WASZAK, Julia, SIWIK, Marcin, MAZUR, Urszula, OGONOWSKA, Paulina, BAZAREWICZ, Jakub, KUBUJ, Cezary, MICHALSKA, Anna, ŚWIDA, Michal, DMOWSKI, Daniel and ADAŚKO, Grzegorz. Erectile Dysfunction in Young Men: A Growing Medical Problem of the 21st Century - The Literature Review. Quality in Sport. 2025;45:66490. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.45.66490
https://apcz.umk.pl/QS/article/view/66490

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 l.p. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).
The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 07.11.2025. Revised: 10.11.2025. Accepted: 10.11.2025. Published: 11.11.2025.

Erectile Dysfunction in Young Men: A Growing Medical Problem of the 21st Century - The Literature Review

WASZAK, Julia, SIWIK, Marcin, MAZUR, Urszula, OGONOWSKA, Paulina, BAZAREWICZ, Jakub, KUBUJ, Cezary, MICHALSKA, Anna ŚWIDA, Michał, DMOWSKI, Daniel and ADAŚKO, Grzegorz

Julia Waszak
Pomeranian Hospitals LLC:Polish Red Cross Maritime Hospital
Powstania Styczniowego 1, 81-519 Gdynia, Poland
ORCID: 0009-0001-8725-7049
Buliawaszak@gmail.com

Marcin Siwik
10. Military Clinical Hospital with Polyclinic in Bydgoszcz
Powstańców Warszawy 5, 85-681, Bydgoszcz, Poland
ORCID: 0009-0001-5621-1048
marcinsiwik5@gmail.com

Urszula Mazur
Pomeranian Hospitals LLC:Polish Red Cross Maritime Hospital
Powstania Styczniowego 1, 81-519 Gdynia, Poland
ORCID: 0009-0006-1645-3479
urszula.mazur15@gmail.com

Paulina Ogonowska
Pomeranian Hospitals LLC:St. Vincent's de Paul Hospital
ul. Wójta Radtkego 1, 81-348 Gdynia, Poland
ORCID: 0009-0001-3766-9985
ogonowska.p@gmail.com

Jakub Bazarewicz
Autonomous Public Health Maintenance Organisation Jędrzej Śniadecki Voivodship
Polyclinical Hospital in Białystok
M. C. Skłodowskiej 26, 15-950 Białystok, Poland
ORCID: 0009-0006-6137-4366
bazarewiczjakub@gmail.com

Cezary Kubuj
Miedzyleski Specialist Hospital in Warsaw
Bursztynowa 2, 04-749 Warszawa, Poland
ORCID: 0009-0006-1578-8541
cezary.kubuj1234@gmail.com

Anna Michalska
Autonomous Public Health Maintenance Organisation Jędrzej Śniadecki Voivodship Polyclinical Hospital in Białystok
M. C. Skłodowskiej 26, 15-950 Białystok, Poland
ORCID: 0009-0008-1806-7699
michalskaanna731@gmail.com

Michał Świda
University Clinical Hospital in Bialystok
M. C. Skłodowskiej 24a, 15-276 Białystok, Poland
ORCID: 0009-0003-6101-7324
mi.swida@gmail.com

Daniel Dmowski
Autonomous Public Health Maintenance Organisation Jędrzej Śniadecki Voivodship Polyclinical Hospital in Białystok
M. C. Skłodowskiej 26, 15-950 Białystok, Poland
ORCID: 0009-0004-2399-1342
daniel.dmowski25@gmail.com

Grzegorz Adaśko
Autonomous Public Health Maintenance Organisation Jędrzej Śniadecki Voivodship Polyclinical Hospital in Białystok
M. C. Skłodowskiej 26, 15-950 Białystok, Poland
ORCID: 0009-0004-6426-8636
grzegorz.adasko@gmail.com

ABSTRACT

Introduction: Sexual functioning is an important aspect of health that affects quality of life. Erectile dysfunction (ED) is a condition in which a man is unable to achieve or maintain an erection sufficient for satisfactory sexual intercourse. ED is a common problem, and research shows that it is increasingly affecting young men. Although ED is associated with men over 40, the increase in the number of younger men reporting ED suggests that the problem is becoming more common. ED has a significant impact on men's social interactions and overall well-being. In this review, we are focused on the increasing male problem with ED - epidemiology, diagnosis, and treatment of it.

Materials and Methods: This article reviews literature incorporating data from PubMed using keywords such as 'erectile dysfunction', ' PDE5 inhibitors', 'PIED'

Summary: Erectile dysfunction among men under 40 is an increasingly rapidly growing problem today. Men with ED report decreased life satisfaction and poor interpersonal relationships. Sexual function affects men's well-being. In order to diagnose, thorough diagnostics should be performed, which includes a medical interview and physical examination, sexual function assessment questionnaires, laboratory tests, and imaging. Each patient should be assessed individually. Erectile dysfunction is typically divided by its cause: organic, psychogenic or combination of both. However, this classification should be used with caution as most cases are actually of mixed etiology.

Conclusion: Nowadays, the treatment for ED offers many more or less invasive options. Physicians must be aware that there is no single treatment that fits all patients or all situations.

