Evaluation of the Outback Eye Service

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Outback Eye Service (OES)

Only Ophthalmic Service in North Western NSW (NWNSW)

Image Source:
Past service evaluations – favourable but qualitative vs clinical data\(^1,2\)

- OES’ standards of eye care?
- Is the OES meeting the entire eye care needs of NWNSW?
- Where can the OES be improved based on clinical data?\(^1-4\)
Background: Cataract Surgery Rate (CSR)

- CSR = Number of cataract operations per million persons per year\(^4\)

  - Crude\(^4,5\)
  - Age-Adjusted & Age-Restricted\(^6,7\)

  - Indigenous & Non-Indigenous CSR
  - National CSR (benchmark)
Method 1: OES Evaluation

1. Cross-sectional Audit of OES’ 2015 Clinical Records

2. If standards not met → reasons identified
Method 2.1: CSR Age-Adjustment Analysis

Age-Adjusted Vs Crude CSR
(when compared with National CSR)

Indigenous
Non-Indigenous
Total NWNSW
Method 2.2: CSR Age Restriction Analysis

Indigenous/Non-Indigenous Age-Adjusted CSR Relationship

30+ Group\textsuperscript{6,8} \hspace{1cm} Total Population
Results: OES Service

29 clinics, 9 surgery lists, 789 patients, 1637 visits

- 165 Full Time Ophthalmology Days
- 90 anti-VEGF injections
- 94 HVFs
- 119 surgeries (107 cataract)
- 19 Nd:YAG lasers
- 25 retinal lasers
- 269 OCTs
- 176 Referrals
- Optom – 1485 people 662 spectacles

Source: http://dogr.io/
Results: Patient Demographics

- 30% Indigenous, 36% new (increased access)

- Hometown: 89% main town

- 32% travelled for care
  > Average distance = 198km per year
  > Range = 0 - 4378km!
  > Transport assistance
  > Service expansion

Source: https://www.travelwheels.com.au
## Results: Eye Disease Prevalence

<table>
<thead>
<tr>
<th></th>
<th>Indigenous</th>
<th>Non-Indigenous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expected(^9)</td>
<td>Seen</td>
</tr>
<tr>
<td><strong>Cataract</strong>(^{11})</td>
<td>113</td>
<td>110</td>
</tr>
<tr>
<td><strong>Macular Degeneration</strong>(^{12})</td>
<td>54</td>
<td>26 (48%)</td>
</tr>
<tr>
<td><strong>Glaucoma</strong>(^{12,13})</td>
<td>15</td>
<td>11 (73%)</td>
</tr>
<tr>
<td><strong>Diabetes</strong>(^{11})</td>
<td>751</td>
<td>132 (18%)</td>
</tr>
<tr>
<td><strong>Diabetic Retinopathy</strong>(^{11,14})</td>
<td>177</td>
<td>48 (27%)</td>
</tr>
<tr>
<td><strong>Vision Threatening DR</strong>(^{11,14})</td>
<td>65</td>
<td>24 (37%)</td>
</tr>
<tr>
<td>Disease</td>
<td>Management Standard</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Cataract</td>
<td>Median wait for public surgery = 12-18 months$^{15}$</td>
<td></td>
</tr>
<tr>
<td>Glaucoma</td>
<td>Moderate patients reviewed every 2 years$^{16}$</td>
<td></td>
</tr>
<tr>
<td>Proliferative DR</td>
<td>Treated with PRP and/or Anti-VEGF injections$^{17}$</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>No more than 28,000 people per full time ophthalmologist$^{5}$ OCT given at least 1 month before any injection</td>
<td></td>
</tr>
</tbody>
</table>
1. National CSR = 9300 cataract surgeries per million persons per year

2. Annual HVF testing for glaucoma patients

3. If nil HVF, cup-disc ratio recorded in glaucoma patients & suspects

4. Advanced glaucoma patients reviewed 3x/year

5. Annual review of diabetic patients (optom. or ophthal.)

6. Review of early glaucoma patients every 2 years

7. Wet MD treated with Anti-VEGF injections every 8 weeks

8. Maximum waiting list time for surgery = 90 or 365 days

9. Average waiting list time for public cataract surgery = 84 days

10. Macular oedema treated with Anti-VEGF injections and/or laser
Results: Improvements Needed

- Service expansion with minor redistribution$^{1,3,21}$
- Investigation of strategies to reduce missed appointments$^1$
- Equipment & maintenance$^1$
- Transport assistance$^1$
- EMR implementation$^1$
- Further auditing$^{1,3}$
- Increased collaboration$^2$

