dutchwebinars

The Human Stress Response:

A Biopsychosocial Overview & Evidence-Based Approaches for Resilience

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Fundamental Stress Truths

Another talk on stress? Yes!

- Stress is often oversimplified - this creates misinterpretation and sometimes incorrect treatment approach
- Need for greater physiologic nuance and clinical precision in stress education – DUTCH can help with this
- Stress ≠ pathology by default
- The goal is not stress elimination, but improving adaptive capacity

Fundamental Stress Truths

The Bad News:

- There will always be stress (surprise!)
- Evidence-based supplements that help support stress and HPA axis can be helpful, but don't help us cultivate resilience

The Good News:

- It is possible to improve how we respond to stressors!
- Cultivating resilience and implementing evidence-based, intentional lifestyle practices can promote healthy responses

Fundamental Stress Truths

Stress

- a constraining force or influence, such as a physical, chemical, or emotional factor that causes bodily or mental tension and may be a factor in disease causation

  - Stress is a normal biological response

  - Helpful in short bursts, harmful when the response remains prolonged

Resilience

- the ability to recover from or adjust easily to misfortune or change

QUESTION:
How do we bend rather than break?

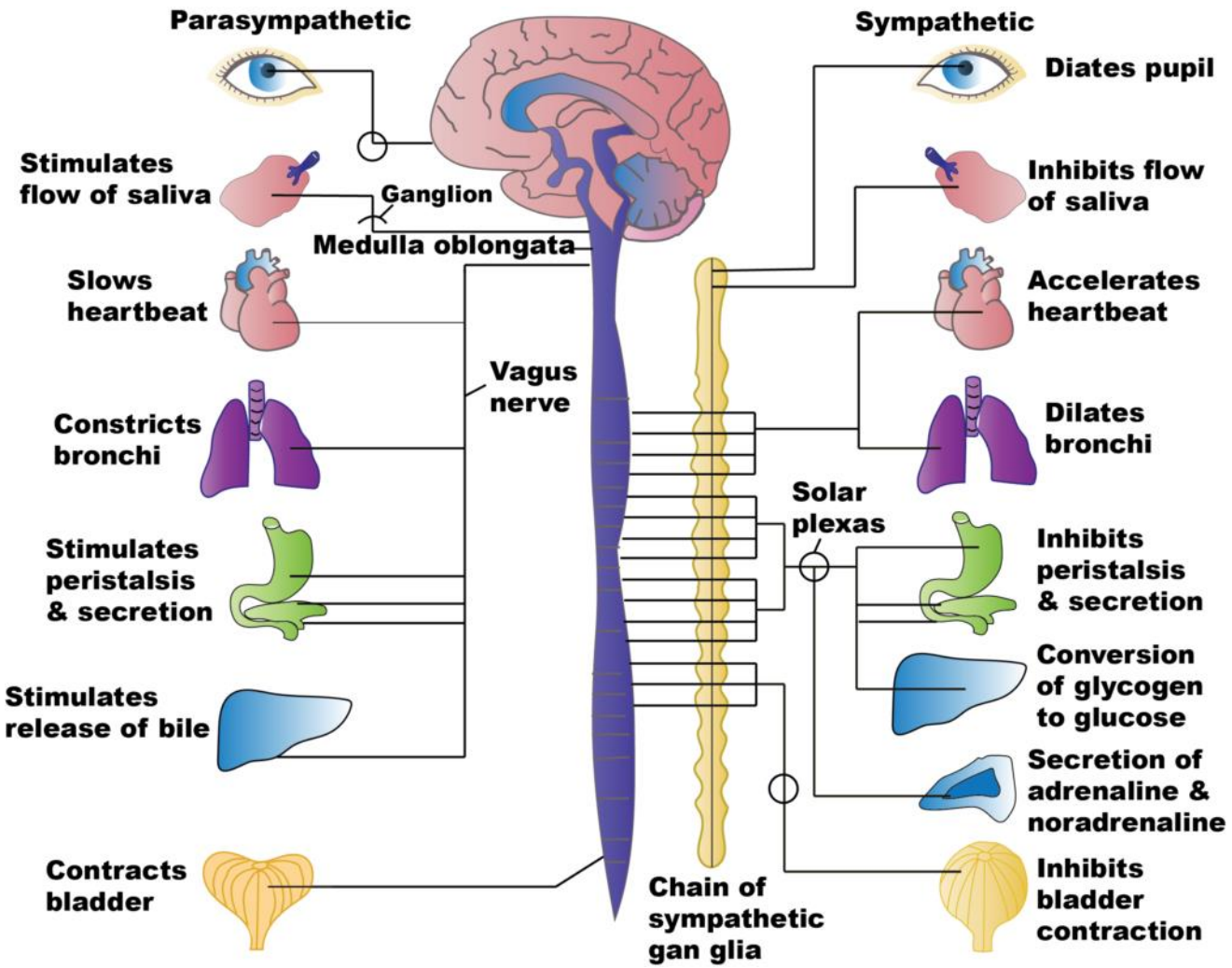
Learning Objectives

Learning Objectives

- Review and understand stress physiology through a biopsychosocial lens
- Discussion on how modern lifestyle habits may contribute to stress and how to incorporate habits that cultivate resilience and overall wellness
- Review key points of DUTCH to gain deeper insight into your patient's stress response
- Improve knowledge related to interpreting cortisol patterns as well as the significance of the cortisol awakening response
- Explore how these insights can be used to inform clinical decision-making to provide individualized treatment plans that target your patient’s stress

Biological Foundations of the Stress Response

The Human Stress Response



Autonomic nervous system branches:

- **Sympathetic Nervous System (SNS)**
  - Activates stress response
  - "Fight-or-flight"
- **Parasympathetic Nervous System (PNS)**
  - Promotes recovery
  - "Rest-and-digest"
- **A healthy system can switch between both**

The Human Stress Response

Hypothalamic-pituitary-adrenal axis (HPA axis)

→Hypothalamus releases CRH (In the PVN)

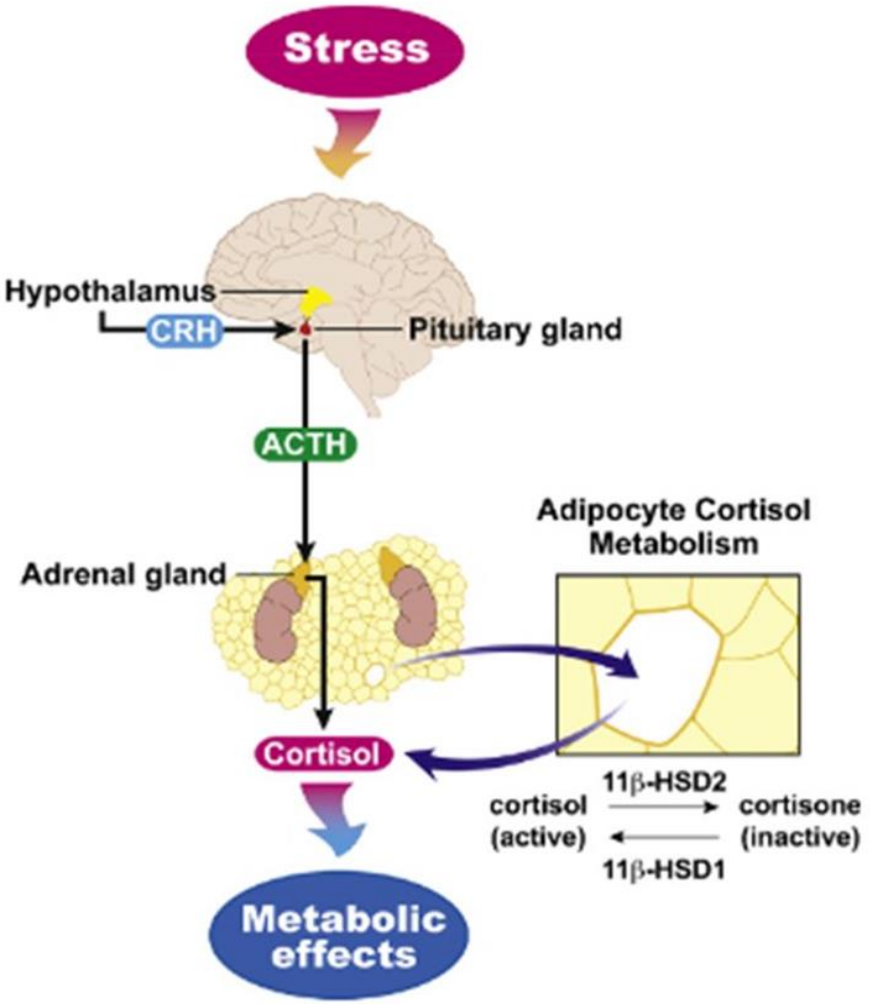
→CRH binds to anterior pituitary gland receptors

→Anterior pituitary then releases ACTH

→ ACTH binds to adrenal cortex zona fasciculata receptors

→Adrenal cortex releases cortisol + DHEA

→ Cortisol feeds back to H/P to decrease ACTH



The Human Stress Response

Fast Stress Response (SNS)

- Activates within seconds
- Releases **adrenaline and noradrenaline**

Acute cortisol effects (Fight or Flight):

- Maintains glucose levels for energy
- Gluconeogenesis: mobilizes glucose from fat and liver cells
- Blocks insulin to maintain blood sugar for energy
- Increased focus: mental and physical
- Increased HR, blood pressure (vasoconstriction), muscle blood flow
- Decreased digestive effort
- Decreased sex hormone response
- Decreased immune response

Chronic cortisol effects

- Insulin dysregulation, dysglycemia, IR/diabetes
- Central adiposity
- Immune dysregulation, immune suppression, and inflammation
- Chronic fatigue
- Sleep problems
- Mood issues such as anxiety and depression
- Bone mineral density decrease
- Gastrointestinal effects: parasympathetic nervous system suppression
- Cardiovascular effects: HTN, hyperlipidemia, endothelial dysfunction
- Sex hormone dysfunction

General Stress Statistics

- The APA's “Stress in America” survey found most Americans report increased stress over the past five years, with **around 75% reporting physical or emotional symptoms related to stress**
- Gallup’s Global Emotion's Report in 2023 found that about **49% of Americans experience significant daily stress**
- Smith et al. in 2025 examined data from the Gallup World Poll and found that **35.1% of people worldwide report experiencing stress in daily life** when surveyed across **131 countries. N=300,000**

Smith MD, Wesselbaum D. Global evidence on the prevalence of and risk factors associated with stress. *J Affect Disord*. 2025;374:179-183. doi:10.1016/j.jad.2025.01.053

Muir L. What the Latest Reports Say About Stress in America. *The American Institute of Stress*. Published August 29, 2025. Accessed January 16, 2026. https://www.stress.org/news/what-the-latest-reports-say-about-stress-in-america/

Stress can influence decision making and impact memory

- A 2022 systematic review from Duque et al. summarized 18 studies found that **stress and cortisol responses can alter decision-making patterns**
- Many studies reveal significant differences in decision outcomes depending on individuals' cortisol responses to acute stress, suggesting stress may skew risk assessment, impulsivity, and judgment under pressure
- Sabia et al. In 2020 found relative **increases in cortisol were strongly correlated with worse performance on recognition memory tasks**, indicating that elevated cortisol during stressful experiences may disrupt memory encoding and retrieval

Duque A, Cano-López I, Puig-Pérez S. Effects of psychological stress and cortisol on decision making and modulating factors: A systematic review. *Eur J Neurosci*. 2022;56(2):3889-3920. doi:10.1111/ejn.15721

Sabia M, Hupbach A. Stress-induced increase in cortisol negatively affects theconsolidation of contextual elements of episodic memories. *Brain Sci.* 2020;10(6):358.doi:10.3390/brainsci10060358

Stress and Cardiovascular Disease

- Chronic stress is broadly associated with an **increased risk of cardiovascular disease** via physiological pathways (blood pressure, vascular inflammation, autonomic dysfunction)
- Stress contributes to **high blood pressure and inflammation** - two major risk factors for heart attack and stroke
- **Work-related stress and social stress** have been linked to elevated CVD risk

Vaccarino V, Bremner JD. Stress and cardiovascular disease: an update. *Nat Rev Cardiol*. 2024;21(9):603-616. doi:10.1038/s41569-024-01024-y

Immune System & Inflammation

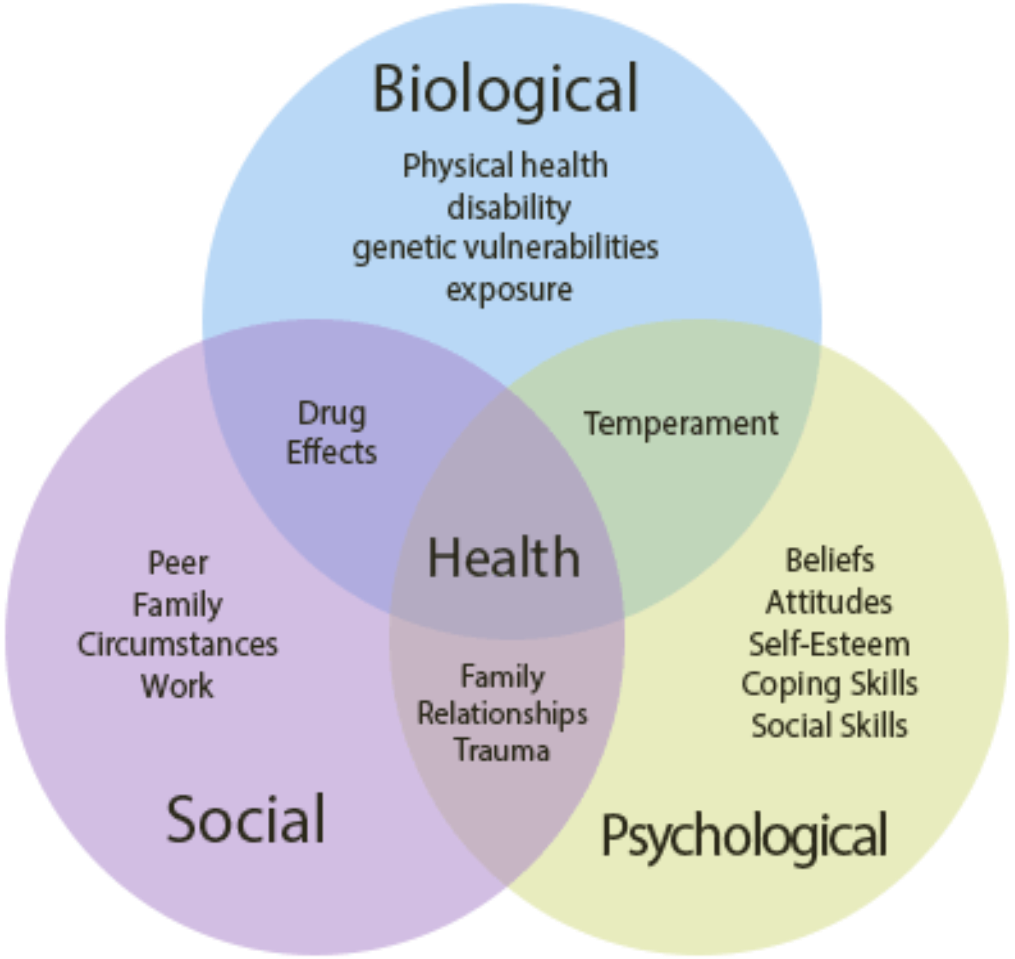
- Chronic stress can **suppress immune function over time**, making the body more susceptible to infections and slowing healing
- Physiological stress responses influence inflammatory pathways, which are implicated in metabolic, autoimmune, and chronic diseases

Liu YZ, Wang YX, Jiang CL. Inflammation: The Common Pathway of Stress-Related Diseases. *Front Hum Neurosci*. 2017;11:316. Published 2017 Jun 20. doi:10.3389/fnhum.2017.00316

Salleh MR. Life event, stress and illness. *Malays J Med Sci*. 2008;15(4):9-18.

