Decision Making Regarding Mammographic Screening for Breast Cancer in Women 40-49 y.o. with First Degree Relative with Breast Cancer

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ABSTRACT

This paper aims to help health care providers to advise the healthy female patients age of 40-49 y.o. who have one first degree relative with breast cancer, whether she should or should not participate in mammographic screening. The author’s patient is anxious whether she should have her mammogram done and whether it will benefit her. Her sister was most recently diagnosed with breast fibroadenoma. In order to answer their patient’s question the author take into consideration medical aspects of mammography as a screening test, and integrate them with patient values and preferences into a single decision-making model. This paper is based on the modeling of a decision tree, using the information extracted from open sources and peer-reviewed publications. It is based on comprehensive search for each model parameter, but is not an all-inclusive systematic review. The purpose of this work is both educational and practical: the author tries to apply the decision analysis methodology in an attempt to solve this dilemma while trying to avoid or at least minimize biased assumptions regarding usefulness of mammography in this group of patients. Based on their proposed model the decision regarding the participation into mammographic screening in this particular scenario is highly driven by patient values and preferences.

INTRODUCTION

We aim to provide professional advice to our patient Mrs. A, a 45 y.o. healthy female with a family history of breast cancer, regarding whether she should participate in mammographic screening, and if she should, at what intervals.

There is a controversy about effectiveness of the screening, particularly in the younger age group (40-49 y.o.), where the benefits of breast cancer mortality reduction should be evaluated against the risks of overdiagnosis, discomfort caused by diagnostic procedures and psychological stress related to false-positive results and additional tests.

Our goal is to construct the personalized decision-making algorithm which will consider...
the outcomes of screening for breast cancer, analysis of risks and benefits of screening adjusted to patient values (utility-disutility scale) for a final decision making.

This paper depicts the process of decision making rule construction and involves several steps:

**Step 1:** Search for and analyze the evidence regarding clinical efficiency and accuracy of mammographic screening in the target age group;

**Step 2:** Generate a list of possible breast cancer outcomes in screened and non-screened target age group, necessary for decision making model and perform additional literature search if the sources identified in Step 1 are insufficient;

**Step 3:** Generate a list of patient values (utility-disutility scale) regarding all possible outcomes of screening based on additional literature searches;

**Step 4:** Construct decision tree using extracted or derived parameter values from the available evidence;

**Step 5:** Evaluate decision-making algorithm using the decision tree, considering:
A. death reduction from breast cancer as the only valued outcome; and
B. death reduction adjusted to disutilities based on possible patient values;

**Step 6:** Discuss the controversy surrounding breast cancer screening and its potential implications for individual decision making.

**Glossary of Terms used in this Work (Extracts from Fitzpatrick-Lewis D. et al, 2011, Unless Otherwise Specified):**

- **True-positive mammogram:** abnormal mammogram with histologically (biopsy) confirmed breast cancer;
- **True-negative mammogram:** negative mammogram, no cancer is present after initial screen;
- **False-positive mammogram:** abnormal initial mammogram, but further investigations ruled out cancer by either review of the images, other by invasive tests (biopsy). It is not completely clear how to classify the mammograms which were initially called positive, but were re-classified as negative after a second review (and for which no biopsies were recommended). In this work I used two types of false positives: “overall” false positives – i.e. any mammograms with the abnormal initial result, after which cancer was excluded either by image review or biopsy. The second definition considers only those positive results which required biopsy, after which no cancer was confirmed. Also, occasional cases may appear unclassifiable when the biopsy result does not confirm cancer, but signifies “atypical” risk lesion. This is also considered false positive;
- **False-negative mammogram:** There is no complete clarity in the available guidelines regarding the definition of false negative results. They also can be of two kinds: the first is related to overlooked cancers by the screeners. The European Quality Control Guidelines for breast cancer screening (2006) identify false negatives as an abnormality which is clearly visible and warrants assessment, i.e. reading error, detected by another reader. This definition reflects an avoidable error. In practice, this error should be eliminated through quality assurance activities before the mammographic result is issued. The second definition of false negatives is related exclusively to the cancers developing during the screening interval periods (so-called interval cancer). For the purpose of this work, the rate of interval cancers is used as a false negative rate (Bucci et al., 2008);
- **Overdiagnosis:** Brewer N et al (2007), cited by Fitzpatrick-Lewis D. et al (2011) indicates that “Any invasive or noninvasive breast cancer detected by screening that would have not been identified clinically or would not have resulted in symptoms or death in a person’s lifetime is called overdiagnosis”. Apparently, there is no consensus about
ICT Aspects of Next-Generation-Sequencing Applied to Molecular Diagnostics
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