VITALS VAULT

A VITALS VAULT FIELD GUIDE

What poor sleep does to your labs, plus a 2-week log

For people who sleep badly and wonder if it shows in their numbers. Learn what studies found and what to ask.

8

CHAPTERS

15 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 sleep badly and wonder if it shows up in your blood sugar, blood pressure or labs.
- You want what controlled studies and large cohorts found, with real numbers and limits.
- You have a tracker or a snoring partner and are unsure what to make of either.
- You want a two-week sleep log you can hand to a clinician.

HOW TO USE IT

Read the one-line summary at the top of each chapter first, then read what interests you. Start the two-week log in the last chapter tonight, so it is done before your next appointment. This guide reports what studies found. It does not say what is wrong with you.

WHAT IS INSIDE

01 What a night of sleep is for

02 Short sleep and blood sugar

03 Appetite, weight and blood pressure

04 Sleep, immune cells and inflammation

05 Sleep apnea signs, and why the heart cares

06 Caffeine, alcohol and evening light

07 What sleep trackers can and cannot tell you

08 Your two-week log and what to ask

CHAPTER 1

What a night of sleep is for

THE ONE THING TO REMEMBER

Sleep is not one block of rest. It runs in cycles of about 90 minutes, and each half of the night does different work.

Think of a restaurant after closing. The doors are locked, but the night crew is busy restocking, scrubbing and filing the day's receipts. Sleep works the same way. You do nothing, yet the body and brain run jobs that are hard to do while awake. Those jobs differ across the night, which is why hours in bed are only part of the story.

Part of the night	What dominates	What drives it
First half	Deep non-REM sleep [the heavy, slow-wave kind]	Mostly how long you have been awake
Second half	REM sleep [the dreaming kind]	Mostly the time of night
Every 90 minutes or so	One full cycle repeats	Cycle length varies by person
Cut 8 hours to 6	25% less sleep	Up to 70% less REM, by one estimate

WHAT A STUDY FOUND

Older adults were grouped by how long they said they slept. Those reporting 7 hours or less had more beta-amyloid [a protein linked to dementia] on PET brain scans than those reporting 7 or more. It is an association from self-reported sleep. It cannot show which came first, and experts disagree about how much amyloid drives dementia.

Spira et al., amyloid PET imaging study, 2013

COMMON BELIEF

“Eight hours in bed means eight hours of sleep.”

WHAT THE EVIDENCE SAYS

The usual 7 to 9 hour advice means actual sleep, not time in bed. Sleep efficiency [share of bed time asleep] is often 85 to 90%, so 8 hours of sleep can need about 8 hours 50 minutes in bed. This is one sleep researcher's worked example.

7 to 9 **hours of actual sleep is the standard adult recommendation. It counts sleep, not the time you spend lying in bed.**

Two people can both sleep six hours and lose different things. Someone who goes to bed early and rises early loses mostly REM. Someone who goes to bed late loses more deep sleep. This is one researcher's explanation, not a measured result in one study.

CHAPTER 2

Short sleep and blood sugar

THE ONE THING TO REMEMBER

In lab studies, one to two weeks of short sleep made healthy people handle sugar worse, and cohorts link short sleep to later diabetes.

Insulin is a key that lets sugar leave your blood and enter muscle. Short sleep seems to make the locks stickier. Doctors call that insulin resistance [cells ignoring insulin's signal]. It has no symptoms at first, and a single glucose reading can look normal while it builds.

WHAT A STUDY FOUND

Healthy volunteers slept about 4 hours a night for roughly two weeks. Later work used 4, 5 or 6 hours for one week. Their muscles took up about 50% less glucose on a clamp test [lab test of glucose uptake], and after a week they looked pre-diabetic. Small lab studies in healthy people, as summarized in later reviews.

Spiegel et al., glucose handling after sleep debt, 1999

WHAT A STUDY FOUND

Fat tissue was sampled after 4 to 5 hours of sleep and after 8. After short sleep, the insulin needed to switch on Akt [a signal that opens glucose doors] nearly doubled. It is a tiny lab study. It shows a mechanism, not a diagnosis.