Biopsychosocial Contributors to Stress

Biopsychosocial Contributors to Stress

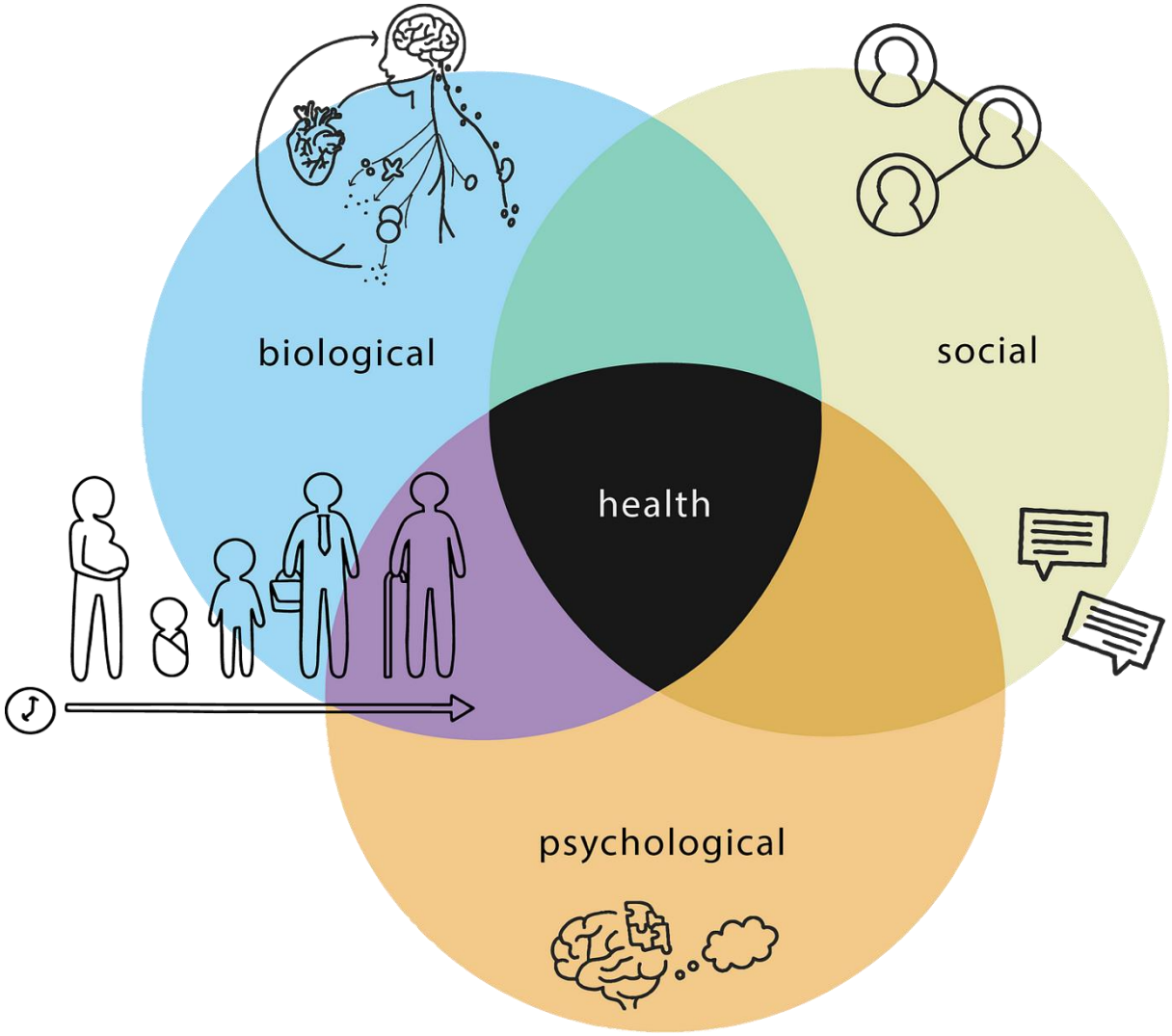


- The biopsychosocial approach to stress integrates biological, psychological, and social factors to provide a comprehensive understanding of how stress affects individuals
- Highlights that stress is a multifaceted phenomenon that cannot be fully understood by only examining one aspect
- This holistic perspective is essential for effective stress management and improving mental health outcomes

Biopsychosocial Contributors to Stress

Why Stress Requires a Biopsychosocial Model

- Stress is not purely psychological or hormonal
- Emerges from biological signaling, cognitive appraisal, and social context
- Reductionist approaches miss underlying stress drivers
- Clinical outcomes improve when adaptability is the goal



Biopsychosocial Contributors to Stress

Biological Factors

- These include genetic predispositions and physiological reactions to stress. E.g. HPA axis

Biological Contributors

- Sleep disruption
- Glycemic variability/insulin resistance
- Chronic inflammation
- Hormonal transitions (e.g., perimenopause)
- Nutrient depletion under chronic stress

Biopsychosocial Contributors to Stress

Stress and insulin resistance

- **116 adults** (62 with IR defined by HOMA-IR >2.5 and 54 insulin-sensitive controls) and monitored their **daily perceived stress** using ambulatory assessments alongside **continuous glucose monitoring** over 7 days. The analysis showed that **higher levels of everyday stress were significantly associated with elevated blood glucose levels in individuals with insulin resistance**, but not in insulin-sensitive participants, indicating that stress may exacerbate metabolic dysregulation in those at risk for type 2 diabetes

Work stress and insulin resistance

- Large cross-sectional study of **766 Chinese workers**, researchers investigated whether **chronic psychosocial stress** (assessed via validated work-related stress questionnaires) was associated with insulin resistance measured by **HOMA-IR**. They found that higher levels of job-related stress were significantly correlated with **higher cortisol concentrations, higher fasting glucose, and increased HOMA-IR**, even after adjusting for confounders such as obesity

Schrems E, Gruber JR, Schiweck C, et al. Daily life stress is linked to increased glucose levels in individuals with insulin resistance: a real-world assessment. *Diabetologia.* 2025;68(12):2709-2718. doi:10.1007/s00125-025-06552-X

Yan YX, Xiao HB, Wang SS, et al. Investigation of the Relationship Between Chronic Stress and Insulin Resistance in a Chinese Population. *J Epidemiol*. 2016;26(7):355-360. doi:10.2188/jea.JE20150183

Biopsychosocial Contributors to Stress

Psychological Factors

- This encompasses cognitive processes, emotional responses, and individual coping mechanisms.
- How a person perceives and appraises stressors

Psychological Contributors

- Perceived lack of control
- Threat appraisal and cognitive load
- Trauma history and nervous system patterning
- Perfectionism and over-responsibility

Biopsychosocial Contributors to Stress

Anxiety Disorders and Elevated Stress Reactivity

- Individuals with GAD often exhibit **higher basal cortisol** and **stronger cortisol responses to stress tasks** than controls, indicating a more reactive HPA axis

PTSD & Cortisol Response to Stress

- A meta-analysis found that PTSD is linked with **lower cortisol levels at baseline and in response to stress tests** versus non-PTSD controls, despite higher subjective stress

Resilience Modulates Cortisol Patterns After Trauma

- Among trauma-exposed adults, those with higher resilience scores showed **more adaptive cortisol responses** (e.g., less hyperreactivity) compared with lower-resilience peers

Morris MC, Compas BE, Garber J. Relations among posttraumatic stress disorder, comorbid major depression, and HPA axis dysregulation: a meta-analysis. *Clin Psychol Rev.* 2012;32(4):301-315. doi:10.1016/j.cpr.2012.02.005

Ong AD, Bergeman CS, Boker SM. Resilience comes of age: defining features in later adulthood. *J Pers.* 2009;77(6):1777-1804. doi:10.1111/j.1467-6494.2009.00600.x

Biopsychosocial Contributors to Stress

Social Contributors

- Occupational demands and role strain
- Caregiving stress
- Social isolation or relational conflict
- Cultural expectations around productivity

Social Factors

- How social support, relationships, and environmental influences shape an individual's stress response

Biopsychosocial Contributors to Stress

Phone/social media use and stress

- Participants in a 2017 study who used Facebook **showed sustained (higher) salivary cortisol concentrations** during the recovery period compared with controls who did not use Facebook
- This suggests that **social media use may impair physiological recovery from stress,** even if subjective feelings of stress do not increase

Brief bouts of social media or video viewing don't always raise cortisol

- A 2024 study with participants aged 13–55 looked at **20-minute sessions of social media use** and measured both **heart rate and salivary cortisol**:
- **No increase in cortisol or autonomic stress response occurred** during 20 minutes of social media or YouTube use

Patterns of mobile use correlate with stress

- A cross-sectional study of undergraduates (n=1408) l inked **greater smartphone/social media engagement** with **higher self-reported stress and anxiety**

Rus HM, Tiemensma J. Social media under the skin: Facebook use after acute stress impairs cortisol recovery. *Front Psychol.* 2017;8:1609. doi:10.3389/fpsyg.2017.01609

Oppenheimer S, Bond L, Smith C. Social media does not elicit a physiological stress response as measured by heart rate and salivary cortisol over 20-minute sessions of cell phone use. *PLoS One.* 2024;19(4):e0298553. doi:10.1371/journal.pone.0298553

Joshi SC, Woltering S, Woodward J. Smartphone use and social media involvement in young adults: Association with nomophobia, depression anxiety stress scales (DASS) and self-esteem. *Int J Environ Res Public Health.* 2023;20(2):1197. doi:10.3390/ijerph20021197

Biopsychosocial Contributors to Stress

Blue light exposure increases morning cortisol after smartphone use

- In research where participants read on smartphones before **bed morning cortisol was elevated** after reading on a smartphone without a blue light filter, and the cortisol awakening response was reduced relative to filtered or printed conditions

Electronic screens & disrupted sleep timing in adults

- Large cross-sectional evidence supports associations between evening screen use and **poorer sleep quality, later sleep timing, and sleep debt**
- Daily electronic screen use before bedtime was associated with nearly a **33% higher prevalence of poor sleep quality** and significantly **later bedtimes** compared with no screen use

Gruber G, Höhn P, et al. Preliminary results: the impact of smartphone use and short-wavelength light during the evening on circadian rhythm, sleep and alertness. *Clocks & Sleep*. 2021;3(1):5.

Baron KG, Abbott S, Jao N, et al. Electronic screen use and sleep duration and timing in adults. *JAMA Netw Open.* 2023;6(4):e2371993

Biopsychosocial Contributors to Stress

Loneliness linked with dysregulated cortisol patterns

- In a community sample of healthy adults, researchers examined loneliness, social support, and cortisol:
- Lonely individuals had **higher evening cortisol** relative to less lonely peers
- Loneliness also predicted **elevated cortisol awakening responses (CAR)**

Loneliness is associated with elevated cortisol & altered HPA axis regulation

- A longitudinal study of older adults measured salivary cortisol multiple times per day over several days and found those reporting higher **loneliness** showed **elevated daytime cortisol rhythms** (higher morning and evening levels) compared with non-lonely individuals
- Loneliness was associated with **flatter diurnal cortisol patterns**

Doane LD, Adam EK. Loneliness and cortisol: momentary, day-to-day, and trait associations. *Psychoneuroendocrinology*. 2010;35(3):430-441. doi:10.1016/j.psyneuen.2009.08.005

Cacioppo JT, Hawkley LC, Crawford LE, et al. Loneliness and health: potential mechanisms. *Psychosom Med*. 2002;64(3):407-417. doi:10.1097/00006842-200205000-00005

Evidence-Based Approaches to Building Stress Resilience

Biopsychosocial Contributors to Stress

Reducing blue light improves subjective sleep quality

- A peer-reviewed study of students found that **reducing blue light from smartphone screens at night** significantly improved **self-reported sleep quality and daytime functioning**
- After reducing blue light exposure, participants reported **better sleep quality, going to sleep earlier, and improved daytime functioning** than before the intervention

Better sleep quality is linked with higher psychological resilience

- A large survey study found that **better sleep quality was positively correlated with greater psychological resilience**. Poor sleep, including insomnia symptoms, was associated with lower resilience scores

Randjelović P, Stojanović N, Ilić I, Vučković D. The effect of reducing blue light from smartphone screen on subjective quality of sleep among students. *Chronobiol Int*. 2023;40(3):335-342. doi:10.1080/07420528.2023.2173606

Zhang Y, Li J, Dong J, Shi L, Zhang N. The relationship between sleep quality and psychological resilience of college students: the examination of insomnia as a mediator and attachment as a moderator. *Front Psychol*. 2025;16:1640656. Published 2025 Sep 12. doi:10.3389/fpsyg.2025.1640656

Building Stress Resilience

Good sleep quality reduces perceived stress

- A comprehensive meta-analysis of sleep improvement interventions showed that enhancing sleep quality leads to **medium-sized reductions in perceived stress**, anxiety, and depression across diverse populations
- This supports the idea that improving sleep increases emotional and psychological resilience

Sleep quality & stress adaptation

- Systematic reviews of sleep and HPA axis research show that **poor sleep potentiates HPA axis stress reactivity** and is linked with aberrant cortisol secretion patterns, whereas **sleep that maintains normal circadian regulation is associated with better HPA axis health**

Scott AJ, Webb TL, Martyn-St James M, Rowse G, Weich S. Improving sleep quality leads to better mental health: A meta-analysis of randomised controlled trials. *Sleep Med Rev*. 2021;60:101556. doi:10.1016/j.smrv.2021.101556

Van Dalfsen JH, Markus CR. The influence of sleep on human hypothalamic-pituitary-adrenal (HPA) axis reactivity: A systematic review. *Sleep Med Rev*. 2018;39:187-194. doi:10.1016/j.smrv.2017.10.002

Building Stress Resilience

Social Connection and Stress

- A 2019 study by Ellwardt et al. analyzed social network structure and psychological stress in older adults and found **more frequent and balanced social networks were associated with lower perceived stress and better coping**
- Several studies have demonstrated that even brief, routine social interactions can have a positive impact on stress and mood
- In 2025 a randomized trial by Yeung et al. found that **volunteering significantly reduced stress among older adults who reported loneliness**
- Several studies also show reductions in cortisol and lower stress from social interactions with non-human companions

Ellwardt L, Wittek RPM, Hawkley LC, Cacioppo JT. Social Network Characteristics and Their Associations With Stress in Older Adults: Closure and Balance in a Population-Based Sample. *J Gerontol B Psychol Sci Soc Sci.* 2020;75(7):1573-1584. doi:10.1093/geronb/gbz035

Dannii Yuen-Lan Yeung, Da Jiang, Lisa Marie Warner, Namkee G Choi, Rainbow Tin Hung Ho, Jojo Yan Yan Kwok, Kee-Lee Chou. The effects of volunteering on loneliness among lonely older adults: the HEAL-HOA dual randomised controlled trial. The Lancet Healthy Longevity. 2025;6(1): https://doi.org/10.1016/j.lanhl.2024.100664.

