VITALS VAULT

A VITALS VAULT FIELD GUIDE

Low testosterone, or something else? Read the labs in 20 min

For men 35 to 60 with low energy, low drive or erection changes: know which labs matter and how to test.

7

CHAPTERS

20 minutes

Every claim is tied to a named study. References are on the last page.

Educational only. Not medical advice.

THIS GUIDE IS FOR YOU IF

- You are a man between 35 and 60 with low energy, low drive or erection changes.
- You wonder whether it is testosterone, or something else with the same symptoms.
- You have a result or an appointment coming and want to know what to ask.

HOW TO USE IT

Read the chapters in order, or jump to the one that fits your question. Each opens with one thing to remember. Tick the boxes and fill in the log pages as you go, then bring the last page to your appointment. Nothing here is advice to start, stop or change a medicine or supplement.

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CHAPTER 1

Symptoms are not a diagnosis

THE ONE THING TO REMEMBER

Tiredness, low drive and erection changes have many causes, so a testosterone number only means something next to symptoms and a repeat test.

Low energy, low drive and erection changes are real. They are also some of the most common complaints in medicine. Think of a smoke alarm. It tells you something is wrong. It does not tell you which room. Testosterone [the main male sex hormone] is one room. Sleep, blood sugar, thyroid, weight and mood are others. A clinician's first job is to find the right room, so this guide starts with the whole house.

WHAT A STUDY FOUND

Researchers looked at 1,222 men over 40 with symptoms. Among symptomatic men with no other health condition, only 4.7% had lab evidence of late-onset hypogonadism [low testosterone after midlife]. Among symptomatic men with conditions such as obesity, high blood pressure or lung disease, 79% did. It is a snapshot in time, so it shows a link, not a cause.

Cross-sectional study of 1,222 men over 40, as summarized in a clinical review

10–13%

In one prevalence study, about 10% of men in their 40s and 12 to 13% in their 50s had total testosterone under 325 ng/dL (Rhoden and Morgentaler, 2004).

WHAT A STUDY FOUND

In observational data, symptoms bunched up at lower testosterone levels. Below 432 ng/dL, 41% reported loss of libido. Below 288, depression, poor sleep and type 2 diabetes were more common. Below 230, erection problems and hot flushes. Below 225, 90% reported low libido. The links are loose, and illness can lower testosterone too.

Zitzmann et al., 2006; Nieschlag, 2020

COMMON BELIEF

“If I feel flat and tired, my testosterone must be low.”

WHAT THE EVIDENCE SAYS

Not necessarily. The same symptoms come from poor sleep, thyroid problems, low iron, high blood sugar and depression. In the 1,222-man study, men with symptoms but no other conditions rarely had low labs. Symptoms without low labs, or low labs without symptoms, are unlikely to be true late-onset hypogonadism.

SYMPTOMS TO NOTE THIS WEEK

- [ ] Energy: which time of day is the worst
- [ ] Drive: less desire than you remember
- [ ] Morning erections: fewer than before
- [ ] Erections: hard to get, or hard to keep
- [ ] Mood: flatter or more irritable
- [ ] Sleep: hours, and how rested you feel
- [ ] Strength and recovery after exercise

ASK YOUR CLINICIAN

- **Could my symptoms have a cause other than testosterone?**
- **Which labs would you check first, and why?**
- **Should we repeat any low result before drawing conclusions?**

CHAPTER 2

How to test: morning, repeated, same lab

THE ONE THING TO REMEMBER

One random afternoon result can mislead, so the careful way is a morning draw, repeated about a month later, at the same lab.

Testosterone rises and falls through the day, and from one day to the next. So a single afternoon number can mislead. The careful method is a morning draw, usually between 7 and 11 a.m., repeated about 30 days later. Think of weighing yourself. One reading after a big dinner tells you little. Two morning readings tell you something. Labs also use different methods, so repeats belong at the same lab.

15–30%

A glucose (sugar) load can lower total testosterone by 15 to 30%, even with normal glucose tolerance. This is one reason clinicians ask for a fasting morning draw.

What can shift the number	What the sources report	What to note
Time of day	Levels vary by hour and day to day	Book a morning draw, 7 to 11 a.m.
Sugar before the draw	A glucose load lowered total T 15 to 30%	Note what you ate or drank
Acute illness	Illness can temporarily lower testosterone	Tell the clinician you were sick
A multi-day fast	A 2 to 4 day fast shifts many blood tests	Mention any recent fast
Biotin supplements	Biotin can distort many hormone tests	Mention supplements to the lab
Different labs	Test methods are not standardized	Use the same lab for repeats

Source	Total T (ng/dL)	Note
Quest, adult male	250 to 827	One large lab's range
Labcorp, adult male	264 to 916	Another large lab's range
Reference text (Laposata)	300 to 1,200	Wider, older style range
CDC harmonized, men 19 to 39	264 to 916	Healthy, non-obese; 2.5th to 97.5th
Endocrine Society low line	Under 300	Usually weighed with symptoms
EMAS criteria for late-onset	Under 320	Plus symptoms, confirmed on repeat

WHAT A STUDY FOUND

A physician compared one of his own blood samples on two methods. Testosterone read 502 ng/dL by immunoassay and 381 by mass spectrometry, about 25% lower. His estradiol read 41.3 pg/mL by immunoassay and 18.3 by mass spectrometry. It is one sample from one person, not a trial. It shows why the lab and the method matter.

