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TESTICULAR AWARENESS: THE WHAT, THE WHY, AND THE HOW

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ABSTRACT

Globally, men have a lower life expectancy than women and health outcomes among men are poorer than women. Only Australia, Brazil, Iran, and Ireland possess national men's health policies. Testicular disorders can have a negative effect on men's health and are rarely addressed in these policies. Findings from the empirical literature on men's awareness of testicular disorders suggest that men's knowledge of testicular disorders is lacking and their intentions to seek timely medical attention for testicular symptoms are low. This paper aims to introduce the concept of 'testicular awareness' and explore its implications for health research, practice, and education. The key attributes of 'testicular awareness' include: (i) familiarity with own testes; (ii) knowing what is normal versus abnormal; (iii) ability to detect an abnormality; and (iv) knowing own risk factors. Testicular awareness is an all-encompassing concept since it helps men become familiar with an intimate body part that is seldom discussed and enables them to detect testicular abnormalities and to seek timely medical attention for testicular symptoms, regardless of the ultimate diagnosis. Testicular awareness can be promoted using a number of strategies, such as: (i) involving men in drafting men's health policies that address testicular awareness; (ii) partnering with men to develop and test interventions promoting testicular awareness; (iii) being cognizant of the learning needs of men who are at risk of health disparities including those with low literacy and health literacy; (iv) promoting testicular awareness in clinical practice and health education; and (v) using men's daily spheres of information to promote testicular awareness; these include but are not limited to: workplaces, universities, gyms, and community organizations.

Globally, health outcomes for men continue to be markedly poor and their life expectancy remains four years lower than that of women.[1] Efforts promoting men's health remain relatively scarce and health organizations and national governments tend to assume that gendered approaches to health promotion should be primarily focused on women's health, rather than on both genders equally.[2] This might lead to gender-based health disparity and poorer health outcomes among men, and would potentially discourage them from engaging with health services.[3]

To date, only Australia, Brazil, Iran, and Ireland possess national men's health policies.[4] Testicular disorders can have a negative impact on men's health and are often overlooked in these policies. Testicular cancer (TC) is the most frequently diagnosed solid tumour

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among men aged 18 to 50 years.[5] The incidence of this malignancy has doubled over the past four decades,[6] and TC mortality is highest in the developing world due to late presentation and limited access to healthcare.[7] Orchiectomy remains the primary treatment modality for TC and can be followed by chemotherapy and/or radiotherapy depending on the stage and type of the tumour.[8] TC treatments are linked to various physical and psychosocial complications including: fatigue[9]; peripheral neuropathy[10]; metabolic syndromes[11]; myocardial injury[12]; pulmonary toxicity[13]; infertility[14]; depression[15]; fear of recurrence[16]; and long-lasting feelings of loss.[17]

Like TC, many benign disorders of the testes can be life-threatening. For instance, testicular torsion is a medical emergency that often causes excruciating scrotal pain.[18] A delay in help-seeking for six hours or more from the onset of pain results in testicular ischemia and necrosis and often necessitates an emergency orchiectomy.[19] Benign testicular disorders also include thrombosis of the pampiniform plexus, a rare life-threatening condition that is often misdiagnosed as hernia or orchitis thus leading to treatment delay.[20] In addition, epididymo-orchitis is often sexually transmitted among men younger than 35 years and makes up 1 in every 144 outpatient visits among men younger than 50 years.[21] This condition increases a man's risk for sepsis and infertility if not diagnosed and treated promptly.[22] Filarial hydrocele is another benign disease that is seldom discussed in the literature on testicular disorders affecting 40 million men in over 80 developing countries and leading to disfigurement, disability, and discrimination.[23,24]

MEN'S AWARENESS OF TESTICULAR DISORDERS

A number of studies have been conducted to explore and enhance men's awareness of TC and its screening. In contrast, very little is known regarding men's awareness of benign testicular disorders.[25] In a systematic review of 25 studies exploring TC awareness, Saab et al.[26] found that men were often unaware of TC and its screening, very few practiced testicular self-examination (TSE), and those who reported performing TSE did not know what they were looking for. Nevertheless, interventions such as a university campaign, shower gel stickers with TSE messages, written information on TC and TSE, television shows featuring TC survivors, and PowerPoint presentations were successful in increasing men's awareness of TC and TSE, at least in the short-term.[27,28]

As for awareness of benign testicular disorders, findings from an integrative review of four cross-sectional studies suggest that men's knowledge of testicular torsion and filarial hydrocele is lacking and their intentions to seek help for scrotal pain and swelling are low.[25] What is notable about these reviews was that none of the studies aimed to raise men's awareness of testicular diseases other than TC. A summary of the empirical literature on men's awareness of testicular disorders is presented in Table 1.

