

Testicular Cancer Awareness and Screening Practices: A Systematic Review

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Purpose/Objectives: To critically appraise empirical evidence gathered from studies that (a) explored men's knowledge, awareness, and attitudes toward testicular cancer (TC) and its screening; (b) addressed their testicular self-examination (TSE) practice; and/or (c) highlighted barriers and facilitators to this practice.

Data Sources: MEDLINE®, CINAHL®, and EMBASE®.

Data Synthesis: 25 articles met the inclusion criteria. Knowledge deficits regarding TC and its screening were seen. Participants who did not perform TSE often were uninformed about this practice. The majority of men perceived TC education as a positive step toward raising awareness about this malignancy.

Conclusions: Very few men were informed about TC and TSE. Future studies should include valid and reliable tools to assess TC knowledge and screening, address the means through which TC knowledge is delivered, explore the individual's experience with TC screening, and focus on TC awareness and screening among minority groups.

Implications for Nursing: Although regular screening for TC is a controversial issue, nurses should encourage young men to seek medical attention in the event of discovering scrotal abnormalities.

Testicular cancer (TC) is a rare malignancy that constitutes 0.5% of all new cancer cases and 0.1% of all cancer deaths in the United States. About 1 in every 263 men will develop TC in their lifetime and 8,430 men will be diagnosed with TC in 2015 (National Cancer Institute, 2014a). Men aged 20–34 years are at the highest risk for TC, with a median age of 33 years at diagnosis. However, in the United States, TC has one of the highest cure rates, with a five-year survival rate of 95% (National Cancer Institute, 2014a).

TC screening in asymptomatic males continues to be a controversial issue because of a lack of empirical evidence that supports or discourages the practice (Law, 2004; National Cancer Institute, 2014b). The U.S. Preventive Services Task Force ([USPSTF], 2011) issued a statement against TC screening among asymptomatic males. This statement was based on a Cochrane review conducted by Ilic and Misso (2011) in which no evidence was found regarding the beneficial effect of TC screening on mortality. In addition, it was suggested that TC screening may cause unnecessary anxiety and increase the likelihood of having false-positive findings that would consequently expose men to invasive diagnostic tests. However, key cancer organizations, such as the American Cancer Society ([ACS], 2014c), recommend TC screening as a component of routine cancer-related physical examinations. In the United Kingdom, men are encouraged to be aware of the normal anatomy of their testes (Cancer Research UK, 2014) despite having no evidence to support weekly or monthly testicular self-examination (TSE). Similarly, the Irish Cancer Society (2014) offers infographic material to

encourage young men to perform TSE. In addition, a number of foundations have been established to raise awareness about TC and its screening. One of those organizations, the Testicular Cancer Awareness Foundation (2014), uses 89% of its funds to educate young men about the importance of periodically practicing TSE.

Studies that have assessed TC knowledge and TC screening practices among healthy men have been conducted; however, no systematic reviews have been conducted to pool findings from these studies to inform practice. The aim of this review was to critically appraise evidence gathered from studies that explored men's knowledge, awareness, and attitudes toward TC and its screening; addressed their TSE practice; and/or highlighted barriers and facilitators to this practice.

Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) checklist was used in this review (Moher, Liberati, Tetzlaff, & Altman, 2009). Studies included in this systematic review are quantitative or qualitative; published in or translated to English; published from 2004–2014; included findings from men only; assessed knowledge, awareness, and attitudes toward TC; assessed knowledge, awareness, attitudes, and practice of TC screening, including TSE; and examined barriers and facilitators to TC knowledge and screening. The term *TC screening* was considered to comprise TC examination by a clinician and TSE.

Three electronic databases (MEDLINE®, CINAHL®, and EMBASE®) were searched. Boolean terms “OR” and “AND,” Medical Subject Headings (MeSH), and truncation “*” were used. Keywords and their synonyms were combined and yielded the following search history: (cancer* OR tumor* OR tumour* OR malignan* OR neoplas*) AND (testicul* OR testes OR testis OR testicle*) AND (self-exam* OR ‘self exam*’ OR screening OR ‘early detection’ OR awareness OR knowledge OR attitudes OR practice OR ‘health promotion’ OR symptoms).

Studies were exported to EndNode® X7 and duplicates were deleted. Records were screened on title and abstract and irrelevant articles were excluded. Data from the included studies were extracted by the primary reviewer (MS) using a standardized research matrix (Gooseens et al., 2014) and later cross-checked by another reviewer (JH). Data collected included name of the author(s), year of publication, and country and setting where the studies were conducted. Demographic data of the study population (sample size, mean age, and age range) were ex-

tracted along with the study design and instruments. The search results were independently reviewed by two authors (MS and ML), and a kappa coefficient was calculated.

A total of 3,076 records were identified through database search. Following the deletion of duplicates, 1,731 articles were independently screened on title and abstract by two reviewers (MS and ML) and irrelevant articles were excluded. A Cohen's kappa coefficient of 0.715 was obtained and was perceived as satisfactory (Higgins & Green, 2011). The authors assessed 126 full-text articles for eligibility. Following the exclusion of 101 articles, 21 quantitative cross-sectional surveys, 3 qualitative descriptive studies, and 1 integrative review were deemed eligible for review. Figure 1 summarizes the study selection process.