Building Stress Resilience

Physical Activity & Exercise

- A systematic review found that physical activity interventions were associated with **lower cortisol levels and improved sleep quality** — both critical components of stress resilience

Exercise Reduces Perceived Stress

- Randomized and prospective intervention studies consistently show that regular exercise (especially moderate intensity) **reduces perceived stress, physiological stress symptoms, and improves quality of life**

De Nys L, Anderson K, Ofosu EF, Ryde GC, Connelly J, Whittaker AC. The effects of physical activity on cortisol and sleep: A systematic review and meta-analysis. *Psychoneuroendocrinology*. 2022;143:105843. doi:10.1016/j.psyneuen.2022.105843

Stults-Kolehmainen MA, Sinha R. The effects of stress on physical activity and exercise. *Sports Med*. 2014;44(1):81-121. doi:10.1007/s40279-013-0090-5

Building Stress Resilience

Mindfulness Training (MBSR & Related Programs)

What it is: Practices (often 8-week programs) that train present-moment awareness and non-judgmental acceptance of thoughts and emotions

- Meta-analytic reviews find mindfulness-based interventions improve psychological resilience and reduce stress across diverse groups
- Acceptance components of mindfulness training are key mechanisms that reduce stress in daily life

Why it works: Mindfulness enhances emotion regulation, reduces reactivity to stressors, and improves cognitive flexibility

Joyce S, Shand F, Tighe J, Laurent SJ, Bryant RA, Harvey SB. Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. *BMJ Open*. 2018;8(6):e017858. Published 2018 Jun 14. doi:10.1136/bmjopen-2017-017858

Chin B, Lindsay EK, Greco CM, et al. Psychological mechanisms driving stress resilience in mindfulness training: A randomized controlled trial. *Health Psychol*. 2019;38(8):759-768. doi:10.1037/hea0000763

Building Stress Resilience

More Mindfulness & Meditation

- An 8-week MBSR intervention significantly reduced cortisol levels and improved attention and awareness compared with controls in healthcare professionals during the COVID-19 pandemic

Women Veterans and MBSR

- In women veterans at risk for cardiovascular disease, MBSR **reduced perceived stress and improved psychological well-being** (including reduced loneliness and PTSD symptoms)
- Led to a **more rapid decline in diurnal salivary cortisol** compared with an active control group

Panzeri A, Bettinardi O, Giommi F, et al. Mindfulness improves awareness and cortisol levels during COVID-19 lockdown: a randomised controlled trial in healthcare workers. *Healthcare.* 2025;13(19):2455. doi:10.3390/healthcare13192455

Saban KL, Collins EG, Mathews HL, et al. Impact of a Mindfulness-Based Stress Reduction Program on Psychological Well-Being, Cortisol, and Inflammation in Women Veterans. *J Gen Intern Med.* 2022;37(Suppl 3):751-761. doi:10.1007/s11606-022-07584-4

Building Stress Resilience

CBT and Resilience Training

What it is: Therapeutic approach targeting unhelpful thoughts and behaviors, teaching coping skills and cognitive reframing

- Meta-analyses show CBT-based resilience interventions moderately improve resilience and reduce stress

Why it works: CBT enhances *problem-solving skills*, reframes stress perceptions, and strengthens adaptive coping responses

Pinto T, Veiga V, Macedo E. Effectiveness of cognitive-behavioral therapy on resilience of adults: A systematic review and meta-analysis. *J Behav Cogn Ther.* 2024; 34(2): 100495. doi.org/10.1016/j.jbct.2024.100495.

Building Stress Resilience

Combined Mindfulness + CBT Interventions (Multicomponent)

What it is: Programs blending mindfulness training with CBT skills (e.g., acceptance, cognitive restructuring)

- Systematic review shows multicomponent programs (CBT + mindfulness) had moderate positive effects on resilience more consistently than single-component programs

Why it works: Multiple skill sets target both *cognitive reappraisal* and *emotional awareness*, enhancing flexibility in stress responses

Joyce S, Shand F, Tighe J, Laurent SJ, Bryant RA, Harvey SB. Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. *BMJ Open*. 2018;8(6):e017858. Published 2018 Jun 14. doi:10.1136/bmjopen-2017-017858

Building Stress Resilience

SMART Resilience Training — Healthcare Professionals

- **Program:** 8-week multimodal stress management (mind-body skills, cognitive strategies, lifestyle, social support)
- **Key Outcomes:**
- ↓ **Perceived stress**
- ↑ **Mental & physical health**
- ↑ **Job satisfaction**
- **No significant change in burnout**
- **Participant Feedback:**
- Increased **resilience, coping skills, and stress awareness**
- Skills applied in **clinical and personal life**
- Program **well-received and feasible** - resilience training can **reduce stress and support resilience** in healthcare professionals

Dossett ML, Needles EW, Nittoli CE, Mehta DH. Stress Management and Resiliency Training for Healthcare Professionals: A Mixed-Methods, Quality-Improvement, Cohort Study. *J Occup Environ Med*. 2021;63(1):64-68. doi:10.1097/JOM.0000000000002071

Building Stress Resilience

Combined Lifestyle Approaches

- A broad meta-analysis of 96 RCTs found that **lifestyle interventions — including physical activity, sleep hygiene, and nutrition — significantly reduced stress symptoms**, anxiety, and depression

Amiri S, Mahmood N, Javaid SF, Khan MA. The Effect of Lifestyle Interventions on Anxiety, Depression and Stress: A Systematic Review and Meta-Analysis of Randomized Clinical Trials. *Healthcare (Basel)*. 2024;12(22):2263. Published 2024 Nov 13. doi:10.3390/healthcare12222263

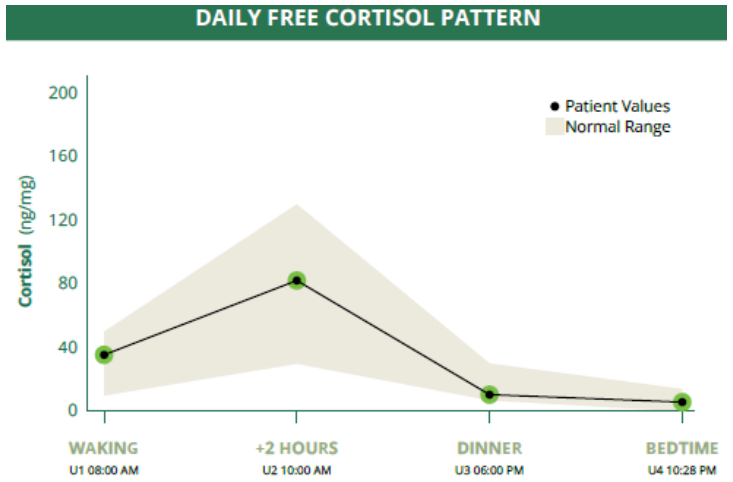
DUTCH Adrenal Assessment

DUTCH Adrenal Assessment

The only difference between these two panels is that the DUTCH Complete measures ***urinary*** free cortisol while the DUTCH Plus measures ***salivary*** free cortisol and thus includes the cortisol awakening response (CAR)

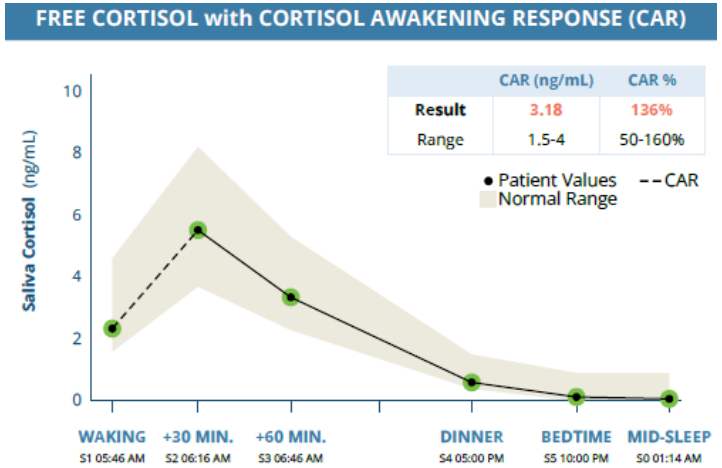
DUTCH Complete

Urinary free cortisol

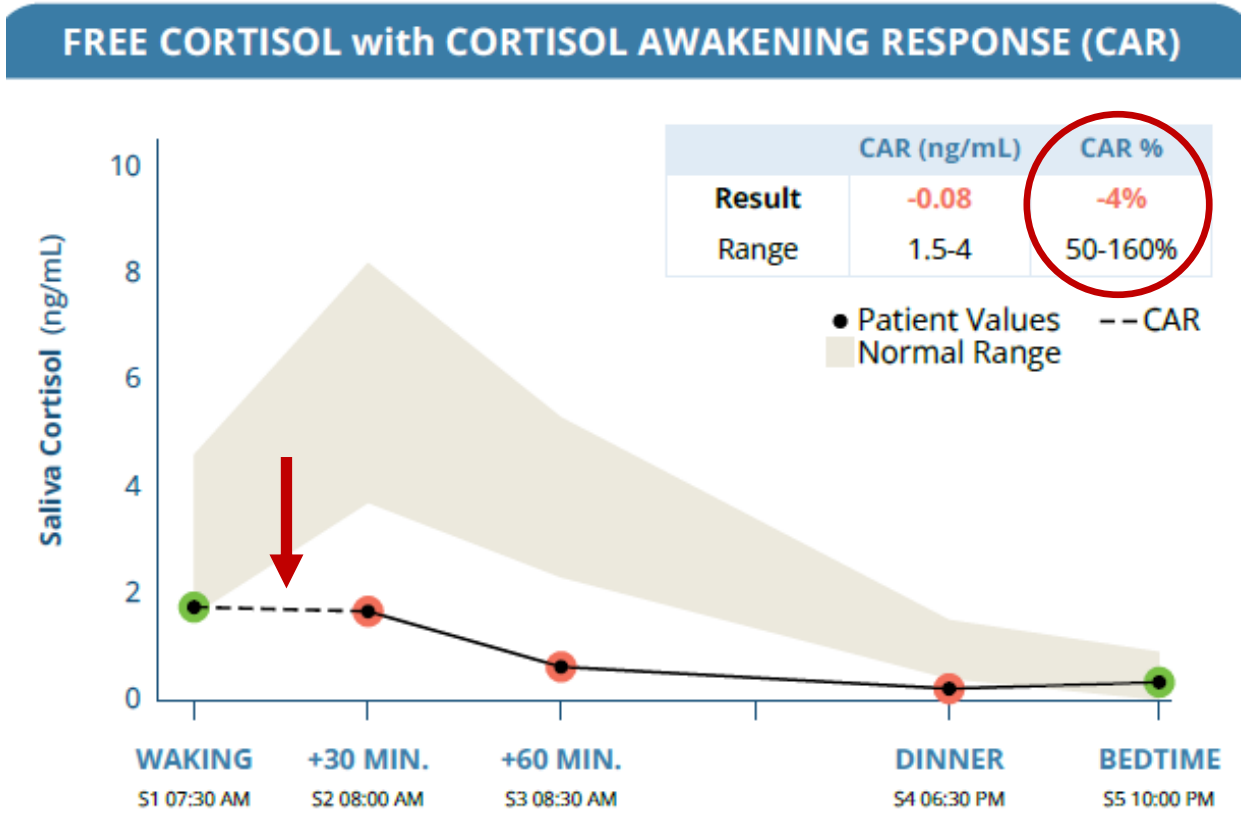


DUTCH Plus

Salivary free cortisol (includes the CAR)



DUTCH Adrenal Assessment



The CAR is the % rise of free cortisol from waking to 30 minutes after waking. It estimates a person's ability to cope with a stressor

Low CAR

For example, this person has an *under-response* to stress

DUTCH Adrenal Assessment

- The **DUTCH Dozen** is an interpretation framework that allows clinicians to understand their patients' DUTCH Test results quickly and comprehensively
- The DUTCH Dozen is a set of **12 assessments** that allows clinicians to quickly evaluate key hormone markers using the **Hormone Testing Summary on page 1** of the report
- The DUTCH Dozen prioritize the most critical aspects of hormone function, covering estrogens, progesterone, androgens, and cortisol, making it easier for providers to develop targeted treatment plans

Estrogen and Progesterone (Assessments 1–4)

Androgens (Assessments 5–8)

Cortisol (Assessments 9–12)

DUTCH Adrenal Assessment

Estrogen Progesterone

1. Assess estrogen levels given the patient's reproductive status
2. Assess progesterone levels given the patient's reproductive status
3. Assess 2-OH preference in phase 1 estrogen metabolism
4. Assess methylation of 2-OH estrogens

Androgens

5. Assess adrenal androgen levels (Total DHEA)
6. Assess testosterone levels
7. Assess cellular production of 5a-DHT via 5a-androstanediol
8. Assess if there is a preference for the more potent alpha metabolism of the androgens

Cortisol

9. Assess the daily free cortisol pattern
10. Assess the daily total of free cortisol in circulation (24hr Free Cortisol)
11. Assess the total cortisol produced by the adrenal glands (Metabolized Cortisol)
12. Assess the rate of cortisol clearance from the body

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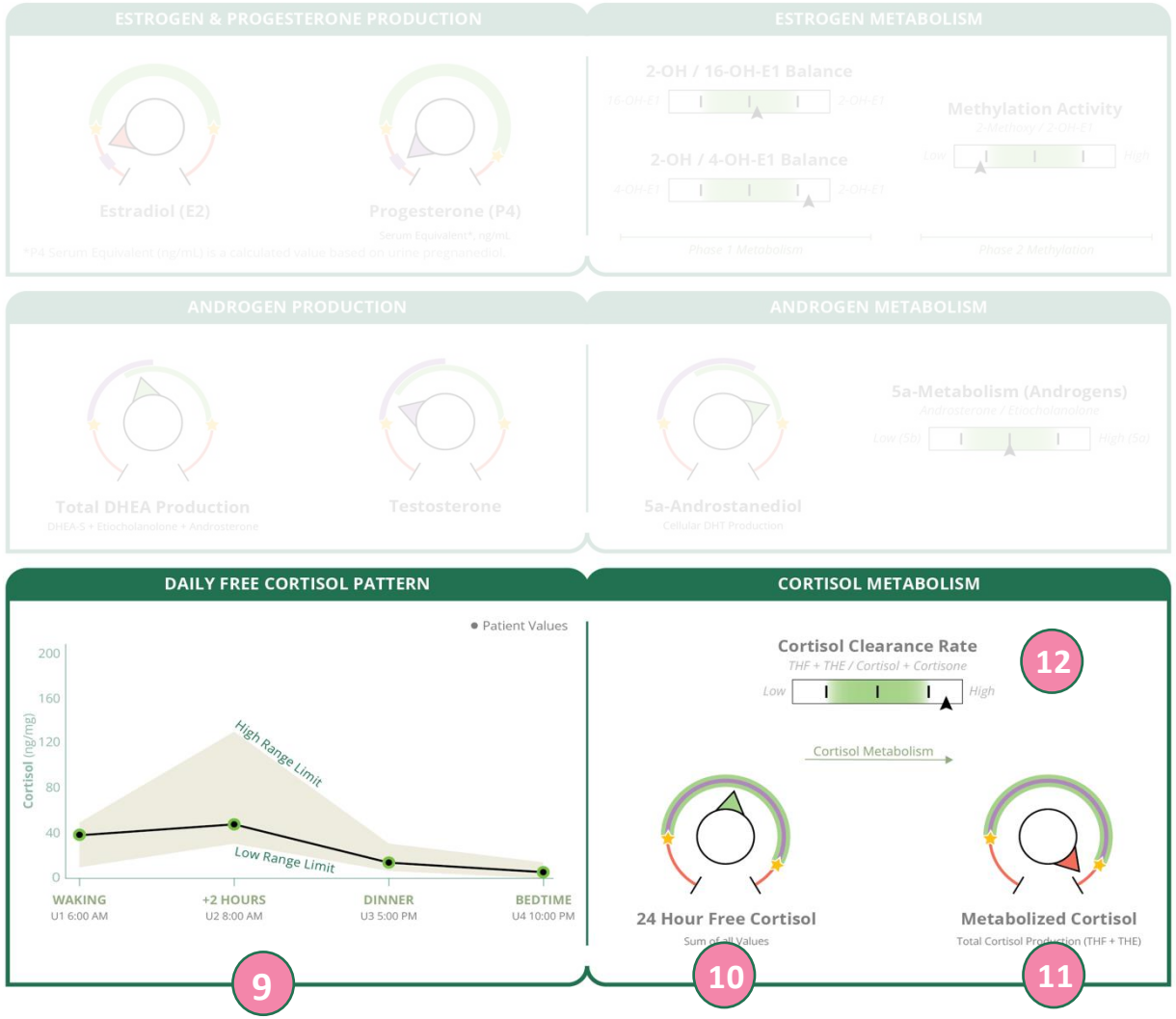
DUTCH Adrenal Assessment