Keywords: erectile dysfunction, PDE5 inhibitors, hypogonadism, PIED, intracavernosal injection, pharmacological treatments; regenerative strategies; surgical strategies; vacuum erection device

Introduction

Erectile dysfunction (ED) is a growing problem among men under 40. Studies show that it is becoming increasingly common among young men in Poland. Despite available therapies, many men avoid seeking help, which highlights the need for education and campaigns to reduce the stigma surrounding sexual health. ED is most often associated with older men, but the problem is increasingly related to young men. Traditional factors that once explained male sexual problems, such as diabetes mellitus (DM), cardiovascular diseases (CVD), and psychogenic factors, seem insufficient to explain the rapid increase in erectile dysfunction in men under 40. Although psychogenic factors remain the most common cause of ED, attention should be focused on the possible etiology underlying porn-related sexual dysfunction. Most patients with ED can be treated appropriately after a basic diagnostic evaluation, which includes

a detailed medical interview including the topic of sexual life, a physical examination, and laboratory tests.

Epidemiology

Based on the current ED studies published in 2023, it can be seen that in the entire population in Poland, the incidence of erectile dysfunction ranged from 30.1% to 61.1%, depending on the definition and diagnostic methods used. Although the incidence increases with age, the data also indicate a significant increase in cases among young men. Studies show that 17% of men under 40 have experienced erection problems in at least one sexual initiation. In this age group, ED occurs in both sporadic and chronic forms. Despite this, only 15% of young men reported to a specialist because of ED, which demonstrates the low level of awareness and reluctance to seek medical assistance among young men [1]. For comparison, a systematic review from 2002 found that the prevalence of ED in men under 40 years of age was approximately 2%. Although pooling data across studies is difficult because of methodological differences in the magnitude of the increase, this is a significant and independent approach to epidemiological trends [2].

Etiology

ED is commonly classified as either psychogenic or organic. Psychogenic ED has been linked to factors such as depression, stress, generalized anxiety, or fear of developing ED. At the same time, organic ED has been attributed to physical conditions—neurological, hormonal, anatomical, or pharmacological side effects [3, 5]. In men under 40, psychogenic ED is the most common diagnosis. Researchers estimated that only 15%–20% of cases are of organic origin [3, 4]. Psychogenic conditions are often associated with couple misunderstandings, as well as problems related to work, which can often affect sexual desire. Even the occurrence of initial episodes of ED, as well as other sexual dysfunctions, can lead to performance anxiety and thus to an evasive reaction to avoid failure [3]. Among organic diseases, endocrine disorders such as hypogonadism play a significant role. Hyperprolactinemia also affects sexual desire, and therefore is related; Finally, hypothyroidism can occur due to hyperprolactinemia from

hypothyroidism [6]. The psychiatric cause, from the remains of depression, which is the inability to "feel pleasure" and a mood set on sadness, is the cause of ED [3]. Other infections of the disease system can cause deterioration of the quality of life and thus entail the risk of disease. Another condition can stem from vascular, metabolic, neurological, inflammatory and iatrogenic causes [3]. Diabetes affects 20-25% of men with erectile dysfunction, and dyslipidemia in 40-70% [7, 8]. Neurogenic causes, such as multiple sclerosis, Parkinson's disease, and spinal cord injuries can lead to organic erectile dysfunction. [9, 11] Symptomatic patients undergoing radiotherapy and radical pelvic surgery (i.e., radical prostatectomy) have a high risk of developing cavernous nerves with subsequent neurogenic ED. Mechanical conditions are the main source of fibrosis, caused by induration plasticity of the penis (IPP) or after penile trauma. In patients infected with male accessory gland infection (MAGI) and presenting ED, dilatation of the periprostatic venous plexus has been shown [11, 12]. The appearance has also been reported to be a consequence of preceding COVID-19. There are even some categories, such as antiandrogenic drugs, H2 antagonists, ACE inhibitors, and psychotropic drugs, that may be ED through mechanisms that are not fully understood [11]. Traditional factors that once explained men's sexual problems appear insufficient to explain the dramatic increase in erectile dysfunction in men under the age of 40. Alterations in the brain's motivational system are being investigated as a possible etiology underlying pornography-related sexual dysfunctions [2, 3]. This review also considers evidence that the unique properties of Internet pornography (unlimited novelty, potential for easy escalation to more extreme material, video format, etc.) may be strong enough to condition sexual arousal to aspects of Internet pornography use that do not transfer easily to real-life partners, such that sex with desired partners may not register as fulfilling expectations and arousal declines [3,10]. Clinical reports suggest that cessation of Internet pornography use is sometimes sufficient to reverse negative effects, emphasizing the need for large-scale studies using methodologies that require subjects to control for the variable of Internet pornography exposure [3].

Diagnostic

The evaluation of a man with erectile dysfunction includes three categories: history and physical examination, laboratory tests, and additional imaging tests. Every patient reporting a sexual problem should have an interview and physical examination. Risk factors for ED should always be considered. An assessment to differentiate between organic and psychological causes

of ED is essential. During the visit, the severity, onset, and duration of ED should be assessed. The assessment should also include a psychosocial assessment, as ED and its treatment are related to overall quality of life, relationships, self-confidence, self-esteem, and depression. It should be remembered that disease can be both a cause and a result of ED [13,15].