Results

Study Characteristics

The majority of the reviewed studies were conducted in the United States ($n = 7$). Because TC is most common among young adults, the majority of data was collected in universities ($n = 13$). The smallest sample size in quantitative studies was 177 (Beydag, 2012) and the largest sample size was 8,680 (Evans, Steptoe, & Wardle, 2006). As for qualitative studies, the minimum sample size was 20 (Dubé, Fuller, Rosen, Fagan, & O'Donnell, 2005) and the maximum was 37 (Evans, Simon, & Wardle, 2010). Non-probability purposive sampling was used in all of the reviewed qualitative studies as well as the majority of the quantitative studies ($n = 19$). Random sampling was used in only two quantitative studies (Muliira, Nalwanga, Muliira, & Nankinga, 2013; Powe, Ross, Wilkerson, Brooks, & Cooper, 2007). Ages of participants ranged from 14–78 years. With the exception of one integrative review (de Souza, dos Reis, Gomes, & de Carvalho, 2011), all included records used a descriptive approach.

Quality Appraisal of Included Studies

Three tools were used to assess the quality of the included studies. A quality-appraisal tool was used to assess the quality of the quantitative studies (Davids & Roman, 2014; Louw, Morris, & Grimmer-Somers, 2007; Roman & Frantz, 2013; Wong, Cheung, & Hart, 2008). Studies that scored from 0%–33.9% were considered weak ($n = 3$), 34%–66.9% were considered moderate ($n = 9$), and 67%–100% were interpreted as strong ($n = 9$). The quality of the qualitative studies and the integrative review was assessed using two tools developed by the Critical Appraisal Skills Programme (2013a, 2013b). Quality appraisal of the included literature is presented in Tables 1–3.

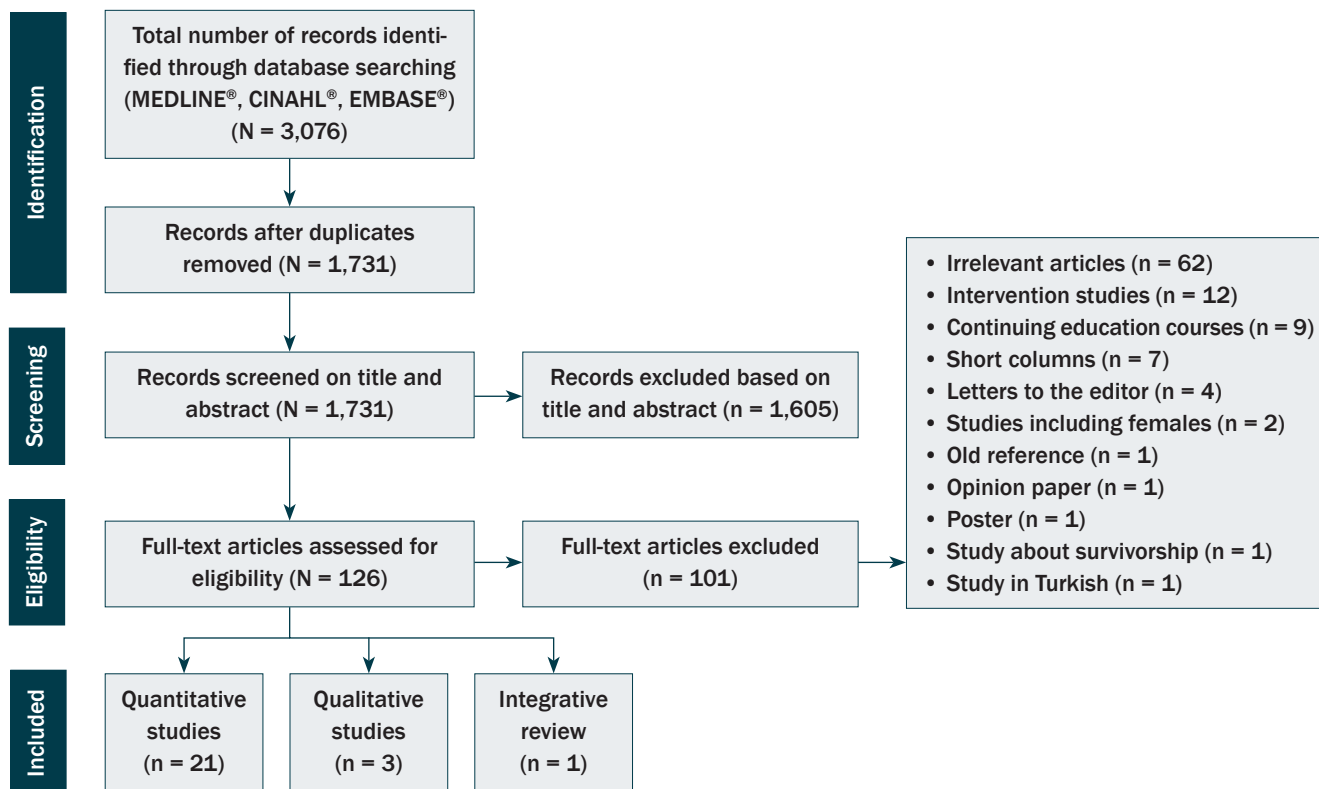


FIGURE 1. Record Identification, Screening, and Selection Process

Discussion

Researchers used a multitude of questionnaires to collect data, with the majority being researcher designed surveys (n = 18). Therefore, given the heterogeneous nature of the data collected, it was not feasible to combine the data for a meta-analysis. Findings from individual studies are presented in Appendix A.

