Prostate Cancer Overdiagnosis:
A Product of Technological Oversensitivity

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Modern oncology suggests the risk of prostate cancer is becoming increasingly common. Many other researchers contend that the dramatic increase in the number of perceived cases of prostate cancer coincides with use of protein-specific antigen (PSA) screening as the primary tool in diagnosing these patients. Research has shown that the PSA test is overly sensitive, and does not differentiate between men with prostate cancer, and men with higher levels of PSA in their blood. The researchers who defend this "overdiagnosis" of prostate cancer refer to increase in the incidence rate of prostate cancer alongside the advent of PSA testing; while there have been negligible changes in the mortality rates from prostate cancer. This raises the question of whether PSA testing should be used as frequently as it is, putting patients at risk of "overdiagnosis" and receiving unnecessary treatments.

It is increasingly common for physicians to use screening as their primary means of diagnosing cancer, as early detection of malignant tumours is considered one of the most successful measures in cancer treatment. While routine screening can be beneficial for many cancer patients, a recent study in the *Journal of the National Cancer Institute* suggests that prostate cancer screening has been used in exhaustive proportions (Welch et al, 2009). This has led to what the medical community refers to as "overdiagnosis" – concluding that a patient has a certain disease, and proceeding with treatment of this disease when it is neither necessary nor beneficial for the patient (Bangma et al., 2007). Overdiagnosis is an increasingly contentious issue in the medical community. The aforementioned study further develops the justification that specific, well-defined elements must exist before one confirms the diagnosis of prostate cancer (Welch et al., 2009). The use of protein-specific antigen (PSA) blood tests as a screening method has played a significant role in the detection of cancer and many studies are now revealing that it may be an oversensitive tool that makes benign tumours seem fatal. Also, since the PSA test may carry risks and cause considerable discomfort that significantly outweighs its benefits, its use should be limited. The goal of researchers is to make methods of prostate cancer detection more standardized to avoid overdiagnosis.

> "Research... suggests this substantial increase in cancer is deceiving"

Over the last two decades, the dramatic increase in prostate cancer incidence has transformed an uncommon cancer into the third most frequently diagnosed cancer today (Bangma et al., 2007). Research conducted by Welch et al. (2009) at the University of Connecticut suggests this substantial increase in cancer incidence is deceiving, largely due to the increased and widespread use of PSA blood tests. PSA is an extremely sensitive screening method that leads researchers to believe that it plays a fundamental role in prostate cancer overdiagnosis. The development of this PSA technique coincides with a significant spike in the incidence of prostate cancer; interestingly, research from Welch et al. reveals that over one million individuals diagnosed with prostate cancer are not actually at risk, and thus have not benefitted from the diagnosis (Welch et al., 2009). There is considerable evidence for the notion that prostate cancer screening may harm more people than it benefits because of the unnecessary exposure to chemotherapy and its negative side effects. Two eagerly anticipated clinical trials support this view by showing that marginal benefits are derived from PSA screening (Welch et al., 2009).

It is important to examine the underlying features of PSA blood tests in order to understand its sensitivity. PSA is a protein

