Safer, better bang for buck: improved efficiency and safety of prostate biopsy for prostate cancer diagnosis using MRI and transperineal biopsy approach

Matthew J Roberts1,2, Andrew Morton1,4, Peter Donato1,4, Alastair Macdonald1, Sachintha Ranasinghe1,4, Harrison Bennett5, Patrick E Teloken6, Patrick Harris2,5, David Paterson2,6, Geoff Coughlin1, Nigel Dunglison1, Rachel Esler1, Robert A Gardner1,2,7,8, Thomas Elliott9, Louis Gordon9, John Yaxley1,2

1. Department of Urology, RBWH; 2. UQCCR, Herston; 3. Department of Urology, Redcliffe Hospital; 4. UQ Faculty of Medicine; 5. Pathology Queensland, Department of Microbiology, Central Laboratory, RBWH; 6. Infectious Diseases Unit, RBWH; 7. Griffith University, Queensland; 8. Edith Cowan University, Western Australia; 9. Population Health Department, QIMR Berghoff

INTRODUCTION

• Prostate cancer (PCA) can be diagnosed via transrectal (TR) or transperineal (TP) biopsy approaches, which have different morbidity profiles.
• TR biopsy was previously used widely as it is time/cost efficient, however, associated with higher rates of UTI, sepsis, hospitalisations.
• TP biopsy is usually performed under general anaesthetic, has growing evidence for “zero sepsis”.
• Multiparametric magnetic resonance imaging (mpMRI) as a pre-biopsy “triage-test” can improve PCA detection with targeted biopsy while reducing unnecessary biopsies1,2.
• In 2014, the Royal Brisbane & Women's Hospital (RBWH) transitioned to a PCA diagnostic pathway utilising MRI-based triage with subsequent TP biopsy.
• We sought to determine the clinical and health economic outcomes of this transition.

METHODS

• A retrospective consecutive cohort study considered prostate biopsies (over 11 years; 2006-2017) and mpMRI (over 3 years; 2014-2017).
• Imaging and histopathological data was collected for analysis of MRI diagnostic accuracy and biopsy avoidance.
• Hospital presentations across Metro North within 30 days of biopsy were collected.
• Cost implications were analysed and generalised linear models applied.

RESULTS

• 2,048 prostate biopsies were performed over 11 years, comprising 1,363 TR (64%) and 744 TP (36%) biopsies.
• Presentations after TR were more likely to:
  - Be infection related (p=0.001)
  - Cause hospital admission (p=0.007)
• Similar rates of re-presentation and urinary retention for each biopsy approach (Table1)
• Mean overall cost (biopsy & readmissions) was higher for TP group (AUS$4,413 vs AUS$3,220; p<0.001)
• Reduced cost over time
  - More patients with length of stay <24hrs
  - Total expenditure over 4 years since introduction of mpMRI (incorporating cost saving due to avoided biopsies): AUS$1,334,692
• Estimated expenditure as per previous TRUS biopsy diagnostic pathway: AU$4,195,000

Table 1: Representation and readmission information, including length of stay, source and cause, according to biopsy approach

<table>
<thead>
<tr>
<th>Readmission duration</th>
<th>TR</th>
<th>TP</th>
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<tbody>
<tr>
<td>Median (IQR)</td>
<td>AU$</td>
<td>AU$</td>
</tr>
<tr>
<td>Hospital stays (days)</td>
<td>7 (2-12)</td>
<td>4.5 (3-9.5)</td>
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</tbody>
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Table 2: Diagnostic performance of mpMRI and subsequent biopsy according to PIRADS score (PIRADS 1= PCa extremely unlikely; 5=extremely likely)

<table>
<thead>
<tr>
<th>PIRADS</th>
<th>Detection of PCa n (%)</th>
<th>Detection of significant PCa n (%)</th>
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<tbody>
<tr>
<td>2</td>
<td>110 (32%)</td>
<td>40 (36%)</td>
</tr>
<tr>
<td>3</td>
<td>28 (8%)</td>
<td>16 (57%)</td>
</tr>
<tr>
<td>4</td>
<td>98 (29%)</td>
<td>81 (83%)</td>
</tr>
<tr>
<td>5</td>
<td>108 (31%)</td>
<td>103 (95%)</td>
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Figure 1: Prostate biopsy cost analysis; mean total and adjusted costs per patient over time, with cost ratio (relative to 2006)

CONCLUSION

• Use of mpMRI prior to biopsy is:
  - Highly accurate - improved PCA detection
  - Cost-effective by reducing unnecessary biopsies
  - Promising for reducing burden of low-risk cancer
• TP biopsy approach led to:
  - Less complications
  - Reduced cost over time
  - Overall cost saving
  - Estimated expenditure as per previous TRUS biopsy diagnostic pathway: AU$4,195,000
  - Reduced cost over time:
    - More patients with length of stay <24hrs
    - Total expenditure over 4 years since introduction of mpMRI (incorporating cost saving due to avoided biopsies): AUS$1,334,692