Cortisol

9 Assess the daily free cortisol pattern

10 Assess the daily total of free cortisol in circulation (24hr Free Cortisol)

11 Assess the total cortisol produced by the adrenal glands (Metabolized Cortisol)

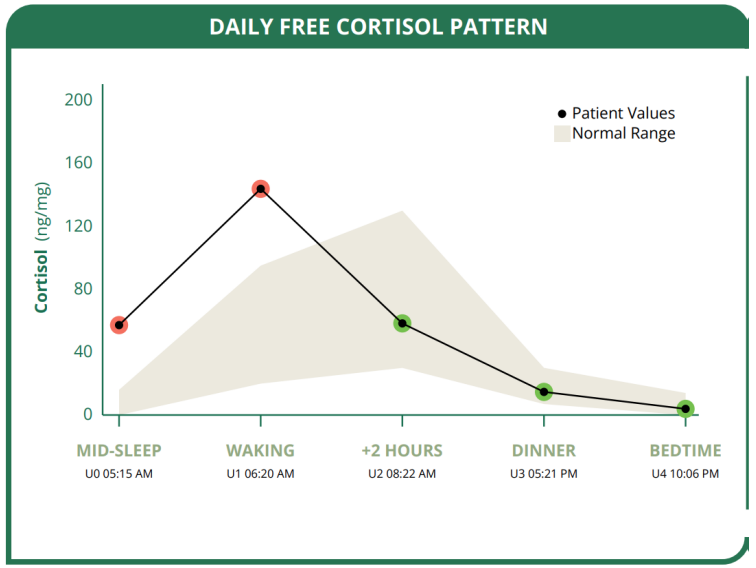
12 Assess the rate of cortisol clearance from the body

DUTCH Adrenal Assessment

Cortisol

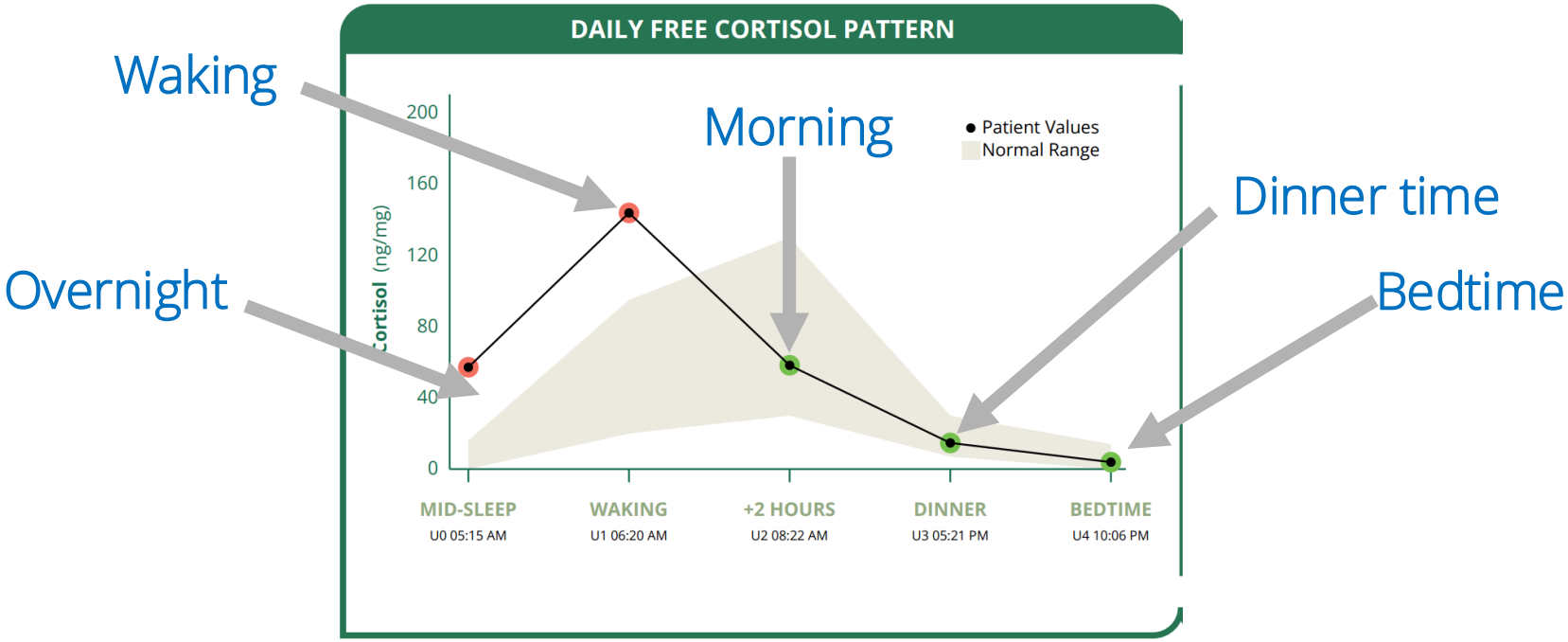
9 Assess the daily free cortisol pattern

- The **ninth assessment** analyzes the **daily free cortisol pattern**, plotted from urine samples (or saliva in a DUTCH Plus or DUTCH CAR) collected throughout the day
- This pattern helps identify disruptions in the diurnal cortisol rhythm, which can affect energy, sleep, and stress response



Daily Free Cortisol Pattern

- The ***urine*** samples reflect the cortisol that collected in the bladder during the hours *prior* to collection

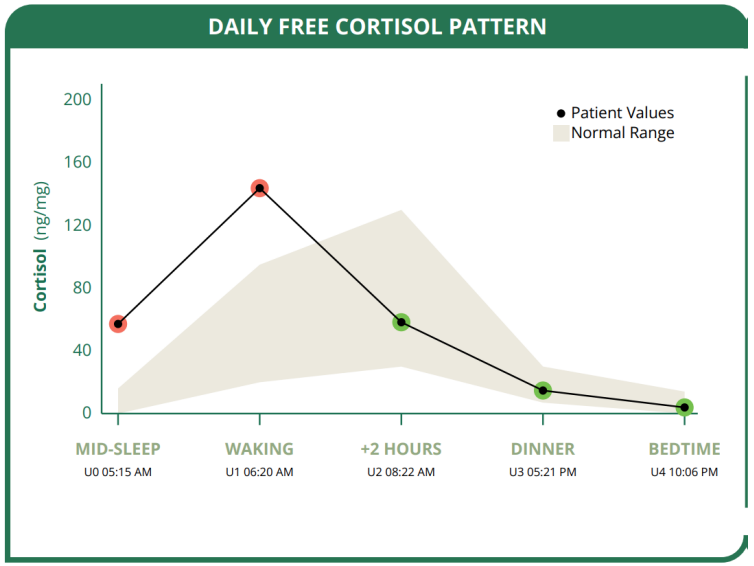


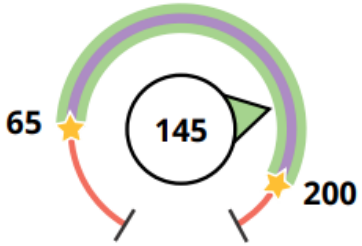
DUTCH Adrenal Assessment

Cortisol

10 Assess the daily total of free cortisol in circulation (24hr Free Cortisol)

- The **tenth assessment** measures the total daily free cortisol **(24hr Free Cortisol)** in circulation, calculated as the sum of four points on the Daily Free Cortisol Pattern
- This dial provides insight into overall cortisol levels in circulation on the day of testing, which is crucial for assessing conditions like burnout or hypercortisolism



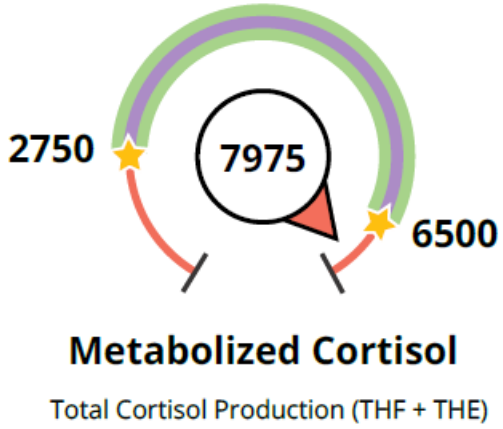


DUTCH Adrenal Assessment

Cortisol

11 Assess the total cortisol produced by the adrenal glands (Metabolized Cortisol)

- The **eleventh assessment** evaluates total adrenal cortisol production by summing the cortisol metabolites a-THF, b-THF, and b-THE
- This metric, known as **Metabolized Cortisol**, reflects the adrenal glands' cortisol output, offering a broader perspective on adrenal function

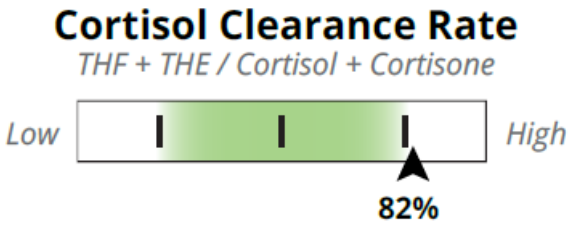


DUTCH Adrenal Assessment

Cortisol

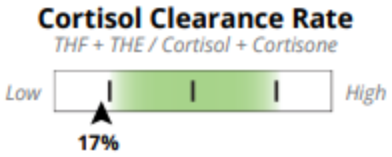
12 Assess the rate of cortisol clearance from the body

- The **twelve and final assessment** examines the **cortisol clearance rate (CCR)**, calculated as the ratio of THF + THE to cortisol + cortisone
- A low CCR (below 20%) suggests slower clearance, while a high CCR (above 80%) indicates faster clearance
- Both extremes may point to metabolic issues affecting the hypothalamic-pituitary-adrenal (HPA) axis, requiring further evaluation



DUTCH Adrenal Assessment

Low CCR



Top Considerations:

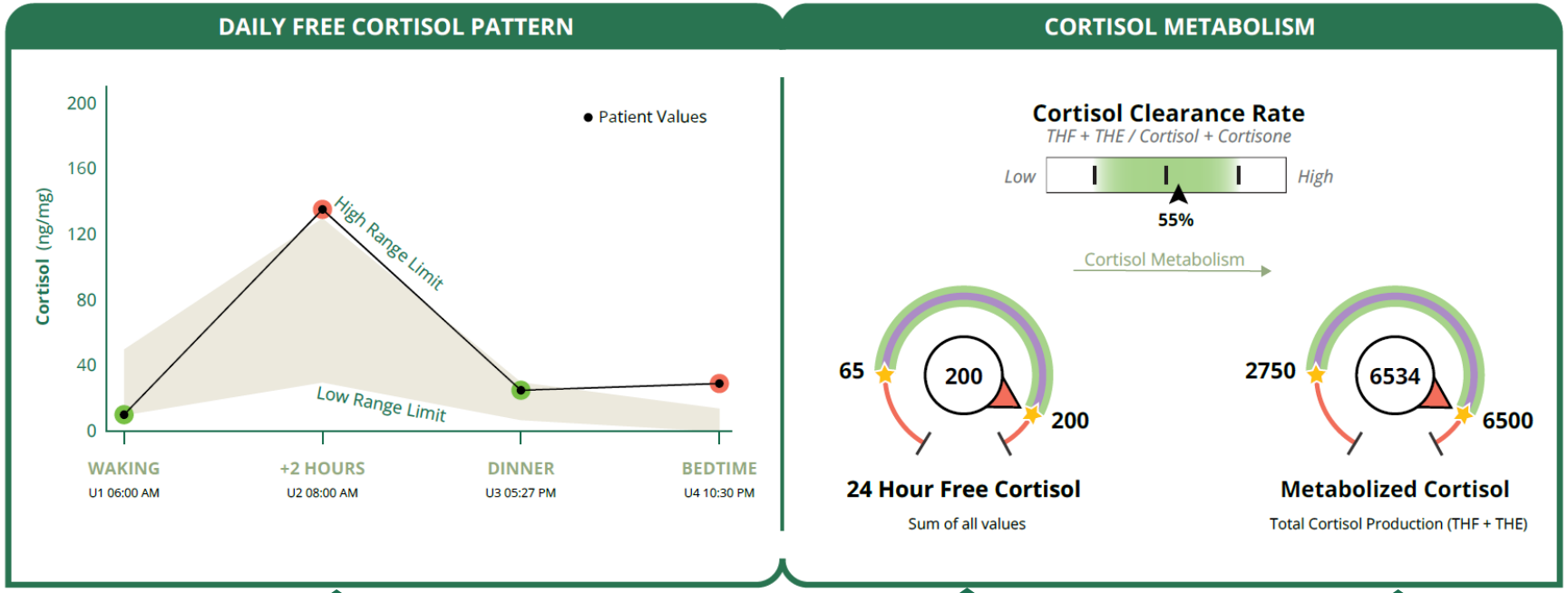
- Hypothyroid (even subclinical)
- Liver/gallbladder stasis
- Very low caloric intake (anorexia)

High CCR

Top Considerations:

- Obesity, insulin resistance
- Hyperthyroid
- Fatty Liver, inflammation

DUTCH Adrenal Assessment



Assess the rate of cortisol clearance from the body

12 The Cortisol Clearance Rate (CCR) is normal.

Assess the daily free cortisol pattern

9 The Morning and Bedtime free cortisol are above range.

Assess the daily total of free cortisol in circulation

10 The 24-Hour Free Cortisol is above range.

Assess the total cortisol produced by the adrenal glands (Metabolized Cortisol)