Backed up by Prior Studies
Results: CSR Analysis

Age-Restriction had NO effect → Not Necessary
Age-Adjustment & Comparison with National CSR Needed

<table>
<thead>
<tr>
<th>NWNSW population</th>
<th>Crude</th>
<th>Age-Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSR</td>
<td>Extra Surgery Needed (%) Improvement</td>
</tr>
<tr>
<td>Indigenous</td>
<td>4627</td>
<td>26 (104%)</td>
</tr>
<tr>
<td>Non-Indigenous</td>
<td>7144</td>
<td>25 (30%)</td>
</tr>
<tr>
<td>Total NWNSW</td>
<td>6338</td>
<td>51 (48%)</td>
</tr>
</tbody>
</table>

National CSR = 9300 per million persons per year (benchmark)
Conclusions

- OES is a **vital** service

- OES currently unable to meet total eye care needs of NWNSW → **Requires improvements**

- Cataract surgery access ≠ Total service delivery → CSR tools should **not** be used alone

- **Audit** care + compare **age-adjusted** local CSRs with the **national CSR** to evaluate and improve services
Acknowledgements

- Supervisors: Dr Ashish Agar, Dr Michael Hennessy & Dr Marlene Kong

- OES: Ben Whitham, Ellysa Brennan, Joanna Barton, Kyriacos Mavrolefteros

- Associate Professor Boaz Shulruf

- Entire OES team & Prince of Wales Ophthalmology Department
References

18. National Health and Medical Research Council. NHMRC Guidelines for the screening, prognosis, diagnosis, management and prevention of glaucoma. 2010
Questions?

Not so #Flawless

FLAWS

FLAWS EVERYWHERE

Source: Mememake.net
Study Limitations/Assumptions

- 2015 OES = representative
- Refractive Error and Diabetic Patient Review Not Assessed
- NWNSW = service scope of OES
- Expected vs actual disease rates
- Self-Reported vs Population Based Rates
- 2011 Indigenous + 2014 Non-Indigenous = 2015 population
- Prevalence & Standards = national averages
- Non-Indigenous ≠ homogenous
- Retrospective study
Importance of Study

- Quantified the Clinical Impact of the OES -> future funding
- Identified Improvements -> better eye care for NWNSW
- Identified an effective tool to evaluate and improve eye care services

Areas for Future Research

- DNAs -> Investigate strategies
- Future audits
- Evaluate patient clinical outcomes
- Compare to other services
## Results: Unmet Management Standards

<table>
<thead>
<tr>
<th>Unmet Management Standard</th>
<th>Number Unmet</th>
<th>Why</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>National CSR = 9300 surgeries per million persons per year</td>
<td>I= 8662</td>
<td>&gt;Government Restriction on Number of Surgeries Per Year</td>
<td>&gt;Increase cataract surgery provision Extra 52 surgeries per year (with 43 for NI)</td>
</tr>
<tr>
<td></td>
<td>NI=5626</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total=6232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual HVF testing for glaucoma patients</td>
<td>32(44%)</td>
<td>&gt;HVF machine breakdown</td>
<td>&gt;Equipment maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Insufficient staff</td>
<td>&gt;Service expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Referred but missing result</td>
<td>&gt;Investigate DNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Did Not Attend (DNA)</td>
<td></td>
</tr>
<tr>
<td>If nil HVF, cup-disc ratio recorded for glaucoma patients &amp; suspects</td>
<td>17 (22%)</td>
<td>&gt;Insufficient Staff</td>
<td>&gt;Service expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Slit lamp breakdown</td>
<td>&gt;Equipment maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;Future audits</td>
</tr>
<tr>
<td>Advanced glaucoma reviewed 3x /year</td>
<td>7(50%)</td>
<td>&gt;Insufficient staff</td>
<td>&gt;Service expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;DNA</td>
<td>&gt;Investigate DNA</td>
</tr>
<tr>
<td>Annual review of diabetics (including review by other services)</td>
<td>146(52%)</td>
<td>&gt;Insufficient staff</td>
<td>&gt;Service expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;Late referral</td>
<td>&gt;Increased collaboration with other services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;DNA</td>
<td>&gt;Investigate DNA</td>
</tr>
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</tr>
</tbody>
</table>
## Results: Unmet due to Did Not Attends (DNAs)

