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Mastering Your Internal Clock: Sleep, Circadian Rhythms & Men's Vitality

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Clinical Advisory Board Member for MyPattern

MSc in Marine Biology from University of Alaska-Fairbanks, emphasis on non-invasive hormone monitoring

Chinese Medicine Thesis: Circadian Rhythms, Mood Disorders and Chinese Medicine

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Learning Objectives

1. Relate the most-searched men's health concerns by life stage (hair loss, fertility, low T, ED, nocturia) to sleep and circadian disruption
2. Describe how the master clock, sleep architecture and peripheral clocks set daily hormone and physiological rhythms in men
3. Interpret DUTCH patterns through a circadian lens and explain how timing of lab testing/screening can affect real-world interpretations
4. Evaluate the strength of evidence (tiers A–C) behind lifestyle, botanical and supplement interventions for sleep and male hormone health
5. Build a chrono-lifestyle plan (sleep regularity, light, meal and exercise timing) as first-line care before hormones or supplements

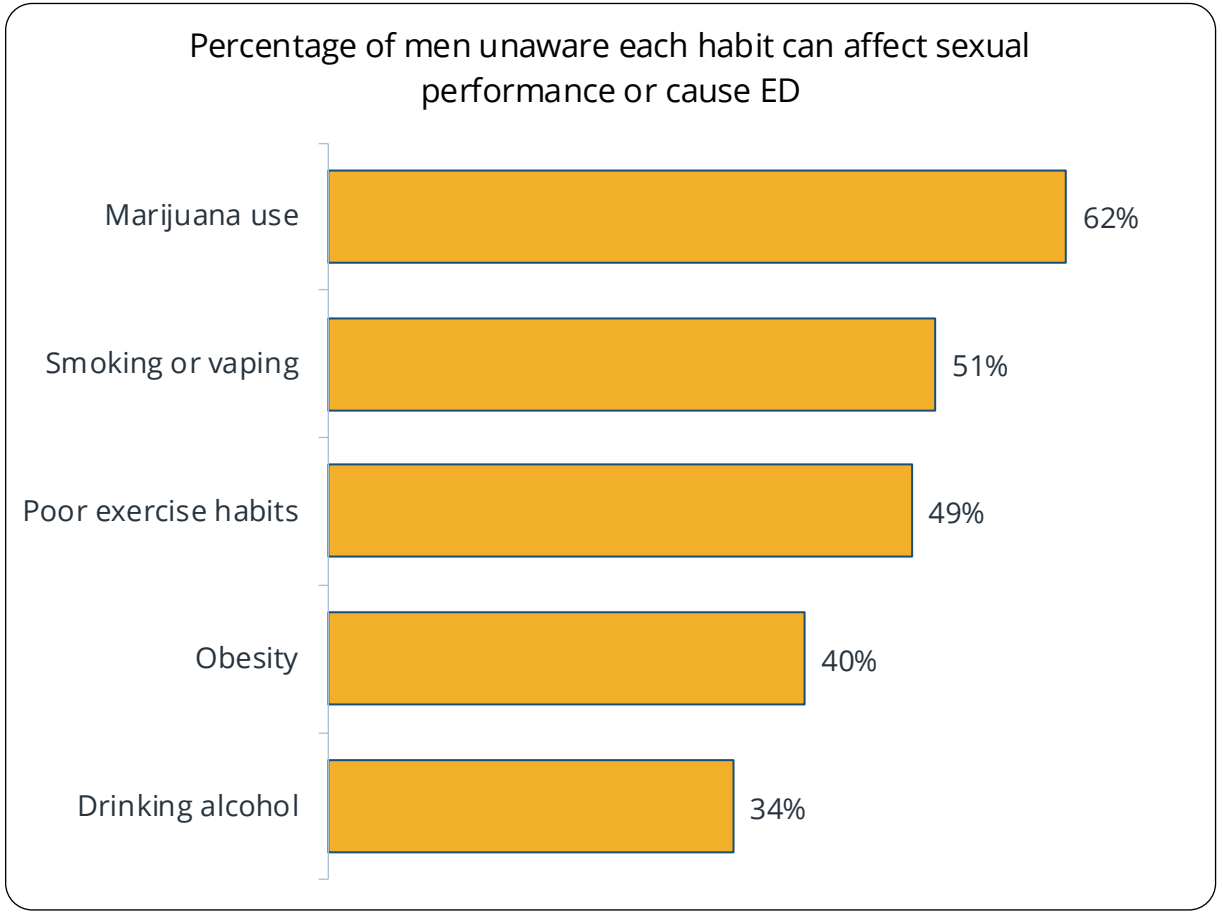
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What men think they know about their health

The man in your office is online, motivated and possibly misinformed.

Cleveland Clinic · 11th Annual MENtion It Survey (2026)

Many men miss the lifestyle links to erections, fertility and testosterone levels



- 50% don’t recognize that lifestyle affects sperm quality
- Men are unaware that daily habits can affect sexual performance or cause ED
- 28% of men believe testosterone therapy improves sexual performance

Cleveland Clinic. MENtion It Survey (YouGov, n=1,135 US men). 2026.

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Cleveland Clinic · 11th Annual MENtion It Survey (2026)

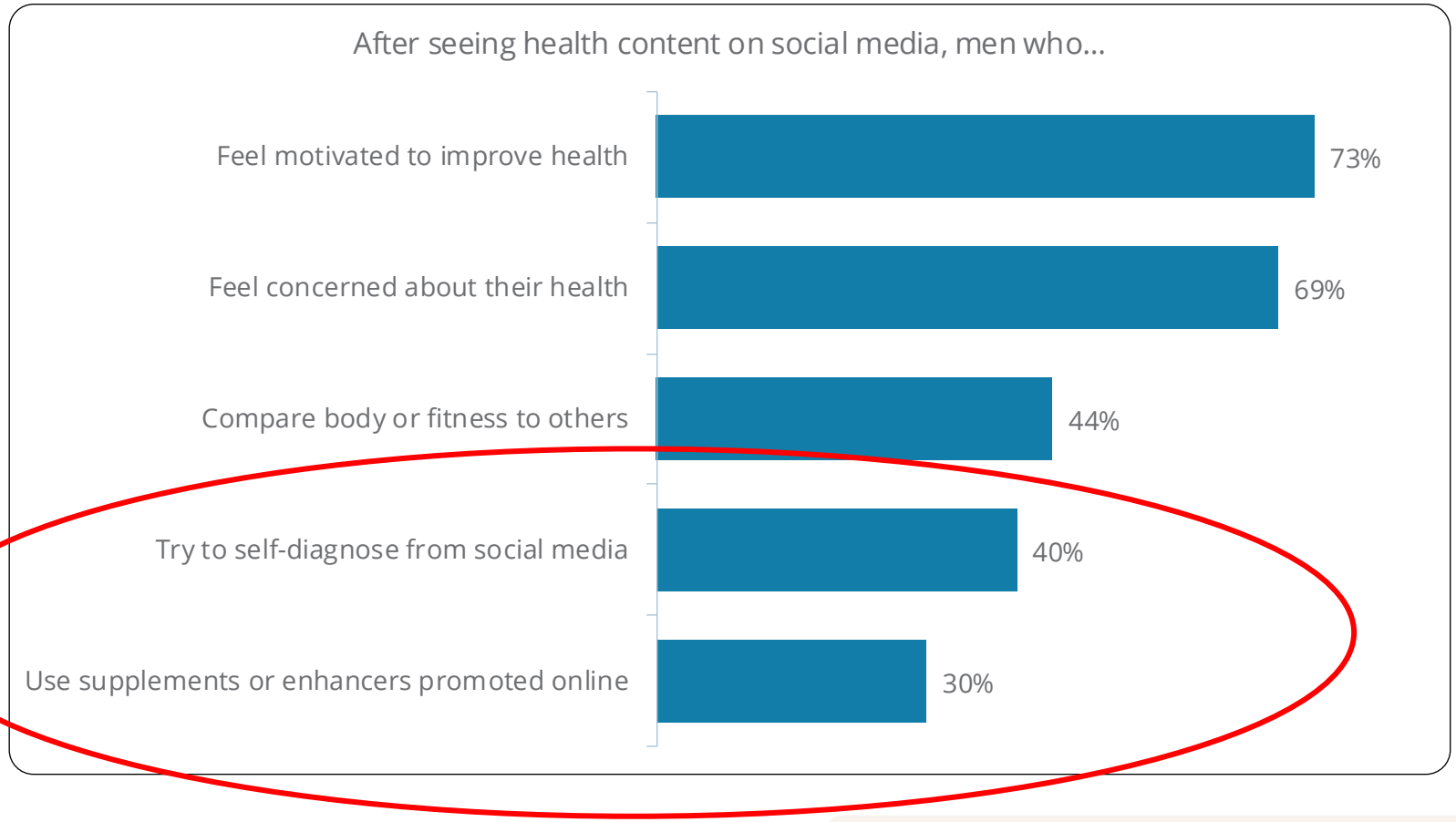
Men say they don't trust health influencers, but they act on them anyway

74%

rarely or never trust health info shared by influencers

39%

have tried a diet or wellness trend after seeing it on social media



Cleveland Clinic. MENtion It Survey (YouGov, n=1,135 US men). 2026.