11 The Metabolized Cortisol is above range.

Adrenal Patterns and Support

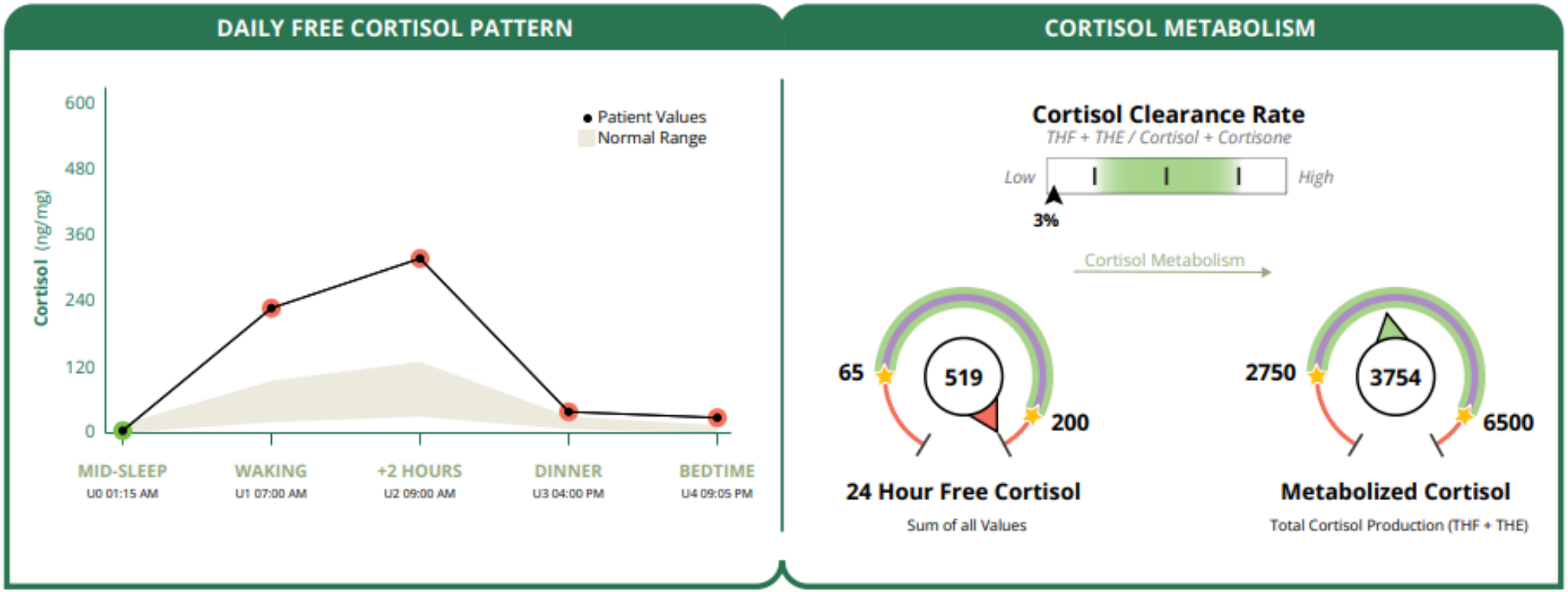
Adrenal Patterns

General HPA Axis Support

- Correct insulin resistance. See **page 54**.
- Encourage weight loss if appropriate. See **page 58**.
- Engage in regular aerobic exercise.
- Lower inflammation. See **page 53**.
- Lower stress and support parasympathetic activity. See **page 63**.
- Manage acute and chronic pain.
- Manage chronic infections.
- Minerals, including magnesium and zinc (balance copper).
- Nutritional and herbal adaptogens (see next page).
- Optimize sleep and the circadian rhythm. See **page 60** for more information.
- Probiotics such as Bifidobacterium longum 1714 and Lactobacillus plantarum PS128
- Vitamins, including B vitamins and vitamin C

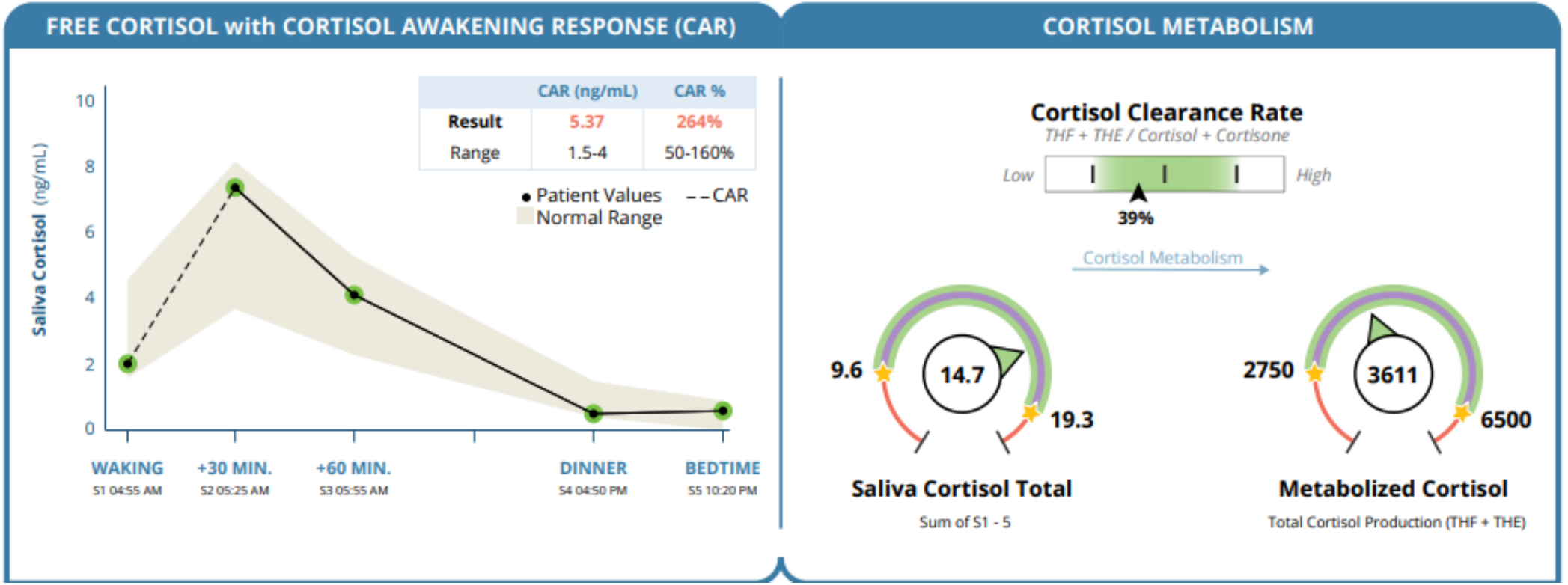
Adrenal Patterns

25 yo F – Anxiety, acne, struggling with weight loss



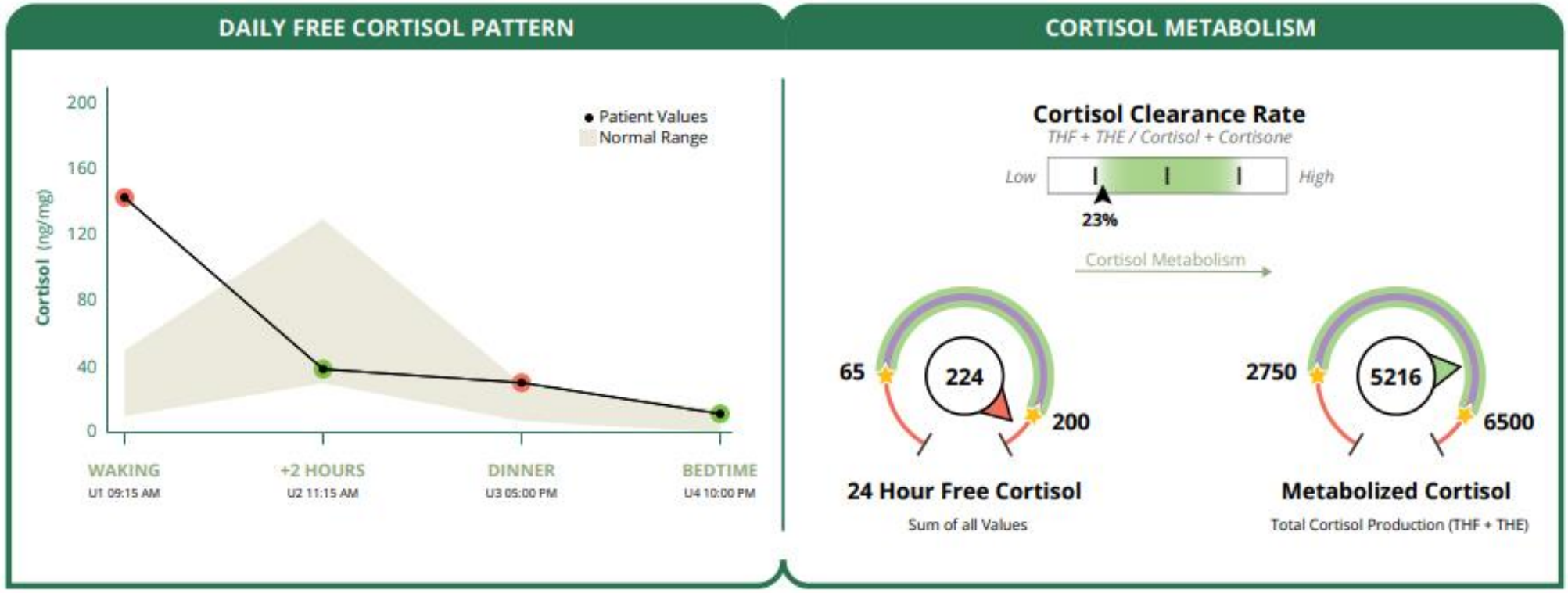
Adrenal Patterns

63 yo F – Anxiety, sleep disturbance



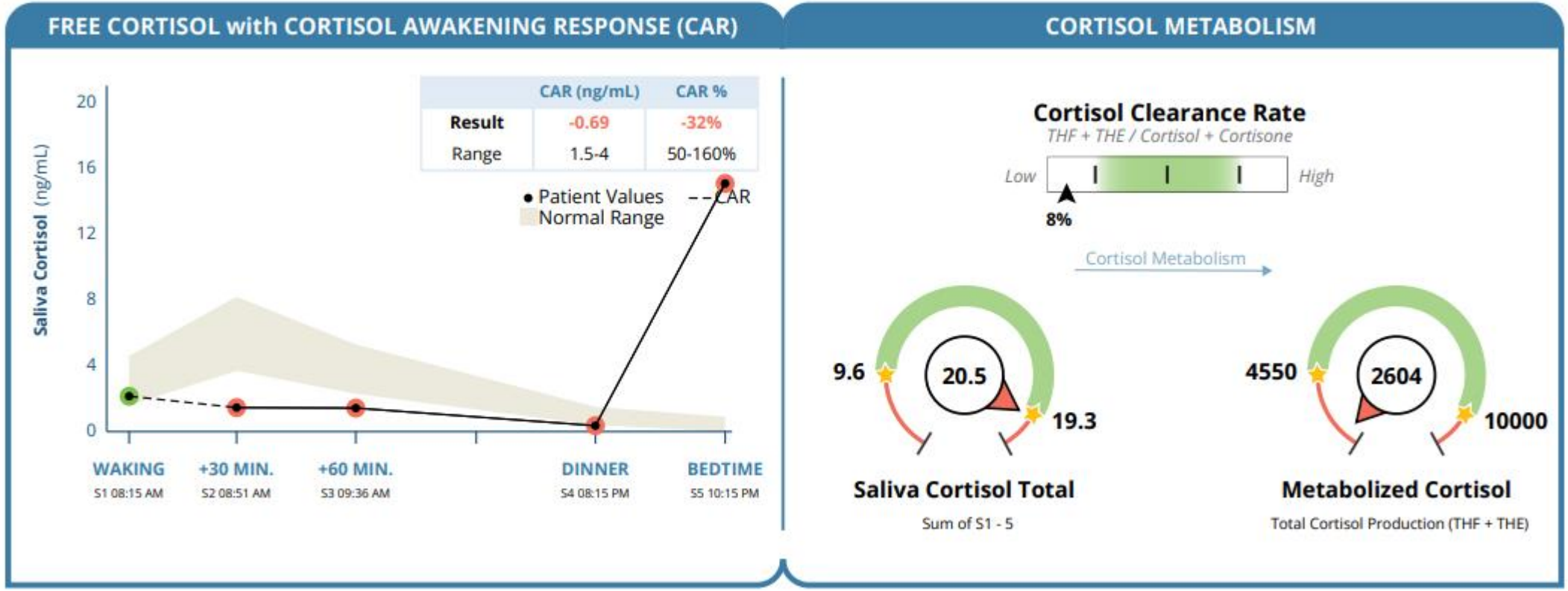
Adrenal Patterns

39 yo F – PCOS, struggling to lose weight



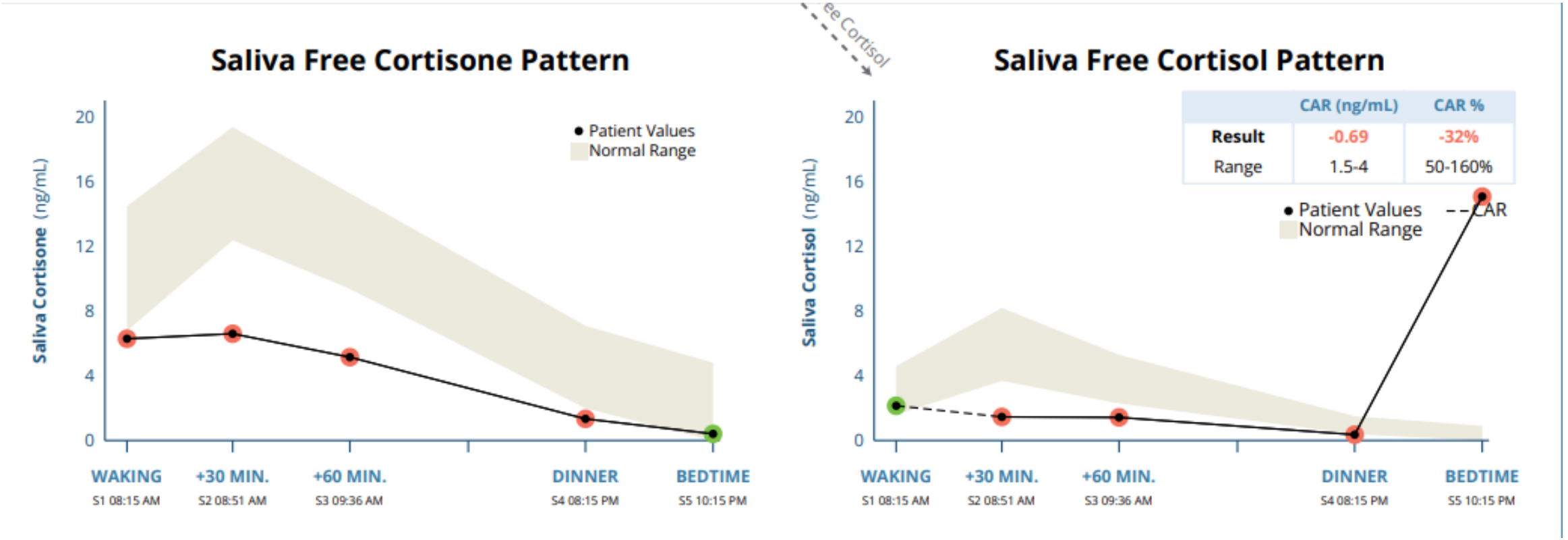
Adrenal Patterns

34 yo M – Fatigue, anxiety, depression



Hydrocortisone contamination?

