Diabetic retinopathy screening in remote communities

A futuristic outreach model

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Diabetic retinopathy (DR)

• The leading cause of preventable blindness\(^1\)

• Up to **50%** of people with proliferative DR who do **NOT** receive timely treatment will become legally blind within **5 years**\(^2\)

• **98%** of visual loss can be prevented with early detection & treatment. However once it has progressed vision loss is often permanent\(^3\)
DR screening

- NHMRC DR screening guidelines recommend that all Australian diabetics undergo at least biennial screening\(^4\)

- <50\% of Australian diabetics receive appropriate screening\(^5\)

- 36\% of diabetic patients have NEVER had an eye examination\(^6\)

- Only 20\% of Indigenous diabetics had an eye examination in the last 12 months\(^7\)

- ~70\% of images captured show no DR\(^8\)

- Good sensitivity & specificity of non-ophthalmologist graders\(^9\)\(^-\)\(^11\)

- The prevalence of diabetes in rural areas is increasing\(^12\)

- Growing demand for ophthalmology services (aging population)\(^13\)
The Remote Outreach DR Screening (RODRS) service

Locations of visiting optometry and ophthalmology services

- Diabetic patients are identified from a chronic disease database & invited for screening via the telephone
- Community posters & local health workers promote the service

RODRS Service

- A registered nurse & IHW travel by four-wheel drive to communities
- Joined by diabetes educator, podiatrist & dietician

Screening visit:
- Patient history
- HbA1c, cholesterol, BP, BMI, visual acuity
- Fundal photography with a non-mydriatic camera
**Aims**

1. To compare the proportion of those patients screened by the program who underwent appropriate* DR screening prior to and following the implementation of the program.

2. To identify the proportion of screened patients with mild, moderate or severe NPDR and PDR.

3. To explore the acceptability of the program to patients, health professionals and other key stakeholders.

*Note: Appropriate is DR screening in line with the NHMRC guidelines.*
Methodology

**Phase 1: Systematic review**
International rural remote DR screening models

**Phase 2: Quantitative study**
Review of clinical DR screening data

**Phase 3: Qualitative study**
Semi-structured interviews exploring the acceptability of the service to patients & health professionals

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**Phase 2: Quantitative study**

**Population**
All patients with diabetes mellitus (type 1, type 2) aged ≥18 years, attending DR screening in 11 remote communities

**Exclusion criteria:**
- No perception of light in either eye
- Terminally ill or too unwell to participate
- Physical or mental disability preventing screening or treatment

**Sample size**
218 screening episodes (141 patients)

**Study period**
April 2012 – December 2014
Phase 2: Quantitative study

**Data collection**

**Screening data:**
- Demographics
- HbA1c, BP, visual acuity
- Previous DR screening
- Image adequacy
- DR detection (and severity)
- Other pathology
- Ophthalmology referral

**Queensland Health community health data:**
- Diabetic population coverage

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**Phase 2: Quantitative study**

**Data analysis**  
SPSS (version 22)

- Summary statistics
- Bivariate associations:
  - Chi-square tests (gender, ethnicity)
  - Mann-Whitney U (age, HbA1c)
  - Independent sample t-test (BP)
- Screening prior to & following implementation:
  - McNemar’s test
    (p-value ≤0.05 = significant)
Quantitative: Participant profile

<table>
<thead>
<tr>
<th></th>
<th>n = 141</th>
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<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58.2%</td>
</tr>
<tr>
<td>Female</td>
<td>41.8%</td>
</tr>
<tr>
<td><strong>Indigenous status</strong></td>
<td></td>
</tr>
<tr>
<td>Non-indigenous</td>
<td>76.5%</td>
</tr>
<tr>
<td>Indigenous</td>
<td>23.5%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Median (IQ range)</td>
<td>63 years (19)</td>
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<table>
<thead>
<tr>
<th></th>
<th>High risk of DR (^1,1^{14})</th>
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<tbody>
<tr>
<td><strong>Duration of diabetes</strong></td>
<td>Duration &gt;10 years</td>
</tr>
<tr>
<td></td>
<td>32.1%</td>
</tr>
<tr>
<td><strong>HbA1c</strong></td>
<td>≥8%</td>
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<tr>
<td></td>
<td>28.5%</td>
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<tr>
<td><strong>Hypertension</strong></td>
<td>Systolic BP ≥150mmHg</td>
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<tr>
<td></td>
<td>25.9%</td>
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<tr>
<td></td>
<td>Diastolic BP ≥90mmHg</td>
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<tr>
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<td>32.4%</td>
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AIM 1: DR screening rates

- **Appropriate**: 16.3%
- **Inappropriate**: 15.5% 1.5% 36.2% (53.2%)
- **Unknown**: 30.5%

DR screening prior to the implementation of the RODRS service

1 - <5years  ≥5years No prior DR screening
**AIM 1: DR screening rates**

Patients who received appropriate DR screening

- **NO significant difference** between patients who underwent appropriate screening based on:
  - Gender (1.216; 1df; p=0.27)
  - Indigenous status (0.007; 1df; p=0.93)
  - Age (z=−1.84; p=0.07)
  - HbA1c (z=−0.37; p=0.71)
  - Systolic BP (t=−0.29; p=0.77); or
  - Diastolic BP (t=−0.74; p=0.46)