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Top Google Searches: By Life Stage

20s–30s

- Hair loss
- Stress and mood
- Fertility
- Muscle and training

40s

- Low testosterone
- Low libido and ED
- Stress and weight
- Blood pressure

50s+

- Frequent urination
- Snoring and apnea
- Blood pressure
- Muscle and bone

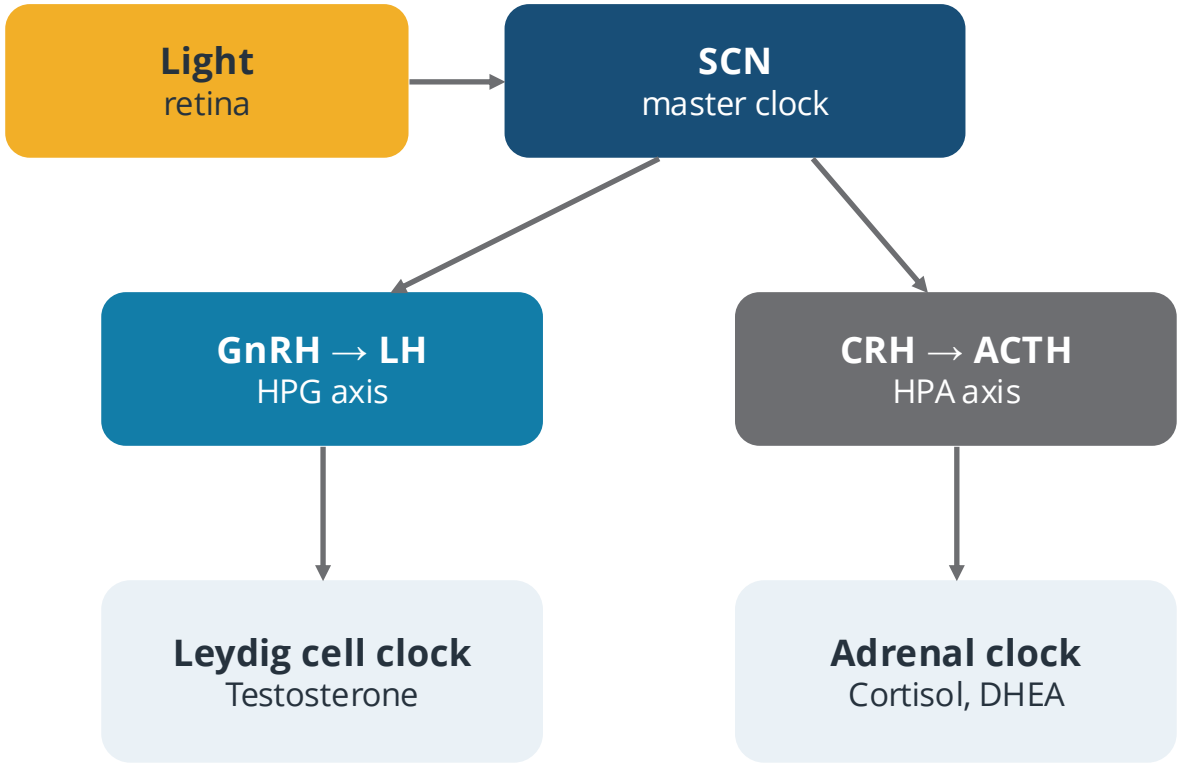
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Hormones, sleep, stress, sexual health: all run on a clock

Fix the timing first, then spend resources only on what has evidence behind it

Master Clock and Peripheral Clocks

Clock genes drive timing through the SCN, but light helps reset the circadian rhythm to reflect the actual solar day.



The Molecular Clock: Transcription-Translation Feedback Loop (TTFL)

- **CLOCK/BMAL1**: Transcription factors that act as the “On” switch
- **PER/CRY**: proteins that accumulate in the cytoplasm, translocate into the nucleus, and repress CLOCK/BMAL1 activity, acting as the “Off” switch, which occurs in a ~24h loop.
- Peripheral clocks work in the same way, and gate tissue sensitivity to LH and ACTH, not just hormone release. Animal studies showed that
  - Forced desynchrony impairs Leydig cell steroidogenesis
  - Clock-gene variation is linked to hypogonadism, ED, infertility and prostate cancer

C Animal and Mechanistic Study

Pavlovic MV, et al. Sci Rep. 2022;12(1).
Ning G, et al. Asian J Androl. 2025;27:564-573.

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Non-photic Zeitgebers: Exercise and Muscle

- **Light resets the SCN but meals, movement and stress hormones set the peripheral clocks (muscle, liver, gut, tendon, gonads)**
  - **Movement is a direct time cue for muscle clocks:** Muscle contraction phase-shifts PER2
  - **Exercise Timing & Sleep:**
    - Morning and daytime exercise generally support healthy circadian alignment and subjective/objective sleep quality.
    - Evening or late-night high-intensity exercise can sometimes delay sleep onset or negativel impact sleep architecture depending on the individual, duration, and dose.
    - Therapeutic opportunities:
      - Late sleepers and late wakers: recommend morning exercise to advance the clock
      - Early sleepers and early wakers: recommend evening exercise to delay it
- **Exercise Intensity:**
  - Acute moderate-to-high intensity exercise during the day often improves slow-wave sleep (SWS) without severely disrupting overall rest.
  - Chronic or excessive high-intensity training (such as overtraining in competitive athletes) can elevate morning cortisol and degrade sleep quality.

Kim N, et al. Phys Act Nutr. 2023;27(3):52-63.
Small L, et al. J Physiol. 2020;598(24):5739-5752.
Lee K, et al. Phys Act Nutr. 2024;28(2):35-42.

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Non-photic Zeitgebers: Meal Timing

- Meal timing
  - A substantial breakfast resets core clock genes
    - RCTs favor earlier eating
  - Timely meals keep the gut microbiota rhythmic
    - Late or skipped meals drive dysbiosis, clock disruption and metabolic dysfunction
  - Meal–clock misalignment alters energy expenditure and weight
    - Late-night eating disrupts sleep and raises ghrelin

Jakubowicz D, et al. Int J Mol Sci. 2024;25.
Boege H, et al. Curr Opin Biotechnol. 2021;70:1-6.
Gil-Lozano M, et al. Am J Physiol Endocrinol Metab. 2016;310.

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Systems View: Clocks Talk to Each Other

- **Peripheral clocks are not just followers**
  - Liver, heart and lung clocks respond **to their own cues**
  - They coordinate with each other and **can feed back to modify the SCN**
- **Stem-cell clocks are temporal gatekeepers**
  - The SCN entrains them, **largely through glucocorticoids**
  - They run on their own but lose phase stability without SCN coordination
  - Clocks open daily windows for proliferation, quiescence and differentiation
  - Without gatekeeping, stem cells tend toward **overactivation, exhaustion and aging**

Bechtel W. J Biol Rhythms. 2024;39(6):513-534.
Alnasser SM. Stem Cell Res Ther. 2026;17(1).

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Muscle, Fitness and Training

Consistent training matters more for sleep than when you train

Evening sessions

Melatonin shifts later and core temperature rises, but NREM and sleep efficiency hold

Morning, long term

Lower cortisol after waking and better sleep quality

Afternoon HIIT

Higher testosterone and T/C ratio than morning HIIT in 11 active men

SLEEP IS PART OF THE PROGRAM

Short or fragmented sleep shifts hormones toward catabolism and lowers muscle protein synthesis

Kim N, et al. Phys Act Nutr. 2023;27(3):52-63.
Zar A, et al. Trends Sport Sci. 2021;28(3):179-185.
Morrison M, et al. Sleep Med Rev. 2022;66.