Physician-reported single-sample comparison, 2024 (not peer reviewed)

ASK YOUR CLINICIAN

- Can the draw be in the morning, and do I need to fast?
- Can the repeat go to the same lab, using the same method?
- Does this lab measure testosterone by mass spectrometry?
- Could any medicine or supplement of mine affect this test?

CHAPTER 3

Total, free, SHBG, LH and FSH in plain words

THE ONE THING TO REMEMBER

Total is everything in the blood, free is the part that works, SHBG is the carrier, and LH and FSH show where a low level starts.

Picture a delivery truck. Total testosterone is every package on the truck. SHBG [sex hormone binding globulin, a carrier protein] is the locked boxes: what is inside cannot be used. Albumin [a looser carrier protein] holds packages that come off more easily. Free testosterone is what has been delivered, and it is the part that acts on the body. That is why two men with the same total can feel very different.

Marker	What it is	The catch
Total testosterone	All testosterone in the blood	Can look normal if SHBG is high
Free testosterone	The unbound, working part	Usually calculated, not measured directly
SHBG	Carrier protein made in the liver	Insulin lowers it; estradiol and thyroid raise it
Albumin	A second, looser carrier	Needed to calculate free T
LH and FSH	Brain signals to the testes	Low T with high LH: testes. With low LH: brain signal

1–3%

Free testosterone is only about 1 to 3% of the total in the blood. Two clinicians say symptoms track free testosterone more closely than total.

WHAT A STUDY FOUND

In the European Male Ageing Study cohort, about 2% had low testosterone with high LH, which points to the testes. Of the low-testosterone cases, about 85.5% had normal or low LH, which points to the brain signal, and obesity was the biggest risk factor. The study is observational, and the cut-offs used were total T 303 ng/dL and LH 9.4 IU/L.

European Male Ageing Study (EMAS) group

WHAT A STUDY FOUND

In 15,907 men and 42,034 women, type 2 diabetes risk rose once SHBG fell below 40 nmol/L in men and below 50 in women. High SHBG has links too: cardiovascular events rose at 46.7 nmol/L or above in one community study. These are associations only, and SHBG ranges differ by lab.

O'Reilly et al., 2019; Gyawali et al., 2019

COMMON BELIEF

"Total testosterone alone tells the full story."

WHAT THE EVIDENCE SAYS

A normal-looking total can hide low free testosterone when SHBG is high. In 608 men over 45, symptom severity tracked calculated free and bioavailable testosterone, not total. Clinicians often calculate free testosterone from total, SHBG and albumin rather than use the direct test.

ASK YOUR CLINICIAN

- Can you calculate my free testosterone from total, SHBG and albumin?
- Do my LH and FSH point to the testes or to the brain signal?
- Is my SHBG high or low, and what could be moving it?

CHAPTER 4

The look-alikes that mimic low testosterone

THE ONE THING TO REMEMBER

Thyroid, blood sugar, iron, sleep apnea, weight, alcohol and some medicine classes can cause the same symptoms or lower testosterone.

Clinicians call the first step ruling out look-alikes [other causes of the same symptoms]. The list includes thyroid trouble, high blood sugar, low iron, sleep apnea [breathing stops during sleep], weight gain, heavy alcohol use, depression and some medicine classes. Alcohol seems to hurt testosterone mostly by damaging sleep, though which causes which is unclear. A car's warning light works the same way: it says look, not what broke.

Look-alike	Lab or check	What the sources say
Thyroid	TSH, free T4	Standard TSH range is 0.40 to 4.50 mIU/L
Blood sugar	A1C, fasting glucose, insulin	About 1 in 3 men with type 2 diabetes has low T
Iron	Ferritin, blood count (CBC)	Low ferritin with normal hemoglobin can bring fatigue
Sleep apnea	Not a lab; raise it with a clinician	Listed as a possibly reversible cause of low T
Prolactin	Prolactin	Checked if total T is under 150; some medicines raise it
Weight and waist	BMI, waist size	In EMAS, weight and waist gain lowered total and free T
Medicines	Your medicine list, with a clinician	Opioids, corticosteroids, some antidepressants are listed

WHAT A STUDY FOUND

In the Diabetes Prevention Program, men with a mean BMI of 32 who followed an intensive lifestyle program lost 7.87 kg in 12 months, and their total testosterone rose by 33 ng/dL. It did not change in the placebo or medicine groups. The rise was small, and symptoms were not the focus. It is one substudy.