Medical History and Physical Examination

The medical history should include age, sexual orientation, marital status, and sexual history. Information should be collected on the onset and duration of erectile dysfunction, the occurrence of morning erections, and whether treatment has been undertaken. An important aspect is also erection on sexual stimulation or masturbation, lifestyle, relationship with a partner, and sexual desire [13, 14]. Questionnaires should be used to assess erectile function and determine the potential effects of treatment. The SHIM is one of the most commonly used tools to assess the severity of ED. The SHIM consists of five questions based on a five-point Likert scale and is derived from the IIEF 15-question gold standard [9]. The IIEF has high sensitivity and specificity in detecting treatment effects, but its length makes it ineffective for use in the office setting, whereas the SHIM is specifically designed as an office screening tool for ED [13, 16,17]. In the SHIM score, lower scores predict worse ED with a classification into five severity levels: no ED (SHIM score 22–25), mild (17–21), mild to moderate (12–16), moderate (8–11), and severe (1–7). Physical examination may be helpful in the presence of comorbidities associated with ED, such as testicular size and consistency, and other conditions [18], including hypertension [19] and arrhythmia [20]. Physical examination in men with ED is recommended but not always necessary, according to the International Consultation on Sexual Medicine (ICSM) [21]. The examination should also assess secondary sexual characteristics, peripheral pulse and sensation, abdominal masses, and the presence of gynecomastia. Waist and hip circumference can help assess obesity, while the waist-to-hip ratio is a good indicator of weight loss and response to hypogonadal therapy [22], and a digital rectal examination is recommended for men considering hormone therapy.

Laboratory tests

Laboratory tests focus on assessing risk factors for ED and, according to ICSM recommendations, include tests assessing the hypothalamic-pituitary-gonadal axis, lipid status, and glucose metabolism (HbA1C). Assessment of the hypothalamic-pituitary-gonadal axis may

reveal endocrinopathies that can significantly affect erectile function, including hypogonadism [13, 23]. Given the similarity of symptoms between hypothyroidism and hypogonadism and the impact of hypothyroidism on hypogonadism, thyroid function tests should be considered if the clinical situation requires them [24, 25]. It should be noted that ICSM recommends performing these tests, but it is not always necessary. The choice of laboratory tests should be made on a case-by-case basis [13].

Additional tests

While the history, physical examination, and laboratory tests are sufficient to diagnose most physical causes of ED, in some patients, additional diagnostic tests may identify a specific etiology of ED and help guide treatment choices.

Psychophysiological Evaluation

The distinction between psychogenic and organic ED can be made without invasive testing using the nocturnal penile tumescence (NPT) test. The NPT test measures the number, duration, and stiffness of tumescence episodes during sleep [13]. The test is usually performed at the patient's home on a minimum of two consecutive nights. Normal erectile function is considered to be at least one episode of >60% penile tip stiffness lasting no less than 10 minutes. However, given the overall complexity of the test, it is not recommended for routine evaluation of the ED. That said, the degree of psychogenic involvement can be easily deciphered by using a thorough sexual history that assesses the quality of erection upon awakening, as well as during masturbation, foreplay, and intercourse [26]. When erectile function varies as a function of circumstances, psychogenic ED can be accurately diagnosed. In contrast, men with organic ED are more likely to have persistent erectile difficulties

Vascular evaluation

Specialist vascular evaluation aims to diagnose arterial and venous insufficiency in men with ED. Penile double-sonography, which combines ICI with Doppler ultrasonography to assess the direction and velocity of blood flow, is the most common and informative method for assessing both arterial insufficiency and veno-occlusive dysfunction [13, 30]. Men with arteriogenic ED demonstrate a peak systolic velocity (PSV) of <25 ml/s, which has 100% sensitivity and 95% specificity in men with abnormal pudendal arteriograms. Veno-occlusive

dysfunction, in contrast, demonstrates a PSV of 25 ml/s or greater but with a sustained end-diastolic velocity (EDV) of >5 ml/s, with a sensitivity of 90% and specificity of 56% for venous leakage on penile cavernosometry [13, 31]. The vascular resistance index (RI) (RI=PSV−EDV/PSV) is a measure of vascular resistance based on the Doppler spectrum, with an RI of ≥0.9 indicating normal function and a value of ≤0.75 indicating venous leakage [13, 28, 29, 81]. Arteriography can help define arterial obstruction, although it is more appropriate for assessing anatomy than function, and is most useful in young men with traumatic arterial rupture or perineal compression injury to plan surgical reconstruction. In ED, the iliac, internal pudendal, penile, and inferior epigastric arteries are examined [9, 27].

Treatment

Treatment of ED, according to the guidelines of the European Society of Urology, includes the use of phosphodiesterase type 5 (PDE5) inhibitors, vacuum erection devices (VED), and low-intensity extracorporeal shock wave therapy (Li-ESWT). In refractory cases, intraurethral injections or surgical procedures are used. ED treatment should be tailored to the patient's needs and take into account efficacy, safety, tolerability, and individual patient preferences. To adapt the treatment, the cause of ED should be taken into account. Depending on whether the cause is primary, the cause should be eliminated, which may lead to the elimination of ED [32]. However, if the cause of ED is different, the following are suggestions for treating patients.

Patient Education

The first method of treating ED may be patient education, which involves informing patients about psychological processes and physiological aspects of sexuality so that the patient can understand their problem. Therefore, consultation with the patient should include a discussion about the needs and expectations of the patient and his partner [33].

