

## Abstract

### Cost-effectiveness of colorectal cancer screening

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Dr. Pignone's work is supported by an Established Investigator Award from the National Cancer Institute (5K05 CA129166)

Economic analyses, including cost-effectiveness analyses can provide valuable information for health care decision makers. Economic analyses that incorporate models allow investigators to explore multiple questions that may be difficult or impossible to answer in a clinical trial. They can also be used to estimate the impact of a new health technology and help decide whether an effectiveness trial should be performed. Most important, models integrate information about effectiveness and costs and thus can provide a measure of health care value.

Several features of colorectal cancer make it well-suited for modeling studies. First, the natural history of CRC is well understood. Secondly, CRC screening with FOBT has been studied in randomized trials and been found to be effective. Third, several different means of screening are available, each with its own set of advantages and disadvantages in terms of ability to detect and successfully treat CRC and polyps, frequency of testing, costs, discomfort, and the likelihood of serious adverse effects. Because even simple screening trials are very large and expensive, it is unlikely that investigators and policymakers could study each of the potential modalities and potential intervals for screening in head-to-head randomized trials. As such, modeling offers a structured, systematic way of comparing tests that differ in these and other regards.

Several models have examined the cost-effectiveness and value of screening for colorectal cancer. Our 2002 systematic review of CRC screening economic analyses found that all commonly recommended screening tests (annual fecal occult blood testing, sigmoidoscopy every 5 years, the combination of annual fecal occult blood testing and sigmoidoscopy, double-contrast barium enema every 5 years, or colonoscopy every 10 years) were each effective and cost-effective compared with no screening. Subsequent analyses have reached similar results for these modalities, as well as for novel stool tests and CT colonography.

The results were less clear for the question of whether any method of screening should be preferred because it is either more effective or more cost-effective (or excluded because it is clearly less effective or less cost-effective). The different available models had different findings as to which screening strategies were most effective or most cost-effective. Differences in results appeared to arise from differences in input variables (principally costs, test accuracy, how complications were modeled, and some features of the natural history of polyps and cancers) as well as differences in model structure. Most of the models did not consider adherence, or only considered it crudely. Few estimated the degree of overall uncertainty around their estimates of cost-effectiveness, although

most did perform multiple sensitivity analyses to test their individual assumptions one at a time.

In general guaiac-based fecal occult blood testing produced modest benefits in life-years gained at relatively low costs and newer occult blood tests were more effective with reasonable incremental costs. Sigmoidoscopy alone was often dominated by (less effective and more costly) occult blood testing. Colonoscopy and the combination of occult blood testing and sigmoidoscopy were often the most effective strategies. In some cases, their incremental cost per life year gained over other effective strategies was modest; in others, it was high. Barium enema's performance varied across models, perhaps in large part because of the limited data available to estimate its screening performance. CT colonography (CTC) performance relative to colonoscopy depended on their relative costs and on assumptions about CTC sensitivity and the effects of extra-colonic findings. Stool DNA was infrequently studied, and was often dominated by other test modalities, based on the costs and accuracy of the assays used at the time of these analyses.