ELSEVIER

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Correspondence

Statistical and pharmacoeconomic issues for Alzheimer's screening

The principles for determining whether a screening test is appropriate requires several considerations [1]. A comprehensive view can be developed from considering a mathematical analysis of the costs and benefits of a clinical evaluation.

A mathematical calculation of the "cost-worthiness" of a test will give a direct assessment of whether a screening test should be implemented. To calculate cost-worthiness, the following factors must be considered: I = incidence (new occurrences each year, by age); $T = cost of test, time to take (for Subject and Tester); Se = sensitivity of test = True positive/I; Sp = specificity of test = True negative/(1 – I); $B = benefit of a true-positive diagnosis; $C = cost of a false-positive diagnosis; True negative = (real peace of mind) (no money); False negative = false peace of mind (no price);
$W = ($B × I × Se) – ($C × (1 – I) × (1 – Sp)) – $T.
If $W is greater than zero, then the test is cost-worthy.

As an example of implementing this equation by using conservative estimations, consider the following variables: I = incidence of Alzheimer's disease (increase from 1/1000 per year at age 62, doubling every 5 years); Se = 0.9; Sp = 0.9 (tests of less than 5 minutes appear to be able to reach this level) (contrasted with a perfect test, Se and Sp = 1, and a less robust test, Se and Sp = 0.8); $B = vary linearly from $25,000 in a 50-year-old patient (considering the value of a 6-month delay of nursing home placement with timely medical treatment) to $0 in a centenarian patient; $C = a false positive would require a $500 clinic visit to disprove the dementia suspicion.

It is apparent from the graph (Figure 1) that even with these conservative estimates, a cost for screening for dementia of $25 per year is justified from 75 years of age until older than 95. Better or less expensive tests or more efficient clinic visits could lead to recommendations as low as 55 years of age, and more valuable treatments would similarly reduce the age for recommending broad application of screening tests.

Risk factors can be introduced to the cost-worthiness equation as they affect incidence "I". For example, *APOE* genotype can greatly affect risk [2], and it would be justified for those with a known *APOE* genotype e4/e4 to begin annual dementia screening by age 56 years, and that is e3/e3 to begin after age 80 years, with the same calculations.

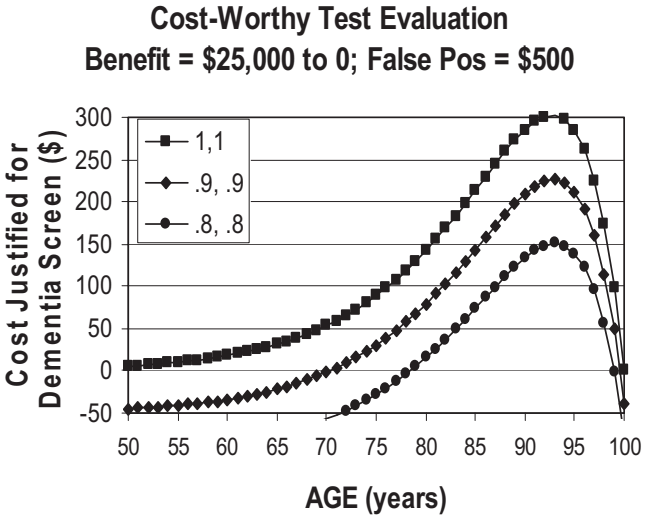

Fig. 1. Graphic display of calculations of $W with $T removed.

Beyond the hard, cold mathematics, there are humanitarian considerations. Because Alzheimer's disease has become a widely feared condition among the elderly, a more effective means of addressing dementia screening needs to be provided to identify this problem in those at risk. However, the cost-worthiness equation provides a clear guideline for assessing the relative implications of costs and benefits of medical testing.

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