

## Appendix S1. RA-CUSUM functions.

The RA-CUSUM chart plots the function:

$$(1) X_t = \max (0, X_{t-1} + W_t), \quad t = 1, 2, 3, \dots$$

Where  $X_0 = 0$  and  $W_t$  is the weight assigned to the the procedure. In this study, each value of  $t$  corresponds to a new patient receiving a robot-assisted procedure. The weights  $W_t$  are given by:

$$(2) W_t = \begin{cases} \log \left[ \frac{1 - p_t + R_0 p_t}{1 - p_t + R_A p_t} \right] & \text{if patient } t \text{ develops no recurrence} \\ \log \left[ \frac{(1 - p_t + R_0 p_t) R_A}{(1 - p_t + R_A p_t) R_0} \right] & \text{if patient } t \text{ develops recurrence} \end{cases}$$

Where  $p_t$  is the probability of recurrence for each patient calculated from the probability of recurrence model;  $R_0 = 1$  represents the odds ratio under the null hypothesis;  $R_A$  represents the odds ratio under the alternate hypothesis.

Both RA-CUSUM procedures can be presented in one plot, with RA-CUSUM+ plotting the function  $X_t$  as described above (1), and RA-CUSUM- plotting the function:

$$(3) Z_t = \min (0, Z_{t-1} - W_t), \quad t = 1, 2, 3, \dots$$

Where  $Z_0 = 0$  and  $W_t$  is provided by the formerly described function (2).