Diagnosis

Evangelists versus snails
The terms “snails” and “evangelists” are commonly used to reflect the contrast between those clinicians that adopt diagnostic tests without reliable evidence that it provides tangible patient benefits (evangelists) versus those clinicians that will only adopt a diagnostic test only when randomized trials have been conducted that demonstrate that the diagnostic test provides tangible patient benefits (snails). These terms were first introduced in 1975 (Sackett and Holland 1975).

Lead time bias
Earlier diagnosis will lead to an apparent longer survival even when treatment does not affect or worsens the natural disease history. Lead time bias is an important consideration when a claim is made that earlier diagnosis improves survival.

Length time bias
Diseases that progress fast are less likely to be detected with screening than disease that progress slow.

Natural disease variability and diagnosis
- Large natural variability in disease progression/regression causes difficulty in determining who needs and who does not need treatment. A quote commonly used to reflect this quagmire is: “Is cure necessary in those in whom it is possible and is cure possible in those in whom it is necessary (Whitmore WF, 1990)”. For several diseases, including caries, those subclinical conditions that can be diagnosed may be best off with no treatment, while those subclinical conditions that are difficult to diagnose may be most in need of treatment
- There is increasing evidence that cancers may spontaneously regress maybe in part due to the host’s immune system. A recent study in JAMA provides on such case study for breast cancer. This study reported “the natural course for some screen-detected breast cancers may be to spontaneously regress (Zahl, Maehlen et al. 2008).

Diagnostic tests can have negative consequences
- Psychological harm of being labeled as “diseased”
- Physical Harm from the diagnostic test itself
- Cost of diagnostic test which can reduce available funds for effective/necessary diagnostic tests
- Diagnostic tests can result in unnecessary/unhelpful treatments that may result in more harm than good.
Is more diagnostic information better?
- Additional information from ultrasound and computed tomography and misdiagnosis rate of appendicitis (Flum, McClure et al. 2005).
- Additional diagnostic testing and rate of incorrect cancer diagnoses (Burton, Troxclair et al. 1998)
- Additional diagnostic information and orthodontic diagnoses (Han, Vig et al. 1991)

Additional information can be “toxic” (Taleb 2007) – More diagnostic test information can lead to more hypotheses that need to be explored and may provide more changes to get stuck on the wrong hypothesis.

High false positive rates are a common challenge when screening for diseases with a low prevalence. Even a perfect sensitivity and a high specificity can result in a high rate of false positive when the prevalence of disease is low.

A useful framework for assessing the clinical value of diagnostic tests was published by Tasioni (Tatsioni, Zarin et al. 2005) (freely available online)
- Accurate diagnosis of a sub-clinical condition does not imply that a tangible patient benefit can be obtained.
- The most reliable evidence in favor of a diagnostic test is the conduct of a randomized controlled trial where access to the diagnostic test is randomized. If those individuals who were randomly assigned to the diagnostic test have a higher probability of having a beneficial outcome than those without access to the diagnostic test, the diagnostic test is beneficial
- The largest and most expensive trials current underway in the United States are randomized trials on diagnostic tests such as PSA or CT lung cancer screening.

References