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To Predict the Future, Consider the Present as Well as the Past

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Published and publicized rates of urinary and sexual dysfunction following radical prostatectomy and other treatments for prostate cancer vary wildly, reflecting such variables as who ascertains the outcome, via what medium (paper, phone, electronic, etc.), and using what specific questions and definitions—not to mention wide variation in baseline patient functional status and surgical technique and quality. For the most part, regardless of these methodological details, quality-of-life outcomes are analyzed and reported based on cross-sectional analysis of results at some fixed time point following treatment—for example, likelihood of being pad free or meeting a score threshold on a given quality-of-life instrument at 6 or 12 mo after surgery. Ideally, analyses may use repeated measures techniques to reflect both short- and long-term impacts of intervention. These study designs are optimal for assessing the overall impact of an intervention over time, and in some cases they are useful for counseling patients before treatment [1].

For a patient who has already been treated, however, counseling tools may be personalized further by incorporating the considerable information content reflected in the recovery to date. For example, two 60-yr-old men in similar overall health treated by the same surgeon may have had comparable a priori risks of long-term incontinence before prostatectomy, but if one is using five pads a day at 6 mo postoperatively and the other is using only one pad, their respective likelihoods of eventually reaching full continence are no longer equivalent. This concept of conditional survival outcomes is naturally intuitive, and surgeons broadly recognize that the greatest functional improvement occurs in the first year after surgery, with a lower likelihood of normalization of function subsequently.

However, few previous studies have attempted to quantify this effect. In this issue of *European Urology*, Abdollah et al. analyzed a relatively large cohort of prostatectomy patients

treated over a 10-yr period in an effort to develop counseling tools that would reflect duration of follow-up as well as baseline function and technical aspects of surgery [2]. One noteworthy finding was that continence recovery >1 yr postoperatively was hardly rare: Among men still incontinent at 1, 2, and 3 yr, 41%, 25%, and 13%, respectively, recovered within the subsequent 6 mo. This observation is consistent with a recent report that men incontinent after prostatectomy benefit from behavioral interventions at a mean of 5 yr and at as many as 17 yr following surgery [3]. Conversely, comparatively few men with persistent erectile dysfunction 1 yr following surgery eventually recovered, highlighting the need for rehabilitation strategies early in the recovery period [4]. Trajectories of recovery also varied between open and robot-assisted surgical patients.

The analysis is marked by a few notable limitations, some of which the authors acknowledged. Continence and potency were defined by dichotomizing scores that are intended to be analyzed as continuous variables. Although the conditional survival analysis required this recoding, these outcomes are not truly binary, and significant information can be lost in this approach [5]. There is a clear clinical implication here: A man with a very low urinary function score at 12 mo naturally has different prospects for eventual complete urinary recovery than on who barely misses the threshold definition for continence, and these two men should not receive the same counseling.

The findings with respect to robot-assisted versus open surgery are dramatic, particularly in terms of urinary function recovery, but they should be interpreted with substantial caution. The patients were not randomized between the two approaches, and it seems quite likely that unmeasured confounding may be significant. Patient age and extent of nerve sparing were dichotomized in the multivariable analysis, and baseline erectile function was

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likewise categorized. Within these broad categories, robot-assisted surgery patients may have been younger and may have received more complete nerve sparing; alternatively, they may have been treated more recently and/or by higher volume surgeons. Certainly it stretches credibility somewhat to suggest, as does the urinary function nomogram, that undergoing robot-assisted versus open surgery should be worth the same number of points in terms of recovery prediction as being 45 rather than 85 yr of age at the time of surgery.

Another important caveat with respect to interpretation of the nomograms is the fact that they were developed using data from a single relatively high-volume center, and they have not been externally validated. A man treated in another center by a different surgeon may have a substantially different likelihood of recovery. Indeed, the erectile recovery prediction model, appears somewhat more optimistic than another recently published model derived from two multicenter cohorts [1]. If and when external validation studies are conducted, it would be interesting to determine whether variation across surgeons and across centers tends to attenuate as time passes. For example, likelihood of continence recovery in the first 6 mo postoperatively may vary substantially across providers, but the conditional likelihood of recovery at 18 mo may be consistent for a man still using one pad per day at 12 mo.

Specific validation issues aside, if novel prediction models are to develop from research instruments into clinically useful tools, the expression of the models will need to evolve beyond static nomograms to more dynamic systems that can routinely collect patient-reported data at baseline and in follow-up, and then can integrate this data in real time to predict outcomes based on data from contemporary patients treated at a given center [6,7]. Of course, the first prerequisite is that *all* men managed for prostate cancer complete validated quality-of-life questionnaires at regular intervals, regardless of their participation in research studies [8].

Ultimately, whether or not the specific predictions from the models of Abdollah et al. eventually prove reliable, the concept of predictions conditional on duration of observation and on short-term outcomes should in the future yield better guidance for men as they transition from early recovery to long-term survivorship.

Conflicts of interest: The author has nothing to disclose.

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