Broussard et al., insulin signaling in fat after sleep restriction, 2012

Study type	What was found	Limit
Lab, 4 to 6 hours for 1 to 2 weeks	About 50% less muscle glucose uptake	Small, healthy volunteers
Cohort of 8,000+ adults, 7.5 years	Disrupted sleep raised new type 2 diabetes	Observational; other factors mix in
Sleep Heart Health Study	Under 6 or over 9 hours raised risk	U-shaped; hours self-reported
Evening versus morning tests	Glucose tolerance was lower in the evening	About timing, not total sleep

COMMON BELIEF

“I can repay a sleep debt on the weekend.”

WHAT THE EVIDENCE SAYS

One sleep researcher says debt is not fully repayable, and a weekend shift of 3 hours is like flying coast to coast every weekend. Another view is that extra sleep cannot undo past risk but may lower risk going forward. Both are expert views, not trial results.

ASK YOUR CLINICIAN

- Is one fasting glucose enough for me, or would another test tell us more?
- Could my sleep be affecting my glucose or A1c, and should we repeat them?

CHAPTER 3

Appetite, weight and blood pressure

THE ONE THING TO REMEMBER

Short sleep nudged hunger hormones and food choices in experiments, and both short and long sleep track with higher blood pressure.

Think of leptin [the fullness hormone] as a fuel gauge and ghrelin [the hunger hormone] as an alarm. In lab studies, a week of about 4 to 6 hours of sleep lowered leptin and raised ghrelin. The gauge read empty when it was not, and the alarm rang more often.

WHAT A STUDY FOUND

After about 4 to 6 hours of sleep for a week, volunteers had lower leptin and higher ghrelin, and people sleeping 6 hours ate extra calories the next day. These were short lab studies in healthy adults. They show a short-term nudge, not what happens over years.

Van Cauter, leptin and ghrelin, 2007; Brondel et al., 2010

WHAT A STUDY FOUND

In a 4 to 5 hour week, volunteers at a buffet ate more and chose pizza, cookies and ice cream over protein, nuts and greens. Brain scans showed weaker braking in the prefrontal cortex [the planning area] and stronger responses to food pictures. Small lab studies.

Greer et al., food desire and brain reward, 2013

Link studied	What was found	Source type
5 hours or less, or 9 hours or more	Both linked to hypertension [high blood pressure]	2019 meta-analysis [pooling many studies]
Sleep apnea and snoring	Both linked to hypertension	Same review
5 hours or less, healthy adults	200 to 300% higher coronary calcium risk	King 2008, cohort [group followed over time]
One extra daily drink	About 30% higher hypertension risk	Gene-based analysis; any amount

COMMON BELIEF

"If I am cutting calories, my sleep does not matter."

WHAT THE EVIDENCE SAYS

In a dieting study, people who were underslept (about 6 hours or less) got about 70% of their weight loss from lean mass instead of fat, as summarized in a review. One small study and a relayed figure, so read it as a signal, not a rule.

TAKING A HOME BLOOD PRESSURE READING

- [ ] No caffeine, exercise or smoking for 30 minutes
- [ ] Empty bladder, rest 5 minutes, back supported
- [ ] Feet flat, arm at heart level, cuff on bare skin
- [ ] Take two readings one minute apart and average them
- [ ] Write the result in your log

ASK YOUR CLINICIAN

- **Should I track home blood pressure, given how I sleep?**

CHAPTER 4

Sleep, immune cells and inflammation

THE ONE THING TO REMEMBER

Short sleep went with weaker immune signals in several studies, and disrupted sleep is linked to higher CRP, a common inflammation marker.

CRP [a protein that signals inflammation] works like a smoke alarm. It sounds for many reasons, including infection, injury, gum disease and, in some studies, disrupted sleep. A high reading does not tell you which fire. Use it as a prompt for questions, not a verdict.

What was tested	What was found	Limit
One night of 4 hours of sleep	Natural killer cell activity fell about 70%	One study, healthy adults
Sleeping under 7 hours	Almost 3 times more likely to catch a cold	Cohen 2009; one classic study
5 hours or less, women	70% higher chance of pneumonia	Patel 2012; about 50,000 women
Short sleep before a flu shot	Under half the usual antibody response	Small experimental study

WHAT A STUDY FOUND

Volunteers slept 6 hours instead of 8 for a week. Activity in 711 genes (about 3% of the genome) changed, about half up and half down. Immune genes fell, while genes tied to inflammation, stress and heart disease rose. It was measured in blood and shows short-term change, not lasting damage.