Knowledge, Awareness, and Attitudes Toward Testicular Cancer

Having heard of TC did not equate to knowledge about the various aspects of this malignancy, such as its risk factors, signs and symptoms, and treatment modalities. Evidence shows that men's knowledge of TC increased over time. This increase in knowledge, however, was not found in studies conducted in developing countries. This trend may be attributable to the lack of public awareness and education about TC and its symptoms in the developing world (Kuzgunbay et al., 2013; Muliira et al., 2013; Ugboma & Aburoma, 2011).

While exploring the different attitudes toward TC, fear was found to be the most commonly reported feeling. Participants perceived TC as a serious illness, believed that they were at risk for TC, and were afraid of developing it. These participants were more likely to be unaware that TC is curable and believed that TC is not preventable. These perceptions may stem

from the general views of cancer. Cancer diagnosis in general and TC in particular has long been associated with fear (Saab, Nouredine, Huijjer, & DeJong, 2014; Skaali et al., 2009).

Of the risk factors for TC, age was addressed the most. A difference exists between the knowledge of TC risk factors among men living in developed countries (Casey, Grainger, Butler, McDermott, & Thornhill, 2010; Cronholm, Mao, Nguyen, & Paris, 2009; Daley, 2007; Powe et al., 2007) and that of men living in developing countries (Muliira et al., 2013; Onyiriuka & Imoebé, 2013). Again, this can be attributed to the lack of public awareness and education about TC in the developing world.

Knowledge, Awareness, Attitudes, and Practice of Testicular Self-Examination

A certain degree of knowledge deficit regarding TC screening was noted. Like TC awareness, having heard of TC screening did not equate to practicing TSE or undergoing TC screening by a clinician. Of those who claimed to have heard of TSE, very few knew what to look for while checking their testes. Like TC knowledge, the lowest TSE knowledge scores were noted among men living in developing countries, which was attributed to the lack of public awareness about health surveillance, insufficient health education in schools and universities, and the lack of endorsement of TC practices by policymakers.

Almost all men in the reviewed studies showed a positive attitude toward TC screening. As for help-seeking behaviors, very few stated that they would delay seeking medical attention in the event of a painless testicular lump. Delay in seeking medical care was strongly associated with not knowing about and/or not practicing TSE, as well as fear from contracting TC. Attitudes toward TC screening were thought to be shaped by cultural norms, health education, and the media. In addition, of the small amount of men who reported performing TSE, few did so regularly.

Barriers to Awareness and Screening

Evidence suggests that participants who did not perform TSE often were uninformed about this practice. Ambiguity of messages delivered by healthcare providers and men's negative attitudes toward TC and TSE served as barriers to TC screening. The evidence suggests that fear of detecting a lump and anxiety from false-positive results played a key role in the participants' refusal to perform TSE. In addition, those who perceived TSE as unimportant, time consuming, embarrassing, and/or painful were more likely to refrain from performing it. Of note, misconceptions about TC screening were predominant in developing countries and stemmed from the preexisting knowledge deficit about TC and its screening.

The lowest TC knowledge scores and TC screening practices were noted in studies conducted in developing countries. Conceivably, education could have affected their scores. However, the majority of participants in these studies were university students, including medical students (Kuzgunbay et al., 2013). Of note, the risk of developing TC is highest in the United States and Europe and lowest in Africa and Asia (ACS, 2014b). This

could be another reason why efforts were not made to increase TC awareness and TC screening practices in developing countries.

Participants' ethnic backgrounds also were found to influence TC knowledge and TC screening practices. In the United States, African American men scored the lowest on questions about TC and TSE. Despite the fact that the incidence of TC is higher among Caucasians,

TABLE 1. Quality Assessment of Quantitative Studies

Study	Quality Assessment Items					Relevance to Current Review				Score % ^a
	A	B	C	D	E	F	G	H	I	
Rudberg et al., 2005	1	1	1	1	1	1	1	1	1	100
Ward et al., 2005	1	1	1	0	1	1	1	1	1	88.9
Evans et al., 2006	1	1	1	1	0	0	1	0	0	55.6
Roemer et al., 2006	1	1	0	0	1	0	1	0	0	44.4
Sirin et al., 2006	1	0	0	0	1	0	1	0	0	33.3
Powe et al., 2007	1	0	1	0	1	1	1	1	1	77.8
Handy & Sankar, 2008	1	0	0	0	1	0	1	1	1	55.6
Cronholm et al., 2009	1	0	0	0	1	1	1	1	0	55.6
McGilligan et al., 2009	1	0	0	0	1	0	1	0	0	33.3
Casey et al., 2010	0	1	0	0	1	1	1	0	1	55.6
Reece et al., 2010	1	0	0	0	0	0	1	0	1	33.3
Brewer et al., 2011	0	1	0	0	1	0	1	1	1	55.6
Rovito et al., 2011	1	0	1	1	1	1	1	0	1	77.8
Ugboma & Aburoma, 2011	1	1	0	0	1	1	1	1	1	77.8
Urgurlu et al., 2011	1	1	0	0	1	1	1	1	1	77.8
Beydag, 2012	1	1	0	0	1	1	0	0	0	44.4
Özbaş et al., 2012	1	0	0	0	1	0	1	1	1	55.6
Kuzgunbay et al., 2013	0	0	0	0	1	1	1	0	1	44.4
Muliira et al., 2013	1	1	0	1	1	1	1	1	1	88.9
Onyiriuka & Imoebe, 2013	1	1	0	0	1	1	1	1	1	77.8
Kennett et al., 2014	1	1	0	0	1	1	1	1	1	77.8

^a Total score divided by the total number of items multiplied by 100.