In order to address the lack of awareness of testicular disorders and the limited research on benign testicular diseases, health researchers, practitioners, and educators could adopt a novel and comprehensive concept namely 'testicular awareness.' This paper aims to introduce the concept of 'testicular awareness' and explore its implications for health research, practice, and education.

THE KEY ATTRIBUTES OF TESTICULAR AWARENESS

To put 'testicular awareness' into perspective, it is important to consult the literature on the concept of 'breast awareness.' This concept was defined by Thornton and Pillarisetti[29] as "a woman becoming familiar with her own breasts and the way they will change throughout her life. It encourages women to know how their own breasts look and feel normally so that they gain confidence about noticing any change" (p.2119). 'Breast awareness' is increasingly replacing breast self-examination in research and practice following findings from two randomized controlled trials whereby routine breast self-examination exposed women to futile diagnostic tests and did not impact on survivorship.[30,31]

The definition of 'breast awareness' could help better understand and conceptualize 'testicular awareness'; however, Thornton and Pillarisetti[29] did not allude to the fact that, in order to establish awareness, early detection of an abnormality must be followed by a specific course of action. In other words, in addition

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TABLE 1 Summary of Evidence Regarding Men's Awareness of Testicular Disorders

Reviews	Methods	Findings
Systematic review of 25 studies on men's knowledge, awareness, and attitudes towards testicular cancer (TC) and testicular self-examination (TSE).[26]	Medline, CINAHL, and Embase searched for qualitative and quantitative descriptive studies and structured literature reviews published in English between January 2004 and November 2014 and included men only.	• Men lacked awareness of TC risk factors, signs and symptoms, and treatment. • Very few men reported practicing TSE, with the majority not knowing what to look for. • Many reported an intention to delay help-seeking for testicular symptoms.
Systematic review of 11 studies aimed to promote men's awareness of testicular cancer and self-examination.[27]	Medline, CINAHL, and Embase searched for experimental studies published in English between January 2004 and November 2014 and included men only.	• 10 studies successfully raised men's awareness of Tc and TSE. • None of the studies accounted for men's preferred learning strategies, reported on involving men in the design and delivery of interventions, or used innovative/unconventional educational strategies.
Integrative review of four studies on men's awareness of benign disorders of the testes.[25]	Medline, CINAHL, PsychINFO, and PubMed searched for qualitative, quantitative descriptive, and experimental studies as well as structured literature reviews published in English between January 1985 and July 2015 and included men only.	• Men's awareness of and help-seeking intentions for benign testicular disorders were lacking. • No interventions promoting awareness of benign testicular disorders were sourced.
Systematic review of five studies aimed to promote men's knowledge and awareness of testicular disorders and/or self-examination, behaviours and/or intentions to examine their testes, and help-seeking behaviours and/or intentions for testicular symptoms.[28]	Academic Search Complete, Medline, CINAHL, PsycINFO, ERIC, the Cochrane Library, and Grey Literature databases searched for experimental studies and structured literature reviews published in English between November 2014 and April 2018 and included men only.	• The majority of the interventions succeeded in raising men's awareness of TC and self-examination. • Studies promoting help-seeking for testicular symptoms and awareness of benign testicular disorders were lacking.

to detecting changes in the testes, one must be able to make a decision with regard to these changes.[32] This is key, as most testicular disorders are detected accidentally by men themselves.[33] Moreover, a man's partner can play a key role in detecting testicular abnormalities during sexual activity.[34]

Therefore, the key attributes of 'testicular awareness' which facilitate symptom perception and interpretation are as follows: (i) familiarity with own testes; (ii) knowing what is normal versus abnormal; (iii) ability to detect an abnormality; and (iv) knowing own risk factors. Achieving 'testicular awareness' is not a linear process. Rather, it is a complex process that comprises a cyclical and dynamic interplay between the aforementioned attributes, and factors influencing help-seeking leading to either prompt help-seeking, delay in help-seeking, or absence of help-seeking.

