The Critical Role of POCT in Setting up a Cardiovascular Clinical Network

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IFCC POCT Pathology Symposium, Cancun Mexico, 16 -17 Nov 2015
Synopsis

• Health Inequality and Access to Care
• What is a Clinical Network
• The Integrated Cardiovascular Clinical Network in South Australia
• Evaluation and Outcomes in Overcoming Health Inequality in South Australia
• The Expanded Role of POCT in Rural and Remote Health Care Delivery
UN Inequality Adjusted Human Development Index 2013

Access to Care Barriers

Socio-economic
  • The poor – education, employment, income, housing, transport
  • Women, children and the elderly

Ethnic
  • Minority and indigenous groups

Geographic
  • People who live in rural or remote/isolated areas

Infrastructure
  • Poor health facilities, communication, transport, power

Workforce
  • Lack of or insufficient capacity of the healthcare workforce
The Global Health Challenge

• Building healthy populations and strong communities through improving access to healthcare for everyone
• New systems of care
• New technology
  • Digital information collection, analysis and sharing
  • New diagnostic technology
  • New drugs
Global Family Medicine

• Looking after individuals and families across the life span:
  – Mothers, new-born, and infants
  – Young children
  – Teenagers and young adults
  – Adults of working age
  – Older Adults
  – The Elderly

• Only primary health care combined with appropriate specialist medical support and universal health insurance cover can deliver this
Geography and Demographics

South Australia

- Area 980,000 square km
- Population 1,600,000
Australian Population Outcomes

CHD Mortality Trends Australia 1959-2003

- 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 amongst younger age groups

Sexton and Sexton, MJA 2000; 172: 370-4
Mexico and Australia

Mexico
- Area: 1,980,000 km$^2$
- Population: 121,000,000
- Overall pop density: 61/km$^2$

Continental Australia
- Area: 7,660,000 km$^2$
- Population: 22,400,000
- Overall Population Density: 3.2/km$^2$
South Australia
Flinders Medical Centre & University

- One of 3 large tertiary public hospitals in Adelaide
- 500 bed teaching hospital co-located with University
  - CCU
  - Cardiology general
  - Cath Lab – 3
  - Cardiothoracic Surgery
- 160 bed private hospital
South Australia Country Health Workforce is Primary Care

- Rural and Regional SA
  - Population – 420,000 (28% SA)
  - Acute Care – 66 hospitals, 1400 beds
  - Internal medicine specialists - 5
  - GPs – 424
  - GP registrars – 41
  - Salaried Drs - 46
  - Nurses – 3000

Adelaide
- Pop 1,070,000

Remote: area ~ 600,000 km²
- pop 20,000
- mining, energy, pastoral
- rainfall 100-200mm/yr

1200 km
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A Clinical Network

- Clinical networks are a catalyst for achieving improving healthcare delivery:
  - “... a social-professional structure made up of doctors, nurses and allied health staff tied through... collegiality, friendship, referrals, function or common interest”
  - “..a device for culture change” (Braithwaite 2010)
  - “to provide integrated cost-effective, equitable services and the best clinical outcomes and ... improved patient experience from the perspective of an entire patient pathway”.

Cunningham and Braithwaite 2010
Clinical Networks

• Aim - improve outcomes at various levels:
  • Patient outcomes – esp clinical
  • Practitioner/Health Service outcomes
  • Community/Population outcomes
A Clinical Network

• Find out what works – the evidence base
• Talk to those who actually deliver the care about what works – CME
• Ask these practitioners what they would need to deliver what works – needs analysis
• Give them what they need to do the job
  – Implementation: clinical tools
  – clinical systems
  – Evaluate and implement new technologies to make the job easier and more satisfying
• Measure and evaluate the outcomes, feedback the results to the practitioners and seek their feedback - CQI
Continuous Practice Improvement

Evidence Based Medicine

Care providers

Outcomes

Interventions

Executive Sponsorship

Multi-disciplinary team

Performance Indicators

Comparison of practice with benchmark

RCTs

Local Guidelines

Clinical Pathways

Clinical Leadership

Measurement Systems

Local Evidence

Multi-disciplinary

Ref: Prof Drew Fitzpatrick, TASC, NSW Dept of Health
Role of the Provider Clinical Network