0—no or not reported; 1—yes; A—Was sample likely to be representative of the study population?; B—Was a response rate mentioned within the study?; C—Was the instrument used reliable?; D—Was the instrument used valid?; E—Was it a primary data source?; F—Was TC knowledge, awareness, and/or attitudes assessed?; G—Was TC screening knowledge, awareness, attitude, and/or practice assessed?; H—Were barriers to TC knowledge and TC screening explored?; I—Were facilitators to TC knowledge and TC screening explored?; TC—testicular cancer

Note. Quality appraisal score and match with the objectives of current review: weak: 0–33.9%, moderate: 34%–66.9%, strong: 67%–100%

TABLE 2. Quality Assessment of Qualitative Studies and Reviews

Study	Questions From the Critical Appraisal Skills Programme									
	A	B	C	D	E	F	G	H	I	J
Dubé et al., 2005	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Very
Daley, 2007	Yes	Yes	Yes	Yes	Yes	PA	Yes	No	Yes	Very
Evans et al., 2010	Yes	Yes	Yes	Yes	Yes	PA	PA	No	Yes	Very

A—Was there a clear statement of the aims of the research?; B—Is a qualitative method appropriate?; C—Was the research design appropriate to address the aims of the research?; D—Was the recruitment strategy appropriate to the aims of the research?; E—Was the data collected in a way that addressed the research issues?; F—Has the relationship between researcher and participants been adequately considered?; G—Have ethical issues been taken into consideration?; H—Was the data analysis sufficiently rigorous?; I—Is there a clear statement of findings?; J—How valuable is the research?; PA—partially addressed

Note. Based on information from Critical Appraisal Skills Programme, 2013b.

information about TSE, showed willingness to practice TSE, and thought that men should be taught about TC. Participants also believed that no harm could come from TC education and suggested that delivering useful information and highlighting the TC high curability rate can help overcome cancer-related anxiety (Evans et al., 2010). They also believed that men should be encouraged to perform TSE the same way women are encouraged to perform breast self-examination and assumed that the normalization of TSE would lead to increased TC screening practices (Dubé et al., 2005; Evans et al., 2010).

African Americans are more likely to have advanced TC at time of diagnosis (ACS, 2014c). To date, no clear explanation exists for this trend; however, a number of factors could have contributed to these findings. For instance, African Americans often learn about TC and TSE through healthcare providers and schools. African Americans are, as a group, less likely than Caucasians to visit physicians on a regular basis (Powe et al., 2007). African Americans also generally have a lower socioeconomic status, which often is associated with lower screening rates, advanced stage of disease at diagnosis, and decreased survival rates (ACS, 2014a).

Facilitators to Awareness and Screening

The evidence suggests that men who were educated about TC and TSE were more likely to undergo TC screening. In the majority of the reviewed studies, mass media served as the means through which knowledge about TC and TC screening was conveyed. Despite its numerous detrimental effects, such as exposure to violent content and harmful lifestyle habits, the evidence suggests that mass media can play a key role in providing information about safe health practices (Strasburger, Jordan, & Donnerstein, 2012).

The majority of participants believed that TC education is a positive step toward raising awareness about TC and increasing TC screening practices. They displayed interest in obtaining

Limitations

During the review process, a number of methodologic limitations were noted. Using the American Association of Critical Care Nurses' hierarchy of evidence, all the reviewed papers fall under the level of evidence C (Armola et al., 2009). Focus groups rather than individual interviews were conducted in all three qualitative studies; therefore, some participants may not have been forthcoming in their answers, which could have led to omission of important details. In addition, no meta-analyses or meta-syntheses were identified during the literature search. Of note, a multitude of researcher-designed questionnaires were used in the majority of the reviewed survey studies, which has led to heterogeneous results that could not be combined for a meta-analysis. In addition, the majority of these studies did not report on reliability and validity. Almost all the reviewed studies used non-probability purposive sampling, which is known to

TABLE 3. Quality Assessment of the Integrative Review

Study	Questions From the Critical Appraisal Skills Programme								
	A	B	C	D	E	F	G	H	I
de Souza et al., 2011	Yes	PA	PA	No	Yes	-	No	PA	PA

A—Did the review address a clearly focused question?; B—Did the authors look for the appropriate sort of papers?; C—Were the important, relevant studies included?; D—Did the review's authors do enough to assess the quality of the included studies?; E—If the results of the review have been combined, was it reasonable to do so?; F—What are the overall results of the reviews?; G—Were the results clearly presented?; H—Were all important outcomes considered?; I—Do the benefits exceed the risks and costs?; PA—partially addressed

Note. Based on information from Critical Appraisal Skills Programme, 2013a.

