META-ANALYSIS OF VISUAL INSPECTION ACCURACY FOR CERVICAL CANCER SCREENING: DOES PROVIDER TYPE OR TRAINING MATTER?

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Disclosures

No financial relationships or conflicts of interest to disclose
Global Health Inequity

Cervical Cancer
- 4th most common cancer in women worldwide

In 2012
- 528,000 women diagnosed
- 276,000 women died
- 70% living in low resource countries

Prat & Franchesci (2014)
“The biggest gain in reducing cervical cancer incidence and mortality would be achieved by increasing screening rates among women rarely or never screened”
(Saslow, et al. 2012)

“Screen & Treat” approach with VIA and Cryotherapy (WHO, 2013)
High Cervical Cancer Incidence in Areas with Inadequate Provider Coverage

Dal Poz, Kinfu, Dráger, & Kunjumen, T. (2007)
Aims

Primary aim

- To determine whether the accuracy of cervical cancer screening with visual inspection by CHWs was as accurate as visual inspection performed by nurses or physicians

Secondary aim

- To explore affects of visual inspection provider training on visual inspection accuracy
Systematic Review: Inclusion/Exclusion Criteria

Visual Inspection (VIA, VILI, and/or VIAM)

Participants with no history of HPV, CIN, or prior treatment

Reference to provider type and/or training

Reference test for disease threshold
  • Colposcopy with directed biopsy or random biopsy

Criteria for positive visual inspection

Test accuracy data
  • 2x2 table
  • Sensitivity and specificity

Blinding

Less than 1 month from index to reference test

English
Total Articles for Inclusion
N=27
Total Study Sites
N=34

VIA
Articles N=26
Study Sites N=34

VIA Provider
Study Sites
Nurse N=17
Physician N=8
CHW N=10

VILI
Articles N=10
Study Sites N=17

VILI Provider
Study Sites
Nurse N=8
Physician N=1
CHW N=9

VIAM
Articles N=3
Study Sites N=4

VIAM Provider
Study Sites
Nurse N=0
Physician N=1
CHW N=3
Summary of Included Articles (N=27)

Primary aim
- 22 evaluated the test accuracy of visual inspection alone, in parallel, or in combination with other screening tests
- 2 compared nurses to physicians, but no statistical comparisons
- 2 looked at age differences
- 1 was an HPV prevalence study

Geographic regions
- Asia, Africa, Central America, South America, and the Pacific

Community setting (n=17)
- 12 urban
- 1 suburban
- 3 rural
- 1 mixed
Clinical setting (n=20)
- 9 in primary care clinics
- 8 in specialty clinics
- 3 in hospital

Age range (15-79)
- Most between 30-40 years of age

Education
- 6 reported more than 30% of women with no formal education
- 8 had more than 50% of women with secondary or higher education
Quantitative Meta-Analysis

Bivariate Linear Mixed Models (BLMM)

• Variation of bivariate random effects models (BREM) recommended by Cochrane
• Bivariate analysis of interdependent accuracy outcome measures
  • Sensitivity
  • Specificity
• Random effect: between study heterogeneity
• Fixed effect: predictor variables
• Unconditional and conditional models
Comparison of Visual Inspection Techniques

<table>
<thead>
<tr>
<th></th>
<th>VIA (n=35)</th>
<th>VILI (n=18)</th>
<th>VIAM (n=4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity**</td>
<td>73.6</td>
<td>85.6**</td>
<td>80.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>62.4</td>
<td>80.5</td>
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<tr>
<td>Specificity</td>
<td></td>
<td>89.2</td>
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</table>

*p<.05, **p<.01, ***p<.001
unconditional model
†p<.05, ††p<.01, †††p<.001
conditional model
Comparison of Provider Types

<table>
<thead>
<tr>
<th>Provider Type</th>
<th>Sensitivity</th>
<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>Physicians (n=10)</td>
<td>66</td>
<td>82.1</td>
</tr>
<tr>
<td>Nurses (n=25)</td>
<td>77</td>
<td>77.3</td>
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<tr>
<td>CHWs (n=22)</td>
<td>81*</td>
<td>85.1</td>
</tr>
</tbody>
</table>