Familiarity with one's own testes entails knowing that both testes are ordinarily oval in shape, can be slightly unequal in size, can lie either horizontally or vertically, and one testis – usually the left testis – might hang slightly lower than the other.[35] Men should

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also accustom themselves to the naturally occurring lumps and bumps felt while palpating structures like the epididymis and spermatic cord.[35]

Familiarity does not only help with the detection, and recognition of changes (i.e., swelling, newly occurring lumps and bumps, inflammation, pain, discomfort, and penile discharge), but also enables men to establish a baseline of how their own testes look and feel. This step would help promote heightened body awareness since it encourages men to become attentive to a body area that is seldom spoken about.[34,36] This is key since men's lack of familiarity with the normal testes and their inability to differentiate between normally occurring lumps and bumps and new ones serve as major barriers to testicular awareness and help-seeking for testicular symptoms.[34]

Saab et al.[37] conducted a one-group pre-post study to enhance men's awareness of testicular disorders using a virtual reality intervention and found that men's perceived risk of testicular disorders was low at baseline and remained unchanged following the intervention. This is quite significant since knowing one's own risk factors for testicular disorders would alert men to the aforementioned symptoms and potential pathologies. For instance, men must recognize that a personal history of undescended testes and having a first degree relative with TC increase their risk for this malignancy. As for benign testicular disorders, men should be aware that unprotected sex (i.e., fellatio and penetrative) increases the risk of epididymo-orchitis[22]; testicular trauma is a risk factor for testicular torsion[38]; and living in a developing country increases the risk of filarial hydrocele.[24] A list of risk factors for testicular disorders is presented in Table 2.

TESTICULAR AWARENESS: AN ALL-ENCOMPASSING CONCEPT

Testicular pain, lumpiness, and swelling are not symptoms of TC exclusively. Testicular torsion, for instance, is known to cause excruciating pain and swelling,[18,38] epididymo-orchitis is the primary cause of testicular swelling and often leads to discomfort and lumpiness,[21] and varicocele, hydrocele, and spermatocele can be painful.[25]

The incidence of several non-malignant testicular disorders is higher than that of TC. Testicular torsion affects 1 in 4,000 males who are younger than 25 years annually.[18,38] Moreover, each year 600,000 men aged 18 to 50 years are diagnosed with epididymitis in the United States alone, whereas TC occurs in 5.7 per 100,000 men,[5] with only 55,300 cases diagnosed with this malignancy around the world in the year 2012.[40] Therefore, it may be tentatively suggested that the likelihood of the aforementioned symptoms occurring secondary to a benign testicular disease rather than TC is highly probable.

'Testicular awareness' does not necessarily entail knowing each and every testicular disorder; rather, it enables men to become familiar with their own testes. One can speculate that, when a man becomes more familiar with the normal appearance, shape, and size of his own testes, he is more likely to seek medical attention for symptoms of testicular disease, regardless of the ultimate diagnosis. This is reflected in the literature on men's help-seeking behaviours whereby the lack of awareness of the normal testes was linked to lower testicular awareness and greater intentions to delay help-seeking.[34,41]

TESTICULAR AWARENESS VERSUS TESTICULAR SELF-EXAMINATION

'Testicular awareness' does not necessarily involve routine TSE especially that the risks and benefits of this practice are debatable,[42] and the evidence regarding the impact of TC screening (i.e., screening by a physician or by means of TSE) on TC mortality is lacking.[43] As a result, whether to undergo TC screening has been divided into three competing positions.

The U.S. Preventive Services Task Force[44] and the National Cancer Institute[45] discourage TC screening due to the potential harms of false positives and concomitant anxiety. Proponents of routine TC screening, on the other hand, argue that recommendations discouraging this practice are based on speculations rather than empirical evidence,[46] especially that early detection of TC is linked to a reduced cost of treatment,[47] and public health initiatives promoting TSE are believed to be linked to a reduced tumour size at diagnosis.[48] The third position is to: (i) promote TC screening among at-risk men only; (ii) leave the decision to undergo TSE to the men themselves; and (iii) encourage awareness of the normal testes and

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TABLE 2 Risk Factors for Testicular Disorders[39]

