Broadband Satellite based Tele-Eye care

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The Health Gap between Urban and Remote Australia
People in Rural Australia have higher mortality rates...

Mortality ratios compared with Major Cities, by place of residence: 2004-06

More hospital admissions...
Admissions per 1,000 population, by place of residence 2007-8

Project Stakeholders

• Department of Health

• WA Health/ WA Country Health Service

• Australian Society of Ophthalmologists:
  • Indigenous Remote Eye Service (IRIS)

• Queensland Health:
  • Torres Strait-Northern Peninsula Hospital & Health Service
Project Objectives

• Connect ophthalmologists to patients with eye conditions in rural and remote WA (600 patients) and Queensland (300 patients)

• **Goal:** Demonstrate a sustainable model to continue service provision after the trial

• Secondary objectives:
  • A model that could be expanded to other medical specialties and services.
Trial Locations

Goldfields & Great Southern
Laverton, Leonora
Norseman, Ravensthorpe
Sites:

WA:
- Laverton
- Leonora
- Norseman
- Ravensthorpe

Qld:
- Thursday Island
- Badu Island
- Bamaga
Tele-eye Care Delivery Model

Patient & health worker at remote location

Phase 2: local server for
• automated DR grading
• Clinical decision support

Store & forward image reading for routine cases

Tele-eye care server

Videoconferencing for trauma, urgent & complex cases

City-based Ophthalmologist
Imaging Device for Tele-Eye Care

• Fully automated fundus camera with autofocus and take photos automatically - DRS
REMOTE-I System: Video Conferencing with Store/Forward and mobile Platform...
Clinical Protocol

- One Fundus image/eye of Field of View 60 degrees and macula centered

- If not clear image then obtain Red-reflex image for cataract

- Visual acuity
Workforce Training

Training in WA:
Local workers are switched on and keen on participation
Tele-eyecare promotion
100 patients requested appointments
Patient Referral Pathway

Satellite / Broadband Location

1. Patient screened and image taken
2. Collect GP/Optometrist Details
3. Screener send assessment to Specialist
4. Screener gets and alert about the outcome and check in Remote-I
5. If Referral required
   - Yes: Screener write advice letter to GP/Optom to refer the patient to ophthalmologist
   - No: Screener inform the patient of outcome and advice of next visit
6. Screener primary care provider Send referral letter to patient to see an ophthalmologist

Specialist Location

1. Specialist review the assessment
2. Specialist provide diagnosis comments in Remote-I
Outcome – Satellite Tele-EyeCare

• We exceeded the target numbers – 900 patients
  • In WA – 800 patients screened
  • In QLD – 288 patients screened

• 344 of them are Aboriginal people

• Almost 50% of the images from DRS not gradable
  - we built a quality control software to avoid bad quality images

• 82 cases with diabetic retinopathy (10%) and 8 of them with severe or sight threatening DR

• If this kind of service is not available some of them would have gone blind
Cost benefit– Satellite Tele-EyeCare

• Cost benefit analysis
  • In WA – $28,000/ month savings
  • In QLD – $22,000/ month savings
Issues in rolling out Tele-eye care

• Tele-ophthalmology is not part of the main stream healthcare delivery
  • Ophthalmologists part of public health system not required to read images
  • Who read images?

• No Fee for Service for private ophthalmologists
  • Private ophthalmologists not interested
  • Only champions provide service until they burnout

• Increasing the workload
  • screening will identify many who need monitoring and treatment
NEXT PHASE: Automated Reading & Referrals
Funded by NHMRC in 2015

• No fee for reading available & not many ophthalmologists

• Use computer-aided grading of images for diabetic retinopathy – **disease (mild, moderate or severe) / no disease**
  – To empower the screeners and primary care providers
**Automatic DR grading workflow - Dr.Grader**

WA and National ICT awards for

1. **Automatic DR features detection**
   - Detected MAs (green contours)
   - Detected HMs (green contours)
   - Detected EDs (green contours)

2. **Automatic summary report generation**
   - Summary report
     - Information of MAs, HMs, and EDs in 4 quadrants and 3 macular regions.

3. **Evaluate the report according to DR severity scales**
   - Less MAs (4 MAs)
   - Less HMs (19 HMs; in each quadrant, the number of HMs < 20)

   3.1. **DR level**
     - Moderate NPDR

   3.2. **DME level**
     - Severe DME

4. **Generate DR grading report**
   - 2 EDs in macular center
   - 12 EDs in macular 2DD region

**American Academy of Ophthalmology (AAO)**
**NHMRC, Australia**
- International clinical diabetic retinopathy disease severity scale
- International clinical diabetic macular edema disease severity scale
• Tested the algorithms on 21 patients
  • Sensitivity and Specificity > 85%

• Presently working to improve detection rate and test on entire database
Thank you

“Gentlemen, we have run out of money. It is time to start thinking.”

Winston Churchill, 1874-1965
UK Prime Minister

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