COST-EFFECTIVENESS EXERCISE

LDI Health Economics and Management Workshop

Cost-effectiveness of diagnostic for malaria in Extra-Amazon Region, Brazil

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http://www.malariajournal.com/content/11/1/390

Background

- Rapid diagnostic tests (RDT) for malaria have been demonstrated to be effective and they should replace microscopy in certain areas.

Methods

- Cost-effectiveness of the following 6 strategies was assessed:
  - First Response Malaria Combo
  - Parascreen
  - SD Bioline FK60
  - CareStart
  - ICT BinaxNow
  - Microscopy

Cost-Effectiveness Ratio

- Cost per case of “adequately diagnosed” malaria
- Costs
  - Direct diagnostic costs
- Outcome: Adequate diagnosis of malaria
  - Adequate diagnosis defined as true positive (positive test given disease) or true negative (negative test given no disease) test results
  - Lack of an adequate diagnosis defined as false negative (negative result given disease) or false positive (positive test given no disease) test results.

Cost of Microscopy

- Analysis explored 2 assumptions about the cost of the microscope used for microscopy
  - Exclusive use for malaria diagnosis
  - Shared use with other health programs
- For pedagogic reasons, we are focusing on the “exclusive use” strategy

Decision Tree

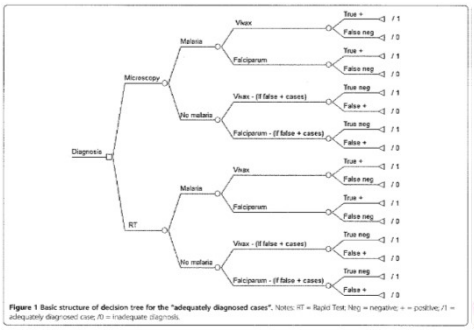

Figure 1 Basic structure of decision tree for the "adequately diagnosed cases". Notes: RT = Rapid Test; Neg = negative; + = positive; /1 = adequately diagnosed case; /0 = inadequate diagnosis.

Data, Perspective, Time Horizon

- Data sources included:
  - National Malaria Control Programme of the Ministry of Health
  - National Healthcare System reimbursement table
  - Laboratory suppliers
  - Scientific literature.
- Perspective: Brazilian public health system
- Time horizon: From start of fever until the diagnostic results provided to patient
- Costs expressed in USD $2010

Data for Calculation of Cost-Effectiveness Ratio

Strategy	Cost ($)	Effect (%)
First Response	12.22	0.9116
Parascreen	12.32	0.8660
SD Bioline	12.33	0.9034
CareStart	15.26	0.9795
ICT Binax Now	16.33	0.9432
Microscopy	36.59	0.9801

Exercise

- Report on the cost-effectiveness of the 6 strategies for malaria diagnosis
- If you were to base an adoption strategy on your analyses, which therapy would you recommend?
- What additional information might you like to aid you in your recommendation?

ANSWER GUIDE

RESEARCH Open Access

Cost-effectiveness of diagnostic for malaria in Extra-Amazon Region, Brazil

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Malaria Journal. 2012;11:390

The Data

Strategy	Cost	Adeq Diag
First Response	12.22	0.9116
Parascreen	12.32	0.8660
SD Bioline	12.33	0.9034
CareStart	15.26	0.9795
ICTBinaxNow	16.33	0.9432
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Step 1. Order Data

Strategy	Cost	Adeq Diag
First Response	12.22	0.9116
Parascreen	12.32	0.8660
SD Bioline	12.33	0.9034
CareStart	15.26	0.9795
ICTBinaxNow	16.33	0.9432
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- Therapies correctly ordered by increasing cost
- Would reach same conclusions if ordered by adequate diagnosis (Parascreen, SD Bioline, First Response, ICT, CareStart, and Microscopy)

Step 2. Eliminate Strongly Dominated Options

Strategy	Cost	Adeq Diag
First Response	12.22	0.9116
~~Parascreen~~	~~12.32~~	~~0.8660~~
~~SD Bioline~~	~~12.33~~	~~0.9034~~
CareStart	15.26	0.9795
~~ICTBinaxNow~~	~~16.33~~	~~0.9432~~
Microscopy	36.59	0.9801