Testicular Cancer	• White ethnicity • European ancestry • Age (15–35 years) • Being tall • Late puberty • Positive family history of testicular cancer • Personal history of testicular cancer • High body mass index • Low socio-economic status • Asbestos exposure • Subfertility • Cryptorchidism • Inguinal hernia • Testicular microlithiasis • Hypospadias • Testicular dysgenesis syndrome • Human Papilloma Virus (HPV) infection • Human Immunodeficiency Virus (HIV) infection • Acquired Immunodeficiency Syndrome (AIDS) • Low birth order • Gestational bleeding • Having several biological siblings • Low birth weight • Being a twin • Preterm birth
Epididymo-Orchitis	• Anatomic abnormalities • Being sexually active (age 18–35 years) • Urinary tract infections (age <14 and >35 years) • Urinary tract surgery or instrumentation (e.g. catheterization and recreational) • Benign prostate hyperplasia • Tuberculosis • Mumps • Vasculitis • Strenuous physical exercise • Bicycle or motorbike riding • Long periods of sitting • Medications such as amiodarone
Hydrocele	• Incomplete closure of the processus vaginalis (congenital) • Testicular trauma • Testicular torsion • Testicular surgeryv • Viral or bacterial infections (Western countries) • Parasitic infection (tropical and developing countries)
Testicular Torsion	• Horizontal lie of the testes • Large testicular volume • Testicular cancer • Testicular trauma (e.g., sports injury) • Cryptorchidism

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testicular symptoms over routine TSE. This position is endorsed by the American Cancer Society[49] and Cancer Research UK.[50] The positions of key policy makers and cancer organizations regarding TC screening are presented in Table 3. Of note, there are no clear guidelines regarding screening for testicular diseases other than TC.

The different positions surrounding TC screening, the lack of evidence regarding the risks and benefits of this practice, and the absence of guidelines relating to screening for benign testicular diseases can cause a certain level of uncertainty among men and healthcare professionals. This can be addressed by promoting 'testicular awareness.'

PROMOTING TESTICULAR AWARENESS

In 2011, the European Commission published a comprehensive report highlighting gender-based health inequities and proposing action plans to improve men's health in 34 European countries.[51] Moreover, the World Health Organization Regional Office for Europe expressed its commitment to achieving gender equity in health.[52] However, to our knowledge, very little has been done to promote men's health in research, education, and practice. This necessitates the establishment of national policies that promote optimal health outcomes among men and to actively involve men in drafting these policies.

In fact, there is an increasing global interest in patient and public involvement (PPI) in research. A systematic review of 66 studies on the impact of PPI on health and social research found that PPI impacted positively on research quality, objectives, recruitment, analysis, implementation, and dissemination.[53] Therefore, while attempting to promote testicular awareness, health educators and researchers must ensure that research is being conducted 'with' or 'by' members of the public rather than 'to', 'about' or 'for' them.[54]

TABLE 3 Positions of Key Policy Makers and Cancer Organizations Regarding Testicular Cancer Screening

Authority	Position on Testicular Cancer Screening	Statement
American Cancer Society[49]	Recommends testicular self-examination for at-risk men, provides tips to those who choose to perform testicular self-examination, and encourages familiarity with own testes	*"The American Cancer Society advises men to be aware of testicular cancer and to see a doctor right away if they find a lump in a testicle. Because regular testicular self-exams have not been studied enough to know if they reduce the death rate from this cancer, the ACS [American Cancer Society] does not have a recommendation on regular testicular self-exams for all men."*
Cancer Research UK[50]	Encourages awareness of the normal testes over regular testicular self-examination	*"It's useful to know how your body normally looks and feels, and this includes your testicles. This makes it easier for you to notice any changes. It's a good idea to look at and feel your testicles every now and then. But there's no need to worry about doing it regularly in a set way at a set time."*
National Cancer Institute[45]	Discourages testicular cancer screening	*"Screening for testicular cancer would not result in an appreciable decrease in mortality, in part because therapy at each stage is so effective. It would result in unnecessary diagnostic procedures with attendant morbidity."*
U. S. Preventive Services Task Force[44]	Discourages testicular cancer screening	*"There is inadequate evidence that screening asymptomatic patients by means of self-examination or clinician examination has greater yield or accuracy for detecting testicular cancer at more curable stages."*