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Weight, Blood Sugar and Blood Pressure

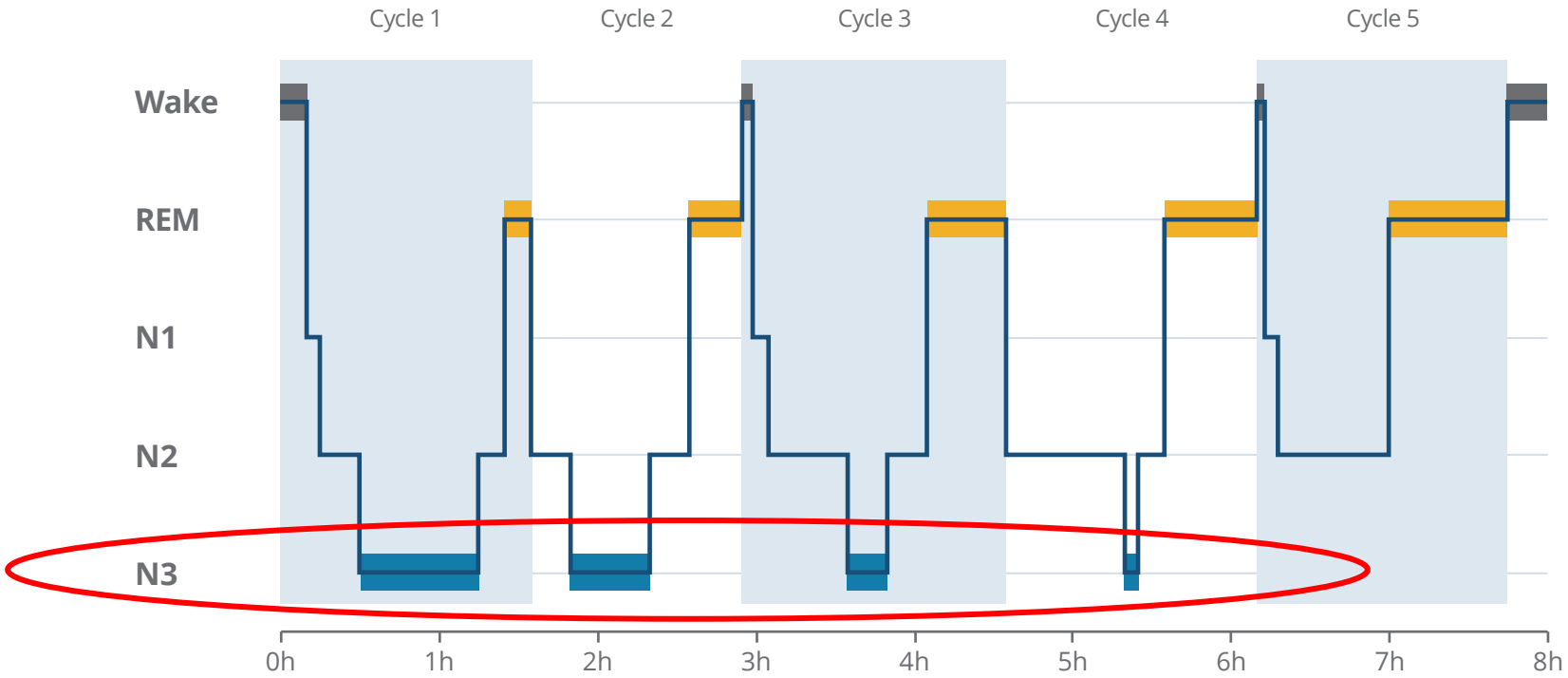
- **Light at night**
  - Human gut L-cells (GLP-1) carry clock genes; GLP-1 secretion varies by time of day
  - Sleep loss + night light = Altered melatonin and cortisol and raised insulin resistance
  - Sleep loss in the dark = No change
  - **Conclusion: light at night, regardless of sleep loss, itself impairs glucose regulation**
- **Abnormal sleep worsens insulin sensitivity**
  - Sleep restriction for 1–14 days: +15–25%.
  - Circadian misalignment: +14–26%, rising to +55% combined with restriction.
  - Treating OSA with CPAP improves it by a median of about 40% on clamp or minimal-model measures, though HbA1c rarely changes.
    - Epidemiologically, short sleep, shift work and OSA each go with hypertension, CV events and type 2 diabetes.
    - Adherent CPAP (≥4 h/night) lowers BP and CV events.
- **Weekend catch-up sleep improved insulin sensitivity**, while one night of sleep deprivation with light exposure altered the time-of-day pattern of GLP-1 and insulin in men

Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Gil-Lozano M, et al. Am J Physiol Endocrinol Metab. 2016;310.

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Sleep Architecture-Slow Wave Sleep is the “endocrine” stage of the night

First half: N3-rich **Second half:** REM-rich



Hours after lights out

During slow-wave sleep

- Cortisol is suppressed
- Growth hormone is released
- Sympathetic tone, heart rate and blood pressure fall
- Cerebral glucose use falls
- Cycles run ~90 min; SWS shrinks with age

C Physiology reviews

Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Mong J, et al. Philos Trans R Soc B. 2016;371.
Nobari H, et al. Heliyon. 2023;9(9):e19636.

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Testosterone Rhythms, Sleep and Chronotype

What Causes Low T?

Circadian syndrome = Metabolic syndrome components + short sleep (≤6 h) + depressive symptoms

- Using NHANES data from 2011–2016 on over 3,400 men: those with circadian syndrome were 2.3× more likely to have low T (fully adjusted OR 2.28, 95% CI 1.57–3.32)
- Correlation, not causation

Shift work

- Shift workers sampled at the start of a morning shift had lower pregnenolone and total T than day workers
- Shift work moves the T peak to soon after waking without changing the mean, so some "low T" in shift workers is an artifact of sample timing

Light at night

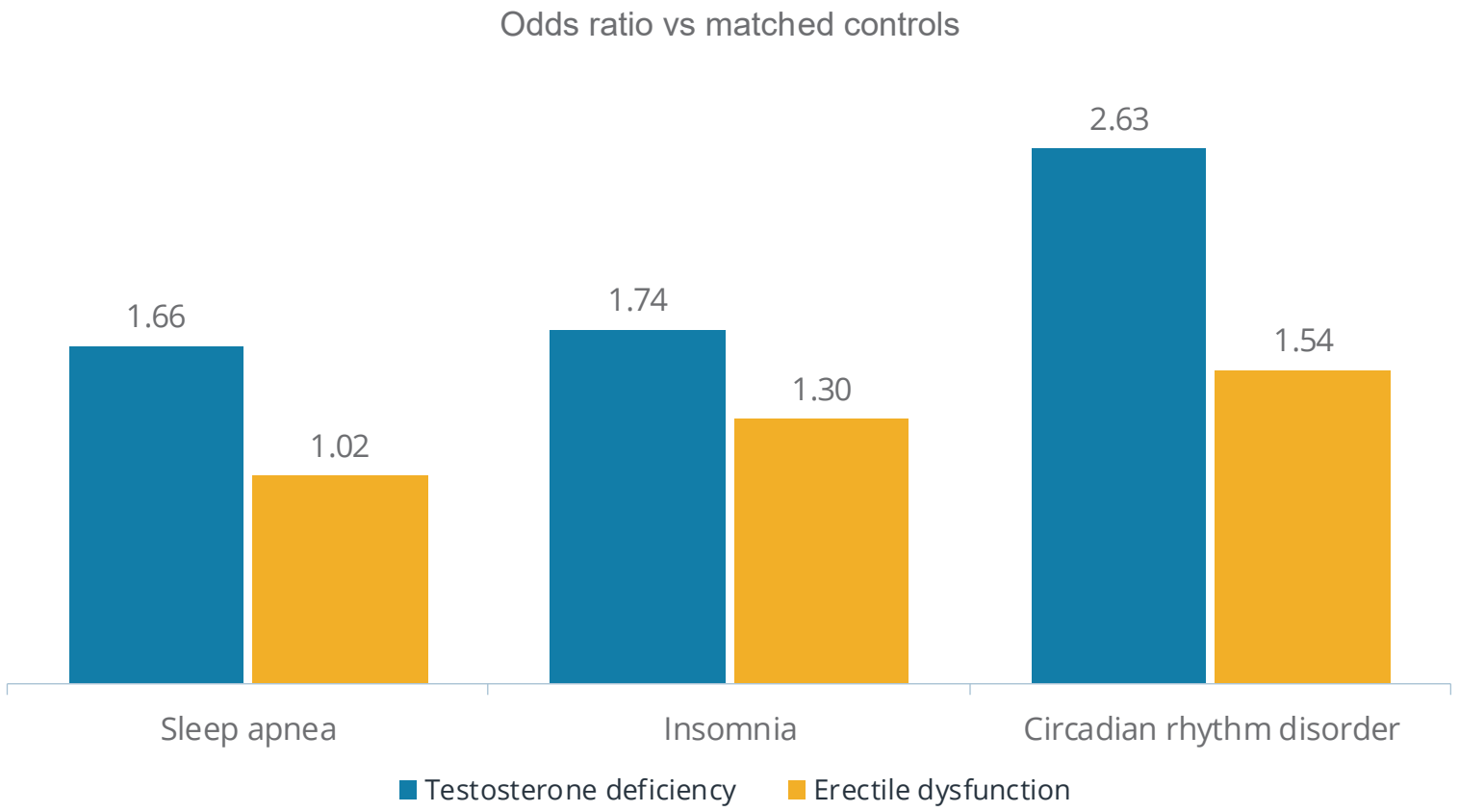
- In animal models, dim light at night (2–5 lux) flattens melatonin and T rhythms
- In one study, 50% melatonin suppression occurred at a group mean of about 25 lux over 5 h in the evening, with individual thresholds ranging from 6 to 350 lux. Exposure at 10, 30, and 50 lux delayed melatonin onset by 22, 77, and 109 min, respectively
    - For reference, smart phones, e-readers (backlit) and tablets are estimated to emit ~30-70 lux depending on size. "Nightshift" or blue blocking settings can lower this, but it isn't clear how much.

