

## **Expert Elicitation to Populate early Health Economic Models of medical diagnostic devices in development.**

**Wieke Haakma, Laura Bojke, Lotte M.G. Vrijhoef-Steuten and Maarten J. IJzerman**

**Purpose:** During the development of new diagnostic and therapeutic devices, it is desirable to indicate the cost-effectiveness through modeling and to establish its potential clinical value to guide further developments. However, in these early stages of development, there are usually no or limited clinical data available. Instead elicitation methods involving experts can be used to obtain estimates on uncertain model inputs. In this study, expert elicitation was used as a method to estimate uncertain priors of the diagnostic performance of a new imaging technology, i.e. Photo Acoustic Mammography (PAM). We compared PAM as an alternative to MRI in the detection of breast cancer. Experts are asked to predict the sensitivity and specificity of PAM.

**Method:** Expert elicitation was used as a method to formulate the knowledge and beliefs of experts about the future performance of PAM and to quantify this information into probability distributions. Using the mathematical approach to elicitation, 13 experts (radiologists specialized in examining MR-images of breasts) estimated the true positive rate (TPR) and true negative rate (TNR) based on existing MRI data (with a TPR of 263 out of 292, and a TNR of 214 out of 308) and specified the mode (the most likely value), the lower, and the upper boundaries (a 95% credible interval). An overall probability density function (PDF) was determined using the linear opinion pooling method in which weighting is applied to reflect the performance of individual experts.

**Result:** The overall PDF indicated a sensitivity ranging from 56.1% to 86.9%, with a mode of 73.3%. The specificity ranges from 48.1% to 78.2%, with a mode of 64.7%. Experts expressed difficulties making the estimations, as there is not sufficient data about the manner in which PAM visualizes different tumor types.

**Conclusion:** Using expert elicitation in the absence of clinical data, priors distribution of the range of sensitivity and specificity could be obtained. Theoretically, this data can be fed into early health economic models. However, experts have difficulties estimating the performance based on limited data. Therefore, large clinical trials with PAM should indicate whether these results are valid and expert elicitation could be used in early technology assessment. Before that, the use of the elicited priors in health economic models requires careful consideration.