Modifiable risk factors

ED may be associated with modifiable or reversible risk factors. The patient's lifestyle and medications should be taken into account. ED may also be associated with the patient's diseases, such as endocrine or metabolic disorders, such as diabetes, and cardiovascular problems, such

as hypertension. Some studies indicate that lifestyle changes such as physical activity, weight loss, or treatment of CVD risk factors can improve sexual function in men with ED [9, 32].

Phosphodiesterase type 5 inhibitors

Four selective PDE5 inhibitors have been approved for the treatment of ED. Their efficacy has been confirmed in almost every subgroup of patients with ED. Efficacy is defined as an erection in which the penile rigidity is sufficient for satisfactory intercourse. The choice of PDE5 inhibitor depends mainly on the frequency of sexual intercourse and the patient's personal preferences [9, 32].

Sildenafil

Sildenafil is administered in doses of 25, 50, and 100 mg, and the recommended starting dose is 50 mg. The dose should be adjusted according to the patient's response and side effects. The window of efficacy is 30-60 minutes after administration, up to 12 hours. In a 24-week dose-response study, 25, 50, and 100 mg improved erectile function by 56%, 77%, and 84%, respectively, in men with ED compared to 25% in patients taking a placebo [9,32,34,35].

Tadalafil

Tadalafil is administered in occasional doses of 10 and 20 mg or in a daily dose of 5 mg. The recommended starting dose is 10 mg and should be adjusted according to patient response and side effects. The window of efficacy ranges from 30 minutes after administration to 36 hours, with maximum efficacy achieved after about 2 hours. In a 12-week dose-response study, improved erectile function was reported by 67% and 81% of men with ED taking 10 and 20 mg of tadalafil, respectively, compared to 35% taking a placebo [9,32,36].

Vardenafil

Vardenafil is administered at on-demand doses of 5, 10, and 20 mg. The recommended starting dose is 10 mg and should be adjusted according to patient response and side effects. Vardenafil is effective 30 minutes after administration. In a 12-week dose-response study, improved erectile function was reported by 66%, 76%, and 80% of men with ED taking 5, 10, and 20 mg of vardenafil, respectively, compared with 30% of men taking a placebo [9,32,37].

Avanafil

Avanafil is administered in on-demand doses of 50, 100, and 200 mg. The recommended starting dose is 100 mg taken as needed 15 to 30 minutes before sexual activity, and the dose may be adjusted based on efficacy and tolerability. In the general ED population, the mean percentage of sexual attempts that resulted in intercourse was 47%, 58%, and 59% for the 50, 100, and 200 mg groups compared with 28% for the placebo group [9, 32, 38].

Current recommendations are to try all PDE5 inhibitors (one at a time) before moving on to more invasive therapy.

In patients with ED who are not responding to PDE5 inhibitor therapy, the physician should ensure that the medication is prescribed and used correctly by the patient. Absorption of sildenafil, vardenafil, and avanafil may be delayed by high-fat meals. Care should be taken to ensure that patients do not wait too long or too soon after taking the medication before attempting intercourse [9,32].

To date, there are no data available from double- or triple-blind multicenter studies comparing the efficacy and/or patient preferences of sildenafil, tadalafil, vardenafil, and avanafil. The choice of medication will depend on the frequency of intercourse (occasional use or regular therapy, three to four times per week) and the patient's personal experience. Patients need to know whether the medication is short-acting or long-acting, what its possible drawbacks are, and how to use it [39].

Intracavernosal injection

The intracavernosal injection (ICI) of vasoactive agents like papaverine and prostaglandin E1 represents a significant advancement in erectile dysfunction treatment and can also serve as a diagnostic tool [40]. ICI is an effective local drug therapy for ED, and individual treatment plans can be formulated according to the individual conditions and needs of patients [41]. Combining various vasoactive drugs and adjusting their dosages can greatly enhance treatment effectiveness while minimizing complications. Research has shown that patients receiving a combination of papaverine and prostaglandin E1 experienced better erectile function compared to those treated with prostaglandin E1 alone [42]. However, with the use of PDE5 inhibitors, the clinical use of ICI has gradually declined because it has a high dropout rate and is associated

with priapism, ecchymosis, hematoma, and penile fibrosis [43]. Currently, the combination of ICI and Doppler ultrasonography is mainly used in the diagnosis of ED and the assessment of penile hemodynamics [44].

Hormone Replacement Therapy

Androgen plays an important role in promoting normal penis growth and stimulating secondary sexual characteristics in men. Androgen is mainly secreted by the testicles, androgen deficiency leads to a series of pathophysiological conditions that damage sexual function and overall body health [45]. In the clinic, androgen replacement therapy can restore serum testosterone levels to normal and improve sexual desire in patients with hypogonadism [46]. More importantly, androgen replacement therapy in combination with PDE5 inhibitors can effectively treat ED, and patients' erectile function can be maintained even long after discontinuing the medication [47].

Vacuum erection device

The vacuum erection device (VED) is a mechanical tool that enhances blood flow to the corpora cavernosa by generating a vacuum pressure of up to 250 mmHg. A constriction ring placed at the base of the penis helps sustain the engorgement and supports erection [48]. VED is primarily employed in the treatment of organic erectile dysfunction and is known for its effectiveness and minimal side effects [49].