Xiao Y, et al. Front Nutr. 2023;10:1137668.
Bracci M, et al. Int J Environ Res Public Health. 2023;20.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Zeman M, et al. Int J Mol Sci. 2023;24.
Phillips AJK, et al. Proc Natl Acad Sci U S A. 2019;116(24):12019-12024.
Gil-Lozano M, et al. Am J Physiol Endocrinol Metab. 2016;310.

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Sleep Disorders, Testosterone and ED - US Claims Data

Every sleep disorder raised the odds of testosterone deficiency, circadian disorders most



Agrawal P, et al. Int J Impot Res. 2024;36(1):78-82.

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The Daily Testosterone Rhythm-Does Sleep Affect T?

Testosterone follows sleep, but which part of sleep matters most is still debated

Which part of sleep drives T?

- **Slow-wave sleep**: suppressing SWS for one night lowered morning T and 17-OHP, with cortisol unchanged; a higher DHEA/androstenedione ratio suggests lower 3β-HSD activity
- Late-night sleep near REM may matter more
- T tracks continuous sleep and REM cycles, not the biological or solar clock
- Sleep loss lowers 24 h testosterone and raises afternoon cortisol
    - Tips the anabolic–catabolic balance toward lean muscle loss

B Experimental + reviews

How much sleep, and what modifies it?

- The nocturnal T rise needs at least 3 h of SWS, possibly more in older men
- After one night shift, the daily T pattern shifts to track sleep, with no change in mean T
- Sleep-restriction effects on the HPG axis are contradictory and may depend on age, other circadian disruption, SHBG, stress, depression, medication and the timing of restriction

Ukraintseva YV, et al. Sleep Med. 2018;48:117-126.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Wittert G. Asian J Androl. 2014;16(2):262-265.
Mong J, et al. Philos Trans R Soc B. 2016;371.

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The Daily Testosterone Rhythm-Summary

Sleep disruption shifts testosterone more than testosterone disrupts sleep

What the evidence shows

- Consolidated sleep and SWS both likely matter for peak T
- Insufficient or fragmented sleep can block the nocturnal rise in T
- Claims that T fluctuations affect sleep in men remain inconsistent; life stage and comorbid conditions or treatments likely contribute

Sleep disruption is more likely to affect the circadian pulses of testosterone than testosterone fluctuations are to disrupt sleep.

Therefore: TRT may not be the best treatment option for sleep disruption in men

Ukraintseva YV, et al. Sleep Med. 2018;48:117-126.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Wittert G. Asian J Androl. 2014;16(2):262-265.
Mong J, et al. Philos Trans R Soc B. 2016;371.

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Chronotype-What Genetics Tells Us

Background

- **Chronotype:** morning-active (early bird) vs evening-active (night owl)
- Light is usually the main variable studied when linking chronotype to health risks
- **UK Biobank:** genetic and health data on ~500,000 people aged 40–69 across the UK, including lifestyle, blood and urine biomarkers (incl. serum hormones) and physical characteristics

Associated with	Source
Genetic light sensitivity	
Greater eveningness and shorter sleep	—
Genetic morning preference	
Lower risk of prostate cancer	Sun 2021
Lower total and bioavailable T; no reverse causation, no effect on SHBG	Ichikawa 2024
Genetic evening preference	
Insomnia: longer sleep onset, lower sleep efficiency	Partonen 2026
More depressive symptoms	Partonen 2026
More caffeine, nicotine and alcohol use	Partonen 2026

A Mendelian randomization

Genetic chronotype links early birds to low T, but night owls to poorer sleep and mood, AND…

Ichikawa T, et al. Front Endocrinol. 2024;15:1264410.
Sun X, et al. Sleep. 2021;44(10):zsab104.
Partonen T. Curr Sleep Med Rep. 2026;12(1).

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Chronotype-Risks of Being a Night Owl

Evening chronotype is linked to higher cancer, neurodegenerative, cardiovascular and metabolic risks

Condition	Disease	Evidence
Brain		
Alcohol misuse	Alcohol abuse	**High**
Smoking	Nicotine dependence	**High**
Irregular or unhealthy diet	—	**Moderate**
Low physical activity	—	**Moderate**
Irregular or deprived sleep	—	**High**
Sleeping difficulties	Insomnia	**Moderate**
Overweight	Obesity	**Low**
Sleep disturbances	Sleep apnea	**Low**
Depressive symptoms	Depressive disorder	**High**
Depression, hypomania or mania	Bipolar disorder	**High**
Symptoms of anxiety	Anxiety disorder	**Low**

Condition	Disease	Evidence
Heart and blood vessels		
Elevated blood pressure	Arterial hypertension	**Moderate**
Ischemic attacks	Circulatory disease	**Low**
Lungs and respiratory tract		
Wheezy breathing	Bronchial asthma	**Low**
Allergic respiratory symptoms	Hay fever	**Low**
Endocrine organs		
Reduced insulin sensitivity and glucose tolerance	Type 2 diabetes	**High**
Difficulties in getting pregnant	Infertility	**Low**

Adapted from Table 1 of the source below. *Evidence strength reflects the author's rating of the association with evening preference.*

Partonen T. Curr Sleep Med Rep. 2026;12(1).

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Before diagnosing low testosterone, ask about his sleep and schedule

What about other complaints?

Hair Loss

- Poor sleep quality and sleep deprivation (under 6 hours) aggravate hair loss severity.
  - Sleep disturbance higher across AGA, alopecia areata, TE and scarring alopecia
  - Sleep disturbance, measured with the PSQI, was consistently higher across subtypes of hair loss
  - For AGA specifically, correlates for hair loss were:
    - Sleep Deprivation
    - Poor Sleep Quality (PSQI above 5)
    - High OSA risk (STOP-BANG of 5)
    - Proposed AGA mechanisms are circadian misalignment, OSA-related hypoxia and hormonal imbalance.
  - NOTE: The Epworth Sleepiness scale was less sensitive in the AGA group.
- **Other proposed circadian rhythm MOAs for hair loss**
  - Less melatonin
  - More cortisol pushing follicles into catagen
  - Androgen–estrogen imbalance
  - Oxidative stress
  - Stress–sleep loop.

Boghosian T, et al. Dermatol Ther (Heidelb). 2026;16(2):937-952.
Huang F, et al. Front Public Health. 2026;14.

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Erectile Dysfunction

- Men with a circadian rhythm sleep disorder are more likely to have ED
- Mechanistically, clock genes regulate penile vascular and smooth-muscle function in animal work.
- OSA, insomnia, shift work disorder and restless legs are all associated with ED
  - In the only sham-controlled RCT, adherent CPAP improved IIEF erectile function by about 6 points, above the 4-point minimal important difference, even though CPAP does not reliably raise T.
- For comparison, testosterone therapy in men with low T gives modest gains in nocturnal erections, ED scores and satisfaction (meta-analysis)

Agrawal P, et al. Int J Impot Res. 2024;36(1):78-82.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Cho JW, Duffy JF. World J Mens Health. 2019;37(3):261-275.
Isidori AM, et al. Clin Endocrinol. 2005;63(4):381-394.
Li T, et al. Aging Dis. 2022;13(1):8.