<table>
<thead>
<tr>
<th>Unmet Management Standard due to DNA</th>
<th>Number Unmet</th>
<th>Why</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Max cat. waiting list time = 90 days</td>
<td>4 (17%)</td>
<td>&gt;NRFC (sickness) &gt;DNA (family, transport issues)</td>
<td>&gt;Investigate DNA &gt;Transport assistance</td>
</tr>
<tr>
<td></td>
<td>29 (35%)</td>
<td>&gt;Poor weather &amp; staffing requirements &gt;Infrequency of service &gt;NWNSW demographics</td>
<td>&gt;Greater frequency of surgery provision</td>
</tr>
<tr>
<td>2. Max cat. Waiting list time = 365 days</td>
<td>292 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Average cat. waiting list time = 84 days</td>
<td>292 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet MD: Anti-VEGF injections every 8 weeks</td>
<td>1 (11%)</td>
<td>&gt;Patient declined to travel for care</td>
<td>&gt;Transport assistance &gt;Service expansion</td>
</tr>
<tr>
<td>Early glaucoma reviewed every 2 years</td>
<td>2 (6%)</td>
<td>&gt;DNA</td>
<td>&gt;Investigate DNA</td>
</tr>
<tr>
<td>Macular oedema treated with Anti-VEGF injections and/or laser</td>
<td>3 (12%)</td>
<td>&gt;Untreatable disease from prior DNAs &gt;Patient declined to travel for care &gt;Not referred for management</td>
<td>&gt;Investigate DNA &gt;Transport assistance &gt;Service expansion &gt;Future auditing</td>
</tr>
</tbody>
</table>
Results: Location, Location

- Hometown ≠ service supply -> redistribute care

- Hometown: 89% main town

- 32% travelled for care
  > Average distance = 198km per year
  > Range = 0-4378km!
  > Transport assistance
  > Service expansion

Source: https://www.travelwheels.com.au
## Results: CSR Age Restriction

<table>
<thead>
<tr>
<th>Population</th>
<th>Unrestricted (age-adjusted CSR)</th>
<th>30+ Age Restricted (age-adjusted CSR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigenous</td>
<td>8662</td>
<td>14797</td>
</tr>
<tr>
<td>Non-Indigenous</td>
<td>5626</td>
<td>9611</td>
</tr>
<tr>
<td><strong>Same Non-Indigenous/Indigenous CSR relationship</strong></td>
<td><strong>64.95%</strong></td>
<td><strong>64.95%</strong></td>
</tr>
</tbody>
</table>

Same Non-Indigenous/Indigenous CSR relationship

-> Age Restriction is Not Necessary
Results: Eye Disease Severity

- 11% Visually Impaired (VI), 1% Blind

- Cataract
  >31.3% VI + 62% both eyes

- Diabetes
  >27.6% DR, 12.7% VTDR
  >DR = 46.2% VTDR, 91% both eyes

- Glaucoma
  >44% early, 35% moderate, 19% advanced, 83.3% both eyes

- MD
  >43% VI, 76% both eyes
## Results: OES Service Over Time

<table>
<thead>
<tr>
<th></th>
<th>2005/06</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of clinics</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Aboriginal Consults</td>
<td>308</td>
<td>359</td>
<td>302</td>
<td>339</td>
<td>355</td>
<td>461 (236 people)</td>
</tr>
<tr>
<td>Non-Indigenous Consults</td>
<td>604</td>
<td>765</td>
<td>776</td>
<td>1243</td>
<td>1233</td>
<td>1176 (553 people)</td>
</tr>
<tr>
<td>Total consults</td>
<td>912</td>
<td>1124</td>
<td>1078</td>
<td>1582</td>
<td>1588</td>
<td>1673 (789 people)</td>
</tr>
<tr>
<td>New clients</td>
<td>?</td>
<td>152</td>
<td>154</td>
<td>196</td>
<td>?</td>
<td>287 (36%)</td>
</tr>
<tr>
<td>% of consults</td>
<td>34</td>
<td>32</td>
<td>28</td>
<td>21</td>
<td>22</td>
<td>28 (30% of individuals)</td>
</tr>
<tr>
<td>Aboriginal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Bansemer & Beatty, 2012
Results: Ages of Cataract Patients

25 Indigenous, 82 Non-Indigenous

Age at Surgery

Number of Surgeries

Age (years)

- Indigenous
- Non-Indigenous
- Total
Results: Crude Vs Age-Adjusted CSR

**Crude CSR**

- **Crude Indigenous CSR**
- **Crude Non-Indigenous CSR**

**Age-Adjusted CSR**

- **Age-Adjusted Indigenous CSR**
- **Age-Adjusted Non-Indigenous CSR**
2\textsuperscript{nd} Eye – Time Gap Between Surgeries