Knowledge Translation

- Some organizations still recommend testicular cancer (TC) screening as a component of routine cancer-related physical examinations, despite a lack of evidence to support this practice.
- Lack of knowledge and misconceptions about TC can lead to decreased testicular self-examination practices.
- Very few studies included ethnic minorities, and none included sexuality and gender or religious minorities who are at risk for health disparities.

increase the risk of selection bias and yield a sample that is less likely to be representative of the target population (Cochrane Bias Methods Group, 2013). Finally, the majority of participants were Caucasian university students. Data from ethnic, sexuality, and gender, as well as religious minorities and people with disabilities was not sought, which hinders the generalizability and transferability of the findings.

The search was limited to three databases and did not include data from the grey literature. In addition, the search was limited to studies conducted from 2004 to 2014 and studies that were published in or translated to English, which leaves room for study selection bias. Reporting bias may have taken place since only findings pertinent to the review aims are presented (Cochrane Bias Methods Group, 2013). Finally, some descriptive statistics were calculated using data from the publications, which leaves room for error. Minimizing the risk for this error was attempted by having a second reviewer (JH) cross-check the extracted data.

Implications for Future Research

Future research on TC and TC screening is needed to close the gap in the literature and address the identified limitations. The use of standardized, valid, and reliable tools should be encouraged to allow the replication of studies in different contexts. In addition, the use of random sampling should be encouraged to minimize the risk of selection bias and yield a representative sample.

Despite assessing men's knowledge of TC and TSE, very few studies addressed the means through which this knowledge is delivered. For this reason, future research should focus on assessing men's information needs and exploring the preferred means through which they wish to acquire new knowledge. From a qualitative perspective, a need exists to explore the individual man's experience with TC screening and to offer an in-depth interpretation of the psychosocial constituents of this experience.

Research on cancer prevention in minority groups is among the top priorities of key oncology organizations, such as the Oncology Nursing Society (Wood et al., 2014). For this reason, future studies should be targeted toward assessing TC knowledge and screening practices as well as exploring the experiences minority groups.

Finally, given that the majority of existing data was collected from universities, future studies that focus on TC knowledge and screening in men with low educational and/or socioeconomic background should be considered.

Implications for Nursing

The controversy and lack of consensus regarding TC screening might instill a sense of ambiguity amongst healthcare providers and educators. A middle ground could be reached by informing nurses who are involved in health promotion to encourage young men to seek medical attention in the event of scrotal abnormalities, such as pain or the presence of a testicular lump or swelling.

Conclusions

A certain degree of knowledge deficit regarding TC and its screening exists. Generally, men perceived TC as a serious illness, were unaware that it is curable, and often were uninformed about TSE. In addition, not all who claimed having heard of TC screening knew what to look for during TSE. The majority of men perceived TC education as a positive step toward raising awareness about TC and TSE. Men who were educated about TC and TSE were more likely to undergo TC screening. Mass media served as the key means through which participants learned about TC and its screening.

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APPENDIX A. Research Matrix				Findings		
Study	Sample	Design	Instruments	Q1	Q2	Q3
				Quantitative Studies		
Rudberg et al., 2005	727 high school students in Sweden (\bar{X} age = 17 years, SD = 1.17, range = 15–21).	Descriptive cross-sectional survey	Researcher-designed questionnaire (60 items)	82 (11%) knew about TC; 521 (72%) were afraid of getting TC; 635 (87%) perceived TC as a very serious illness; 236 (33%) did not know that a swollen testicle can be a sign of TC	40 (6%) knew about TSE; 74 (10%) performed TSA a few times per year; 9 (1%) performed TSE once per month.	Barriers: The majority of participant were uninformed about TC and TSE. Facilitators: Of those who were informed about TC and TSE, 55 (68%) and 24 (61%), respectively, learned about TC and TSE via mass media.
Ward et al., 2005	213 males from a community-based youth organization in the United States (\bar{X} age = 15.4 years, SD = 1.1, range = 13–19)	Descriptive cross-sectional survey	Boy Scout Health and Safety Survey Two questions designed by the researchers about TC and TSE	155 (73%) had heard about TC	90 (42%) had performed a TSE at least once; 22 (10%) performed TSE 10 or more times per year.	Barriers: African Americans were least knowledgeable about TC ($p < 0.0001$) and less likely to perform TSE ($p = 0.024$). Facilitators: Participants who were Caucasian ($p = 0.0006$), had future educational goals ($p = 0.0376$), and who participated in physical education classes ($p = 0.0206$) were more likely to know about TC.
Evans et al., 2006	8,680 males from university settings in 13 European countries (ages not provided)	Descriptive comparative survey	Researchers used a questionnaire adapted from Wardle and Steptoe (1991).	NR	In 1990, 289 (4%) practiced TSE less than once a year, 436 (6%) practiced TSE 1–9 times per year, and 210 (3%) practiced TSE at least 10 times per year. TSE practice across Europe significantly increased from 1990 (13%) to 2000 (18%) ($p < 0.0001$).	NR
Roemer et al., 2006	1,600 males from a military medical center affiliated with the German armed forces (ages not provided)	Descriptive cross-sectional survey	Researchers designed a standardized face-to-face interview.	NR	1,527 (95%) reported having their testes examined; 2 (0.1%) refused to have the examination.	NR