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Reproductive Physiology and Male Factor Infertility

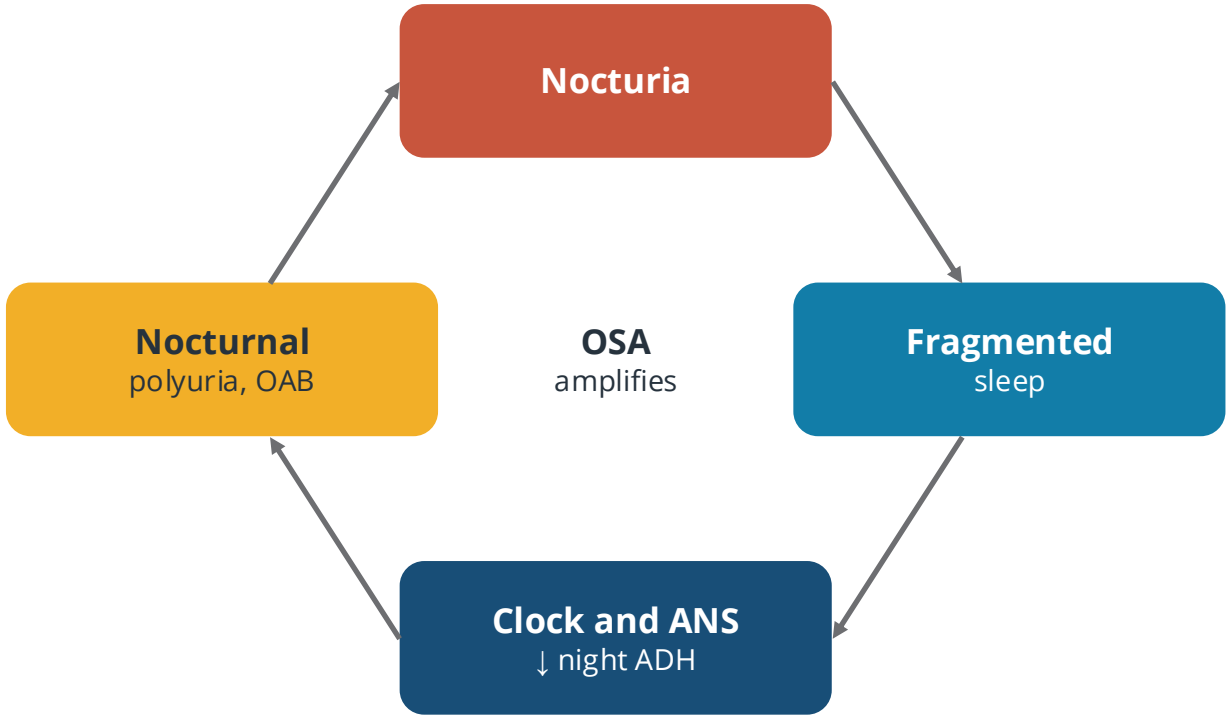
- Men with sleep disorders had lower total sperm count, concentration, progressive motility and normal morphology. Semen volume, T, FSH and LH did not differ.
  - Clinical relevance: a normal testosterone result does not clear sleep as a factor in male-factor infertility.
- Short sleep (<6 h) in the male partner is linked to reduced couple fecundability and smaller testis volume
- Night shift work, short and poor-quality sleep can be threats to sperm quality, however, many studies have inconsistent study design
- Circadian disruption may lower acrosin activity and increases sperm head defects

Zhong O, et al. Front Physiol. 2022;13:913369.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Li T, et al. Front Endocrinol. 2022;13.
Garg A, Sharma M. J Infertil Reprod Biol. 2025;13(1).

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Nocturia

Frequent night-time urination and poor sleep feed each other



Lin YH, et al. Eur Urol Focus. 2026;12:144-146.
Cavanaugh D, et al. Prostate. 2024;84(5):417-425.
Schwartzmann I, et al. Drugs Context. 2026;15:1.

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Stress, Anxiety and Mood

- **The relationship is bidirectional:**
  - Mood disorders often come with disrupted clock-controlled outputs such as sleep and cortisol.
  - Jet lag, night-shift work, or artificial light at night can trigger or worsen affective symptoms in susceptible people
- Major depression
  - Patients with MDD show reduced amplitude of melatonin and cortisol rhythms, blunted body-temperature rhythms, and REM changes, and symptom severity tracks the degree of circadian misalignment.
  - Most effective treatments (bright light, wake therapy, social rhythm therapy, SSRIs/SNRIs, agomelatine) act directly on circadian rhythms, and morning light's antidepressant effect correlates with how far it advances the melatonin phase.
  - In animals, just 3 nights of 5-lux dim light at night was enough to alter clock genes and increase depressive-like behavior in mice.
- Anxiety
  - Anxiety seen with shift work and jet lag may come from disturbed sleep rather than circadian disruption itself.
- Bipolar disorder:
  - Eastward travel, which phase-advances the clock, is linked to mania, and westward travel, which phase-delays it, to depression.
  - Midday bright light can resolve bipolar depression, but morning light can induce mixed states. Blue-blocking glasses or enforced darkness can treat mania.
- Schizophrenia:
  - Unmedicated patients show lower nighttime melatonin, blunted amplitude, and phase shifts
  - The cortisol rhythm stays roughly intact but levels are often elevated

Walker WH, et al. Transl Psychiatry. 2020;10(1).

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Measuring on the Clock

Measuring Sleep -Wearables vs PSG

Measure	Traditional actigraphy	Consumer multi-sensor devices
Sleep detection	**>90%**	**Usually >90%**
Wake detection	**Rarely above 50%**	**20–70%, highly variable**
Total sleep time	Overestimated	Usually overestimated, sometimes by over an hour
Wake after sleep onset	Underestimated, potentially by hours	Usually underestimated, by up to an hour
Light sleep staging	Not available	~50–90%
Deep and REM staging	Not available	~30–80%; deep sleep least accurate

Single-night lab studies vs PSG, mostly young healthy adults

Key takeaways

- **Comparable or better:** in lab protocols, modern multi-sensor wearables match or beat actigraphy.
- **Worse on bad nights:** error grows with more disturbed sleep, in the patients who most need accuracy
- **Kids flip the error:** devices may underestimate total sleep and overestimate wake times

de Zambotti M, et al. Sleep. 2024;47(4):zsad325.

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Measuring Sleep-Blind Spots with Wearables

- Actigraphy (movement only) agrees with PSG 81–90% of the time in athletes, but overestimates when sleep is fragmented
- Men rated sleep better than women despite worse home PSG--> men under-perceive short awakenings (n=476)
  - Questionnaires may under-call fragmented sleep in men: ask the bed partner
- Sleep Research Society panel
  - Skin color and obesity can degrade sensor performance-->healthcare disparities?
  - Skin tone and thickness, hair, gender, tattoos, body temp, motion and ambient light can all distort the PPG signal
  - Disease and medications can change cardiac signals on which sleep staging algorithms rely
  - It is unclear whether these devices work for shift workers or people with circadian rhythm disorders.

Nobari H, et al. Heliyon. 2023;9(9):e19636.
Åkerstedt T, et al. Sleep Adv. 2026;7(2):zpag048.
de Zambotti M, et al. Sleep. 2024;47(4):zsad325.

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Measuring Sleep -When to Use Which Device

Match the device to the question you are asking

Goal	Use	Why
Diagnose OSA	**PSG or home sleep apnea test**	Wearable SpO_2 is not for medical decisions*
Track trends	Consumer device, healthy adults	TST is most reliable; log bedtime manually
Insomnia	Device plus a sleep diary	Device wake time and sleep efficiency are least reliable
Overnight HRV	Device that averages the whole night	Short sampling windows are unreliable
Exercise HR	Chest strap (e.g., Polar)	Wrist PPG is inaccurate in motion
Naps, shift work	Sleep diary	**No device is validated**
Research	Research-grade device with raw data	Skip proprietary "readiness" scores

***Placement affects oxygen readings.** The back of the wrist and the finger are less vascular and move more than the fingertip or earlobe sites medical oximeters use.

de Zambotti M, et al. Sleep. 2024;47(4):zsad325.