Moller-Levet et al., PNAS, 2013

WHAT A STUDY FOUND

A review pulled together studies of sleep loss and immune disease. Sleep deprivation raised cytokines [immune system messenger proteins] and suppressed regulatory immune cells. Many cited reviews are narrative, results are mostly associations, and illness also disrupts sleep, so direction is unclear.

Garbarino et al., Communications Biology, 2021

COMMON BELIEF

"Sleeping more is always better for you."

WHAT THE EVIDENCE SAYS

In large studies, risk stops falling around nine hours and then rises. One explanation is reverse cause: ill people sleep more because immune signals induce sleep. Another is that poor sleep quality keeps people in bed longer. Either way, very long sleep is a flag to ask about.

3.0 mg/L is a level most healthy people stay below on a CRP test (Nehring, 2022). Some lab ranges run up to 7.9. CRP rises with infection, injury and gum disease too, so ask which line your lab uses.

ASK YOUR CLINICIAN

- If my CRP is high, what else besides sleep could explain it?
- Should I repeat a high CRP when I am well, and after two weeks of steadier sleep?

CHAPTER 5

Sleep apnea signs, and why the heart cares

THE ONE THING TO REMEMBER

Sleep apnea [breathing that stops during sleep] is common, often missed and linked to high blood pressure, so the signs are worth raising.

Think of a garden hose that someone steps on. In obstructive apnea, the airway narrows or closes during sleep, breathing pauses, then restarts with a snort or gasp. Central apnea is a brain signal problem instead of a blocked airway. You may remember none of it. You may just wake unrested, or a partner notices the pauses.

80% **of people with sleep apnea have not been diagnosed, by one sleep researcher's estimate. The same source says men are about twice as likely to have it.**

SIGNS TO MENTION TO A CLINICIAN

- [ ] Snoring most nights
- [ ] Snoring loud enough to hear through a wall
- [ ] Someone saw you stop breathing or gasp in sleep
- [ ] A large neck size (collar size)
- [ ] Falling asleep during the day while busy or driving
- [ ] High blood pressure

Possible link	What the sources say	Strength
High blood pressure	Apnea and snoring linked to hypertension	2019 review of sleep and pressure
Hard-to-treat pressure	Apnea is one cause of secondary hypertension	Secondary causes: 5 to 10% of cases
Blood sugar	Treating apnea lowered glucose in one clinic's patients	A physician's observation, not a trial

WHAT A STUDY FOUND

In older adults with sleep apnea, about half used CPAP [mask that keeps airway open]. Those who did held off Alzheimer's by about 10 years in this analysis. It is observational, and people who stick with CPAP may also eat and exercise better, so the benefit may not come from the mask alone.

Osorio et al., sleep-disordered breathing and cognitive decline, 2015

COMMON BELIEF

"Snoring is just noise."

WHAT THE EVIDENCE SAYS

Snoring alone is not a diagnosis. But a partner's report of pauses, not feeling rested, or unexplained high blood pressure are reasons to be evaluated. A questionnaire only screens. A sleep study is the diagnostic test.

ASK YOUR CLINICIAN

- I snore and wake unrested. Should I be screened for sleep apnea?
- Would a home or lab sleep study make sense for me?
- Could my blood pressure be linked to my sleep?

CHAPTER 6

Caffeine, alcohol and evening light

THE ONE THING TO REMEMBER

Caffeine can cost sleep many hours later, alcohol breaks sleep up, and bright light at night went with more diabetes in a large cohort.

Caffeine blocks adenosine [the sleepiness chemical built up awake]. It peaks in blood within about 30 minutes and has a half-life near 5 hours, so a noon coffee can leave about a quarter of its caffeine at midnight. People clear it at very different speeds. Carriers of a fast gene variant can clear it about five times faster than slow carriers.

WHAT A STUDY FOUND

In a small randomized crossover trial [same people try both], caffeine before bed cut total sleep by about two hours (25%), added 45 minutes to falling asleep and four awakenings, and cut deep sleep 28 minutes. At 100 mg, 4 or more hours before bed, the effect was minimal. At 400 mg, sleep suffered even 12 hours before.

Gardiner et al., Sleep, 2023

Drink	Caffeine per 100 mL (mg)	Note
Brewed coffee	30	Cup size changes real intake
Espresso	279	Very concentrated per mL
Black tea	18	Lab table value
Green tea	20	Lab table value
Energy drink	30	Product labels vary
Brewed decaf coffee	2	Low, not zero

COMMON BELIEF

"A nightcap helps me sleep."