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CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men’s knowledge, awareness, and attitude toward TC?; Q2—What are men’s knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men’s barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination

APPENDIX A. Research Matrix (Continued)				Findings		
Study	Sample	Design	Instruments	Q1	Q2	Q3
Quantitative Studies (Continued)						
Sirin et al., 2006	195 men in a shopping center in Turkey (age range = 20–60 years)	Descriptive cross-sectional survey	Researchers designed a 38-item questionnaire.	NR	15 (14%) knew how to perform TSE; of those, 5 performed monthly TSE.	NR
Powe et al., 2007	190 males in a university setting in the United States (\bar{X} age = 21.8 years, SD = 5.7, range = 18–56)	Descriptive comparative survey using Powe's Fatalism Model	Powe Fatalism Inventory TC knowledge survey Perceived cancer risk survey Student demographic data questionnaire	160 (84%) had heard of TC; 133 (70%) knew that men aged 20–40 years are at risk for TC.	95 (50%) performed TSE; of those, 15 performed monthly TSE.	Barriers: African Americans had lower TC knowledge (df = 188, t = 3.15, p = 0.002), scored higher on perceptions of cancer fatalism ($\chi^2 = 4.46$), and were more likely to identify non-risk factors as risk factors for TC (df = 2, $\chi^2 = 10.52$, p = 0.005). Facilitators: Participants who were taught about TSE (df = 2, $\chi^2 = 46.2$, p = 0.0001) and those who were freshmen or sophomores (df = 1, OR = 0.39, p = 0.027) were more likely to perform TSE.
Handy & Sankar, 2008	1,000 males in a genitourinary medicine clinic in the United Kingdom (age range = 16–44 years)	Descriptive cross-sectional survey	Researchers designed an eight-item questionnaire.	NR	859 (86%) performed TSE; 132 (13%) were taught to perform TSE by a general practitioner, 79 (8%) at school, and 88 (9%) in a genitourinary clinic. A total of 503 (51%) knew what to look for during TSE.	Barriers: No education about TSE Facilitators: 980 (98%) think that men should be taught about TSE through school (n = 598, 60%) and/or by their general practitioner (n = 548, 55%).
Cronholm et al., 2009	203 high school students in the United States (age not available)	Descriptive cross-sectional survey	Researchers designed a seven-item questionnaire.	139 (69%) identified the age group at risk for TC.	74 (37%) believed that TSE should be performed monthly, 75 (37%) knew how to perform TSE, 51 (25%) never heard of TSE, and 37 (18%) would delay seeking medical help if they detected a lump.	Barriers: Participants who reported never having heard of TSE were more likely to delay seeking care (OR = 2.83, 95% CI [1.32, 6.04], p = 0.007). Facilitators: NR
<i>(Continued on the next page)</i>						
<p>CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men's knowledge, awareness, and attitude toward TC?; Q2—What are men's knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men's barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination</p>						

APPENDIX A. Research Matrix (Continued)

Study	Sample	Design	Instruments	Findings		
				Q1	Q2	Q3
Quantitative Studies (Continued)						
McGilligan et al., 2009	500 university students in Northern Ireland (\bar{X} age = 25.67 years, SD = 9.77, range = 17–35)	Descriptive cross-sectional survey using the Extended Theory of Planned Behavior	Researchers designed the questionnaire in a format based on Theory of Planned Behavior.	NR	Attitude, subjective norm, and self-efficacy contributed to TSE intention. Planned behavior and anticipated regret increased the variance in intention scores (5.9% and 5.7%). Attitude, anticipated regret, planned behavior, subjective norm, and self-efficacy were significantly associated with TSE intention.	NR
Casey et al., 2010	677 men at a banking institution in Ireland (\bar{X} age = 44.9 years, range = 18–67)	Descriptive comparative cross-sectional survey	Researchers designed an eight-item questionnaire.	2010 data compared to 1986: 673 (99%) versus 269 (68%) were aware of TC, 413 (61%) versus 52 (13%) identified the age group at risk for TC, and 481 (71%) versus 90 (23%) were aware of TC symptoms. In 2010, 54 (8%) stated possible causes of TC.	210 (31%) were aware of TSE; of those, 183 (87%) performed TSE, 27 (4%) performed TSE monthly compared to 5 (1.3%). 657 (97%) were interested in obtaining information about TSE and TC compared to 357 (90%) in 1986.	Barriers: NR Facilitators: Participants who practiced TSE had a higher knowledge score than those who did not (\bar{X} = 5.11, SD = 0.04 versus \bar{X} = 4.06, SD = 0.003; $p < 0.01$).
Reece et al., 2010	665 males in the United States (\bar{X} age = 31.75 years, SD = 8.04, range = 18–44)	Descriptive cross-sectional survey	Researchers designed a three-part questionnaire. International Index of Erectile Function Male Genital Self-Image Scale	NR	264 (40%) reported performing TSE in the past month.	Barriers: NR Facilitators: Men who performed TSE were more likely to be gay or bisexual ($p = 0.021$), report physical examination by a clinician within the past year ($p = 0.002$), score high on the Index of Erectile Function desire subscale ($p < 0.001$), and score high on the Male Genital Self-Image Scale ($p = 0.035$).