- **AIM 1:**
  - DR screening rates
  - Service implemented: 66.3% of patients
  - Patients who received appropriate DR screening: 16.3% of patients
  - (p=0.00025)

**AIM 2: DR detection and referral**

- **AIM 2:**
  - DR detection and referral
  - Ophthalmology referral: 28.2%
  - No DR detected: 58.9%
  - DR detected: 24.3%
  - Inadequate image: 16.8%
Proportion of screening episodes requiring re-screening due to inadequate images

**Image Quality**

- **2012**: 5.9%
- **2013**: 26.5%
- **2014**: 6.0%

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**DR detection**

- **Duration of diabetes >10 years**
  - DR detected in **37.21%** of patients (>10yrs) vs. **15.79%** (<10yrs)
  - *(7.798; 1df; p=0.005)*

- **HbA1c ≥8%**
  - DR detected in **39.34%** of patients (HbA1c ≥8%) vs. **18.12%** (<HbA1c <8%)
  - *(10.602; 1df; 0.001)*

**NO statistically significant association** between detection of DR and:

- Absence of appropriate screening prior to intervention *(0.525; 1df; p=0.47)*
- Blood pressures
  - ≥90mmHg diastolic *(0.363; 1df; p=0.547)*
  - ≥150mmHg systolic *(3.447; 1df; p=0.063)*
### Phase 3: Qualitative study

**Participants**
- 14 patients
- 6 health professionals
- 3 key stakeholders

**Data collection**
Semi-structured interviews (face-to-face, telephone) explored the acceptability of the model

**Data analysis**
- Interviews were transcribed and coded using Nvivo
- An iterative process of thematic analysis

**Health professionals**
1. Eye screening coordinator
2. Registered nurse screener
3. Indigenous outreach worker
4. Diabetes educator
5. General practitioner grader
6. Buddy ophthalmologist

**Key stakeholders**
1. Visiting ophthalmologist
2. Optometrist
3. Director of health district

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**Aim 3: Explore the acceptability of the program to patients and health providers**

**Key themes:**
1. Improved access to DR screening
2. Efficiency, financial implications and sustainability
3. Quality and safety
4. Provision of a multi-disciplinary diabetes service
5. Training and education
6. Operational elements of service delivery
7. Communication, information sharing and linkages
8. Coordination and integration of the service
9. Suggested improvements to service delivery
Community based service
Focus on preventative health

Governance & duty of care
Eye screener & GP training
Patient education
Detection of other pathology
Method of screening & service delivery

Health personnel
Training, education
Multi-disciplinary diabetes care
Operational infrastructure
Service promotion & patient identification

Health professional (HP)

Benefit
Benefit and challenge
Challenge

Quality & Safety

HP*

HP* & patient

Patient

Operational

Eye screening coordinator
GP grader
Nurse screener

Communication, integration, coordination

PHC / local health workers
Patients
Optometrist

Local employment agencies
Allied health professionals

‘Buddy’ ophthalmologist
Other visiting ophthalmologist

Key
Health professionals involved in the RODRS service
Health professionals / community organisations external to the RODRS service
Represents poor or absent communication
Represents some communication and linkage but some issues raised
Represents good communication and linkages
Could not be determined

*Health professional (HP)
Broader literature

- **Aim 1**: DR screening rate **66.3%**
  - <50% of Australian diabetics receive appropriate screening\(^5\)

- **Aim 2**: DR detected in **24.3%** of screening episodes
  - Other rural remote Australian studies 11% to 45% (majority 16-18%)\(^{15-18}\)

- **Aim 3**: Patient acceptability
  - **Similarities**\(^{19,20}\) & **differences**\(^{19,21}\)
    - Close service proximity
    - Positive financial consequences
    - Health personnel
    - Service quality
  - **Differences**
    - Screening methods that allowed immediate results
    - Camera technology
    - Culturally sensitive practices

Clinical significance

- Quadrupling of the proportion of patients undergoing appropriate DR screening → prevention of blindness!
- Efficient use of specialist services & uses existing infrastructure
- Highly acceptable to patients and health professionals:
  - Equitable
  - Locally appropriate
  - Multi-disciplinary
  - Sustainable
- The Medical Services Advisory Committee has recently recommended an MBS item number for non-mydriatic retinal photography\(^{22}\)
Dissemination of results

Publications


Acknowledgements

- Dr Lisa Crossland
- Professor Sarah Larkins
- RODRS team
Questions?

“I think it is a great model and it should be emulated elsewhere around Australia.” [Health professional]

“I have seen people coming up here to this test who would normally never come and it is all because of the project delivering to the community needs.” [Patient]

“This new model allows ownership of the system, involves the people... the GPs have ownership of the programme and the nurses have ownership...it’s about devolving responsibility back to the local level.” [Health professional]
Theme 1: Improved access

Benefit *(Health professionals, patients)*

- **HP**
  - Without the service many patients would NOT undergo screening due to large travel distances, lack of transportation & negative financial consequences.