Penile prosthesis implantation

Implantation of a penile prosthesis (PPI) is currently considered a third-line therapy for erectile dysfunction. Because it can cause irreversible damage to the smooth muscle of the corpora cavernosa, it is usually considered when oral PDE5 inhibitors, intracavernous injections, and VED therapy are ineffective [50]. The 3-piece inflatable prosthesis is currently the most commonly used implant and is also the most satisfactory [51]. The three-piece inflatable prosthesis allows manual control over the penis's thickness, length, and rigidity, effectively mimicking the natural erection process. An early multicenter study showed that more than 90% of ED patients and their partners could achieve normal sexual activity after receiving a penile prosthesis implant [52]. However, PPI is expensive, traumatic, and prone to complications such

as prosthesis infection, pump migration, automatic pumping, secondary surgery, etc. Therefore, PPI is not considered a first-line therapy. [53].

Low-intensity extracorporeal shock wave

Low-voltage extracorporeal shock wave (Li-ESW) is a physical shock wave that emits an energy density of less than 0.1 mJ/mm2. Li-ESW, as a noninvasive therapeutic technique, directs sound waves to the target tissue by penetrating through the tissue structure [54]. Research indicates that reduced blood flow in the corpus cavernosum is a contributing factor to erectile dysfunction (ED). Li-ESW has been shown to enhance the expression of eNOS, VEGF, and other angiogenic factors within the corpus cavernosum, leading to blood vessel dilation, the formation of new blood vessels, improved circulation, and enhanced erectile function [55, 56]. Li-ESW is a promising treatment method for refractory ED. It can restore the function of the penile endothelium and increase the blood flow through the corpus cavernosum. Nevertheless, the exact therapeutic mechanism of Li-ESW remains unclear and requires further investigation and study.

Summary

Erectile dysfunction is increasingly affecting young men and should be recognized as an important public health concern. The diagnosis of erectile dysfunction is the result of comorbidities, primarily from the circulatory system. Information about the patient with erectile dysfunction can be appropriately treated after basic diagnostics, which consists of detailed information on the topics of daily life, physical examination, and research on the topic. While PDE5 inhibitors remain the first-line therapy, alternative treatments such as hormone therapy, vacuum devices, intracavernosal injections, or penile implants may be necessary. Novel therapies like low-intensity shockwave therapy and regenerative strategies hold promise, but require further research. Physicians must be aware that no one treatment applies to all patients or all situations. Further research into the molecular mechanisms of ED and the development of improved results on ED and its conclusions will further expand the information arsenal of current treatment, improving not only the quality of life of these men but also their life expectancy.

Disclosure

Author's contribution

Conceptualization: Waszak Julia

Methodology: Siwik Marcin

Formal analysis: Mazur Urszula

Investigation: Ogonowska Paulina, Dmowski Daniel

Writing-rough preparation: Waszak Julia, Jakub Bazarewicz, Świda Michał

Writing-review and editing: Michalska Anna, Kubuj Cezary

Supervision: Adaśko Grzegorz

Receiving funding - no specific funding.

All authors have read and agreed with the published version of the manuscript.

Financing statement

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflict of interest

The authors deny any conflict of interest.

References:

1. Przydacz M, Chlosta M, Rajwa P, Chlosta P. Population-level prevalence, effect on quality of life, and treatment behavior for erectile dysfunction and premature ejaculation in Poland. Sci Rep. 2023 Aug 14;13(1):13168. doi: 10.1038/s41598-023-39968-9. PMID: 37580405; PMCID: PMC10425435.
2. Prins J, Blanker MH, Bohnen AM, Thomas S, Bosch JL. Prevalence of erectile dysfunction: a systematic review of population-based studies. Int J Impot Res. 2002 Dec;14(6):422-32. doi: 10.1038/sj.ijir.3900905. PMID: 12494273.
3. Park BY, Wilson G, Berger J, Christman M, Reina B, Bishop F, Klam WP, Doan AP. Is Internet Pornography Causing Sexual Dysfunctions? A Review with Clinical Reports. Behav Sci (Basel). 2016 Aug 5;6(3):17. doi: 10.3390/bs6030017. Erratum in: Behav Sci (Basel). 2018 Jun 01;8(6):E55. doi: 10.3390/bs8060055. PMID: 27527226; PMCID: PMC5039517.
4. Papagiannopoulos D, Khare N, Nehra A. Evaluation of young men with organic erectile dysfunction. Asian J Androl. 2015 Jan-Feb;17(1):11-6. doi: 10.4103/1008-682X.139253. PMID: 25370205; PMCID: PMC4291852.
5. Heidelbaugh JJ. Management of erectile dysfunction. Am Fam Physician. 2010 Feb 1;81(3):305-12. PMID: 20112889.
6. Salonia A, Rastrelli G, Hackett G, Seminara SB, Huhtaniemi IT, Rey RA, Hellstrom WJG, Palmert MR, Corona G, Dohle GR, Khera M, Chan YM, Maggi M. Paediatric and adult-onset male hypogonadism. Nat Rev Dis Primers. 2019 May 30;5(1):38. doi: 10.1038/s41572-019-0087-y. PMID: 31147553; PMCID: PMC6944317.
7. Seftel AD, Sun P, Swindle R. The prevalence of hypertension, hyperlipidemia, diabetes mellitus and depression in men with erectile dysfunction. J Urol. 2004 Jun;171(6 Pt 1):2341-5. doi: 10.1097/01.ju.0000125198.32936.38. PMID: 15126817.
8. Roumeguère T, Wespes E, Carpentier Y, Hoffmann P, Schulman CC. Erectile dysfunction is associated with a high prevalence of hyperlipidemia and coronary heart disease risk. Eur Urol. 2003 Sep;44(3):355-9. doi: 10.1016/s0302-2838(03)00306-3. PMID: 12932936.