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CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men’s knowledge, awareness, and attitude toward TC?; Q2—What are men’s knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men’s barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination

APPENDIX A. Research Matrix (Continued)				Findings		
Study	Sample	Design	Instruments	Q1	Q2	Q3
Quantitative Studies (Continued)						
Brewer et al., 2011	188 men in a university setting in the United Kingdom (\bar{X} age = 33.37 years, SD = 10.77, range = 18–67)	Descriptive, cross-sectional survey	Researchers designed a 63-item questionnaire.	NR	101 (54%) previously performed TSE, 21 (11%) frequently performed TSE, 125 (67%) intended to occasionally perform TSE, and 90 (48%) indicated that they would do so monthly.	Barriers: NR Facilitators: Men who intend to perform monthly TSE are more likely to know about TSE, acknowledge the benefits of TSE, and fear TC ($p < 0.01$).
Rovito et al., 2011	300 university students in the United States (\bar{X} age = 22.74 years, SD = 4.11, range = 18–35)	Descriptive cross-sectional survey	Control Identity Survey (41-items) Multidimensional Health Locus of Control Survey	On a scale of 0–10, participants were unaware about TC risk and screening ($\chi^2 = 4.14$ – 5.72) and believed that they are vulnerable to TC ($\chi^2 = 5.57$).	On a scale of 0–10, participants would consider performing TSE ($\chi^2 = 7.52$) and perceived TSE as an important means to fight TC ($\chi^2 = 8.36$) and prolong life ($\chi^2 = 8.35$).	Barriers: NR Facilitators: Intention predictors for TSE include valuing health promotion ($p < 0.001$) and being informed about TC and TSE ($p < 0.01$). Predictors via pamphlet promotional material include being informed about TSE and intending to perform TSE ($p < 0.001$). Predictors via promotional material on personalized information include valuing health promotion ($p < 0.01$) and being informed about TSE ($p < 0.001$).
Ugboma & Aburoma, 2011	750 university students in Nigeria (age range = 18–50 years)	Descriptive cross-sectional survey	Researchers designed a 25-item questionnaire.	78 (10%) were aware of TC.	7 (1%) were aware of TSE, 9 (1.2%) were taught about TSE, and 7 (1%) performed TSE.	Barriers: 200 (27%) refused to do TSE due to fear of detecting a lump. Facilitators: 625 (83%) showed a willingness to practice TSE if instructed. A personal history of testicular abnormalities was associated with a greater awareness of TC and TSE. The tool used in this study resulted in 15 (2%) participants detecting a testicular abnormality.

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CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men’s knowledge, awareness, and attitude toward TC?; Q2—What are men’s knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men’s barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination

APPENDIX A. Research Matrix (Continued)				Findings		
Study	Sample	Design	Instruments	Q1	Q2	Q3
Quantitative Studies (Continued)						
Urgurlu et al., 2011	634 students in a university setting in Turkey (\bar{X} age = 21.3 years, SD = 2.14, range = 17–34)	Descriptive cross-sectional survey	Researchers designed a 32-item questionnaire.	279 (44%) heard about TC. Agreement with the statements came as follows: 444 (70%) were afraid of having TC, 401 (63%) thought that TC is a very serious illness, and 373 (59%) thought that TC negatively affects a man's sex life.	38 (6%) received information on TSE, 111 (18%) performed TSE prior; of those, 21 (19%) performed monthly TSE.	Barriers: 596 (94%) were not educated about TSE, and 291 (56%) did not think that TSE is important. Facilitators: 543 (86%) wanted to be informed about early diagnosis and prevention of TC.
Beydag, 2012	Students in a university setting in Turkey (age range = 18–21 years)	Descriptive cross-sectional survey	Researchers designed a sociodemographic data survey and a 10-item questionnaire.	Females' knowledge of breast cancer was higher than that of males about TC ($p < 0.05$).	NR	NR
Özbaş et al., 2012	275 students in a university setting in Turkey (age range = 20–25 years)	Descriptive cross-sectional survey	Researchers designed a 27-item questionnaire.	NR	33 (12%) knew how to perform TSE; of those, 12 (36%) performed TSE.	Barriers: 17 (6%) did not think that TSE is important, and 11 (4%) were afraid to perform TSE. Facilitators: 14 (20%) learned about TSE from the television, and 11 (16%) learned from their friends.
Kuzgunbay et al., 2013	799 students in a university setting in Turkey (\bar{X} age = 18.7 years, SD = 1.1, range = 17–25)	Descriptive cross-sectional survey	Researchers designed a 10-item questionnaire.	89 (11%) knew about TC; of those, 11 (1%) answered all the questions about TC correctly.	20 (3%) performed TSE; of those, 8 (1%) performed monthly TSE.	Barriers: NR Facilitators: 60 (67%) of those who knew about TC did so from the Internet and the media. Participants who performed TSE answered questions about TC correctly ($p = 0.01$).
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CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men's knowledge, awareness, and attitude toward TC?; Q2—What are men's knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men's barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination						