Diabetes Prevention Program testosterone substudy

30

In one review, a ferritin under 30 ug/L flags iron deficiency in the general population. Iron deficiency is even more common than iron-deficiency anemia.

COMMON BELIEF

"A normal blood count means my iron is fine."

WHAT THE EVIDENCE SAYS

Not always. In iron deficiency without anemia, hemoglobin is normal but ferritin is low. Fatigue and poor concentration can still occur, and fatigue improved in some studies after correction. Ferritin also rises with inflammation, so it can look falsely normal, and transferrin saturation helps.

LOOK-ALIKE CHECK BEFORE THE VISIT

- [ ] I snore loudly or stop breathing in my sleep
- [ ] My sleep is poor most nights
- [ ] I drink alcohol most days
- [ ] My waist has grown in the past year
- [ ] I take an opioid, steroid or antidepressant
- [ ] I had a recent illness, surgery or fast

CHAPTER 5

Erections as an early blood-vessel signal

THE ONE THING TO REMEMBER

Erection changes can show up before heart symptoms, so they deserve a heart and blood sugar check, not only a hormone test.

An erection is a blood-vessel event. Nerves release nitric oxide [a gas that relaxes blood vessels], blood flows in, and the vessel lining [the endothelium] has to respond. High blood pressure, smoking and too many cholesterol particles can injure that lining. One urologist calls erection trouble a canary in the coal mine for vessel health. The first sign is often getting an erection but not keeping it.

Group	Labs and checks named	Why they are linked
Blood sugar	Fasting glucose, A1C, fasting insulin	A1C 5.7 to 6.4% is the prediabetes line
Cholesterol particles	ApoB, LDL-C, triglycerides	ApoB counts particles; ED and heart disease share biology
Inflammation	hs-CRP, homocysteine	Linked to ED, especially CRP in men with diabetes
Hormones	Total and free T, SHBG, prolactin, thyroid	Low T tracked with poorer vessel widening in one review
Blood pressure	Clinic or home readings	High pressure damages vessels over time

WHAT A STUDY FOUND

Among about 4,000 healthy men without ED, 15% of those who developed ED had a cardiovascular event within 7 years. Among men who had a cardiac event, about 50% reported ED about 39 months earlier. These are associations. They do not prove that treating ED prevents events.

Prostate Cancer Prevention Trial ED analysis, JAMA; Montorsi et al.

WHAT A STUDY FOUND

In a 2-year trial of 110 obese men, 55 got a diet and exercise program and 55 did not. The program group lost weight, gained 3 points on an erection score (IIEF), and had better vessel-lining function and lower IL-6 [an inflammation marker]. It was one trial in obese men only.

Esposito et al., JAMA, 2004

COMMON BELIEF

"Erection changes are just part of getting older."

WHAT THE EVIDENCE SAYS

ED is common: in a 1994 survey of 1,290 men, 52% of men over 40 had some. But the urologist interviewed says age itself is not the cause. The pile-up of other conditions, such as high blood pressure, diabetes and obesity, is. That is one clinician's view.

39 mo

On average, men who had a cardiac event reported ED about 39 months before it. This is an association, and the figure comes from one cited study.

ASK YOUR CLINICIAN

- **Given my erection changes, should I have blood pressure, glucose and apoB checked?**
- **Do my labs show any sign of insulin resistance?**
- **Should a heart risk review come before or alongside a hormone test?**

CHAPTER 6

Monitoring labs and why clinicians watch them

THE ONE THING TO REMEMBER

When a clinician prescribes testosterone, they follow red blood cells, PSA, lipids and hormone levels because those can change.

Some men take prescribed testosterone [a hormone medicine class] after a clinician confirms low levels and symptoms. This guide does not say whether that is right for anyone. It explains the labs clinicians watch: hematocrit [share of blood that is red cells], PSA [a prostate protein], estradiol [an estrogen] and lipids [blood fats]. They work like dashboard gauges: they do not drive, they show what is changing.

Lab	What it shows	What the sources say
Hematocrit	Share of blood that is red cells	Can rise on therapy; rechecked at 3 to 6 months, then yearly
PSA	A prostate protein in blood	Checked at baseline and 3 to 6 months in one review
Estradiol	An estrogen made from testosterone	Assays are hard to measure well; varies by lab
Lipids	Cholesterol and triglycerides	Followed with blood pressure and testosterone in year one
LH and FSH	Brain signals to the testes	Fall on outside testosterone; sperm output can fall too

WHAT A STUDY FOUND

TRAVERSE: 5,204 men aged 45 to 80 with total testosterone under 300 (median 227) and heart disease or high risk got gel or placebo for up to about 5 years. Heart attack, stroke or cardiovascular death: 7.0% vs 7.3%. Atrial fibrillation 91 vs 63 cases; kidney injury 60 vs 40. Testosterone rose only about 148 ng/dL, and over 60% dropped out.