- 42 patients both eyes (40%)
- Range 110 days to 10 years
- Average = 724 days, median = 406 days (13.5 months)
## CSR Now Declines In 80+

### NSW CSR 2006/7 to 2012/13

<table>
<thead>
<tr>
<th>Year</th>
<th>0-9 yrs</th>
<th>10-19 yrs</th>
<th>20-29 yrs</th>
<th>30-39 yrs</th>
<th>40-49 yrs</th>
<th>50-59 yrs</th>
<th>60-69 yrs</th>
<th>70-79 yrs</th>
<th>80+ yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>0.00009</td>
<td>0.00004</td>
<td>0.00009</td>
<td>0.0002</td>
<td>0.00093</td>
<td>0.00493</td>
<td>0.01544</td>
<td>0.06293</td>
<td>0.06626</td>
</tr>
<tr>
<td>2007/08</td>
<td>0.0001</td>
<td>0.00005</td>
<td>0.00007</td>
<td>0.00019</td>
<td>0.00098</td>
<td>0.00475</td>
<td>0.01973</td>
<td>0.06293</td>
<td>0.06619</td>
</tr>
<tr>
<td>2008/09</td>
<td>0.00009</td>
<td>0.00006</td>
<td>0.0001</td>
<td>0.00022</td>
<td>0.00094</td>
<td>0.00483</td>
<td>0.02063</td>
<td>0.0656</td>
<td>0.06494</td>
</tr>
<tr>
<td>2009/10</td>
<td>0.00011</td>
<td>0.00006</td>
<td>0.00009</td>
<td>0.00024</td>
<td>0.00102</td>
<td>0.00519</td>
<td>0.02207</td>
<td>0.06786</td>
<td>0.06608</td>
</tr>
<tr>
<td>2010/11</td>
<td>0.00009</td>
<td>0.00005</td>
<td>0.00008</td>
<td>0.00022</td>
<td>0.00097</td>
<td>0.00509</td>
<td>0.02196</td>
<td>0.06465</td>
<td>0.06135</td>
</tr>
<tr>
<td>2011/12</td>
<td>0.00008</td>
<td>0.00007</td>
<td>0.00009</td>
<td>0.00021</td>
<td>0.00105</td>
<td>0.00511</td>
<td>0.02239</td>
<td>0.06609</td>
<td>0.06216</td>
</tr>
<tr>
<td>2012/13</td>
<td>0.00008</td>
<td>0.00007</td>
<td>0.00009</td>
<td>0.00022</td>
<td>0.00098</td>
<td>0.00531</td>
<td>0.0225</td>
<td>0.06476</td>
<td>0.05798</td>
</tr>
</tbody>
</table>

Source: Michael Hennessy
Cataract surgery involves ALL levels of eye care

National CSR = benchmark
Results: Patient Demographics

30% Indigenous, 36% new

Age of OES patients

Number of Patients

Age (years)

Non-Indigenous

Indigenous
Abstract

- **Background**
The Outback Eye Service (OES) provides outreach ophthalmic care to the Indigenous & Non-Indigenous (I&NI) residents of North Western NSW (NWNSW). This study gauges whether the OES is meeting the entire eye care needs of NWNSW.

Eye care services are currently evaluated by comparing their crude or age-adjusted and age-restricted I&NI cataract surgery rates (CSR) with the national CSR. This study evaluates these tools to determine the best method to use in future.

- **Method**
A cross-sectional audit of the OES' 2015 clinical records was performed. The number of eye conditions treated and standards of eye care delivered by the OES were then compared with the expected prevalence and published ophthalmic management standards of the major eye diseases in NWNSW.

The OES' crude, age-adjusted and 30+ age-restricted I&NI CSRs were compared with the national CSR.

- **Results**
In 2015 the OES provided services to 789 individuals over 1637 visits, but saw less than expected diabetic retinopathy, glaucoma and macular degeneration patients. The OES met most ophthalmic management standards, but was unable to meet benchmarks for CSR, glaucoma visual field testing, glaucoma cup-disc ratio recording and advanced glaucoma and diabetic patient review.

Age-adjustment altered the CSR evaluation while age-restriction did not. Comparison with the national CSR benchmark enabled the determination of the degree of service enhancement required in individual populations.

- **Conclusion**
The OES is currently unable to meet the entire ophthalmic care needs of NWNSW. Service expansion with minor redistribution, regular auditing, investigation of missed appointments, EMR implementation, and increased equipment maintenance, transport assistance and collaboration between health services is required to change this.

An eye care provider’s service can be audited, and their age-adjusted I&NI and total CSRs compared with the national CSR to evaluate and improve its service.