9. Pastuszak AW. Current Diagnosis and Management of Erectile Dysfunction. Curr Sex Health Rep. 2014 Sep;6(3):164-176. doi: 10.1007/s11930-014-0023-9. PMID: 25878565; PMCID: PMC4394737.
10. Sun C., Miezan E., Lee N.-Y., Shim J.W. Korean Men's Pornography use, Their Interest in Extreme Pornography, and Dyadic Sexual Relationships. Int. J. Sex. Health. 2015;27:16–35. doi: 10.1080/19317611.2014.927048.
11. Mazzilli F. Erectile Dysfunction: Causes, Diagnosis and Treatment: An Update. J Clin Med. 2022 Oct 30;11(21):6429. doi: 10.3390/jcm11216429. PMID: 36362656; PMCID: PMC9657711.
12. La Vignera S, Condorelli RA, Cannarella R, Giacone F, Mongioi' LM, Cimino L, Defeudis G, Mazzilli R, Calogero AE. Urogenital infections in patients with diabetes mellitus: Beyond the conventional aspects. Int J Immunopathol Pharmacol. 2019 Jan-Dec;33:2058738419866582. doi: 10.1177/2058738419866582. PMID: 32031031; PMCID: PMC6728654.
13. Erectile Dysfunction. A. Salonia. European Urology Supplements 2013; 12: 7-12
14. Althof SE, Rosen RC, Perelman MA, Rubio-Aurioles E. Standard operating procedures for taking a sexual history. J Sex Med. 2013 Jan;10(1):26-35. doi: 10.1111/j.1743-6109.2012.02823.x. Epub 2012 Sep 12. PMID: 22970717.
15. McCabe MP, Althof SE. A systematic review of the psychosocial outcomes associated with erectile dysfunction: does the impact of erectile dysfunction extend beyond a man's inability to have sex? J Sex Med. 2014 Feb;11(2):347-63. doi: 10.1111/jsm.12374. Epub 2013 Nov 20. PMID: 24251371.
16. Cappelleri JC, Rosen RC. The Sexual Health Inventory for Men (SHIM): a 5-year review of research and clinical experience. Int J Impot Res. 2005 Jul-Aug;17(4):307-19. doi: 10.1038/sj.ijir.3901327. PMID: 15875061.
17. Perelman MA. The impact of relationship variables on the etiology, diagnosis and treatment of erectile dysfunction. Adv Primary Care Med: Clin Updat. 2007;3:3–6.
18. Hatzichristou D, Hatzimouratidis K, Bekas M, Apostolidis A, Tzortzis V, Yannakoyorgos K. Diagnostic steps in the evaluation of patients with erectile dysfunction. J Urol. 2002 Aug;168(2):615-20. PMID: 12131320.

19. Seftel AD, Sun P, Swindle R. The prevalence of hypertension, hyperlipidemia, diabetes mellitus and depression in men with erectile dysfunction. J Urol. 2004 Jun;171(6 Pt 1):2341-5. doi: 10.1097/01.ju.0000125198.32936.38. PMID: 15126817.
20. Ghanem HM, Salonia A, Martin-Morales A. SOP: physical examination and laboratory testing for men with erectile dysfunction. J Sex Med. 2013 Jan;10(1):108-10. doi: 10.1111/j.1743-6109.2012.02734.x. Epub 2012 Apr 23. PMID: 22524416.
21. Hatzichristou D, Rosen RC, Derogatis LR, Low WY, Meuleman EJ, Sadovsky R, Symonds T. Recommendations for the clinical evaluation of men and women with sexual dysfunction. J Sex Med. 2010 Jan;7(1 Pt 2):337-48. doi: 10.1111/j.1743-6109.2009.01619.x. PMID: 20092443.
22. Kalinchenko SY, Tishova YA, Mskhalaya GJ, Gooren LJ, Giltay EJ, Saad F. Effects of testosterone supplementation on markers of the metabolic syndrome and inflammation in hypogonadal men with the metabolic syndrome: the double-blinded placebo-controlled Moscow study. Clin Endocrinol (Oxf). 2010 Nov;73(5):602-12. doi: 10.1111/j.1365-2265.2010.03845.x. Erratum in: Clin Endocrinol (Oxf). 2011 Aug;75(2):275. PMID: 20718771.
23. Buvat J. Hyperprolactinemia and sexual function in men: a short review. Int J Impot Res. 2003 Oct;15(5):373-7. doi: 10.1038/sj.ijir.3901043. PMID: 14562140.
24. Donnelly P, White C. Testicular dysfunction in men with primary hypothyroidism; reversal of hypogonadotrophic hypogonadism with replacement thyroxine. Clin Endocrinol (Oxf). 2000 Feb;52(2):197-201. doi: 10.1046/j.1365-2265.2000.00918.x. PMID: 10671947.
25. Kumar A, Chaturvedi PK, Mohanty BP. Hypoandrogenaemia is associated with subclinical hypothyroidism in men. Int J Androl. 2007 Feb;30(1):14-20. doi: 10.1111/j.1365-2605.2006.00705.x. Epub 2006 Jul 24. PMID: 16879621.
26. Althof SE, Rosen RC, Perelman MA, Rubio-Aurioles E. Standard operating procedures for taking a sexual history. J Sex Med. 2013 Jan;10(1):26-35. doi: 10.1111/j.1743-6109.2012.02823.x. Epub 2012 Sep 12. PMID: 22970717.
27. Glina, S., et al. SOP: corpus cavernosum assessment (cavernosography/cavernosometry). J Sex Med, 2013. 10:
28. Sikka, S.C., et al. Standardization of vascular assessment of erectile dysfunction: standard operating procedures for duplex ultrasound. J Sex Med, 2013. 10: 120.