- Provide Clinician leadership and engagement
- Co-ordinate and integrate care – vertical and horizontal, multi-disciplinary, across the continuum of care
- Focus on comprehensive care within an appropriate service delineation framework
- “Grass-roots” and patient focused
- Incremental change
- Open, two way communication across sectors
- Encourage mutual responsibility and professional trust
- Accountability for outcomes
- Provide adaptability and sustainability
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Aims & Objectives

• Eliminate disparities in CVD outcomes between metropolitan and non-metropolitan populations
• Support the primary care doctor/nurse in diagnosis and evidence-based management of acute cardiac conditions
• Enhance the clinical effectiveness of the primary care team through the provision appropriate CME, clinical resources and clinical systems
Clinical Network Operations: Critical Components

• Workforce
  • Medical
  • Nursing
  • Allied Health
  • Administrative and Technical support

• Systems of Care
  • Clinical Tools and Clinical Systems

• Education, Training and Skills Maintenance

• Routine data collection, analysis and feedback
Clinical Tools and Systems

• Evidence based Clinical Pathways
• ECG recording, transmission and interpretation
• Point-of-Care Pathology
• Provision of 3rd generation, fibrin specific thrombolytic medication for STEMI
• Adjunctive and NSTEACS medications
• Shared Electronic medical records / databases
• Cardiology Consultant Advice 24/7
Evidence-based Clinical pathways

1. **Integrated, Evidence-based Clinical Pathways**
   - Immediate Steps
   - Initial Diagnosis and Risk stratification
   - Initial Treatment
   - Further Diagnostic Testing and Risk Stratification
   - Final disposition
   - Chest pain / ACS
   - SOB / CHF
   - AF
ECG Management

• Recording, distribution, interpretation, and storage of high quality ECGs
• Digital ECG systems assist:
  • Recall of old ECGs
  • Serial comparison of current ECGs
  • Distribution of high quality ECGs to multiple providers
  • Integration of ECG into EMR
Point-of-Care Pathology

- Acute care
  - Troponin T
  - Pro BNP
  - Hb, wcc
  - Na, K
  - Creatinine
  - Glucose (and Ketones)
  - Lactate
  - ABG (pO2, pCO2, pH)

- Chronic care
  - Lipids
  - HbA1c
  - Coagulation – INR
  - Ambulatory BP
Thrombolysis for STEMI

Universal Access to Single-Bolus, Fibrin Specific Thrombolytic

- Tenectaplaste (Metalyse)
- 24/7 availability in every hospital and emergency medical facility
Cardiology Consultant Advice

- 24/7 service
- aim <10 min response time
- single statewide telephone number
- Built-in redundancy
Integrated Emergency Medical Transport

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

RFDS Base, Pt Augusta
Digital TeleHealth Network Video-Conferencing

- POCT training, accreditation, technical support
- Continuing Medical Education
  - ECG
  - Clinical Pathways
  - Secondary prevention
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Regional In-Hospital ACS Deaths

Financial Year

% In-Hospital ACS Deaths

91/92 92/93 93/94 94/95 95/96 96/97 97/98 98/99 99/00 00/01 01/02 02/03 03/04 04/05 05/06 06/07

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

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

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
The Major Lessons

• The provision of POCT was necessary (critical) but not sufficient alone for the success of this practice improvement initiative.

• POCT should be part of an integrated approach to practice improvement initiatives.

• This applies to office based POCT just as much as Emergency settings.
Provider Clinical Network: Critical Factors for Success

- Multi-disciplinary
- Co-ordinated and Integrated care – vertical and horizontal focused on Primary Care
- Clinician leadership
- Executive buy-in
- Evidence based care
- Continuous Practice Improvement – safety and quality
- Incremental change
- Comprehensive care within an appropriate service delineation framework
- Harnessing and appropriate use of new
Primary Care Focused Clinical Network

3 important and unique characteristics in clinical change:

• Engagement of care providers
• Adaptability
• Sustainability
The Continuum of Care - Rural

- Public Health
- Primary Prevention
- Acute Care
- Rehabilitation
- Secondary Prevention
- Chronic Disease Management
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POC Tests Useful in Acute Care