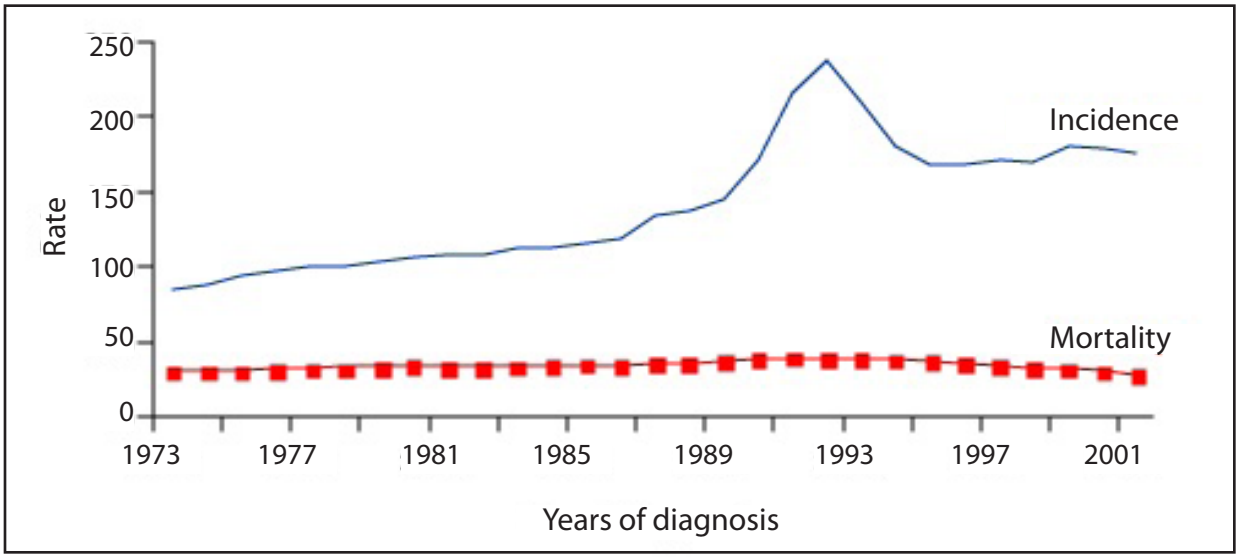

Figure 1 Incident & Mortality Rates of Prostate Cancer Per 100,000 Cases

The above figure illustrates the notion that PSA testing has not been proven as a screening procedure. The use of PSA test-ing was first used in 1987, but became increasingly prevalent over time until the early 1990s, when it became a traditionally-used screening device. This temporal timeline directly coincides with the sharp spike in the incidence of PSA. However, the key is the mortality rate, which remains relatively constant with negligible changes in its rate. This demonstrates that while an increasingly large proportion of cases were being considered to be "at-risk prostate cancer patients" because of excessive PSA use, the actual levels of mortality rate have not changed too much. The obvious implication is that these patients fall under the category of the 'overdiagnosed' or 'misdiagnosed'.

produced by cells within the prostate gland that can be measured by taking blood samples (Doust et al., 2000). Like many other antigens, PSA is used to detect disease and falls under a larger class of compounds known as biological markers (Welch et al., 2009). More specifically, PSA is a tumour marker and its relative levels may indicate whether or not tumours are developing (Doust et al., 2000).

Normally, men without prostate cancer have low levels of PSA in their blood. As men age, the statistical incidence of prostate cancer naturally increases. When examining whether a patient has prostate cancer, it is common to note that the risk of developing prostate cancer increases as PSA levels steadily rise (Doust et al., 2000). However, PSA serum levels may also be indicative of conditions other than metastatic prostate cancer . For example, rising PSA levels are also present in other prostate pathologies such as prostatitis (the inflammation of the prostate) and benign prostatic hyperplasia (the enlargement of the prostate), both of which are increasingly prevalent (Bangma et al., 2007). Therefore, the diagnosis of prostate cancer cannot be based solely on elevated PSA serum levels. Since PSA levels alone are not sufficient to distinguish between prostate cancer and other prostate conditions, it is not surprising that an increasingly large number of physicians use PSA blood tests only for a surface analysis of a prostate condition (Bangma et al., 2007).

One characteristic of prostate cancer that makes it more difficult to detect when compared to other cancers is that the metastasizing rate for prostate cancer is highly variable (Etzioni et al., 2002). In other words, some prostate cancers grow very quickly while many develop relatively slowly. Prostate cancers are unique in that they tend to remain confined to a small region with negligible increases in growth rate (Bangma et al., 2007). In these cases, chemotherapy and radiation treatment are not always necessary (Etzioni et al., 2002). From a physician's perspective, it is difficult to differentiate between which treatments were required and which were unnecessary. On the other hand, a patient is faced with a difficult decision of whether to undergo treatment that may or may not be necessary. As a one of the cancers with the most side effects, with impotence and incontinence being common, the psychological consideration of neglecting prostate cancer treatment can be considered apathetic.

The question of overdiagnosing prostate cancer has many ethical implications. A counter-argument for overdiagnosis is that some prostate cancers will cause significant complications later on in life, as shown by the 2009 estimate of 27,360 fatal cases of prostate cancer out of 192,280 new cases (Welch et al., 2009). For roughly 14 percent of cases, PSA screening and treatment methods would be beneficial.

To argue that physicians should not attempt to treat cancer when they are able to detect a localized, malignant tumour, is to proceed with an action that compromises accepted practices in the field of oncology. This is often considered the ideal situation, as nearly all types of cancer are controlled most effectively when they are suppressed before they metastasize. Moreover, there is a compulsion in modern medicine that physicians have a moral obligation to act. We expect doctors to be proactive and explore all appropriate treatments. With this ideology, physicians must attempt to man-age prostate cancer with all the tools at their disposal, especially since it is often impossible to foresee the final outcome of not treating a patient.

Even though the Hippocratic Oath states that physicians must act in the best interest of the patient, one can argue that a physician with the patient's best interests in mind would refrain from using chemotherapy and radiation unless absolutely necessary. The physiological and emotional side effects of these treatments are often overwhelming for patients. If men can live with prostate cancer that does not metastasize, thus not having to worry about significant health concerns, then the advantages of avoiding treatment may outweigh the costs. Dr. Welch and Dr. Albertsen from the University of Connecticut found that out of the estimated one million men "overtreated" for prostate cancer, the majority were younger men. Specifically, there was a threefold increase in the number of men aged 50-59 who were diagnosed with prostate cancer. This is substantially less than the sevenfold increase found in men under the age of 50 (Welch et al, 2009). These statistics illustrate the urgency with which researchers are diagnosing prostate cancer with the PSA technique. The screening method must be an accurate prognostic tool in determining the probability of the cancer metastasizing. Until then, The American Cancer Society recommends that physicians exercise caution in screening for prostate cancer and that patients be aware of the positive and negative aspects of screening. This would allow patients to make informed decisions regarding whether or not to proceed with treatment.

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Dr. Shana O. Kelley is the director of Biomolecular Sciences at the University of Toronto. Aptly listed by the Globe and Mail as Canada's Top 40 under 40, Dr. Kelley invented the first electronic chip to sense molecular disease markers. Overseeing a team of 20 researchers at Kelley Laboratories, she continues to conduct ground-breaking research to develop nanoscale medical diagnostic technology.

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