WHAT THE EVIDENCE SAYS

Alcohol sedates, but that is not sleep. It breaks the night into brief awakenings, often unnoticed, and cuts REM. One person's tracker after two drinks near bedtime showed resting heart rate up 6 to 8 beats and HRV [beat-to-beat heart timing variation] down at least 20%. One drink 4 to 5 hours before bed did nothing.

WHAT A STUDY FOUND

Over 85,000 UK adults wore a wrist light sensor for a week and were followed about 8 years. Compared with dark nights, the brightest 10% of night light (about 50 lux [a unit of brightness]) had 53 to 67% higher type 2 diabetes risk, after adjusting for sleep, diet and genetics. Cause is not proven.

Windred et al., Lancet Regional Health Europe, 2024

Experts disagree about screens. A Harvard study found that reading on an iPad before bed delayed melatonin and cut REM. Other work suggests stimulating content, not light color, does most of the harm. Short-wavelength light does suppress melatonin. How much that matters for sleep is argued.

400 mg **of caffeine a day or more raised anxiety clearly in a meta-analysis of healthy adults. Lower intakes had a much smaller effect (Liu 2024). It is not a personal limit.**

CHAPTER 7

What sleep trackers can and cannot tell you

THE ONE THING TO REMEMBER

Trackers are decent at total sleep time and trends, poor at sleep stages, and one bad score does not prove a bad night.

Think of a bathroom scale that is always off by a few pounds. It is wrong, but wrong the same way each day, so the trend still helps. Consumer trackers behave like that. They are not accurate enough to compare with a lab sleep study, and one sleep scientist says they are most reliable for total sleep time.

Tracker reports	How far to trust it	Why
Total sleep time	Best of the lot	One scientist's view
Awake, non-REM, REM	Fairly good	Less precise than a lab study
Light versus deep sleep	Least reliable	Do not act on it alone
Weekly trend line	Most useful	A change from your baseline is more likely real
Time in bed versus asleep	Useful	Shows your sleep efficiency

WHAT A STUDY FOUND

Tracker company data on about 68,000 people said total sleep rose about 20% during lockdown. Two peer-reviewed papers found a rise of about 15 minutes, with less social jet lag [weekday versus weekend sleep gap] once commutes stopped. Some people reported worse sleep quality. Headline tracker numbers deserve caution.

Blume et al., Current Biology, 2020; Wright et al., Current Biology, 2020

85% **is a common sleep efficiency benchmark. At 90%, 8 hours of sleep needs about 8 hours 50 minutes in bed. Divide time asleep by time in bed to check yours.**

COMMON BELIEF

“My tracker says I slept badly, so I did.”

WHAT THE EVIDENCE SAYS

One physician says that when a tracker reports bad sleep but a validated questionnaire and your own sense say otherwise, it is usually the device (his estimate: 19 of 20). If you suspect apnea, restless legs or atrial fibrillation, raise that with a clinician.

ASK YOUR CLINICIAN

- **My tracker shows poor sleep most nights. Does that change what you would check?**

CHAPTER 8

Your two-week log and what to ask

THE ONE THING TO REMEMBER

Two weeks of plain notes beat memory. Bring the log, your numbers and your questions to one appointment.

A sleep diary works because the pattern matters more than any single night. One clinic uses seven mornings. Two weeks gives a better look and lets you test one change at a time, such as caffeine timing. Good quality means falling asleep within 30 minutes and few awakenings. Change one thing only, and never change a medicine yourself.

EACH MORNING, FOR 14 DAYS

Date and day of the week _____

Time I got into bed _____

Minutes to fall asleep _____

Times I woke and minutes awake _____

Time I woke for the day _____

Naps, with length and time _____

Caffeine, what and what time _____

Alcohol, how many and what time _____

How rested I feel (1 to 5) _____

ALSO WRITE DOWN

- [ ] Snoring or gasping that anyone noticed
- [ ] Home blood pressure, two readings, one minute apart
- [ ] Screens and bright light after 10 pm
- [ ] Anything new: illness, travel, stress, shift work
- [ ] Medicines I take (I will not change them myself)

WHAT A STUDY FOUND

In 2016 the American College of Physicians named CBT-I [talking therapy for insomnia] the first treatment for chronic insomnia. Its benefits were reported to last years after it ended. A clinician delivers it and checks for sleep apnea and restless legs first. It is a guideline for insomnia, not a test of sleep and labs.