- Myoglobin
- CKMB mass
- Cardiac Troponin T or I
- BNP / Pro-BNP
- Hb (or Hct), Plat, WCC
- Elec (K+), Creat., LFT, BGL
- ABG
- D-dimer
- INR

- Beta-HCG
- Stroke panel
- Perioperative renal function
- Substance abuse toxicology
- Infectious diseases
POC Tests Useful in Ambulatory Care

- INR
- BNP/pro-BNP
- Lipids
- BGL, HbA1c
- Urinary ACR
- CRP
Conclusions

• Improving CVD outcomes for disadvantaged populations requires new systems of care and technology
• POCT Pathology is an essential part of the solution
• It requires an integrated clinical and health service approach
• Clinical Networks are fit for purpose in this regard
POCT Information Flow in an Integrated e-Health System
Aggregating Digital Clinical Data Sources

- All POC Pathology
- Digital ECG
- Decision Support Tools
- Cardiac Rehab
- Home Telemonitoring
iPOCCS

- A system designed to
  - Record and chart patient test results
    - PoCT Blood tests
    - ECGs
    - Ultrasounds etc
  - Generate Patient Reports
  - Download and Chart Quality Control results
  - Order consumables & track usage
  - Enable real time access for GPs & specialists outside of the health network
  - Prevent transcription errors
Quality Control Process

- QC barcode
- QC Test performed using barcode
- PoCT instrument downloaded
- QC result charted and recorded in iPOCCS

Trop QC 1
ECG Process

Patient record on iPCCS

ECG Details
Name: John SMITH
DOB: 11/09/1956
UR: 123456ABC

Patient Details entered

ECG performed

Downloaded as normal

ECG in iPCCS
QC Charting

Integrated Cardiovascular Clinical Network (CNSA)

Quality Control Results

Site: Angaston Hospital
Device Type: ALL
Test Type: Troponin T

Date From: 23/09/2012 08:27
Pathology Request System
Basal Bolus Insulin

- BBI protocol built in to iPOCCS
ADULT BASAL-BOLUS INSULIN CHART

Not for use during pregnancy.
For subcutaneous basal-bolus insulin regimens. Do not use in conjunction with IV insulin infusions.
Record Blood Glucose Levels (BGL). Daily ketones if prolonged fasting. BGL >16mmol/L or acutely unwell.

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>BGL</th>
<th>Slp</th>
<th>Knows</th>
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INSULIN DOSES TO BE REVIEWED DAILY
ULTRARAPID INSULIN WITH MEALS (INCLUSION)
Clinic prescribed ultra-rapid insulin
Humanolog NovoRapid

<table>
<thead>
<tr>
<th>BGL,7000h, Lunch=1200h, Dinner=1700h</th>
<th>DATE</th>
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<td>4</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Slp</th>
<th>Dinner Name:</th>
<th>Date:</th>
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HOLD DOSE IF FASTING
Administer immediately before or with meals.

CORRECTIVE ULTRA RAPID INSULIN
Only needed if BGL > 16mmol/L. If a correction dose is required, use the same type of ultra-rapid insulin as above. This dose can be combined with the above ultra-rapid dose for administration.

<table>
<thead>
<tr>
<th>BGL (mmol/L)</th>
<th>Dose Insulin</th>
<th>DATE</th>
</tr>
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<tbody>
<tr>
<td>&lt;10</td>
<td>none</td>
<td>0700</td>
</tr>
<tr>
<td>10.1-15</td>
<td>2 units subcutaneously</td>
<td>1200</td>
</tr>
<tr>
<td>&gt;15</td>
<td>6 units subcutaneously</td>
<td>1700</td>
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<table>
<thead>
<tr>
<th>Slp</th>
<th>Date</th>
<th>Name (print)</th>
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GLARGINE (Lantus) INSULIN
Basal requirement

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<thead>
<tr>
<th>Slp</th>
<th>Name</th>
<th>Date</th>
<th>Sig.</th>
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</table>

If BGL<4mmol/L correct as per hypoglycemia management protocol but continue with charted insulin dosing above.
Nova StatStrip Meter

- **Glucose**
  - Sample size 1.2 µL
  - Result in 5 seconds
- **Ketones**
  - Sample size 0.8 µL
  - Result in 10 seconds

- Room temperature strip & QC storage
- Network Connectivity
- Rechargeable batteries
ADULT BASAL-BOLUS INSULIN CHART

Not for use during pregnancy.