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Measuring Hormones on the Clock

Measure cortisol and melatonin as rhythms, not as single values

Marker	Best sample	What it shows	Watch out for
Testosterone	Serum, morning (LC-MS/MS), dried urine is complementary	Diagnosis of deficiency	Shift work, age <30, acute illness
Cortisol rhythm	Saliva + urine, 4–5 timed points	Shape of the day: CAR, slope, night value	Sample timing vs waking
CAR	Saliva: waking, +30, +60 min	HPA readiness for the day	Delay after waking blunts it
Melatonin	Urine 6-OHMS, waking	Night-time melatonin output	Light at night, beta-blockers, NSAIDs
Androgen metabolites	Dried urine	5α vs 5β metabolism, DHEA output	Not a substitute for serum T

Stalder T, et al. Endocr Rev. 2025;46(1):43-59.
Pilger A, et al. Sci Rep. 2018;8(1):9151.
Juliana N, et al. Int J Mol Sci. 2025;26.
Luo L, et al. Xenobiotica. 2016;46(7):612-619.
Kanakis GA, et al. Maturitas. 2019.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.

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Reading DUTCH Through a Circadian Lens

- Meals, and activity mask rhythms in sampling

Tips

- Make sure that sleep quality/pattern is noted on requisition. Have them state if it was a typical night.
- Also note meals, exercise timing alongside wake time
- Read cortisol as a curve, not just one point
- Don’t hyperfixate on the Total DHEA and Testosterone, sometimes the hormone metabolism pathways are more relevant to symptom presentations.

Klerman EB, et al. Clin Transl Med. 2022;12(12).
Kanakis GA, et al. Maturitas. 2019.
Stalder T, et al. Endocr Rev. 2025;46(1):43-59.
Luo L, et al. Xenobiotica. 2016;46(7):612-619.

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Cases

Hair loss at 31

Low T and low libido at 46

Night-time urination at 63

Waking with anxiety at 33

Case 1: 31yo M with hair loss

31 · SOFTWARE DEVELOPER · NIGHT OWL

Hair loss

- Sleeps 1:30–7:00 weekdays, 3:00–11:00 weekends (~3.5 h social jet lag)
- Temple thinning for 2 years; vapes
- Interested in having kids



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Case 1: Interpretation and Plan

Androgens and Circadian Rhythms

1	**Anchor wake time**	Same wake time 7 days a week; outdoor light early; dim screens 2 h before bed; aim ≥7 h	B Lab studies + animal
2	**Expect sperm, not T, to move**	Sleep disorders lower count, motility and morphology. The low T on the DUTCH could be reflective of UGT deletion.	A Meta-analysis
3	**Keep training, any time**	Evening sessions don't harm sleep architecture; consistency matters more	A Systematic review
4	**Stop vaping, re-test semen**	Repeat semen analysis after ~3 months, about one spermatogenic cycle	C Clinical practice
5	**Hair: screen sleep, plan around conception**	Short sleep and high STOP-BANG go with AGA; 5α preference and low 6-OHMS support the discussion	A SR, observational

Zhong O, et al. Front Physiol. 2022;13:913369.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Kim N, et al. Phys Act Nutr. 2023;27(3):52-63.
Zeman M, et al. Int J Mol Sci. 2023;24.
Boghosian T, et al. Dermatol Ther (Heidelb). 2026;16(2):937-952.
Cleveland Clinic. MENtion It Survey (YouGov, n=1,135 US men). 2026.

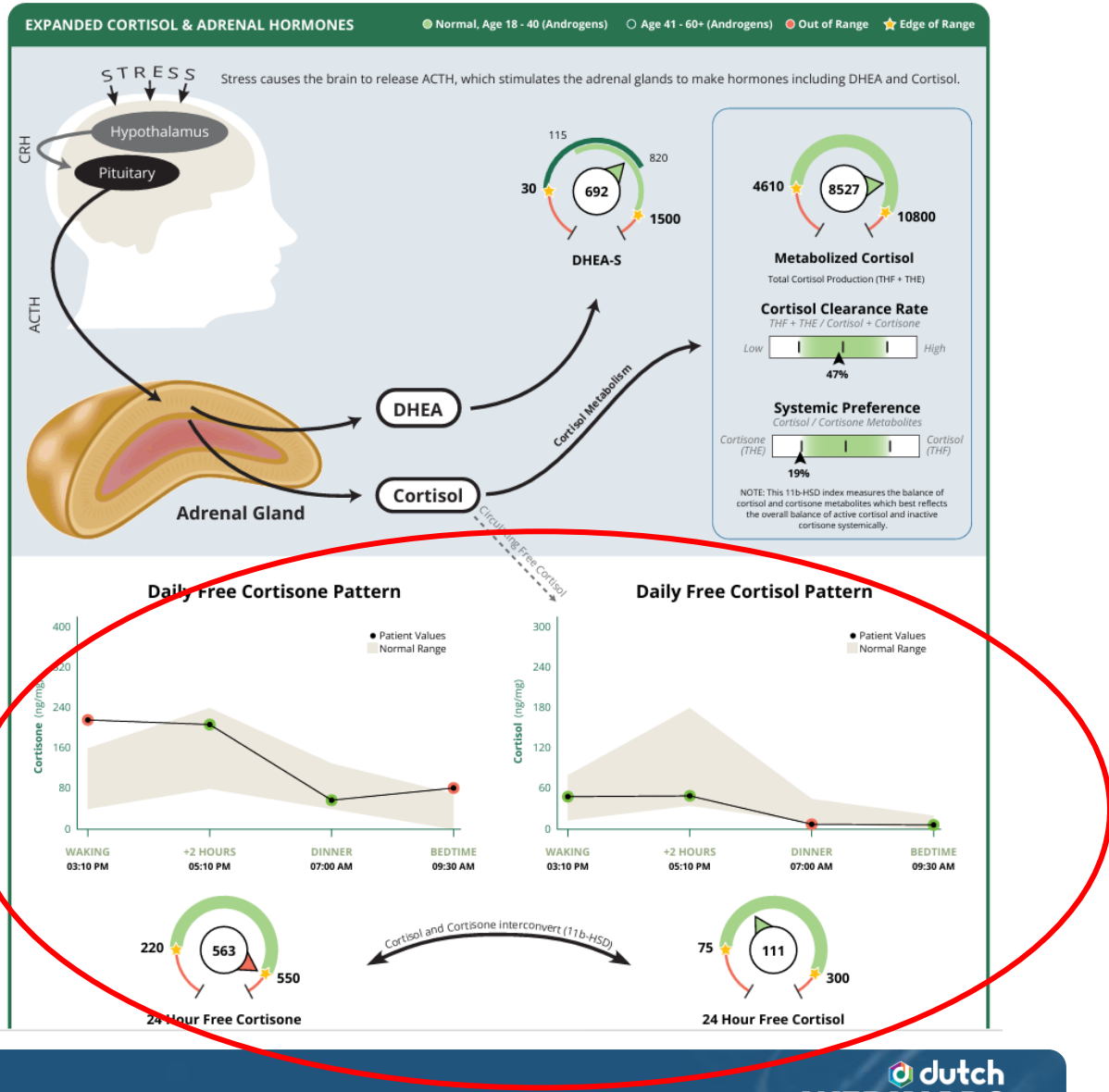
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Case 2: 48yo with low libido and sleep problems

48 · FIREFIGHTER · 24-ON / 48-OFF

Low T + low libido

- BP 138/88; fasting glucose 104
- Low libido; fatigue
- One serum T, drawn 3 p.m. after a night shift: low. Based on this finding, provider Rx'd TRT.



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Case 2: Interpretation and Plan

Sleep hygiene/shift work correction, and re-time the blood draw before considering TRT

1	**Anchor wake time**	Same wake time 7 days a week; outdoor light early; dim screens 2 h before bed; aim ≥7 h	B Lab studies + animal
2	**Repeat T after real sleep**	Draw soon after waking from a normal sleep, then confirm; one 3 p.m. post-shift value is not a diagnosis	B Cohort + lab studies
3	**Daytime main meal on shift**	Avoid large meals overnight	B Lab RCTs, via review
4	**Re-assess if TRT is warranted**	Discuss CV, OSA, and gynecomastia risks;	C Clinical reviews

Xiao Y, et al. Front Nutr. 2023;10:1137668.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Novaes LF, et al. J Sex Med. 2024;21(5):408-413.
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Cojocaru C, et al. Biomed Rep. 2023;19(6).
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Liu PY, et al. Rev Endocr Metab Disord. 2022;23(6):1323-1339.

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Chinese Herbal Medicine

Sleep

- Suan Zao Ren Tang
- Chai Hu Jia Long Gu Mu Li Tang

RCT: Zhumian Tang (contains Suanzaoren) + eszopiclone vs eszopiclone alone, n=130

PSQI 6.98 vs 8.26 at 2 wk; 83% vs 58% responders; similar AEs

B Multi-center RCT

Androgen support: formulas

- You Gui Wan
- Shen Qi Wan

Androgen support: single herbs

- Yin Yang Huo (horny goat weed)
- Tu Si Zi (dodder seed)
- Ba Ji Tian (morinda root)

Wang Y, et al. J Tradit Chin Med. 2024;44(1):162-171.

