MAYO CLINIC

To Screen or Not to Screen: Reconciling Individual and Population Perspectives on Screening

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Abstract

Screening is the early detection of a latent disorder by a test to allow early intervention with the aim of improving prognosis. Individual and population perspectives on screening are perceived as opposing interests of patients and the population. In this article, we try to reconcile these perspectives. The individual perspective is based on the clinical experience of a better prognosis at early stages and patients with missed opportunities. In the population perspective, screening is based on a population-oriented, evidence-based model and addresses the acceptability and possible negative effects, including for people without the disorder. Known possible obstacles to a positive effect of screening include a short latent stage, lead time, overdiagnosis, lack of acceptability, poor performance of tests, and misclassification of outcome. Randomized trials of screening are challenging and need an adaptation of standards such as the Consolidated Standards of Reporting Trials (CONSORT). Simulating the effects of screening can allow the consideration of complex screening strategies and other options to help avoid biases related to treatment improvement and prevention success. Reconciling both perspectives is possible by considering that hypotheses underlying the former are prerequisites for the latter. From an evidence-based medicine and policy perspective, we suggest that recommending screening or prescribing a test is unethical if all possible obstacles are not documented by providing the best available evidence.

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Screening is the early detection of a latent disorder with the goal of starting treatment early to improve prognosis or intervening to avoid unwanted consequences of the disorder.[1] For example, screening for breast cancer with mammography is proposed in many developed countries to initiate treatment of localized tumors and hopefully achieve cure.[2] Screening of blood donors for infections is performed to avoid contamination of transfusion recipients.[3] Screening is fully described as a test proposed for a target population, and an organized process including a frequency of screening, a confirmed diagnostic procedure for those who tested positive, an early intervention for those confirmed, and an outcome to improve.

When targeted at a complete population, screening is called systematic screening.[4] Screening can be limited to an explicitly defined subgroup based on criteria such as age or other markers of high risk of developing the disorder or a poor prognosis; it is then called targeted or selective screening.[4] Systematic and targeted screening are 2 forms of what is also called mass screening.[4] Screening can also be proposed outside of any program to patients consulting a physician for an unrelated problem; this opportunistic approach is called case finding.[5] Whereas systematic and selective screening are usually performed within programs developed with a population-based, public health perspective, case finding depends on the physician's clinical, individual perspective on what is best for his or her patient.

The individual and population perspectives are perceived as opposing interests of patients and populations. Briefly, screening may seem like an obviously good idea from a clinical experience perspective because a perfect test would allow either the chance for reassurance or the possibility of improving prognosis with early intervention. Nevertheless, screening is a complex intervention from the population

Mayo Clin Proc. ■ November 2016;91(11):1594-1605 ■ http://dx.doi.org/10.1016/j.mayocp.2016.07.017
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perspective,[6] therefore implying specific evaluations of the advantages and disadvantages for all individuals to whom the test will be proposed, including people with and without the disorder.

Herein, using examples of screening for chronic diseases (eg, cancer, human immunodeficiency virus infection, and psychosis) and in specific populations (eg, children and the elderly), we illustrate how screening is even more complex than usually perceived, and we try to reconcile the individual and population perspectives. We define and illustrate issues and biases that are potential obstacles to the implementation or positive effects of screening and that need to be addressed in clinical trials and modeling of the effects of screening; we expect to promote adequate methods to document the effects of screening and to improve evidence-based decisions regarding screening.

INDIVIDUAL PERSPECTIVE ON SCREENING

The Obvious Seduction of Early Detection

The individual perspective considers that screening anticipates an intervention for patients with a poor prognosis: (1) for many disorders, patients have a better prognosis or response to treatment at early compared with later stages[7]; (2) some patients seen late in the disorder process have a history of previous contacts with health services for manifestations possibly linked to early stages of the disorder.[8] For example, proposals of early detection of child abuse have been triggered by the observation of children seen at the stage of serious or lethal injuries but who had been previously seen by social services or in emergency departments.[9,10] In such contexts, it is logical to hypothesize that an active search for early stages of the disorder should improve the prognosis (Figure 1A).

This logical hypothesis explains why screening is so "popular" among physicians dealing in their practice with patients with a late diagnosis or a poor prognosis. This popularity is reflected by the US Preventive Services Task Force recommendations: as of July 2015, of 150 active recommendations, 106 (70.7%) are about screening. Still, the difficulty of screening is reflected by the many instances in which screening is contraindicated (23 grade D recommendations) or the evidence is insufficient (39 grade I recommendations) (for details, see Supplemental Table 1, available online at http://www.mayoclinicproceedings.org).

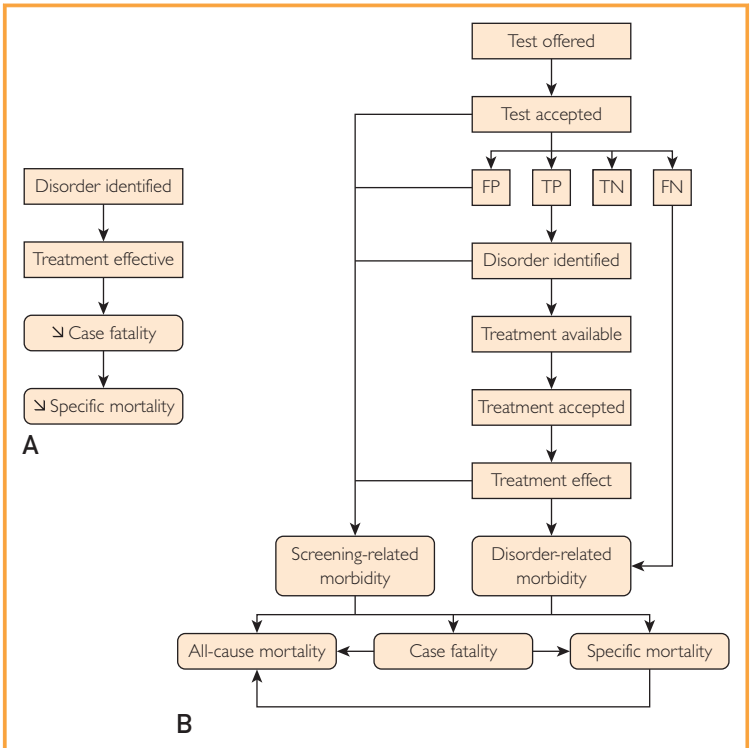

FIGURE 1. Hypotheses underlying screening according to the individual (A) and population (B) perspectives. FN = false-negative; FP = false-positive; TN = true-negative; TP = true-positive.

Difficulties in Judging the Clinical Effects of Screening

The hypothesis underlying the individual perspective is logical, but it can be flawed in three ways. First, early detection is possible only if there is a preclinical stage (obstacle 1) and if this stage is long enough for patients with a poor prognosis, if untreated, to have time to benefit from earlier treatment.[1] The preclinical stage is the period when the disorder is present but without any of the manifestations that usually trigger diagnosis. Many cancers have a potentially long preclinical phase, making screening relevant and implying repeated testing. In other instances, the preclinical phase is always short (bacterial contamination by blood transfusion)[11] or too poorly defined or documented to guarantee its existence (some forms of child abuse).[12]

Second, the anticipation of diagnosis related to the application of a test before any

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