For subcutaneous basal-bolus insulin regimens. Do not use in conjunction with IV insulin infusions. Record Blood Glucose Levels (BGL). Daily ketones if prolonged fasting, BGL>15mmol/L, or acutely unwell.

<table>
<thead>
<tr>
<th>DATE</th>
<th>02/12</th>
<th>02/12</th>
<th>02/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>12:08</td>
<td>12:31</td>
<td>12:48</td>
</tr>
<tr>
<td>BGL</td>
<td>10.2</td>
<td>13.4</td>
<td>11.7</td>
</tr>
<tr>
<td>Sig:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketones</td>
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</tbody>
</table>

Notify MO if BGL <4 or >20

INSULIN DOSES TO BE REVIEWED DAILY

ULTRA-RAPID INSULIN WITH MEALS (subcutaneous)

Circle preferred ultra-rapid insulin

Humalog  Novorapid

HOLD DOSE IF FASTING
Administer immediately before or with meals.

<table>
<thead>
<tr>
<th>B'fast</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Name:</th>
<th>DATE</th>
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<tbody>
<tr>
<td>0700</td>
<td>1200</td>
<td>1700</td>
<td>0700</td>
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<td>1200</td>
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<td>1700</td>
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units  units  units  Date:....../....../......
Warfarin Online Tool

- Manage patients through warfarin initiation
- Ongoing into warfarin maintenance
- Warfarin initiation based on the Age Adjusted Warfarin Initiation Protocol
- Based on PoCT INR results

Warfarin Online Tool

- Patient details from iPOCCS record
- Inbuilt risk calculators
- Contraindications must be checked before proceeding
- PoCT INR result entered
- Dose prescribed
Warfarin Online Tool

**CHA\textsubscript{2}-DS\textsubscript{2}-VASc calculator**

- Calculation of yearly stroke risk

<table>
<thead>
<tr>
<th>RISK FACTORS</th>
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</thead>
<tbody>
<tr>
<td>Age in Years</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Congestive heart failure</td>
</tr>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Stroke/TIA/thrombo-embolism</td>
</tr>
<tr>
<td>Vascular disease</td>
</tr>
</tbody>
</table>

**HAS-BLED calculator**

- Calculation of yearly bleeding risk while on warfarin

<table>
<thead>
<tr>
<th>RISK FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Abnormal liver function</td>
</tr>
<tr>
<td>Abnormal renal function</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Bleeding</td>
</tr>
<tr>
<td>Lébide BVRs</td>
</tr>
<tr>
<td>Elderly (Age &gt; 65)</td>
</tr>
<tr>
<td>Drugs</td>
</tr>
<tr>
<td>Alcohol</td>
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</tbody>
</table>

**Risk of stroke per year**

- **3.2 %**
- Score = 3 points

Stroke risk was 3.2% per year according to Yip et al's 2010 stroke study and the European Society of Cardiology's guidelines.

A 2 score or greater is "moderate-high" risk and should otherwise be an anticoagulation candidate.

**Risk of bleeding while on warfarin per year**

- **4.1 %**
- Score = 2 points

Risk was 4.1% in one validation study and 1.02 bleeds per 100 patient-years in another validation study.
Warfarin Online Tool

**Patient Warfarin - Ongoing**

**Name:** SMITH, John  
**DOB:** 23/05/1952  
**Age:** 62  
**UR Number:** 100564

**Day 5.**  
**Please follow these steps:**

**Age:** 62  
**Date/Time of INR:** 16/03/2015 09:00  
**INR result:** 2.4  
**Warfarin Dose:** 4.5 (mg)

Perform PoCT INR 23/03/2015 between 6:00 am and 10:00 am (Weekly).

**Clinical Comments:**

Useful Links:  
- PoCT sampling tips  
- Complications?  
- Patient Warfarin Information