https://www.ncbi.nlm.nih.gov/pubmed/22970798 112. Pathak, R.A., et al. Novel Evidence-Based

29. Pathak RA, Rawal B, Li Z, Broderick GA. Novel Evidence-Based Classification of Cavernous Venous Occlusive Disease. J Urol. 2016 Oct;196(4):1223-7. doi: 10.1016/j.juro.2016.04.089. Epub 2016 May 7. PMID: 27164516.
30. Broderick GA, Arger P. Duplex Doppler ultrasonography: noninvasive assessment of penile anatomy and function. Semin Roentgenol. 1993 Jan;28(1):43-56. doi: 10.1016/s0037-198x(05)80112-9. PMID: 8465207.
31. Lewis RW, King BF. Dynamic color Doppler sonography in the evaluation of penile erectile disorders. Int J Impot Res. 1994;6:A30. Abstract.
32. EAU Guidelines on Male Sexual Dysfunction 2019
33. McMahon CG, Giuliano F, Dean J, Hellstrom WJ, Bull S, Tesfaye F, Sharma O, Rivas DA, Aquilina JW. Efficacy and safety of dapoxetine in men with premature ejaculation and concomitant erectile dysfunction treated with a phosphodiesterase type 5 inhibitor: randomized, placebo-controlled, phase III study. J Sex Med. 2013 Sep;10(9):2312-25. doi: 10.1111/jsm.12236. Epub 2013 Jul 11. PMID: 23845016.
34. Moncada, I., et al. Efficacy of sildenafil citrate at 12 hours after dosing: re-exploring the therapeutic window. Eur Urol, 2004. 46: 357.
35. Giuliano, F., et al. Safety of sildenafil citrate: review of 67 double-blind placebo-controlled trials and the postmarketing safety database. Int J Clin Pract, 2010. 64: 240.
36. Ventimiglia E, Capogrosso P, Montorsi F, Salonia A. The safety of phosphodiesterase type 5 inhibitors for erectile dysfunction. Expert Opin Drug Saf. 2016;15(2):141-52. doi: 10.1517/14740338.2016.1131818. Epub 2016 Jan 9. PMID: 26752541.
37. Capogrosso P, Ventimiglia E, Boeri L, Serino A, Russo A, La Croce G, Capitanio U, Dehò F, Montorsi F, Salonia A. Time of onset of vardenafil orodispersible tablet in a real-life setting - looking beyond randomized clinical trials. Expert Rev Clin Pharmacol. 2017 Mar;10(3):339-344. doi: 10.1080/17512433.2017.1288567. Epub 2017 Feb 13. PMID: 28129714.
38. Kyle JA, Brown DA, Hill JK. Avanafil for erectile dysfunction. Ann Pharmacother. 2013 Oct;47(10):1312-20. doi: 10.1177/1060028013501989. Epub 2013 Sep 27. PMID: 24259695.