American College of Physicians, insomnia guideline, 2016

Bring this	What it shows	Where it comes from
Your 14-day sleep log	Patterns and sleep efficiency	Your mornings
Home blood pressure readings	Pressure over several weeks	Your cuff
Recent glucose, A1c and CRP	Your numbers to compare	Your last labs
Tracker trend lines	Direction of change, not stages	Your device
A partner's notes on snoring	Pauses or gasping you cannot see	Whoever shares your room

ASK YOUR CLINICIAN

- Could my sleep be affecting my blood sugar, blood pressure or CRP?
- Should I be screened for sleep apnea, restless legs or another sleep disorder?
- Which results would you repeat after two weeks of steadier sleep?
- Is a sleep study, or CBT-I with a trained clinician, right for me?
- If I have symptoms, what else could explain them besides sleep?

THE WHOLE GUIDE ON ONE PAGE

If you remember nothing else

1. Sleep runs in cycles of about 90 minutes. The 7 to 9 hour advice means actual sleep, not time in bed.
2. In lab studies, 4 to 6 hour nights for 1 to 2 weeks cut muscle glucose uptake by about 50%.
3. Short sleep shifted hunger hormones and food choices. 5 hours or less and 9 or more both track with high blood pressure.
4. Short sleep went with weaker immune signals. Disrupted sleep is linked to higher CRP, which many other things raise too.
5. Apnea signs to raise: snoring, witnessed pauses, daytime dozing, large neck size and high blood pressure.
6. Caffeine can cost sleep 12 hours later, alcohol breaks sleep up, and bright night light went with more diabetes.
7. Trackers suit total time and trends. They are weak at sleep stages. A sleep study is the apnea test.
8. Keep a 14-day log and bring it, with your numbers and questions, to a clinician.

WHAT THIS GUIDE CANNOT DO

This guide cannot tell you whether your sleep is affecting your labs. Most findings here come from small lab studies or observational cohorts, which show links, not proof. It cannot diagnose sleep apnea or insomnia, and it cannot say what is behind a symptom. Only your own results, tracked over time and read by a clinician, can do that.

A FREE NEXT STEP

Read our free page on what a fuller blood panel looks at when your labs come back normal but you still feel off. It explains which extra markers clinicians sometimes check and what questions to bring.

vitalsvault.com/lab-check

REFERENCES

1. Spira et al., Self-reported sleep and amyloid on PET imaging, 2013
2. Spiegel et al., Sleep debt and glucose handling, 1999
3. Broussard et al., Adipocyte insulin signaling after sleep restriction, 2012
4. Sleep Heart Health Study, Sleep duration and type 2 diabetes risk
5. Mason et al., Circadian disruption and glucose metabolism, Diabetologia, 2020
6. Van Cauter et al., Leptin and ghrelin after short sleep, 2007
7. Brondel et al., Extra calories after short sleep, 2010
8. Greer et al., Food desire and brain reward after sleep loss, 2013
9. Nedeltcheva et al., Sleep and dieting, lean mass loss, 2011
10. King et al., Short sleep and coronary artery calcification, 2008
11. Meta-analysis of sleep duration and hypertension, 2019
12. Moller-Levet et al., Gene expression after restricted sleep, PNAS, 2013
13. Cohen et al., Sleep habits and susceptibility to the common cold, 2009
14. Patel et al., Sleep duration and pneumonia risk in women, 2012
15. Garbarino et al., Sleep deprivation and immune-related disease, Communications Biology, 2021
16. Nehring et al., C-reactive protein levels in healthy people, 2022
17. Osorio et al., Sleep-disordered breathing, CPAP and cognitive decline, 2015
18. Gardiner et al., Caffeine dose and timing versus sleep, Sleep, 2023
19. Liu et al., Caffeine and anxiety meta-analysis, Frontiers in Psychology, 2024
20. Rocha et al., Caffeine content of foods and drinks, Nutrients, 2022
21. Windred et al., Light exposure at night and type 2 diabetes, Lancet Regional Health Europe, 2024
22. Chang et al., Evening e-reader use, melatonin and REM, PNAS, 2015
23. Blume et al., Sleep and rest-activity rhythms in lockdown, Current Biology, 2020
24. Wright et al., Students' sleep before and during stay-at-home orders, Current Biology, 2020
25. American College of Physicians, Management of chronic insomnia, 2016

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.