Nomograms

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What are nomograms?

- Predictive tools
- Give the probability of a specific event occurring in an individual based on what has been observed in a population possessing similar characteristics (disease / co-morbidities)
- In 2007 alone, there were 61 published prostate cancer nomograms
- Vast majority of prostate cancer nomograms have been generated in US
- And the proliferation in prostate cancer nomograms continues - this is due to the PAUCITY OF RANDOMISED DATA TO GUIDE MANAGEMENT

Examples of nomograms in common use

Partin's Table

- Developed by two urologists, Alan Partin and Patrick Walsh
- Initially based on hundreds of patients who underwent nerve sparing RRP (performed by one surgeon, PW) at John Hopkins
- Prediction of pathological stage based on clinical stage, presenting PSA and biopsy Gleason score
- Has been updated on a number of occasions

Validation of Partin's Tables

- Investigation of a cohort of US patients identified in the NCI SEER database for the years 2004-2005
- Found that the tables performed best for men under the age of 61 and less well for older patients
  - cohort of patients used to build Partin's tables was relatively young
  - greater incidence of BPH attributable PSA (false impression of more advanced disease)
  - differences in biology of disease between younger and older patients
- Authors conclude that Partin's tables performed well - this is despite acknowledging in the article that SEER database only records prostatectomy and NOT biopsy Gleason score

Validation of Partin's Tables

- Study published in 2007
- Set out to validate Partin's tables in French and Italian populations
- Tables performed poorly in these two European Cohorts
- For example:
  Predicted rate of ECE for Italian group - 40%
  ACTUAL observed rate for same group - 20%

  Predicted rate of SVI for French group - 20%
  ACTUAL observed rate for same group - 50%

Kattan's nomogram

- Uses pre-operative PSA, biopsy Gleason grade and clinical stage to estimate risk of disease recurrence after radical prostatectomy.
- Modelled using clinical and pathological data from 996 men with T1a-T3bNXM0 treated with radical prostatectomy by one surgeon with pathology reported by a single pathologist (1983-1997)
- Median age - 63
  88% caucasian
- Nomogram performed well on patient data from academic centres (accuracy of 88%) although confidence interval at some levels can be as wide as +/- 10%
- However, it performed less well on patient data from a national database with ONLY 68% accuracy

- Study published in poster format at ASCO in 2007
- Identified 35 nomograms published since 1997
- NONE HAD BEEN VALIDATED ON UK PATIENTS
- MANY UK CLINICIANS HAVE TAKEN A LEAP OF FAITH - WE CANNOT BE SURE THAT NOMOGRAMS GENERATED IN THE US CAN PROVIDE ACCURATE PREDICTIONS FOR UK PATIENTS

There are so many prostate cancer nomograms - which one do you use?

- Is the question relevant to my practice?
- Is the patient population relevant to my practice?
- Is the nomogram simple and useable?
- Has the nomogram been validated?

Be aware of the limitations of nomograms and counsel your patients appropriately

Limitations (1)

- Freedom from biochemical recurrence is used as a criterion of treatment efficacy
- However, there is a lack of robust data to support the use of biochemical disease free survival as a surrogate marker for overall survival, i.e, longer period of time with undetectable or normal PSA has NOT been proven to equate to cure
- The risk of biochemical recurrence may not therefore provide patients with the information that they require to make treatment decisions. Ultimately, patients want to know about their chances of cure

Limitations (2)

- Nomograms are built using RETROSPECTIVE statistical methods
- Prediction for an individual is predicated on the outcome for a population of patients with SIMILAR characteristics, treated in a SIMILAR fashion, sometimes MANY years ago
- But the demographic characteristics of men with prostate cancer have changed significantly over the years
- Use of PSA has resulted in earlier diagnosis, younger patients, lower PSA and T1c stage seen more frequently
- Gleason score is no longer read in the same way and we are now seeing more cancers in the anterior part of the prostate and tansitional zone
- Patient now is no longer similar to the group of patients on which nomograms are based - reducing the accuracy of nomograms
- NOMOGRAMS ARE FINE IF NOTHING EVER CHANGED

Limitations (3)

- Decisions made now about treatment will be very different from those made many years ago
- Technical aspects of radical therapy will also have changed over the years
- Once again, this reduces accuracy of nomograms

Limitations (4)

- Most nomograms are based on single centre series or derived from data generated in large academic units or both
- Hence such nomograms may not apply to patients treated in other institutions
- Surgeons in academic institutions may well achieve different results to surgeons working in DGH
- There are still many uncertainties even when nomograms are generated using multi-institutional approach
- Selection bias; heterogeneous populations; missing data
- It is unlikely that patients in different institutions will have received identical treatment and follow up

Limitations (5)

- Yes, patients want cure but they also want quality of life
- Nomograms provide no information about quality of life post radical therapy

Conclusion

- Nomograms can empower patients
- However, there is no robust evidence to show that use of nomograms actually improve patient care and treatment outcomes
- Counsel your patients with regard to the limitations of nomograms if you are going to use them in your discussions about treatment and prognosis

BUT

‘No nomogram will ever take the place of good clinical judgment’