- **Patients**
  - Close proximity of the service to their homes
  - Avoidance of the need to travel
    - Large travel distances, a lack of public transport, many patients do not have access to a car and those who were disadvantaged or unwell.
  - Direct transport of patients from their homes to the clinic
  - Working population previously had difficulty accessing out-of-town screening services due to its operation during working hours

*Health professional (HP)*
### Theme 2: Efficiency, financial implications, sustainability

**Benefit** [Health professionals, patients]

**Greater efficiency & positive financial implications**
- **HP**
  - Utilising specialist workforce for treatment rather than screening
  - Saving on PTS
  - Delivering a preventative health service that saves the health dollar in the future
- **Patients**
  - ↓ travel costs, avoiding lost income following absences from employment

**Sustainability**
- **HP**
  - ALL thought it was sustainable & believed it could be successfully trialled in other rural remote communities
  - BUT needed to be flexible and adapt to local needs and other health services.
- **Patients**
  - ALL found the model to be acceptable & intended to return to screening, except one (‘flash of the camera’)

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### Theme 3: Quality and safety

**Benefit** [HP, patients], **Challenge** [HP]

**Benefit [HP, patient]**
- Community-based service delivery
  - Using local workforce led to community-ownership, equitable
- Focus on preventative health (diabetic-related blindness, detection of other complications of diabetes, detection of other cardiovascular risk factors & intervention time)

**Benefit [HP]**
- Detection of other ophthalmic pathology

**Challenge [HP]**
- Clinical governance & duty of care (difficult referring to GP)
Theme 4: Multi-disciplinary care

Benefit [HP, patients], Challenge [HP]

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Challenge</th>
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<tbody>
<tr>
<td>HP</td>
<td>Time inefficiencies</td>
</tr>
<tr>
<td>• ↓ visits to the health centre</td>
<td>• ↓ capacity for retinal screening</td>
</tr>
<tr>
<td>• ↓ patient travel</td>
<td>• Logistically challenging (small clinics)</td>
</tr>
<tr>
<td>• Educational benefits for staff</td>
<td>• Time consuming &amp; intrusive for patients</td>
</tr>
<tr>
<td>• Improved team morale</td>
<td>• ‘Information overload’</td>
</tr>
<tr>
<td>• Higher attendance for allied health</td>
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Patient

Did not identify negative experiences (one patient recognised as a benefit)

• Community gathering point & social interaction
• Pupil dilation (driving)
• Logistics overcome by staff flexibility & utilisation of outdoor spaces
• ‘Superclinic’ attendance, interdisciplinary education

Health professional (HP)

Theme 5: Training and education

Benefit [HP, patients], Challenge [HP]

• Benefit (HP)
  • GP training (improved clinical practice outside of model)

• Challenge (HP)
  • Screener training (lack of formal & ongoing training)

• Benefit & challenge (HP & patient)
  • Patient education
    • Benefit: screening clinics provide patient education in diabetes mx, focal talking point for the community could future attendance
    • Challenge: knowledge of screening recommendations

Health professional (HP)
Theme 6: Operational elements of service delivery

1. Service promotion and patient identification
   
   *(Benefit, challenge – HP, patient)*

2. Infrastructure
   
   *(Benefit – patient), (challenge – HP)*

3. Health personnel
   
   *(Benefit – patient)*

4. Method of screening and service delivery
   
   *(Benefit – patient)*

5. Impact on health professionals working in the RODRS program
   
   *(Benefit - HP)*

Health professional (HP)

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Theme 7: Communication, information sharing and linkages

*Challenge [HP]*

Refer to figure
Changes to service delivery

CENTRALISED COORDINATION

- Service expansion (3 rural communities WITH visiting ophthalmology & permanent GP)
- Service changes (1 community WITH visiting ophthalmology)
- Co-service delivery (parallel clinics)
- Delivered at general practices
- DR screening team
- Ophthalmology

All images transferred to GP grader

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Theme 8: Coordination & integration

**Challenge [HP]**

- Poor workforce continuity
- Long time frames from image capture to results feedback
- Timely follow-up of screen-positive patients
  - Many patients not receiving ophthalmology review (suggested improvement: feedback back to coordinator, ‘medical friend’)
  - Integration of screen-positive patients with general ophthalmology patients
- Coordination of screening visits (timing - local employment agencies, optometry visits and ophthalmology visits)
- Needed to be more comprehensive in order to prevent patients being screened by visiting ophthalmologists and to ensure all diabetic patients in the district are accessing screening
- Service overlap & fragmentation of eye care delivery (patients screened through multiple providers & still using ophthalmology - poor use of specialist ophthalmology services in larger rural regions)

Health professional (HP)
Eligible diabetic population screened

Diabetic population screened by the RODRS program

- 2012: 33.7%
- 2013: 41.3%
- 2014: 47.9%

Population screened (%)