* p<.05. ** p<.01. *** p<.001
unconditional model
† p<.05. †† p<.01. ††† p<.001
conditional model

Sensitivity*
Comparison of Provider Types for VIA

<table>
<thead>
<tr>
<th></th>
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<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>Physicians (n=8)</td>
<td>65.3</td>
<td>83.1</td>
</tr>
<tr>
<td>Nurses (n=17)</td>
<td>75.3</td>
<td>76.8</td>
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<tr>
<td>CHWs (n=10)</td>
<td>77.4</td>
<td>85.1</td>
</tr>
</tbody>
</table>

*p<.05  **p<.01  ***p<.001

unconditional model
†p<.05  ††p<.01  †††p<.001
conditional model
Comparison of Provider Types for VILI

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>Physicians (n=1)</td>
<td>87.5</td>
<td>58.7</td>
</tr>
<tr>
<td>Nurses (n=8)</td>
<td>80.6</td>
<td>78.5</td>
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<tr>
<td>CHWs (n=9)</td>
<td>89.9</td>
<td>84.7</td>
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* p<.05, ** p<.01, *** p<.001

unconditional model

† p<.05, †† p<.01, ††† p<.001

conditional model
Comparison of Didactic Hours

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>60.5</td>
<td>76.6</td>
</tr>
<tr>
<td>79.7**†††</td>
<td>81.7</td>
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</tbody>
</table>

- *p<.05
- **p<.01
- ***p<.001

unconditional model

†p<.05
††p<.01
†††p<.001
conditional model

- Red: No report of didactic hours (n=5)
- Green: Report of didactic hours (n=46)
Comparison of Report of Mentored Hours

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>No report</td>
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<tr>
<td>Report</td>
<td>79.8**†††</td>
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*p<.05. **p<.01. ***p<.001
†p<.05. ††p<.01. †††p<.001

unconditional model
conditional model
Comparison of Number of Training Days

- No report of training days (n=5)
- ≤ 5 training days (n=31)
- 6-29 training days (n=10)
- ≥ 30 training days (n=5)

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>No report</td>
<td>64.4</td>
<td>74.2</td>
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<tr>
<td>≤ 5</td>
<td>81.0*</td>
<td>76.7</td>
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<tr>
<td>6-29</td>
<td>77.0</td>
<td>74.2</td>
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<td>≥ 30</td>
<td>85.2*</td>
<td>74.4</td>
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unconditional model
†p<.05, ††p<.01, †††p<.001
conditional model
Comparison of Training Quality Assessment

<table>
<thead>
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<th></th>
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<th>Specificity**†</th>
</tr>
</thead>
<tbody>
<tr>
<td>No report</td>
<td>77.3</td>
<td>76.9</td>
</tr>
<tr>
<td>Quality</td>
<td>78.2</td>
<td>85.6**†</td>
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</tbody>
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* p<.05, ** p<.01, *** p<.001 unconditional model
† p<.05, †† p<.01, ††† p<.001 conditional model

- No report of quality assessment (n=26)
- Report of quality assessment (n=25)
Comparison of Use of WHO IARC Training Manual

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity***</th>
</tr>
</thead>
<tbody>
<tr>
<td>No report of training manual (n=13)</td>
<td>77.3</td>
<td>76.9</td>
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<tr>
<td>Report of WHO IARC training manual (n=36)</td>
<td>78.2</td>
<td>85.6***</td>
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</tbody>
</table>

*p<.05, **p<.01, ***p<.001 unconditional model
†p<.05, ††p<.01, †††p<.001 conditional model
Conclusions

• VIA and VILI accuracy (sensitivity and specificity) is similar among physicians, nurses, and CHWs
• Visual inspection by CHWs was significantly more sensitive than those performed by physicians and nurses when all visual inspection techniques were combined
• Components of visual inspection provider training (didactic hours, mentored hours, number of training days, quality assessment, and use of WHO IARC training manual) were all significant predictors of visual inspection sensitivity and/or specificity
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References


References, cont.


References, cont.