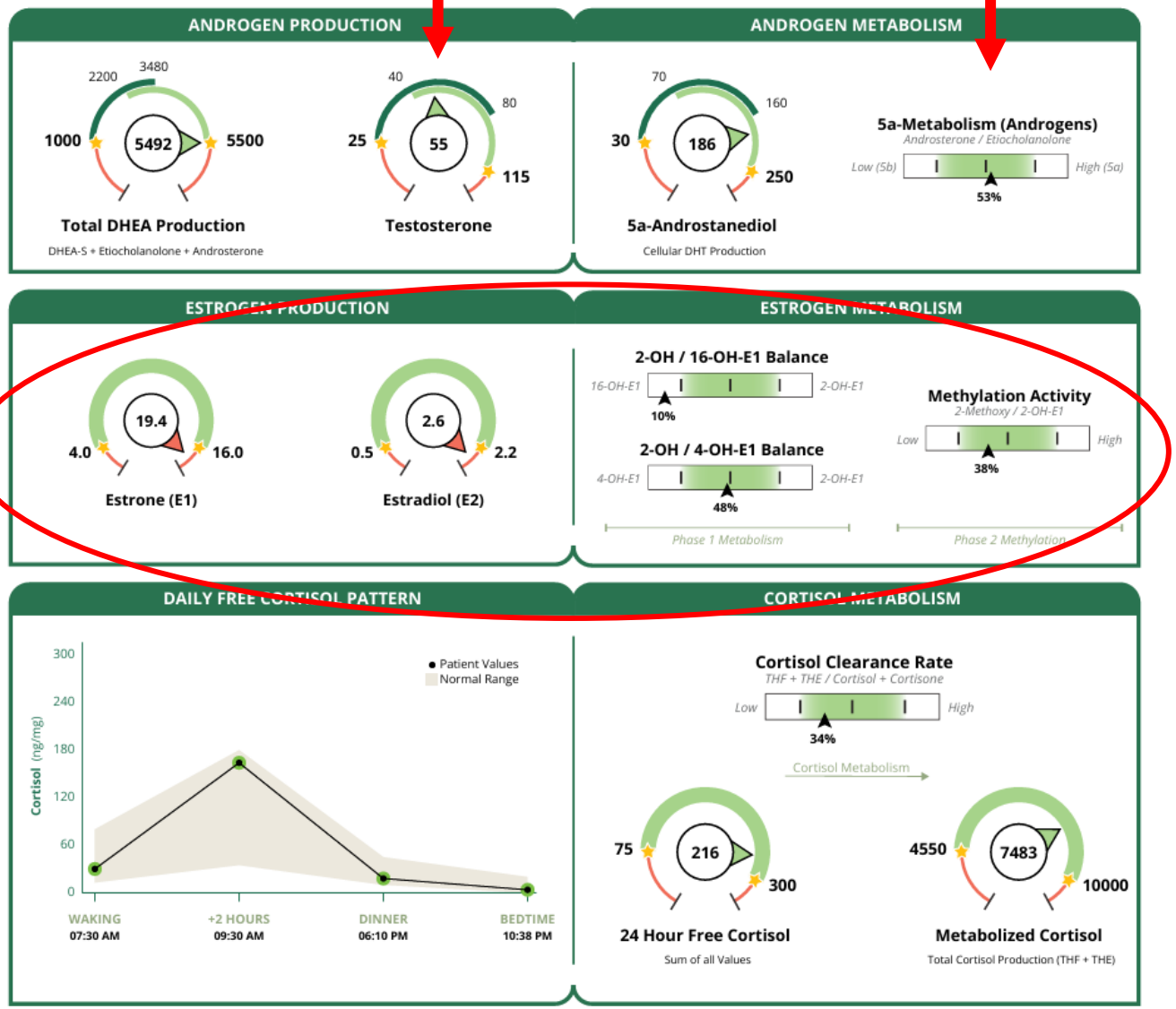
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Case 3: 63yo with nocturia and elevated PSA

63 · RETIRED TEACHER

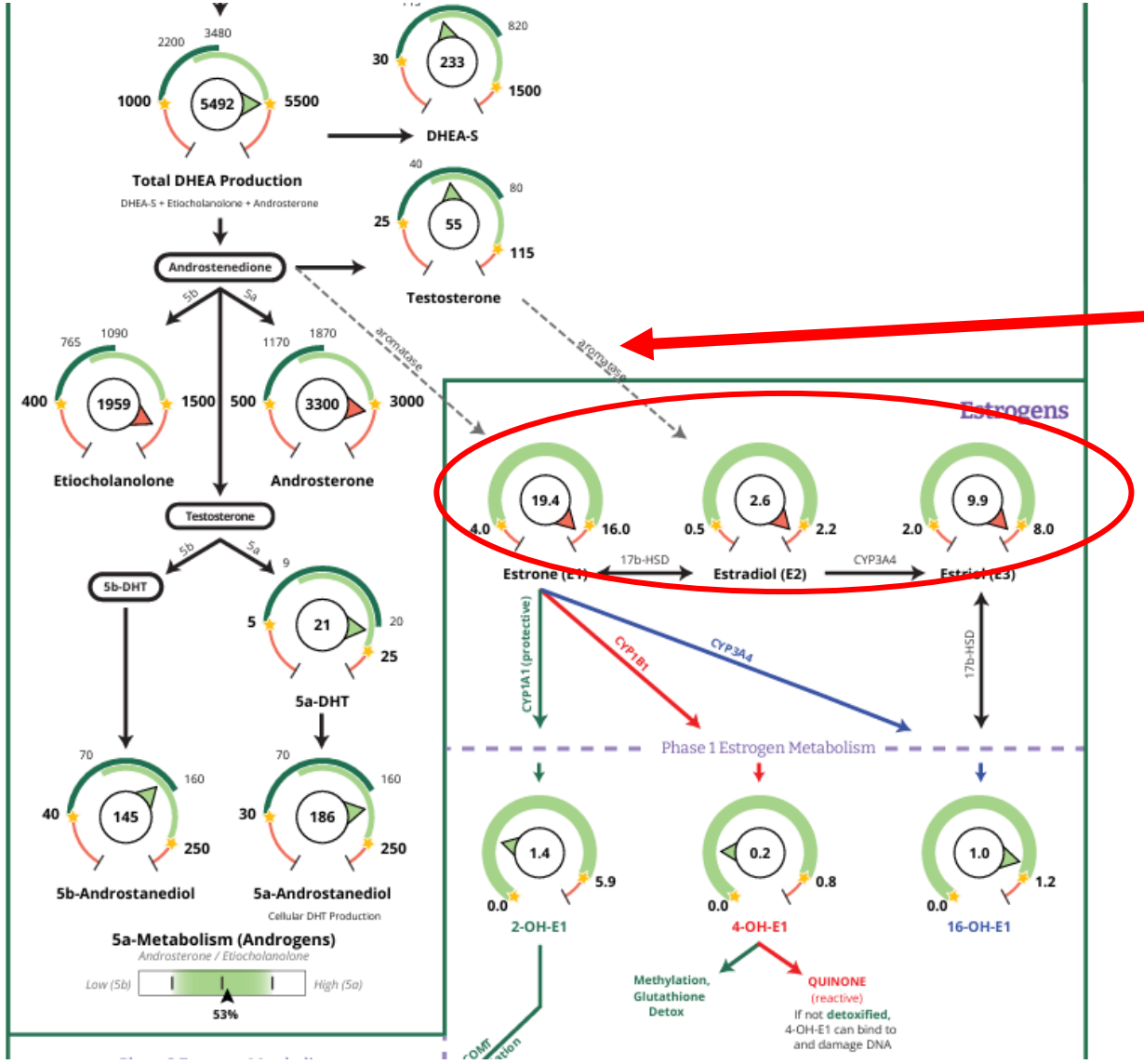
Nocturia + poor sleep

- Up 3× a night; 5–6 h fragmented sleep; wakes at 7:30
- Morning BP higher than evening
- Two glasses of wine at dinner; coffee at 3 p.m.
- Low mood; tired all day



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Case 3: 63yo with nocturia and elevated PSA



Aromatization

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Case 3: Interpretation and Plan

Break the nocturia–sleep loop from both ends

1	**Screen for OSA**	OSA amplifies the nocturia loop and non-dipping BP; home sleep test	C Proposed model
2	**Move fluids and drinks earlier**	Fluids, alcohol and caffeine earlier in the day; morning light and activity	
3	**Aromatase Inhibition**	Herbal or pharmaceutical	See Next Slide
4	**Valerian for sleep**	Whole root or rhizome most reliable; no serious adverse events, ages 7–80	A SR/MA, 60 studies
5	**Lavender inhalation**	+43 min total sleep on PSG, fewer arousals	B Single-blind, n=53

Lin YH, et al. Eur Urol Focus. 2026;12:144-146.
Cavanaugh D, et al. Prostate. 2024;84(5):417-425.
Shinjyo N, et al. J Evid Based Integr Med. 2020;25.
Yang CP, et al. J Chin Med Assoc. 2023;86:655-671.
Liu PY, et al. Rev Endocr Metab Disord. 2022;23(6):1323-1339.

