Hypothetical Hepatitis C Problem

Assume that 8 per cent of patients who are chronically infected with hepatitis C have a specific strain of virus that is associated with a life expectancy of 10 years. Assume that other patients with other strains of hepatitis-C virus have a life expectancy of 15 years.

Hepatitis-C patients with the specific strain of virus (but not other hepatitis-C patients) respond to a new drug that is effective only if given when hepatitis-C infection is first diagnosed. The drug costs $15,000 for a course of treatment, and it prolongs life expectancy 2 years (from 10 to 12 years). The drug has negligible side effects.

There is a diagnostic test that will identify the specific strain of hepatitis-C virus. The sensitivity of the diagnostic test for the specific strain of virus is 0.60, and its specificity is 0.70. The test costs $200.

You are the medical director of a large HMO, and the CEO has asked you to develop a policy for using the new drug for treating patients with chronic hepatitis-C infection.

A lawyer representing patients in your HMO argues that all newly diagnosed patients should be given drug treatment because the diagnostic test misses too many people with the specific strain of virus.

Your consulting group of clinical experts recommends that treatment be given only to patients with a positive test result. They note that the treatment is expensive and most patients will not benefit if it is given to every patient.

The marketing director of your HMO tells you that no one should get the drug. He argues that many positive test results will be falsely positive, that patients with a false-positive test result will not benefit, and that the cost of providing the drug to patients with a positive test result will force the company either to withhold other treatments from other patients or to raise premiums, which would reduce the company’s market share.
Patients with the specific strain of virus

Prevalence

15000 / 12

Other patients

1 - prevalence

15000 / 15

Treat everyone

True positive

Sensitivity * Prevalence / (Sensitivity * Prevalence + (1 - Specificity) * (1 - Prevalence))

False positive

1 - ((Sensitivity * Prevalence) / (Sensitivity * Prevalence + (1 - Specificity) * (1 - Prevalence)))

True negative

Specificity * (1 - Prevalence) / (Specificity * (1 - Prevalence) + (1 - Sensitivity) * Prevalence)

False negative

1 - ((Specificity * (1 - Prevalence)) / (Specificity * (1 - Prevalence) + (1 - Sensitivity) * Prevalence))

Result positive

Patients with the specific strain of virus

Prevalence

15000 / 12

Other patients

1 - prevalence

15000 / 15

Test, treat positives

Patients with specific strain of virus

Prevalence

15000 / 12

Other patients

1 - prevalence

15000 / 15

Don't treat anyone

Choose

Test, treat positives

Patients with specific strain of virus

Prevalence

15000 / 12

Other patients

1 - prevalence

15000 / 15

Don't treat anyone

Patients with specific strain of virus

Prevalence

0 / 10

Other patients

1 - prevalence

0 / 15
<table>
<thead>
<tr>
<th>Choice</th>
<th>Expected Cost</th>
<th>Expected Survival</th>
<th>Incremental Cost</th>
<th>Incremental Survival</th>
<th>Incremental Cost-effectiveness Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't treat anyone</td>
<td>$0</td>
<td>14.600 yrs</td>
<td>$0</td>
<td>0</td>
<td>$0 per yr</td>
</tr>
<tr>
<td>Test, treat positives</td>
<td>$5,060</td>
<td>14.696 yrs</td>
<td>$5,060</td>
<td>0.096 yrs</td>
<td>$52,708 per yr</td>
</tr>
<tr>
<td>Treat everyone</td>
<td>$15,000</td>
<td>14.760 yrs</td>
<td>$9,940</td>
<td>0.064 yrs</td>
<td>$155,312 per yr</td>
</tr>
</tbody>
</table>

To identify the appropriate choice:

- Order the choices according to either increasing values for outcome or increasing values for cost
- Eliminate choices with both a higher cost and a less valuable outcome than an alternative choice
- Compute incremental cost-effectiveness ratios for each adjacent pair of choices
- Eliminate choices that have a lower effectiveness and a higher cost-effectiveness ratio than an alternative choice
- Recalculate the incremental cost-effectiveness ratios
- Select the choice with the highest acceptable ratio