APPENDIX A. Research Matrix (Continued)				Findings		
Study	Sample	Design	Instruments	Q1	Q2	Q3
Quantitative Studies (Continued)						
Muliira et al., 2013	323 students in a university setting in Uganda (\bar{X} age = 22 years, SD = 2.5, range = 18–32)	Descriptive cross-sectional survey	Researchers designed a self-administered questionnaire.	The majority did not know the age group affected by TC (n = 215, 66%), that a lump is a common symptom of TC (n = 228, 71%), the chance of curability (n = 186, 57.6%), and risk factors for TC (n = 196, 61%).	The majority never performed TSE (n = 194, 60%) and did not know the most appropriate time to perform TSE (n = 186, 58%).	Barriers: Perceiving TSE as time consuming (n = 280, 87%), embarrassing (n = 255, 79%), and painful (n = 240, 74%) Facilitators: 200 (62%) heard of TC in the media. Those who reported practicing TSE knew that a lump is a sign of TC (p = 0.0001) and that TC is curable if diagnosed early (p = 0.001). They identified the age group at risk for developing TC (p = 0.003), knew how to perform TSE (p = 0.0001), and that they were at risk for developing TC (p = 0.02).
Onyiriuka & Imoebé, 2013	540 students at a secondary school in Nigeria (\bar{X} age = 16.8 years, SD = 1.7, range = 15–20)	Descriptive cross-sectional survey	Researchers designed a two-part questionnaire.	3 (0.6%) knew that risk for TC is highest among men aged 15–35 years. None knew that TC can occur in men younger than age 20 years.	7 (1%) heard about TSE; 314 (58%) did not know about the TSE steps.	Barriers: No education about TSE Facilitators: Information about TSE was obtained from friends and peers; 255 (47%) expressed their willingness to perform TSE following the questionnaire.
Kennett et al., 2014	740 males in a genitourinary medicine clinic in the United Kingdom (\bar{X} age = 32.9 years, range = 14–78)	Descriptive cross-sectional survey	Researchers designed a nine-item questionnaire.	561 (76%) heard about TC.	591 (80%) heard about TSE, 303 (41%) were taught how to perform TSE, and 586 (79%) performed TSE; of those, 336 (57%) did so at least once a month and 111 (19%) weekly.	Barriers: 440 (60%) did not know what to look for during TSE. Facilitators: 548 (74%) wanted to be informed about TSE, 375 (51%) would like to learn about TSE through a leaflet, 337 (46%) through discussion, and 277 (37%) during their clinic visit.

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CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men’s knowledge, awareness, and attitude toward TC?; Q2—What are men’s knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men’s barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination

APPENDIX A. Research Matrix (Continued)						
Study	Sample	Design	Instruments	Findings		
				Q1	Q2	Q3
Qualitative Studies						
Dubé et al., 2005	20 men in a university setting in the United States (age range = 18–35 years)	Descriptive	Researchers designed a seven-item protocol and conducted focus groups.	Many participants were unaware of TC risk.	Many participants were unaware of TC examination and requested normalization of male genital examination just like female genital examination.	Barriers: Many received ineffective TSE education or were given pamphlets with no explanation. Facilitators: NR
Daley, 2007	31 men in a university setting in the United States (\bar{X} age = 20 years, range = 18–23)	Descriptive	The researcher designed a seven-item protocol and conducted focus groups.	15 (63%) thought that heredity is a major risk factor for TC. The majority thought that a testicle is removed only when necessary, surgery is emasculating, a man's sexual performance is affected, and TC is curable. Many felt uncomfortable talking about the psychological effects of TC and did not think that TC could be prevented.	None performed monthly TSE, 4 (13%) practiced TSE, and 10 (32%) were taught how to do TSE by healthcare providers. Participants thought that a man must perform monthly TSE just like women perform monthly breast self-examination.	Barriers: Many did not know what the physician was looking for while examining their testes. Facilitators: Those who knew about TC did so through shows about celebrities who survived TC.
Evans et al., 2010	37 males in a hospital clinics, workplaces, and individuals homes in the United Kingdom (age range = 15–55 years)	Descriptive	Researchers designed a four-topic interview guide and conducted one-to-one semistructured in-depth interviews.	The majority of participants were in favor of TC education. They believed that TC education helps in early detection.	Less unanimity was found in discussions about TSE. Participants thought that a man must perform monthly TSE just like women perform monthly breast self-examination.	Barriers: Anxiety from false-positive findings was a reason not to educate adolescents about TC. Facilitators: The majority of participants did not find harm in TC education. Delivery of useful information and highlighting positive aspects, such as high curability rates of TC.

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APPENDIX A. Research Matrix (Continued)						
Study	Sample	Design	Instruments	Findings		
				Q1	Q2	Q3
Review						
de Souza et al., 2011	14 participants in Brazil	Integrative review	Databases searched include Cochrane, PubMed®, MEDLINE®, LILACS, BDNF, and CINAHL®.	NR	According to the review authors, “The studies were unanimous in concluding that self-examination of testicles is the best way to identify a possible event of testicular cancer” (p. 270).	NR

CI—confidence interval; df—degrees of freedom; NR—not reported; OR—odds ratio; Q1—What are men’s knowledge, awareness, and attitude toward TC?; Q2—What are men’s knowledge, awareness, attitude, and practice of TC screening?; Q3—What are men’s barriers and facilitators to TC and TC screening knowledge, awareness, attitude, and practice?; TC—testicular cancer; TSE—testicular self-examination