Lincoff et al., NEJM, 2023

WHAT A STUDY FOUND

In the TRAVERSE prostate analysis, 23 cancers appeared in total: 12 on testosterone and 11 on placebo. Average PSA was about 0.9 in both groups, and in most men it changed by under 0.5. Follow-up averaged about 33 months in low-risk men, with high dropout, so a modest difference cannot be ruled out.

Bhasin et al., JAMA, 2023

48%

Several clinical reviews flag hematocrit above 48% as a point to look closely. In 49,983 adults, death risk was lowest at 40 to 49% in men (Boffetta, 2013).

COMMON BELIEF

"A PSA number alone shows whether prostate cancer is present."

WHAT THE EVIDENCE SAYS

No. PSA can be raised by a urinary infection, prostatitis, a rectal exam, a biopsy or ejaculation within 24 hours. A low PSA does not rule out cancer. One clinician notes it can shift about 15% day to day. A medicine class that blocks DHT can lower it by up to 50%.

ASK YOUR CLINICIAN

- **Which labs would you check before, and how often after?**
- **What hematocrit or PSA change would you want to act on?**
- **Do you adjust for any medicine that changes PSA?**

CHAPTER 7

Your symptom log and questions page

THE ONE THING TO REMEMBER

Numbers mean the most as a trend, so write down dates, times and symptoms and bring them to the visit.

A bank balance tells you little on one day. The trend tells you more. Your labs work the same way. One result is a snapshot. Two or three morning results, set beside how you felt on those days, tell a clinician far more. Use this page to keep it simple. Write down the date, the time of the draw, what you ate or drank, and how you felt that week.

WHAT A STUDY FOUND

In an EMAS follow-up, obese men with low testosterone who lost 5% or more of their body weight saw total testosterone rise from 265 to 383 ng/dL, yet their symptoms did not significantly improve. The numbers and the symptoms moved separately. That is why a log of both is worth keeping. It is observational data.

European Male Ageing Study (EMAS) follow-up

DRAW LOG

Date of the draw _____

Time of the draw _____

Fasting? What I ate or drank _____

Illness, travel or poor sleep that week _____

Lab name (use the same one) _____

RESULTS LOG

Total testosterone and date _____

Free testosterone and date _____

SHBG and date _____

LH and FSH and date _____

Other labs: A1C, TSH, ferritin _____

BEFORE THE BLOOD DRAW

- [ ] Morning draw booked (7 to 11 a.m.)
- [ ] Same lab as last time
- [ ] Medicines and supplements listed, with biotin
- [ ] Fasting instructions confirmed
- [ ] Earlier results brought along

ASK YOUR CLINICIAN

- What do my results mean next to my symptoms?
- Which look-alikes should we rule out first?
- When should we repeat the test, and with which labs?
- Should I have a heart and blood sugar review too?

THE WHOLE GUIDE ON ONE PAGE

If you remember nothing else

1. Low energy, low drive and erection changes have many causes. A testosterone number alone is not a diagnosis.
2. Test in the morning (7 to 11 a.m.), repeat about a month later, and use the same lab each time.
3. Total is all testosterone, free is the working part, SHBG is the carrier. Free can be calculated if SHBG is off.
4. LH and FSH show whether a low level starts in the testes or in the brain signal.
5. Thyroid, blood sugar, iron, sleep apnea, weight, alcohol and some medicine classes can look the same.
6. Erection changes can come before heart symptoms, so ask about blood pressure, glucose and apoB.
7. Hematocrit, PSA, estradiol and lipids are the labs clinicians follow when testosterone is prescribed.
8. Keep a log of dates, times, symptoms and results, and bring it to the visit.

WHAT THIS GUIDE CANNOT DO

This guide cannot tell you whether your testosterone is low, why you feel the way you do, or whether any treatment is right for you. Ranges differ by lab and by source, and a single result is one snapshot. Only your own repeated results, read with your symptoms and history by a clinician, can answer that. A blood test also cannot diagnose erection problems.

A FREE NEXT STEP

Read the free page on our site about which hormone markers are worth looking at together. It shows how total testosterone, free testosterone, SHBG, LH and FSH fit side by side, so you know what to ask for before your next draw.

vitalsvault.com/lp/hormones

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This guide is educational. It is not medical advice and not a diagnosis, and it does not replace a clinician who knows your history. Study findings describe groups of people and may not apply to you.