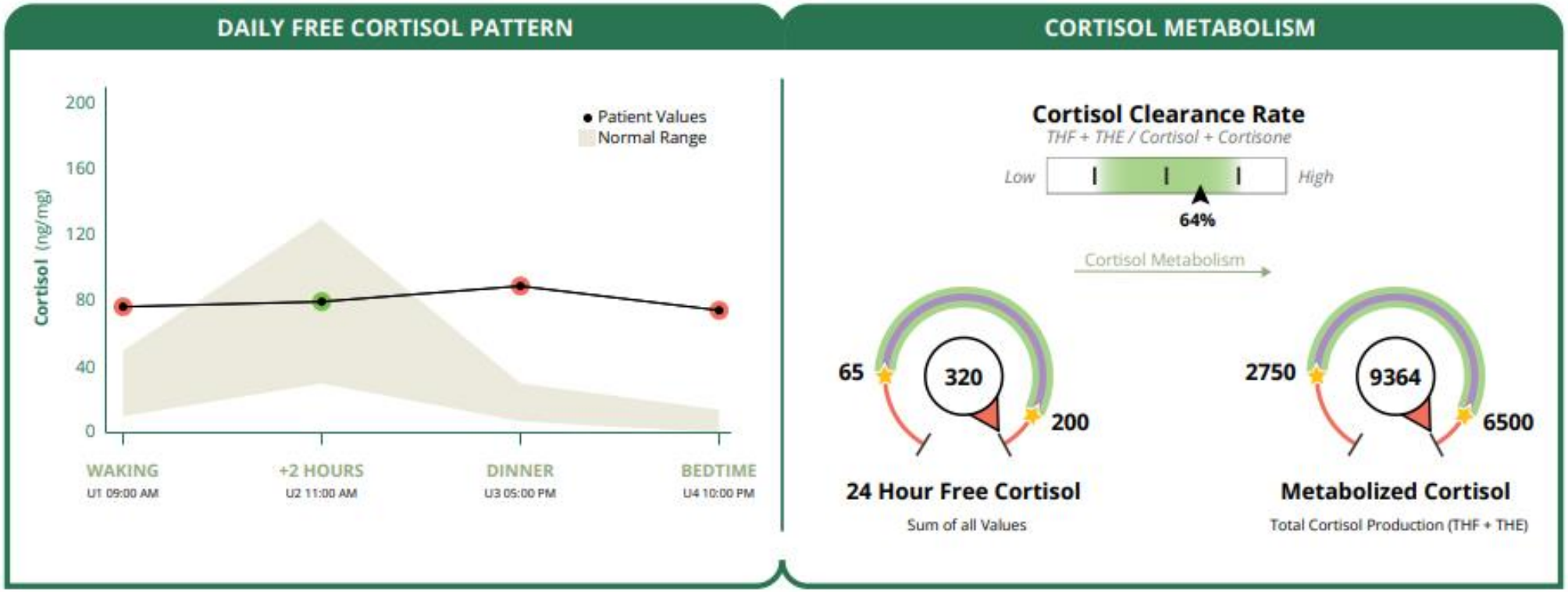
Adrenal Patterns



Yes, hydrocortisone contamination!

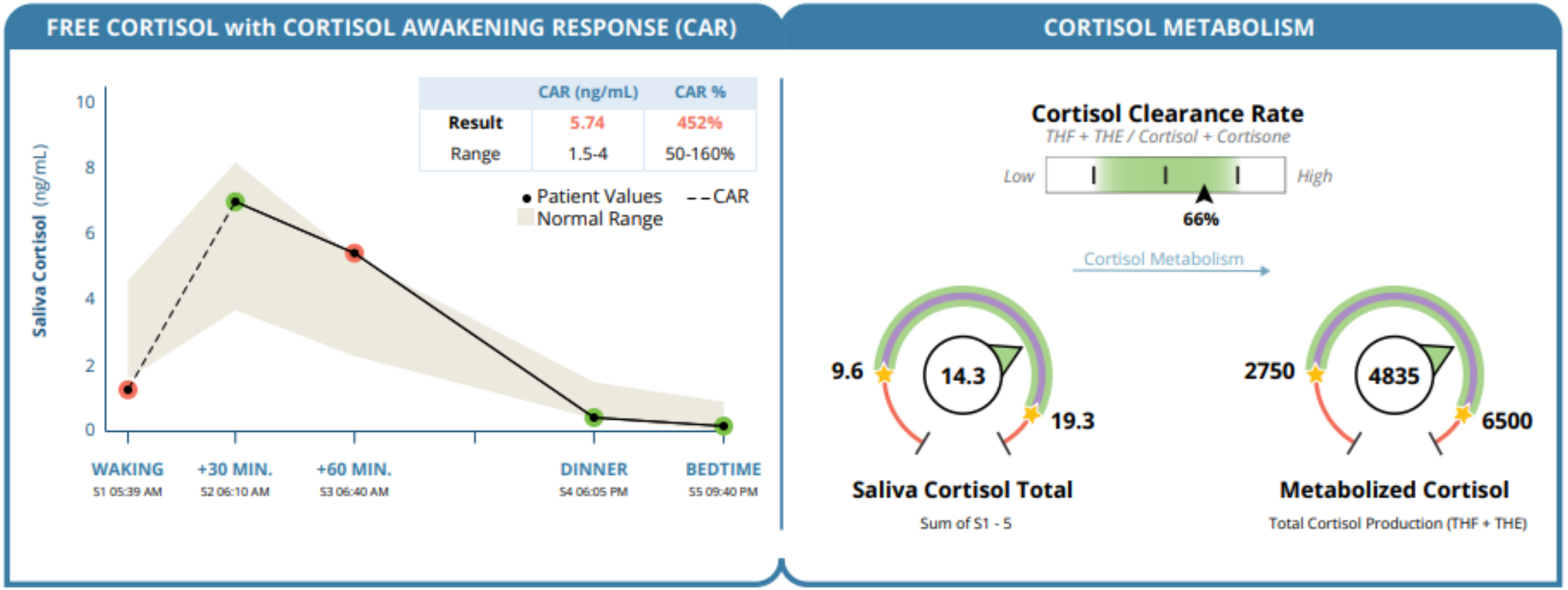
Adrenal Patterns

26 yo F – Insomnia, anxiety, weight gain



Adrenal Patterns

39 yo F – PCOS, insomnia, hypothyroidism, fatigue



Adrenal Patterns – High Cortisol Support

CAR is High

In addition to treating the underlying cause (see the DUTCH Interpretive Guide), other potential support considerations for a high CAR in females and males include:

Calming Support

- GABA
- L-theanine
- Phosphatidylserine (lowers cortisol)
- Hormone therapy that may be calming (pregnenolone, progesterone, etc.) if appropriate
- See "Cortisol Calming" in the "Herbal Support Overview" on **page 36**
- See "Stress and Parasympathetic Activity Support" on **page 63**

Body Weight and Exercise

- Consider restorative exercises.
- Encourage weight loss if appropriate. See **page 58**.
- Light movement (e.g., tai chi, qigong, yoga) on waking.
- Relaxation practices (e.g., meditation, qi gong, yoga) before bedtime.

Lifestyle and Diet

- Correct insulin resistance. See **page 54**.
- Reduce inflammation. See **page 53**.
- Reduce stress and support parasympathetic activity. See **page 63**.
- Optimize sleep and the circadian rhythm. See **page 60**.

Adrenal Patterns – High Cortisol Support

Herbal Adaptogens

- Consider calming adaptogens:
  - Ashwagandha
  - Bacopa
  - Gotu kola
  - Holy basil
  - Magnolia bark
  - Skullcap
- If suboptimal immune function, consider immunomodulating adaptogens (use caution with autoimmune conditions):
  - Ashwagandha
  - Astragalus
  - Cordyceps, Lion's Mane, Maitake, Reishi, and Shiitake mushrooms
  - Rehmannia
  - Schisandra

Nutritional Support

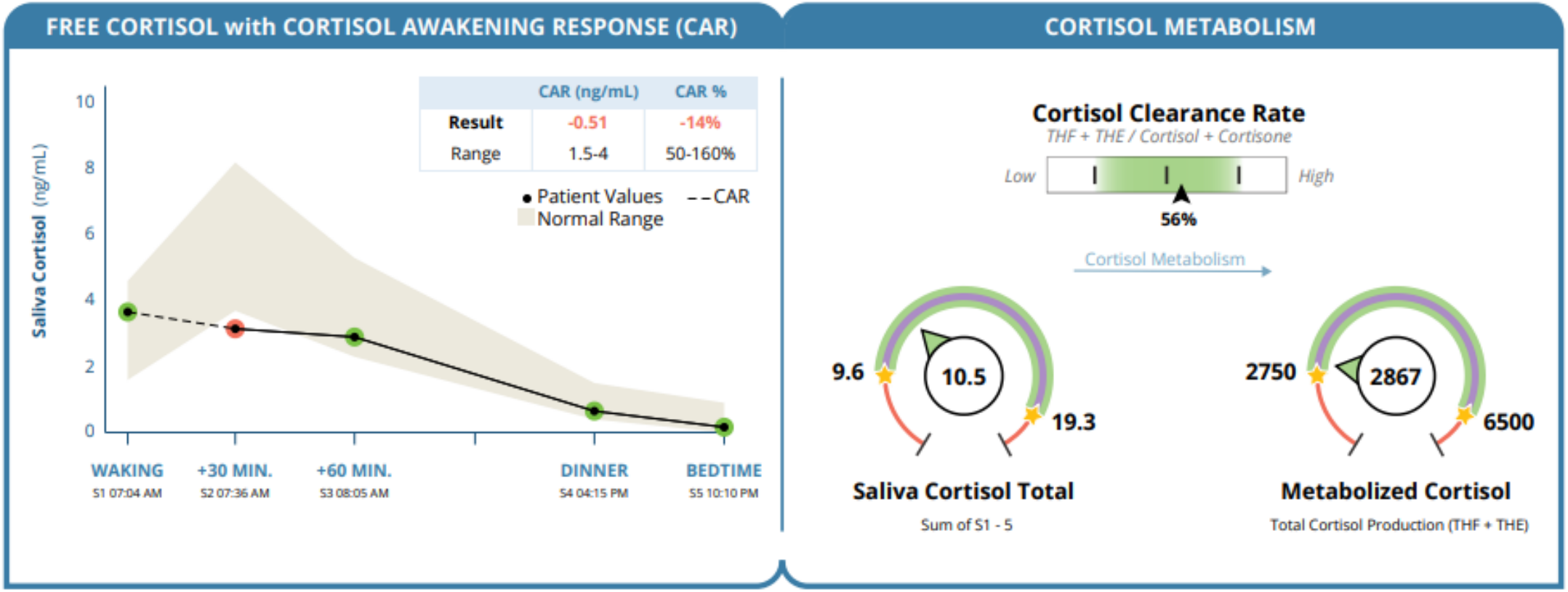
- B vitamins (B5, B6)
- Choline
- Fish oil (DHA/EPA)
- Magnesium
- Vitamin C, especially if CAR is elevated due to elevated reactive oxygen species (ROS)
- Zinc (balance copper)

Lifestyle

- Deep breathing
  - 4,7,8 breathing
  - 4x4 breathing
  - Alternate nostril breathing
- Ending showers with cold water for 30 seconds up to a few minutes
- Gratitude
- Grounding practices
- Journaling