39. Chen L, Staubli SE, Schneider MP, Kessels AG, Ivic S, Bachmann LM, Kessler TM. Phosphodiesterase 5 inhibitors for the treatment of erectile dysfunction: a trade-off network meta-analysis. Eur Urol. 2015 Oct;68(4):674-80. doi: 10.1016/j.eururo.2015.03.031. Epub 2015 Mar 26. PMID: 25817916.
40. Kim S, Cho MC, Cho SY, Chung H, Rajasekaran MR. Novel Emerging Therapies for Erectile Dysfunction. World J Mens Health. 2021 Jan;39(1):48-64. doi: 10.5534/wjmh.200007. Epub 2020 Mar 16. PMID: 32202086; PMCID: PMC7752520.
41. Bassiem MA, Ismail IY, Salem TA, El-Sakka AI. Effect of Intracavernosal Injection of Prostaglandin E1 on Duration and Rigidity of Erection in Patients With Vasculogenic Erectile Dysfunction: Is It Dose Dependent? Urology. 2021 Feb;148:173-178. doi: 10.1016/j.urology.2020.09.030. Epub 2020 Oct 2. PMID: 33017615.
42. Richter S, Vardi Y, Ringel A, Shalev M, Nissenkorn I. Intracavernous injections: still the gold standard for treatment of erectile dysfunction in elderly men. Int J Impot Res. 2001 Jun;13(3):172-5. doi: 10.1038/sj.ijir.3900672. PMID: 11525316.
43. Belew D, Klaassen Z, Lewis RW. Intracavernosal Injection for the Diagnosis, Evaluation, and Treatment of Erectile Dysfunction: A Review. Sex Med Rev. 2015 Mar;3(1):11-23. doi: 10.1002/smrj.35. Epub 2015 Oct 19. PMID: 27784568.
44. Zhang J, Zhou W, Zhang Y, Zhang W, Zhang C. A Novel Method to Quantify Penile Arterial Blood Supply Using Shear Wave Elastography During Penile Duplex Ultrasound in Men with Erectile Dysfunction. Med Sci Monit. 2022 Mar 26;28:e935232. doi: 10.12659/MSM.935232. PMID: 35338109; PMCID: PMC8966436.
45. Schiffer L, Arlt W, Storbeck KH. Intracrine androgen biosynthesis, metabolism and action revisited. Mol Cell Endocrinol. 2018 Apr 15;465:4-26. doi: 10.1016/j.mce.2017.08.016. Epub 2017 Sep 1. PMID: 28865807; PMCID: PMC6565845.
46. Snyder PJ, Bhasin S, Cunningham GR, Matsumoto AM, Stephens-Shields AJ, Cauley JA, et al. Effects of testosterone treatment in older men. N Engl J Med (2016) 374(7):611–24. doi: 10.1056/NEJMoa1506119. PMID: 26886521; PMCID: PMC5209754.
47. Park MG, Yeo JK, Cho DY, Kim JW, Kim JW, Oh MM, Kim JJ, Moon du G. The efficacy of combination treatment with injectable testosterone undecanoate and daily tadalafil for erectile dysfunction with testosterone deficiency syndrome. J Sex Med. 2015 Apr;12(4):966-74. doi: 10.1111/jsm.12842. Epub 2015 Feb 4. PMID: 25648342.

48. Sultana A, Grice P, Vukina J, Pearce I, Modgil V. Indications and characteristics of penile traction and vacuum erection devices. Nat Rev Urol. 2022 Feb;19(2):84-100. doi: 10.1038/s41585-021-00532-7. Epub 2021 Nov 11. PMID: 34764451.
49. Lin H, Wang G, Wang R. [Application of the vacuum erectile device in penile rehabilitation for erectile dysfunction after radical prostatectomy]. Zhonghua Nan Ke Xue. 2015 Mar;21(3):195-9. Chinese. PMID: 25898548.
50. Kohn TP, Rajanahally S, Hellstrom WJG, Hsieh TC, Raheem OA. Global Trends in Prevalence, Treatments, and Costs of Penile Prosthesis for Erectile Dysfunction in Men. Eur Urol Focus. 2022 May;8(3):803-813. doi: 10.1016/j.euf.2021.05.003. Epub 2021 May 24. PMID: 34034995.
51. Segal RL, Camper SB, Burnett AL. Modern utilization of penile prosthesis surgery: a national claim registry analysis. Int J Impot Res. 2014 Sep-Oct;26(5):167-71. doi: 10.1038/ijir.2014.11. Epub 2014 May 15. PMID: 24830674.
52. Montorsi F, Rigatti P, Carmignani G, Corbu C, Campo B, Ordesi G, Breda G, Silvestre P, Giammusso B, Morgia G, Graziottin A. AMS three-piece inflatable implants for erectile dysfunction: a long-term multi-institutional study in 200 consecutive patients. Eur Urol. 2000 Jan;37(1):50-5. doi: 10.1159/000020099. PMID: 10671785.
53. Lee DJ, Najari BB, Davison WL, Al Hussein Al Awamlh B, Zhao F, Paduch DA, Mulhall JP, Chughtai B, Lee RK. Trends in the Utilization of Penile Prostheses in the Treatment of Erectile Dysfunction in the United States. J Sex Med. 2015 Jul;12(7):1638-45. doi: 10.1111/jsm.12921. Epub 2015 Jun 22. PMID: 26096365.
54. Dong L, Chang D, Zhang X, Li J, Yang F, Tan K, Yang Y, Yong S, Yu X. Effect of Low-Intensity Extracorporeal Shock Wave on the Treatment of Erectile Dysfunction: A Systematic Review and Meta-Analysis. Am J Mens Health. 2019 Mar-Apr;13(2):1557988319846749. doi: 10.1177/1557988319846749. PMID: 31027441; PMCID: PMC6487775.
55. Sokolakis I, Dimitriadis F, Teo P, Hatzichristodoulou G, Hatzichristou D, Giuliano F. The Basic Science Behind Low-Intensity Extracorporeal Shockwave Therapy for Erectile Dysfunction: A Systematic Scoping Review of Pre-Clinical Studies. J Sex Med. 2019 Feb;16(2):168-194. doi: 10.1016/j.jsxm.2018.12.016. PMID: 30770067.
56. Gruenwald I, Appel B, Vardi Y. Low-intensity extracorporeal shock wave therapy--a novel effective treatment for erectile dysfunction in severe ED patients who respond poorly to

PDE5 inhibitor therapy. J Sex Med. 2012 Jan;9(1):259-64. doi: 10.1111/j.1743-6109.2011.02498.x. Epub 2011 Oct 18. PMID: 22008059.