Supplemental Digital Content 1

Appendix 1: Justification and Description of Prior Distributions

Prior distribution for the overall mean (μ) is assumed to be a normal distribution with mean 0 and standard deviation 5. The prior distributions for the pre-operative pain at rest, pre-operative pain with coughing, average expected pain severity and the severity of acute post-operative pain during the first 3 days after surgery are assumed to be normal distributions with mean 0 and standard deviation 2. Because age at surgery, pain catastrophizing scale total score and standardized sleep disturbance score has a wider scale, the prior distributions for the regression coefficients of these covariates are normal distributions with mean 0 and standard deviation 1. Finally, the prior distributions for the presence of any chest tube on day 3 after surgery and the type of surgery (thoracotomy vs VATS) is assumed to be a normal distribution with mean 0 and standard deviation 10. These distributions are not very informative.

VATS: video-assisted thoracic surgery

Appendix 2: Prior Distributions for Sensitivity Analyses

As a sensitivity analyses, same analyses were repeated using more informative prior distributions. The incidence of chronic pain at 6 months after thoracotomy was reported as 47% (95% CI: 39% to 56%) from a meta-analysis of 15 prospective studies from 1354 patients.[5] Therefore, it was assumed that around 50% of the patients would develop chronic pain related to thoracic surgery at 6 months, and logit probability of developing chronic pain should sum up to 0 (logit(0.5)= log(0.5/(1-0.5))). In addition, it is known from the literature that higher severities of acute pain and pre-operative pain at rest and upon coughing, expected pain severity and higher pre-operative pain catastrophizing score are associated with the presence of chronic pain. Therefore, one can expect positive logistic regression coefficients for these covariates. Thus, the prior distributions for the pre-operative pain at rest, pre-operative pain with coughing, average expected pain severity, the severity of acute post-operative pain during the first 3 days after surgery and pain catastrophizing scale total score are assumed to be normal distributions with mean 0.3 and standard deviation 1. We were also expecting both presence of chest tube on day 3 after surgery and thoracotomy (vs VATS) to be associated with the presence of chronic pain after surgery, and is assumed to be a normal distribution with mean 0.3 and standard deviation 2. Because all these covariates are defined as positive, and as explained before, because of logit(0.5) = 0, the sum of the prior distribution for the overall mean (μ) should be negative and is assumed to be a normal distribution with mean -3 and standard deviation 2. Same non-informative prior distributions were used for age at surgery and the standardized sleep disturbance score; Normal (0, 1^2).

Consistent with the non-informative prior distributions, the final multivariate model using the informative prior distributions only included the severity of acute post-operative pain during the first 3 days after surgery (NRS, 0–10).

The final Bayesian multivariate model using the informative prior distributions is Logit(probability of chronic pain) = -2.42 + 0.21 acute pain.

Posterior mean and 99% credible interval of the beta coefficient for the severity of acute post-operative pain during the first 3 days after surgery are 0.21 (0.05 to 0.57). Posterior mean and 99% credible interval for the relative risk associated with the severity of acute post-operative pain during the first 3 days after surgery are 1.23 (1.06 to 1.78). These values can be compared with the values provided on last two columns of Table 6 for the non-informative prior distribution.

NRS: numerical rating scale, VATS: video-assisted thoracic surgery