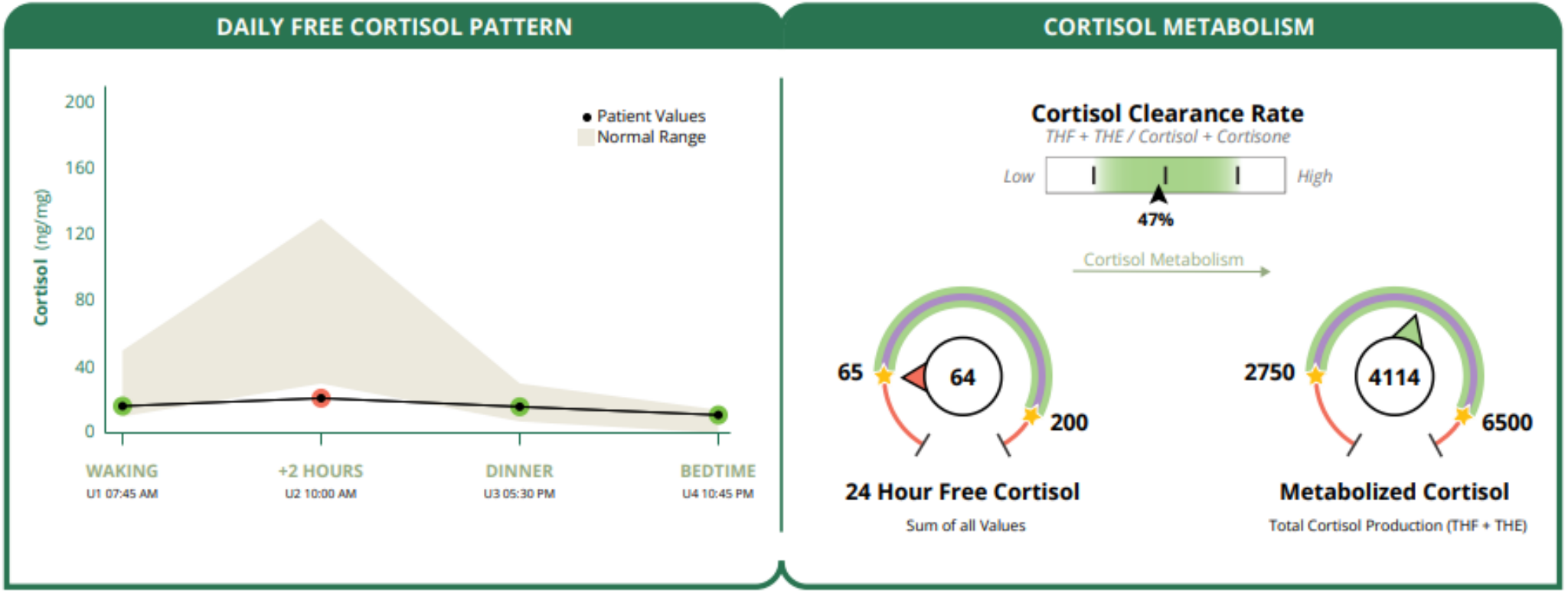
Adrenal Patterns

62 yo F – Fatigue, OSA



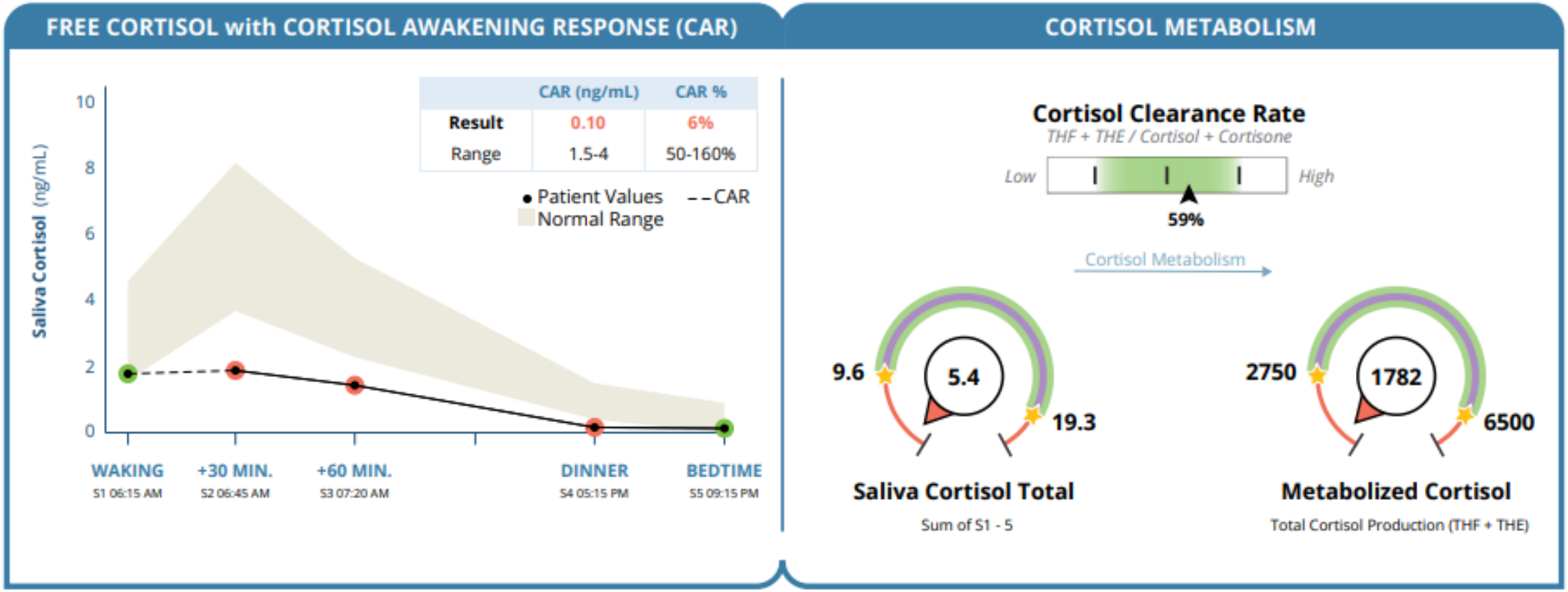
Adrenal Patterns

36 yo F – Chronic fatigue, depression



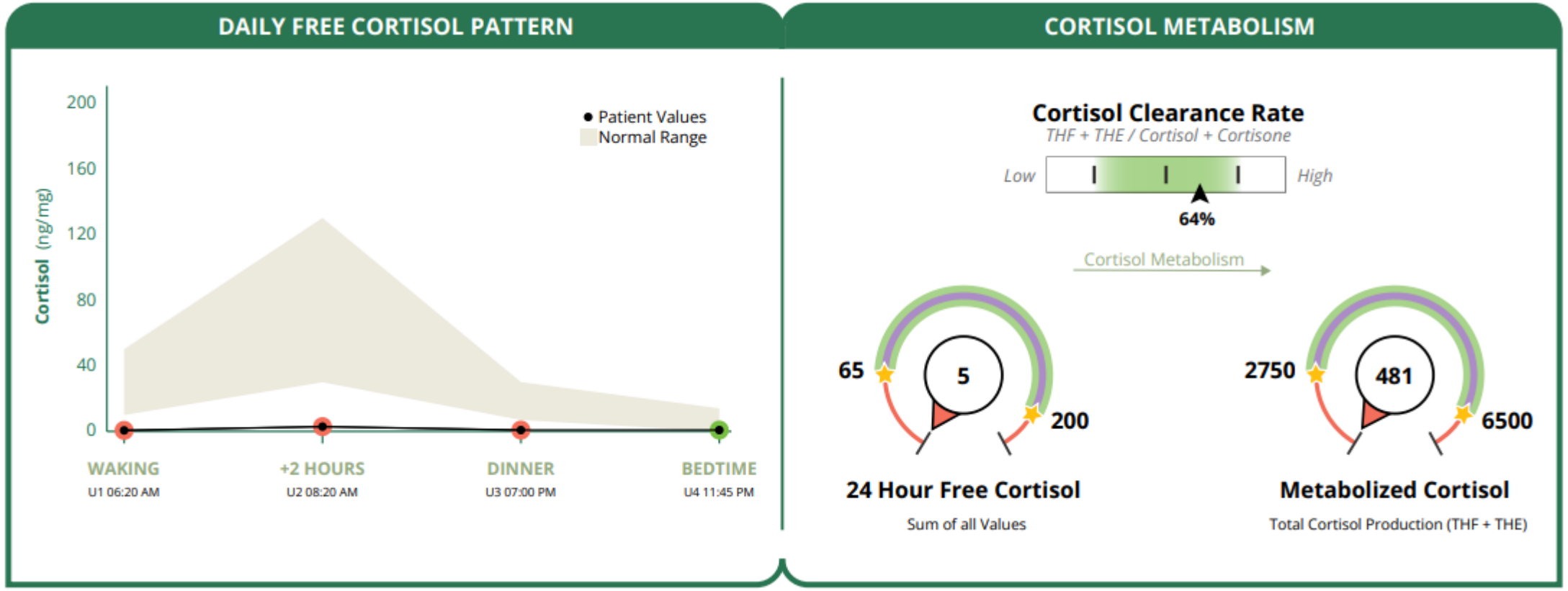
Adrenal Patterns

42 yo F – Depression, fatigue, vasomotor sx



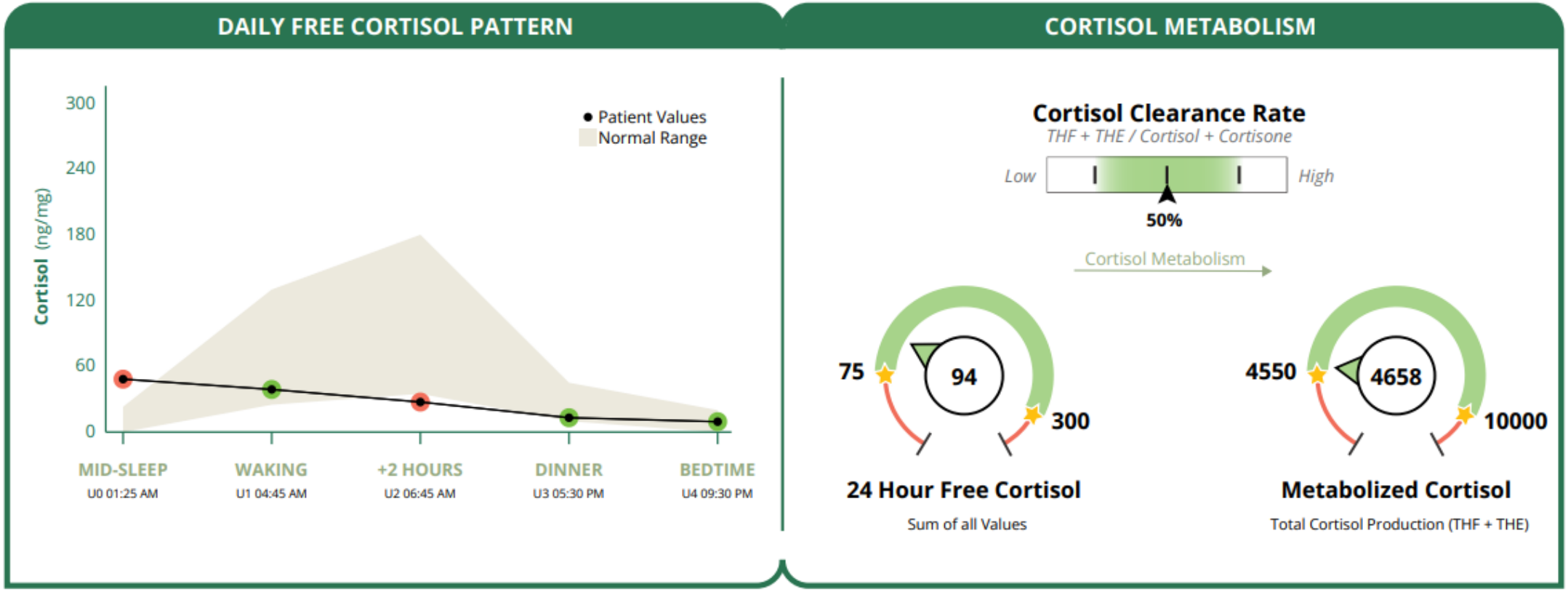
Adrenal Patterns

55 yo F – Fatigue, insomnia



Adrenal Patterns

62 yo M – Hyperlipidemia, fatigue



Adrenal Patterns – Low Cortisol Support

CAR is Absent/Low

In addition to treating the underlying cause (see the DUTCH Interpretive Guide), other potential support considerations for an absent or low CAR in females and males include:

Nutritional Support

- Adrenal cortex bovine/porcine glandulars
- B vitamins (B5, B6)
- Essential fatty acids (EFAs)
- Mitochondrial combination formulas
- Para-aminobenzoic acid (PABA)
- Vitamin C

Brain (Hippocampal) Support

- Improve Blood Flow to the Brain
  - Exercise/movement
  - Inversion poses
  - Smoking cessation
  - Treat anemia, hemochromatosis, and sleep apnea
- Herbal/Nutrient Support
  - Bacopa
  - Cordyceps
  - Fish oil
  - Ginkgo
  - Maca
  - Nutrient-rich diet
  - Rosemary

Adrenal Patterns – Low Cortisol Support

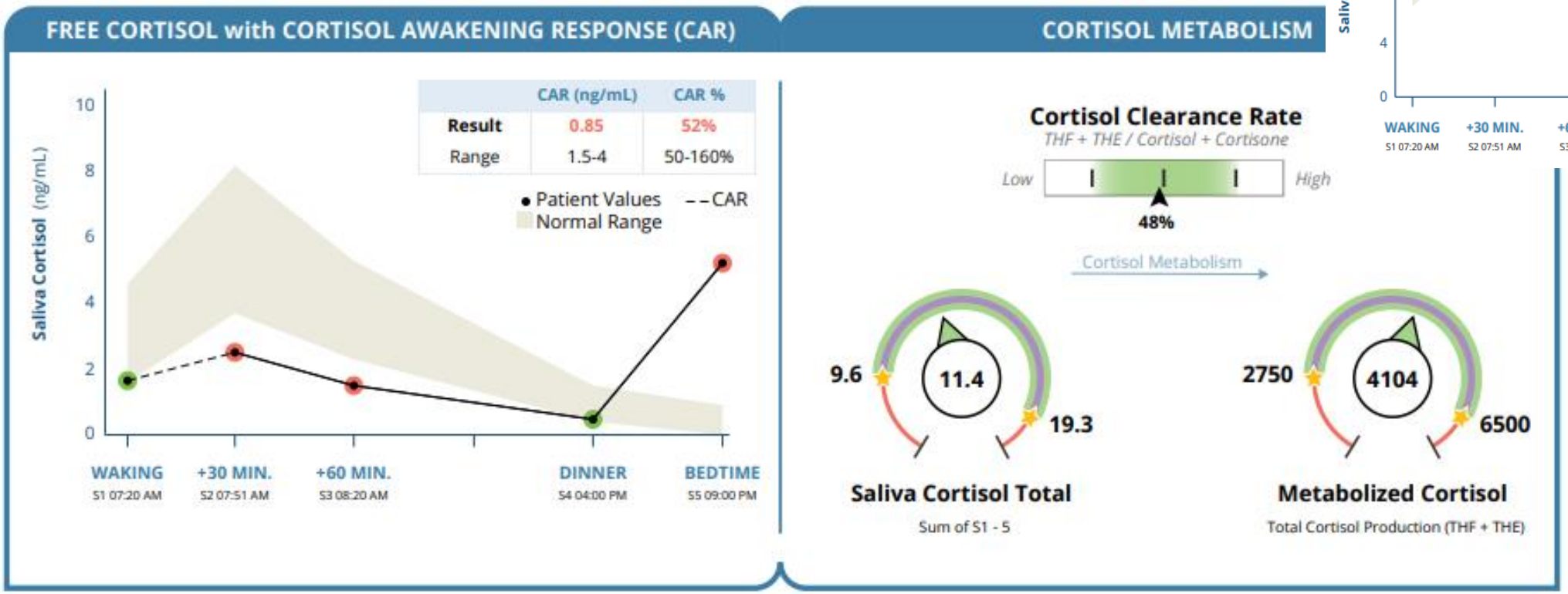
Light Exposure Upon Waking

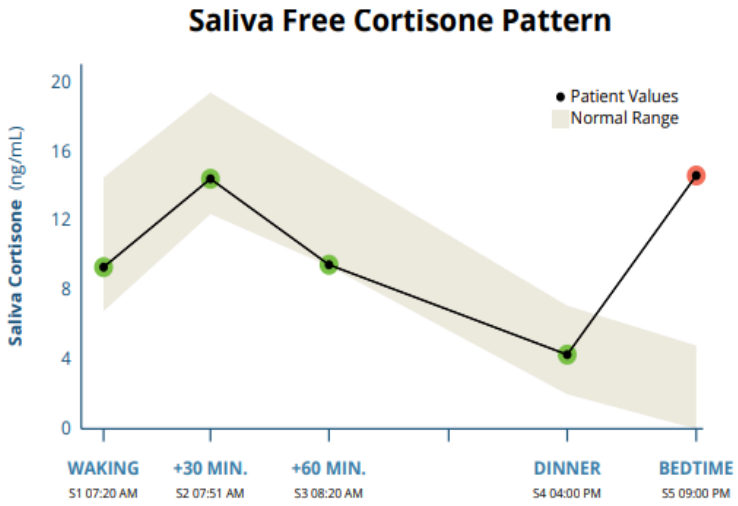
- 30 minutes minimum outdoors, preferably in the morning, without sunglasses, windows, or windshields.
- Light therapy lamp indoors
  - 20-30 minutes a day before 9 am
  - LED
  - UV-free
  - 10,000 Lux
  - 11-15 inches from the head

- If total cortisol is low, consider simulating adaptogens:
  - Cordyceps
  - Korean Ginseng
  - Licorice[1]
  - Reishi
  - Rhodiola
  - Schisandra
  - Siberian ginseng
- If androgens are low, consider androgen supportive adaptogens:
  - Ashwagandha
  - Korean Ginseng
  - Maca
  - Shatavari (females)

Adrenal Patterns

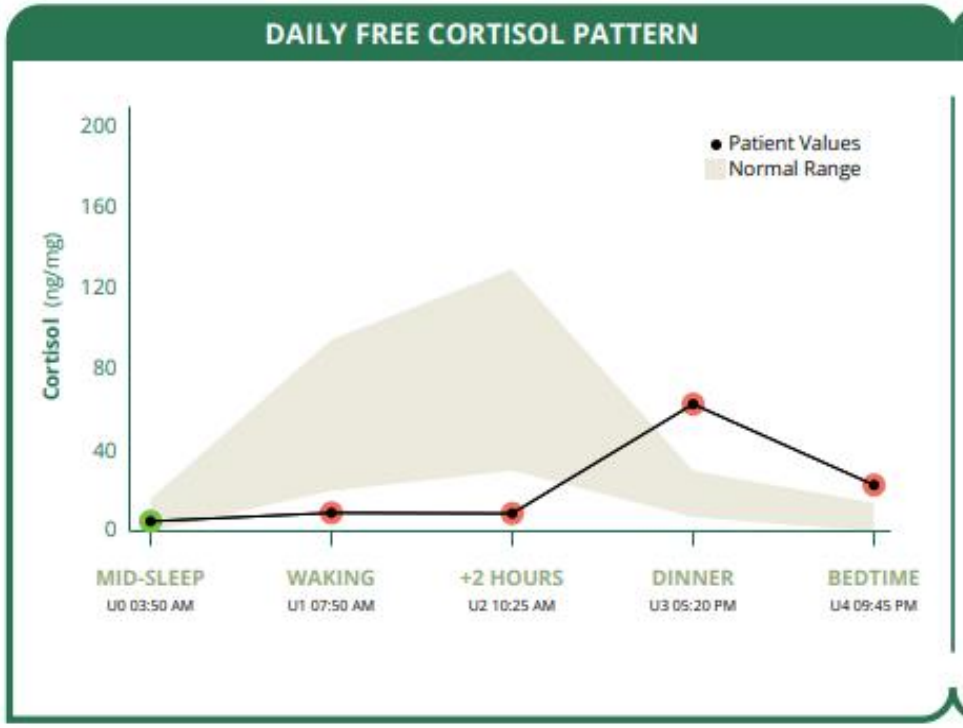
38 yo F - Insomnia, fatigue during the day

