through” feature
SA Rural Pathology Characteristics

- Most hospitals without on-site Laboratory
- 50-600s km distance to Lab
- Increased risk of pre-analytical errors
- Unacceptably long turn-around times
- Low throughput per site
- High specimen transport cost

Current recommendation from American College Cardiology/American Heart Association Guidelines (Circulation 2000) is that cardiac marker results be available within 60 minutes and preferably within 30 minutes.

Conclusion: Unable to risk stratify patients in rural centres presenting with chest pain/possible ACS without access to point-of-care pathology.
Rural Emergency POCT

- Troponin T
- NT-proBNP
- D-Dimer
- Hb, WCC with diff
- Na, K
- Creatinine
- Glucose
- HbA1c
- Lactate
- ABG (pO2, pCO2, pH)
- LFT
- Lipids
- Coagulation – INR
- CRP
- Stroke panel
- Strep A
- BHCG
- Fibronectin
The Role of an Integrated Clinical Network in Provision of POCT

• Evaluation and choice of platform
• Provision and technical support of equipment
• Consumable supply (purchasing power)
• Staff education / training / accreditation
• Quality control and quality assurance
• Sharing of operational information between providers, eg. funding, practice organisation
• Networked results management (in process)
• Research – clinical, population and health service outcomes
Elecsys vs Cobas h232

N=166
Cobas h232 = 27.5 + 0.91 hs TropT
hs TropT vs cobas h232

- 4665 paired results for 805 patients
- 107 numerical result did not agree (2.3%) involving 62 patients
  - 9 patients (1%) different clinical picture
  - 26 patients 50-100 ng/L on cobas <14 on hsTropT
    Reported to Roche as was an unusual finding only affecting 2 machines and one lot number – swapped out and no further issue
  - 27 patients with chronic release hs Troponin (50-100 on cobas h232)
Troponin T Quality Program

cobas h232 (Troponin T)

**Internal Quality Control**

Internal quality control should be tested a minimum of once (1) per month.

Quality control results should be recorded on the quality control sheet provided by iCCnet CHSA and faxed to the iCCnet CHSA office on 08-8201 7850 during the first week of each month.

**External Quality Control**

External quality controls for the year will be sent to each site in January/February along with a result reporting schedule. The sheet provided with external quality controls will show which sample should be run each month and the due date. If using NT-proBNP strips at your site, the same sample is tested for NT-proBNP after the Troponin test.

External quality control samples should be run before the due date and results faxed to the iCCnet CHSA office 08-8201 7850.

**IQC Check**

The IQC should be performed a minimum of once (1) per day, alternating between the two (2) levels.
Internal Trop T Results

CV % over 70 Instruments – 19.5%
66% Sites Report CV <20%
EQA Troponin Report
Regional In-Hospital ACS Deaths

Financial Year

% In-Hospital ACS Deaths

Southern Metro (Moving Average) - - South East (Actual) - - South East (Moving Average)

iCARnet
Commenced April 2001
Regional network fully operational

Regional network fully operational

iCARnet
Commenced April 2001

Regional network fully operational
Impact of a regionalised clinical cardiac support network on mortality among rural patients with myocardial infarction

Philip A Tideman, Rosy Tirimacco, David P Senior, John J Setchell, Luan T Huynh, Rosanna Tavella, Philip E G Aylward and Derek P B Chew

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Appendix 3: Temporal change in 30-day mortality within metropolitan and rural areas, combined with the proportion of rural patients treated in ICCNet enabled hospitals in South Australia from 2001 to 2010.
30-day Mortality

- Risk adjusted Odds-ratio for death at 30 days post MI for rural vs metro patients:
  - 2001: 1.69 (95% CI, 1.40-2.04; P <0.001)
  - 2010: 0.92 (95% CI, 0.75-1.13; P=0.44)

- Implementation of iCCnet model of care in rural hospitals was associated with a 22% reduction in 30 day AMI mortality
PoCT Pathology: How to Use

• Clinical Integration
  – The provision of POCT was essential but not sufficient alone for optimal outcomes in rural and remote settings
  – POCT should be part of an integrated approach to clinical practice improvement initiatives.
Improving Access to Quality Care

• Time critical processes of care
• Geographic isolation
  • Distance, low population density, climatic conditions, limited infrastructure
• Socio-economic disadvantage
  • Developed countries
  • Developing countries
• Other causes of isolation
  • Very large populations with low density of appropriately trained and skilled clinicians