Assuming this future decision support system recommends biopsy, we next need to decide what the biopsy is supposed to achieve, First, it should rule in or out a curable prostate cancer. This is very different from detecting *any* cancer and thus expands the traditional metric for biopsy performance: simple cancer detection sensitivity. Prognostic information to determine whether treatment would benefit the patient would be vital because a cancer that is too indolent to cause harm or too impervious to treatment to justify even trying should probably remain unrecognized until clinical symptoms dictate. Second, a biopsy scheme is preferred if it provides incremental prognostic accuracy in those diagnosed with curable prostate cancers. A third benefit of one possible biopsy scheme over another occurs when a scheme provides improved treatment delivery. An extended biopsy scheme, for example, would be preferred if it guided the surgical approach, resulting in a lower positive margin rate, or enabled selective or "focal" treatment. Given the accomplishment of those three tasks, one would prefer the biopsy scheme with the least morbidity, which might limit both the number and location of cores to an optimal scheme.

Unfortunately, defining who has curable prostate cancer—that which needs treatment and for which treatment exists—is a big problem. For starters, we never know in an individual patient whether he benefited from his treatment because we cannot know what would have happened, favorably or unfavorably, had he forgone intervention. Thus, it is not so easy to learn from our mistakes. Probably the closest we can come is to use all available and emerging data to model a prospective patient's life expectancy and morbidity with and without treatment. This goal is the intent of a large body of research within the *comparative effectiveness* heading, providing prospective patients with the predictions of benefits and harms as a function of the available treatment options.

In summary, the type of biopsy or no biopsy at all should be selected based on that which maximizes that patient's quality-adjusted life expectancy. To accomplish this goal, we have tremendous work remaining toward the development of the ultimate biopsy decision support tool.

Conflicts of interest: The authors have nothing to disclose.

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Platinum Priority

Reply from Authors re: Michael W. Kattan, J. Stephen Jones. The Ultimate Prostate Cancer Biopsy Decision Support Tool. Eur Urol 2010;57:9–10

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Transrectal ultrasound prostate biopsy techniques have evolved tremendously over the years from the digitally guided biopsy to sextant Hodge's scheme, from extended technique with 10–12 cores to current saturation protocol with >20 cores [1]. In contrast, the concept of random, systematic biopsies has remained durable in the evolution of prostatic strategies [2].

Before the end of the second millennium, several authors had already shown limitations in cancer detection with sextant biopsy and had reported high rates of false-negative biopsy. Thus, Hodge's scheme soon became obsolete. Subsequently, different prostatic schemes with 8, 10, or 12 biopsies were proposed because emerging evidence suggested that taking >6 biopsies might significantly increase the rate of cancer detection [1]. In the last 5 yr, there has been a worldwide tendency to perform initial prostatic biopsies with an increasing number of cores beyond the extended strategy, but saturation biopsies have not proven to increase prostate cancer detection significantly in the most recent studies [1]. Thus, after a period of glory for the saturation biopsy, which was performed on almost every patient both in the initial and repeated setting, a period of criticism has recently emerged.

As nicely described by Giannarini et al in their editorial comment, saturation should theoretically define a sampling technique aimed at optimizing the prostate cancer detection rate [3]. Unfortunately, the concept of saturation remains unfulfilled at present. The authors of this editorial have correctly pointed out some considerations that can be advanced to explain this inadequacy. The first one is the number of cores related to the prostatic volume. They have reported that sampling accuracy tends to progressively decrease not only due to the larger volume itself but also because of the more dispersed and thin distribution of the peripheral zone tissue that is posteriorly compressed by the larger transition zone. Due to the anatomic characteristics of the larger prostate, the needle samples only a small fraction of peripheral gland, even with an aggressive strategy. The second consideration is the location of the cores. The authors are convinced that a combination of transrectal and transperineal sampling, with the intent of

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saturating all regions, may result in an optimization of prostate cancer diagnosis. I agree that a combination of two approaches with 30 cores may be more accurate than a single one with the same number of cores, but, unfortunately, the combination of the two approaches is rather complicated in clinical practice and needs general anesthesia (or a combination of two local anesthesias).

For these reasons, saturation biopsy is not necessary as the initial approach, and the gold standard for initial prostatic biopsy still remains the systematic extended scheme. Nevertheless, the optimal number and location of biopsies needed to identify all patients with prostate cancer is still not known.

Giannarini et al stated that if the intention is an optimization of the prostate cancer detection rate, statistical analyses based on the mathematical optimization functions, such as the recursive partitioning models, are the most appropriate tools to gain advantage in the field [3]. This is what we have done in our paper. Specifically, we demonstrated that the most advantageous schemes (defined as a scheme that detected >95% of the cancer detected by a 24-core biopsy with the minimum number of cores) are specific combinations of 10–16 cores that vary according to the clinical characteristics of the patients [4]. Moreover, we proposed a user-friendly flowchart to identify the most advantageous set of sampling sites according to patients' characteristics. In our study we confirmed that it is imperative not only to increase the number of biopsy cores taken but also to target the appropriate locations in the prostate that will lead to the optimal detection of prostate cancer.

So, what is the future of prostatic mapping? Because the concept of random mapping is still valid, a systematic approach with a variable number and location of cores that has to be individualized according to the clinical characteristics of the patient seems like the right path to pursue.

In the future, new technologies, such as real-time magnetic resonance-transrectal ultrasound fusion for guidance of targeted prostate biopsies, three-dimensional real-time ultrasound-guided biopsies, and contrast-enhanced ultrasonography using cadence-contrast pulse sequencing technology for targeted biopsy of the prostate may further revolutionize the approach of prostatic sampling [5–7]. In a prostate-specific antigen era when the incidence of hypoechoic lesions has been reduced and they have lost their clinical relevance, to hit a precise zone of the prostate that has the highest density of positivity is becoming of the utmost importance. In this way, it is possible to maximize prostate cancer detection with the fewest number of cores and the minimum of morbidity and pain.

Unfortunately, the scenario of prostate diagnosis is even more complicated. Kattan and Jones suggested in their editorial that it is also very important to consider which men should undergo a prostatic biopsy, not only which biopsy procedure is optimal [8]. They concluded that the type of biopsy, or no biopsy at all, should be selected based on what maximizes that patient's quality-adjusted life expectancy. A tool that can help us decide when to perform a prostatic biopsy would be easily shareable. Such a tool should incorporate different variables such as life expectancy, comorbidity, and a man's preferences for possible future health states. Once the tool recommends biopsy, we have to choose the optimal scheme that detects prostate cancer with the prognostic information to determine the adequate treatment.

Because the most vital issue in the prostate cancer setting is not overdiagnosis but potential overtreatment [9], the ideal approach should be that one that detects most of the cancers with all pathologic characteristics rather than another approach that has a significantly lower detection rate and a minor prognostic value.

Conflicts of interest: The author has nothing to disclose.

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