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Breast, prostate, and thyroid cancer screening tests and overdiagnosis

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ABSTRACT

The purpose of this study was to examine overdiagnosis and overtreatment related to cancer screening and to review relevant reports and studies. A comprehensive search of peer-reviewed and gray literature was conducted for relevant studies published between January 2000 and December 2015 reporting breast, prostate, and thyroid cancer screening tests and overdiagnosis. This study revealed no dichotomy on where screening would lower risk or cause overdiagnosis and overtreatment. Many screening tests did both, that is, at population level, there were both benefit (decreased disease-specific mortality) and harm (overdiagnosis and overtreatment). Therefore, we need to consider a balanced argument with citations for the potential benefits of screening along with the harms associated with screening. Although the benefits and harms can only be tested through randomized trials, important data from cohort studies, diagnostic accuracy studies, and modeling work can help define the extent of benefits and harms in the population. The health care cycle that prompt patients to undergo periodic screening tests is self-reinforcing. In most developed countries, screening test recommendations encourage periodic testing. Therefore, patients are continuing their screening. It is necessary for patients to become wise consumers of screening tests and

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make decisions with their physicians regarding further testing and treatments.

Introduction

There is an underlying belief that conducting screening tests will enhance subjects' health and extend their life span if diseases are detected early and treated promptly. However, when such a belief is disproportionate, the pain, side effects, and economic costs associated with periodic screening tests may be underestimated. In other words, if the benefits provided by screening tests are not clearly greater than the tangible and intangible costs associated with the screening tests, continued use of that screening test should be reconsidered. However, it is difficult for patients and physicians to make such a decision when there is belief that state-of-the-art medical technologies can make everything possible. Up to date, reports that systematically review the efficacy of screening tests are rare.

Debates on whether screening tests are effective or causing overdiagnosis began with the gradually lowered threshold for separating control and patient groups. In the case of hypertension, the American Medical Association's recommendation has changed in the late 1990s, resulting in patients without symptoms undergoing drug therapy regardless of whether they have risk factors associated with cardiovascular diseases.[1] According to that recommendation, people with a systolic blood pressure of 140 mm Hg or higher and a diastolic blood pressure of 90 mm Hg or higher are classified as hypertensive and advised to undergo drug therapy. These blood pressures are lower than the previous recommended hypertension thresholds of 160/100 mm Hg.[2] Hypertension is the first disease that has been recommended for patients (including asymptomatic individuals) to undergo customary treatment.[3,4] Similarly, the recommended cutoff for cholesterol levels has been lowered from 240 mg/dL or above to 200 mg/dL or above.[2] Likewise, in the case of osteoporosis, the *t*-score, a quantitative bone density measurement, has been changed from −2.5 to −2.0, thus increasing the number of women classified as having osteoporosis.[5] A problem with such reductions is that the number of patients without symptoms is increased markedly when the threshold is lowered because physiological data typically form a normal distribution. Although many people are asymptomatic, they become "patients" based on their test results.

Recommending medical services to patients without symptoms and currently experiencing no inconvenience may constitute overtreatment. In the medical market where information is asymmetrical, supplier-induced demand (SID) can arise.[6] Presence of diabetes mellitus, hyperlipidemia, and osteoporosis is determined based on blood sugar levels, cholesterol levels, and *t*-scores, respectively. Few patients would reject a physician's treatment recommendation when tests yield results beyond the accepted threshold. However, such threshold levels can be imprecise. They might have been determined through negotiations among related physician-based associations. For example, until the mid-1990s, people were diagnosed as having diabetes mellitus when their fasting blood sugar levels exceeded 140 mg/dL.[2] Since then, the threshold for a diagnosis of diabetes mellitus has been lowered to 125 mg/dL. Consequently, many people are reclassified or newly classified as patients with diabetes mellitus. It is unclear whether changing the diagnostic threshold for diabetes mellitus and treating patients with mild diabetes mellitus is beneficial to those patients.[7]

The improvement in medical technology has not only allowed for adjustments of diagnostic threshold levels but also promoted expansion in the use of proactive and preventive checkups. For example, prenatal tests for pregnant women are taken for granted quite often these days. Indeed, the number of times a woman undergoes fetal sonography has increased considerably in many advanced countries.[8,9] Associated with that increase is a considerable increase in the