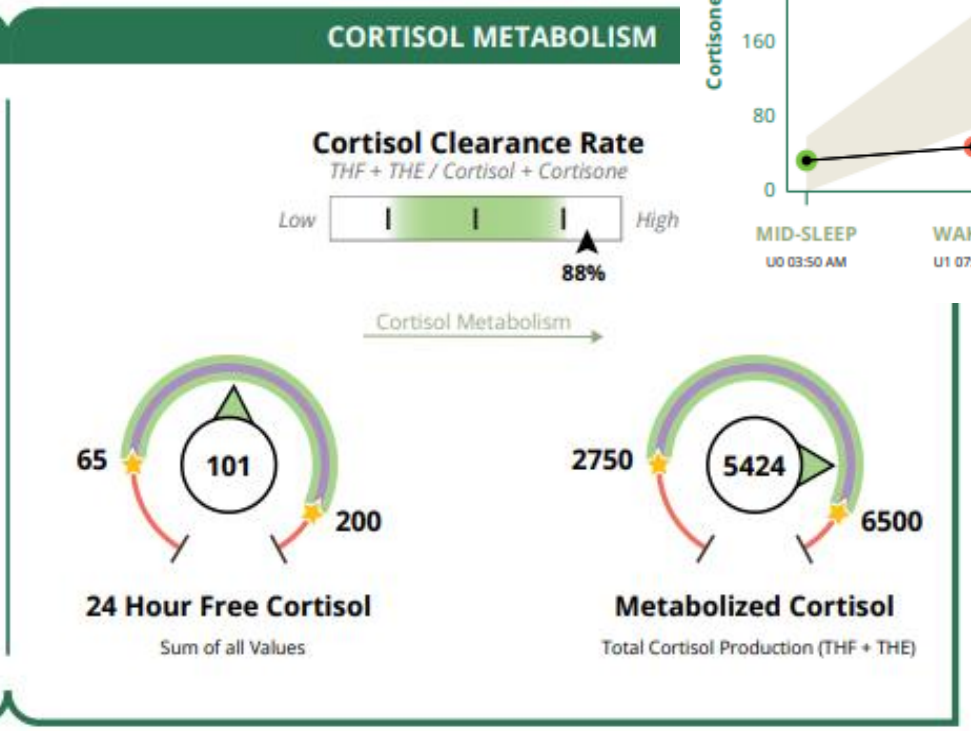


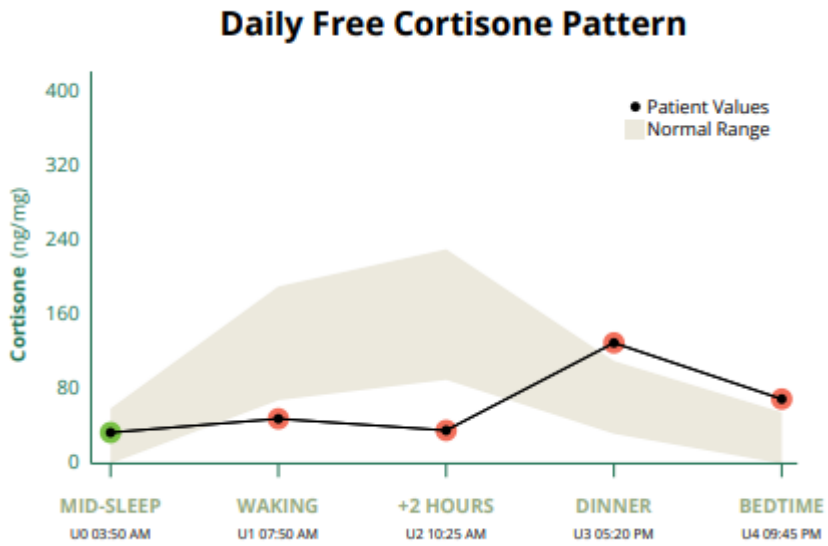


Adrenal Patterns

59 yo F – T2DM, HTN, hair loss

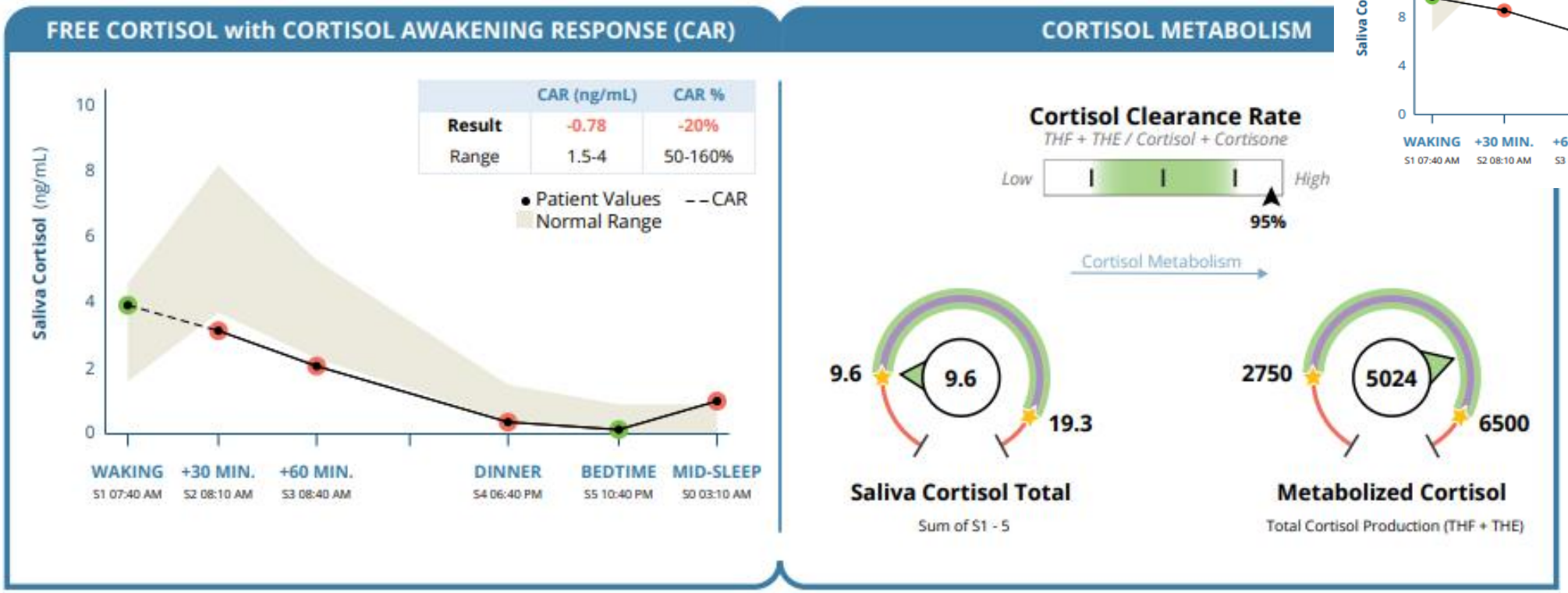


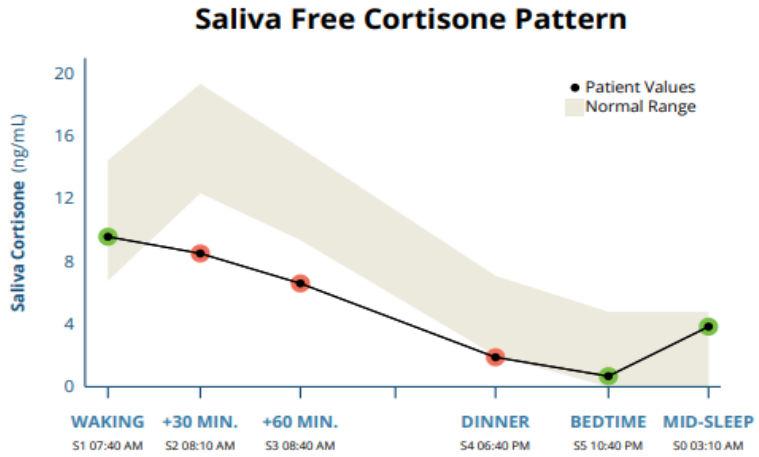




Adrenal Patterns

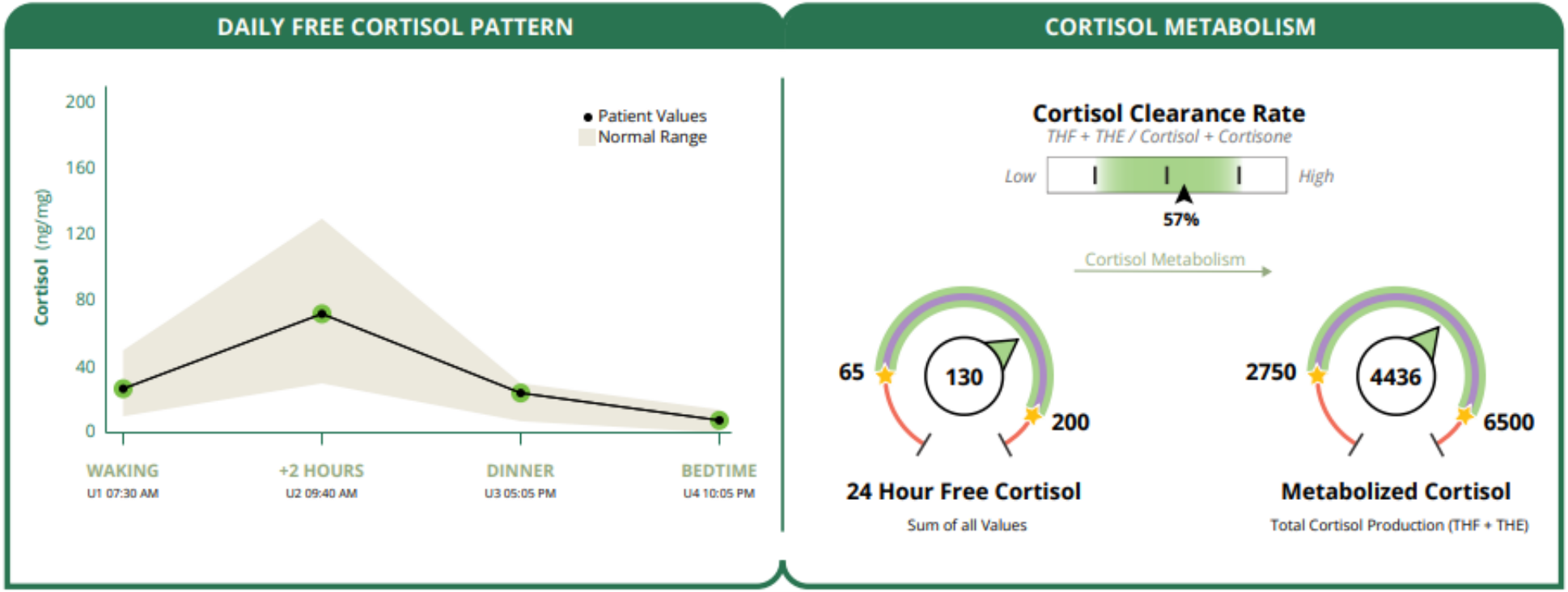
36 yo F – Anxiety, fatigue, depression, insomnia





Adrenal Patterns

22 yo F – Acne, hair loss, anxiety, dysmenorrhea



Summary of Resilience Support

High Cortisol Support

Lifestyle

- Deep breathing, ending showers with cold water for 30 seconds and up to a few minutes
- Gratitude, grounding practices, journaling, meditation,
- Vagal nerve stimulation: humming, singing, chanting, gargling
- Walks in nature, yoga, tai chi, qigong

Therapies

- Acupuncture/acupressure therapy, biofeedback
- Cognitive Behavioral Therapy (CBT), counseling
- Craniosacral therapy, massage therapy
- Emotional Freedom Technique (EFT) – tapping
- Eye Movement Desensitization and Reprocessing (EMDR)

Calming Support

- Ashwagandha, bacopa, California poppy, chamomile, GABA, holy basil, jujube, lavender, lemon balm, L-theanine, magnolia bark, mimosa, passionflower, phosphatidylserine (lowers cortisol), skullcap, valerian, medication if needed

Low Cortisol Support

Lifestyle

- Follow strict circadian rhythm, light therapy (sun/lights)
- Regular exercise and movement – improve blood flow to brain! Lift weights
- Adequate sleep/work on improving sleep if needed
- Vagal nerve stimulation: humming, singing, chanting, gargling
- Maintain healthy diet w/adequate protein and nutrients

Therapies

- Acupuncture/acupressure therapy, biofeedback
- Cognitive Behavioral Therapy (CBT), counseling
- Craniosacral therapy, massage therapy
- Emotional Freedom Technique (EFT) – tapping
- Eye Movement Desensitization and Reprocessing (EMDR)

Stimulating Support

- Maca, rhodiola, cordyceps, reishi, schisandra, licorice, panax ginseng, medication if indicated

Summary of Resilience Support

Sleep Hygiene & Circadian Rhythm Support

Upon waking

- Support the cortisol awakening response (CAR) with **light exposure**: 30 minutes minimum outdoors, preferably in the morning, without sunglasses, windows, or windshields (glasses/contacts are okay)
- **Light therapy lamp**: 20-30 minutes a day before 9 am, 10,000 Lux, 11-15 inches from the head
- Enjoy **caffeine before 12 pm**.

During the day

- Practice **time-restricted eating**: eat during daylight hours and stop eating by 7 pm. Keep to a 12-hour eating window. Eat earlier in the day rather than later, as insulin sensitivity is best in the morning.

- **Regular exercise**: moderate intensity aerobic exercise and mind-body exercise such as yoga, tai chi, and qi gong.

In the Evening

- **Minimize blue light exposure**: avoid blue/white light and screens 2 hours before bedtime. Dim household lights with the sunset. In the evening use lamps (low-angle light) instead of bright overhead lighting. Utilize apps on electronics that reduce blue light.

- **Support parasympathetic activity** and keep cortisol low: Avoid alcohol and sugar before bed. Avoid stimulatory exercise in the evening. Enjoy a few grams of protein before bed if waking up from low blood sugar elevating cortisol. Keep to a regular schedule: Go to bed at the same time and wake up at the same time. Start winding down 1-2 hours before bedtime.
- Create bedtime rituals: favorite book, tea, face mask, bath, journal, pray, meditate, etc.

Thank You!

For questions, contact

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