- Parascreen and SD Bioloine strongly dominated by First Response
- ICTBinaxNow strongly dominated by CareStart

Step 3. Calculate Incremental Cost-Effectiveness Ratios

Treatment	Cost	Δ	Ad Diag	Δ	ICER
First Response	12.22	--	0.9116	--	--
~~Parascreen~~	~~12.32~~	~~--~~	~~0.8660~~	~~--~~	~~SD (FR)~~
~~SD Bioline~~	~~12.33~~	~~--~~	~~0.9034~~	~~--~~	~~SD (FR)~~
CareStart	15.26	3.04	0.9795	0.0679	44.77
~~ICTBinaxNow~~	~~16.33~~	~~--~~	~~0.9432~~	~~--~~	~~SD (CS)~~
Microscopy	36.59	21.33	0.9801	0.0006	35,550

Step 4. Assess Weak Dominance

Treatment	Cost	Δ	Ad Diag	Δ	ICER
First Response	12.22	--	0.9116	--	--
~~Parascreen~~	~~12.32~~	~~--~~	~~0.8660~~	~~--~~	~~SD (FR)~~
~~SD Bioline~~	~~12.33~~	~~--~~	~~0.9034~~	~~--~~	~~SD (FR)~~
CareStart	15.26	3.04	0.9795	0.0679	44.77
~~ICTBinaxNow~~	~~16.33~~	~~--~~	~~0.9432~~	~~--~~	~~SD (CS)~~
Microscopy	36.59	21.33	0.9801	0.0006	35,550

- Incremental ratios ranked from lowest to highest, so no weakly dominated therapies and no need to recalculate any ratios
- Proceed to selection algorithm

Step 5. Recalculate Ratios

Treatment	Cost	Δ	Ad Diag	Δ	ICER
First Response	12.22	--	0.9116	--	--
~~Parascreen~~	~~12.32~~	~~--~~	~~0.8660~~	~~--~~	~~SD (FR)~~
~~SD Bioline~~	~~12.33~~	~~--~~	~~0.9034~~	~~--~~	~~SD (FR)~~
CareStart	15.26	3.04	0.9795	0.0679	44.77
~~ICTBinaxNow~~	~~16.33~~	~~--~~	~~0.9432~~	~~--~~	~~SD (CS)~~
Microscopy	36.59	21.33	0.9801	0.0006	35,550

- No weakly dominated therapies and no need to recalculate any ratios
- Proceed to selection algorithm

Step 6. Interpret Results

- Goal: buy as much health as possible so long as the extra cost for the last unit of health purchased is less than or equal to WTP
  - If WTP is less than 44.77 per adequately diagnosed case, use First Response
    - although we don't have the data to know if it is cost-effective
  - If WTP greater than or equal to 44.77 and less than 35,550, use CareStart.
  - If WTP greater than or equal to 35,500, use microscopy

Suppose We'd Evaluated Cost / Adequate Diagnosis?

Strategy	Cost	Adeq Diag	C/AD
First Response	12.22	0.9116	13.41
~~Parascreen~~	~~12.32~~	~~0.8660~~	~~SD (FR)~~
~~SD Bioline~~	~~12.33~~	~~0.9034~~	~~SD (FR)~~
CareStart	15.26	0.9795	15.58
~~ICT Binax Now~~	~~16.33~~	~~0.9432~~	~~SD (CS)~~
Microscopy	36.59	0.9801	37.33

- ????

Questions

- What is WTP for "adequate diagnosis"?
  - Authors' recommendation of CareStart implies they judge WTP per adequately diagnosed case to be greater than or equal to 44.77 and less than 35,550
  - How should we conceptualize it?
    - Identify QALYs/DALYs associated with an adequate diagnosis?
- IS WTP for avoidance of false positives (inappropriately treating when disease absent) equal to WTP for avoidance of false negatives (inappropriately withholding treatment when disease present)?