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Natural Aromatase Inhibitors? Chrysin, Magnesium and Nettle Root

None of the three has human evidence that it lowers estrogens in men

Chrysin

- Inhibits aromatase in vitro; 17 of 20 studies were cell-based (SR)
- Only male trial: propolis + honey for 21 days left urinary T unchanged (n=10)
- Generally, poorly absorbed, but a micellar form shows promise to increase bioavailability
- Mice: protected T and sperm from phthalate toxicity

C In vitro + animal

Magnesium

- Not a direct aromatase inhibitor; may free T from SHBG (in vitro)
- Older men: higher serum Mg tracked higher total T (n=399)
- Men with MetS: Mg tracked higher, not lower, estradiol (n=152)
- Mg depletion linked to ED; no estradiol RCT in men

C Observational

Nettle root (Urtica dioica)

- Root extracts inhibit aromatase and lignans bind SHBG in vitro (1990s)
- BPH RCT, 300 mg twice daily for 8 weeks: less frequency, urgency, nocturia (n=80)
- Hormones not measured; no human estradiol data

B LUTS · C aromatase

Balam FH, et al. Heliyon. 2020;6(3):e03557.
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Khalafi-Kheydani A, et al. J Herb Med. 2022;34.

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Case 4: 33yo M waking with Anxiety

“I know something is wrong, but nobody can tell me what it is.”

33yo M in commercial real estate

Waking with Anxiety

- Chronic, since adolescence, without clear periods of improvement.
- Denies sleep problems
- Wakes with sense of “impending doom”
- Adaptogenic and sedative herbal formulas ineffective.



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Case 4: Interpretation and Plan

This one really is just correcting the androgenic findings!!

1	**Saw palmetto, hexanic extract**	IPSS gains in several trials; fewer sexual side effects	**A Systematic review**

Schwartzmann I, et al. Drugs Context. 2026;15:1.

Illustrative composite case. Marker positions are schematic, not lab values.

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What to Do:
Timing First, Then Evidence

What to Do: Lifestyle

Change timing first: what to recommend and how strong the evidence is

Lever	What to recommend	Grade	Key source
Sleep duration and regularity	≥7 h; same wake time daily; protect the last 2 h of sleep	**B**	Liu 2019 (lab RCTs)
Exercise	Train consistently; evening sessions are fine	**A**	Kim 2023 SR
Weight loss	Raises T in proportion to loss; first step in OSA	**B**	Wittert 2014; Cojocaru 2023
Meal timing	Main meal earlier; avoid large late or overnight meals	**B**	Gil-Lozano 2016; Boege 2021
Light	Bright light in the morning; dim and warm at night	**C**	Zeman 2023 (animal)
Mediterranean diet	Linked to better sleep quality	**C**	Scoditti 2022
Meditation	More N3, higher DHEA and melatonin in long-term practitioners	**C**	Nagendra 2022

Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
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Cojocaru C, et al. Biomed Rep. 2023;19(6).
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Scoditti E, et al. Nutrients. 2022;14:2998.
Nagendra RP, et al. Sleep Sci. 2022;15(2):179-187.

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What to Do: Supplements Men Are Buying

Product	Use	Finding	Grade
Valerian	Sleep quality	SR/MA of 60 studies; whole root most reliable; no serious AEs	**A**
Saw palmetto	BPH / LUTS	SR of 16 studies; hexanic extract; fewer sexual AEs	**A**
Plant extracts (various)	Sleep	SR of plant extracts; review adds passionflower, lemon balm	**A**
Rice bran extract	Sleep onset	Double-blind RCT: better sleep efficiency and onset	**B**
Lavender inhalation	Sleep	+43 min total sleep on PSG (single-blind, n=53)	**B**
L. plantarum PS128	Sleep, mood	RCT n=40: lower depression scores, fewer deep-sleep awakenings	**B**
Saffron, ginseng, rose oil	Libido, mood	Small RCTs show dual sexual and mood effects (review)	**C**
Ashwagandha	Sleep	Preclinical	**C**
Magnesium, melatonin	Sleep	Top sellers; no human trials in library	**B-C**

Shinjyo N, et al. J Evid Based Integr Med. 2020;25.
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Schwartzmann I, et al. Drugs Context. 2026;15:1.
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Yang CP, et al. J Chin Med Assoc. 2023;86:655-671.
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Ferracioli-Oda E, et al. PLoS One. 2013;8(5):e63773.

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Key Take-home Correlations

What each kind of sleep problem does, and how sure we are

Sleep problem	Correlate in men	Evidence
Loss of slow-wave sleep	↓ morning T and 17-OHP; ↓ glucose tolerance	Small experimental studies
Sleep restriction (late night)	↑ insulin resistance; ↓ T (mixed); ↓ sperm quality and fecundity	Lab RCTs; cohorts; MA of observational
Circadian misalignment	Shifted T peak, unchanged mean; ↑ insulin resistance and BP; ↑ TD odds	Lab RCTs; claims and NHANES data
Chronotype	Morning type → lower total and bioavailable T	Mendelian randomization
OSA and sleep fragmentation	Low T (obesity-mediated), ED, infertility, IR, HTN, CVD, mortality	Cohorts + CPAP RCTs
Insomnia and gut dysbiosis	HPA overactivity, inflammation, ↓ SCFAs, GABA, serotonin	Observational + small RCTs

Ukraintseva YV, et al. Sleep Med. 2018;48:117-126.
Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Zhong O, et al. Front Physiol. 2022;13:913369.
Ichikawa T, et al. Front Endocrinol. 2024;15:1264410.
Agrawal P, et al. Int J Impot Res. 2024;36(1):78-82.
Cojocaru C, et al. Biomed Rep. 2023;19(6).
Li C, et al. Int J Mol Sci. 2024;25:13208.

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Clinician Checklist

Five questions to ask before you order TRT or a supplement

1

When does he sleep and wake?

Weekday and weekend; chronotype; social jet lag

2

Does he work shifts?

If so, time the T draw to his wake-up

3

Snoring, pauses or nocturia?

Screen for OSA before TRT

4

When was his T drawn?

Before 10 a.m., repeated if low

5

Does he want children?

TRT suppresses sperm production; plan around it

Liu P. J Clin Endocrinol Metab. 2019;104(10):4398-4417.
Novaes LF, et al. J Sex Med. 2024;21(5):408-413.
Ichikawa T, et al. Front Endocrinol. 2024;15:1264410.
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Liu PY, et al. Rev Endocr Metab Disord. 2022;23(6):1323-1339.

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Keep Learning

Keep the clock running: Check out the following complementary DUTCH Resources

Testosterone and TRT

Testosterone Delivery Options in 2026: Injections, Gels, Pellets & Beyond

Mark Holthouse, MD · Aug 2026

Using the DUTCH for Prostate and Testosterone Health

Geo Espinosa, ND

Sleep, stress and cortisol

Sleep and Cortisol: Beyond the Diurnal Rhythm

Allison Smith, ND

Understanding the Cortisol Awakening Response

Carrie Jones, ND

Men's health essentials

The HPG Axis & Men's Health

Mark Holthouse, MD

Stress Induced Hair Loss: Make It Stop!

Carrie Jones, ND

https://dutchtest.com/webinars/is-testosterone-right-for-me-now-case-study-of-a-35-year-old-male

DUTCH Test Resource Catalog: Webinars, Podcasts & Articles. 2026.

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- Clinical Support & Education
- Peer Reviewed & Validated Research

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50% off*

*Special offer of 50% off first five test kits is invalid 60 days after new provider registration."

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Thank You!

Abigail Ellsworth, ND, LAc, MSc

November 18th, 2026

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dutch WEBINARS

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