Abstract 11396

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Background
Common questions by cancer patients include “Will I die from this cancer?” and “Will this scan find cancer?” A published survival curve can help answer these questions at the time of initial treatment. But after that point in time, the correct probabilities shift as the DFI (disease free interval) since surgery increases. We do not have an updated nomogram of time dependent survival for postoperative sarcoma patients.

Questions/Purpose:
We present a simplified model of cancer survival that can assist in answering the questions above. We examine the correlation of one particular post-surgical scan having a negative result to the lifetime post-surgical cancer risk, and demonstrate how a patient’s risk of relapse changes after having already survived a certain amount of time. We argue that some of the anxiety experienced by cancer patients is needless, because of misperceptions of the probability of negative events.

Methods
We present a Bayesian model of post-surgical sarcoma risk that dynamically updates the survival curves in Kattan et al. (2002) for DFI, and provides time-dependent probabilities [1]. To examine risk perceptions, we asked a survey sample of 306 adults from the general population to estimate the remaining lifetime risk and scan risk when randomly assigned to realistic cancer scenarios differing in lifetime risk (.20, .50, .80) and DFI (6 mo, 2 yr, 5 yr).

Results
The Bayesian model shows us that the risk of a given scan detecting a recurrence of cancer is actually very low, because that scan covers only a fraction of the remaining lifetime. Figure 1 illustrates this contrast using the overall sarcoma risk of .40 from Kattan et al and our model [1]. Having built up the model to address cancer scans, we discuss how the survival probabilities update upon receiving either positive or negative news about whether a recurrence has been found in a given scan. In Figure 2, we illustrate how receiving good and bad news at a two year scan effects a patient’s survival curve. The lighter blue curve is the improved survival curve that just being alive at year two merits. After receiving good news from the scan, a patient’s survival curve further improves to the green curve shown in the figure. However, if bad news is received, survival is given by the red curve, which drops fairly quickly, but does not go to zero, because a recurrence does not necessarily mean the patient will die from cancer. On average, our survey respondents overestimated the remaining lifetime risk compared to the model probability (mean overestimation = .122, $p < .001$), and even more so as the DFI increased. They also overestimated the probability that a scan will show cancer (mean overestimation = .319, $p<.001$). Many respondents appear to think that the risk for one scan is similar to the remaining lifetime risk. Reactions from focus groups of sarcoma patients suggest that they have similar misperceptions. A survey of similar patients is in progress to assess this more systematically.

Conclusion
To our knowledge, there are no other studies that associate postoperative sarcoma scans and anxiety with an updated survival curve. Follow-up appointments and scans provide natural points in time to update disease risks. These appointments are extremely stressful for patients because a scan result could show that the cancer is back. Fear of recurrence is a common stressor for cancer patients and is heightened around the time of a scan [2]. The literature supports that recurrence of disease does not necessarily mean death from disease [3]. The utility of our updated nomogram is that in the event of recurrence, it provides the patients and practitioners with a probability that remission can be achieved again, versus probability of death from disease. Currently, physicians have no systematic way to adjust the original survival curve for DFI. Our method for determining these time-dependent (and declining) risks could help physicians to decrease patients’ emotional distress and better manage their risk perceptions.

Figure 1.

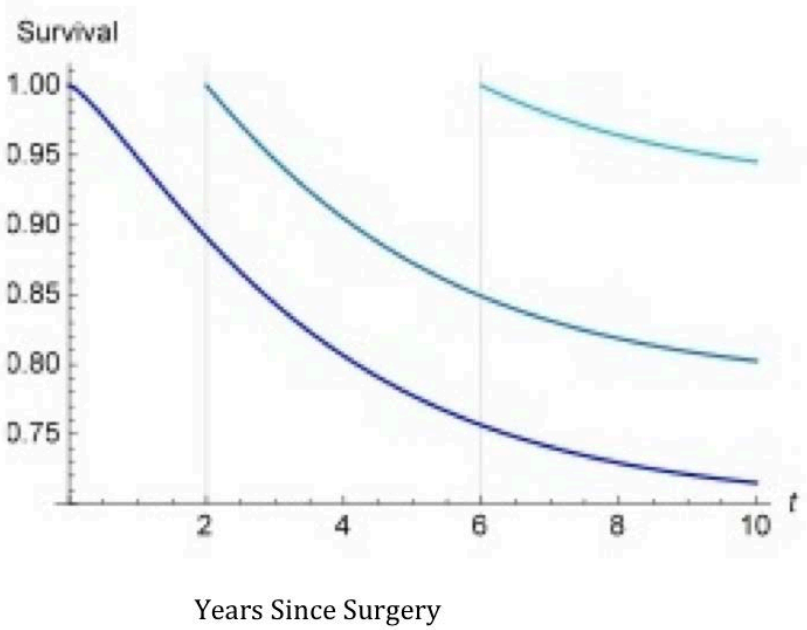

Figure 1. Survival curve with p= 0.30 when currently at years 2 and 6 post operatively

Figure 2

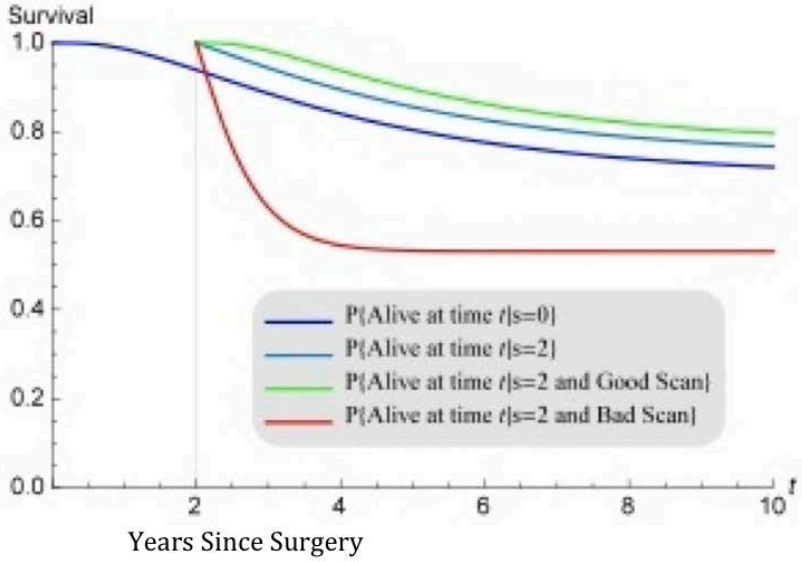

Figure 2. Survival curves after receiving scan information at year 2.

Sources

1. Kattan MW, Leung DH, Brennan MF. Postoperative nomogram for 12-year sarcoma-specific death. *J Clin Oncol* 2002 Feb 1;20(3):791-796.
2. Thompson CA, Charlson ME, Schenkein E, et al. Surveillance CT scans are a source of anxiety and fear of recurrence in long-term lymphoma survivors. *Ann Oncol* 2010;21(11);2262-2266.
3. Ferrari S, Luksch R, Hall KS, et al. Post-relapse survival in patients with Ewing sarcoma. *Pediatr Blood Cancer* 2015.doi: 10.1002/pbc.25388.