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An example is a study that explored, qualitatively, men's (n=29) learning needs and preferred strategies for raising testicular awareness.[55] Overall, men recommended promoting testicular awareness using simple, brief, and interactive technologies. Similarly, a meta-narrative systematic review of 31 studies found that, in comparison to older men, younger men are more likely to use technology to obtain information on cancer prevention and risk-reduction.[56] Accordingly, Saab et al.[57] designed and tested the feasibility, usability, and effectiveness of a computer-based interactive virtual reality intervention aimed at ***E***nhancing ***M***en's ***A***wareness of ***T***esticular disorders ***(E-MAT).*** It was found that E-MAT was effective in increasing men's testicular awareness and intentions to feel their testes and seek help for testicular symptoms.

Theory-based interventions are more likely to achieve positive health outcomes in comparison to interventions that lack a theoretical underpinning.[58,59] In addition, the use of theory in intervention design and testing is a key element of complex intervention development and testing.[60] Therefore, in order to tailor effective messages to promote testicular awareness, researchers are encouraged to underpin their interventions with one or more behavioural change theories, intervention-based models, and/or theories of health communication.[59] An example is the Standard Model of Health Communication that was used to design and implement a TC awareness campaign.[61] Another example is the Control Identity Typology proposed by Rovito et al.[62] to create effective testicular health promotional messages. More recently, Saab et al.[63] developed the Preconscious Awareness to Action Framework following an iterative narrative review process of the theoretical literature on health promotion and education. This framework was used to design and test the E-MAT intervention which was successful in promoting testicular awareness and early help-seeking.[37,39,57]

Men who are at risk of health disparities, including those living in developing countries, were underrepresented in the literature exploring and promoting awareness of testicular disorders,[25–28] which necessitates the inclusion of these men in future research endeavours. This is particularly important since TC among ethnic minorities is often diagnosed at an advanced stage,[7] and benign disorders such as hydrocele are endemic in a number of developing countries.[64] Moreover, men's literacy and health literacy levels are known to affect their overall health awareness. Reidy et al.[65] systematically reviewed evidence from 25 experimental studies aimed at increasing men's knowledge about cancer risk-reduction. A key outcome from this review was the impact of health literacy on knowledge gain. It was found that cancer screening knowledge was lowest among men who had marginal to low literacy and health literacy levels.[66] Similarly, in their systematic review of 31 studies exploring men's information-seeking behaviours in relation to cancer prevention and risk-reduction, Saab et al.[56] found that men with low literacy and health literacy were less likely to seek information on cancer prevention and risk-reduction. However, interestingly, Reidy et al.[65] found that, in comparison to men with high literacy, men with lower literacy were more likely to engage with health promoting interventions and to report greater knowledge gains.

From a clinical perspective, like TSE, there are no clear guidelines or evidence as to whether the benefits of testicular clinical examination outweigh its risks. Clinicians who choose to perform clinical testicular examination ought to inform men about the goal of genital examination, signs and symptoms of various testicular diseases, and the importance of seeking timely medical attention for testicular symptoms. Moreover, clinicians who choose to promote TSE must inform their clients about the normally occurring lumps and bumps and must encourage this practice as a means to detect not only TC, but also non-malignant conditions.

As noted, men seldom seek out help from healthcare professionals and men at risk for health disparities have limited access to healthcare settings.[34,41] For this reason, settings that extend beyond healthcare should be considered to help raise testicular awareness and reach out for a wider audience. This can be achieved by delivering messages promoting testicular awareness in men's daily spheres of information i.e. "the totality of possible sources an individual may consult and incorporates their information network" (p.415).[56] These include but are not limited to: schools, colleges, barbershops, places of worship, sports centres, and workplaces.[56,65,66]

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CONCLUSION

Testicular awareness can help men become familiar with their own testes, know what is normal for them, detect an abnormality, and know their own risk factors. This can positively influence their decision to seek timely medical; attention, therefore improving health outcomes. Testicular awareness can be promoted using a number of strategies such as: (i) involving men in drafting men's health policies that address testicular awareness; (ii) partnering with men to develop and test interventions promoting testicular awareness; (iii) being cognizant of the learning needs of men who are at risk of health disparities including those with low literacy and health literacy; (iv) promoting testicular awareness in clinical practice and health education; and (v) using men's daily spheres of information (e.g., workplaces, universities, gyms, and community organizations) to promote testicular awareness.

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