OMCeO ASTI
Ordine Provinciale dei Medici Chirurghi e degli Odontoiatri

ASTI, 11 giugno 2026

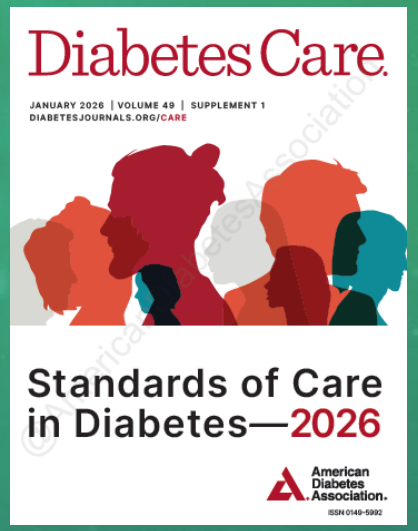
OSAS E DIABETE MELLITO

- *INSULINO-RESISTENZA*
- *IMPATTO della CPAP sul CONTROLLO GLICEMICO*

Dr.ssa ELENA REPETTI

S.C. MALATTIE ENDOCRINE e del METABOLISMO

Ospedale Cardinal Massaia, Asti



Importance of 24-hour physical behaviors for type 2 diabetes

SITTING/BREAKING UP PROLONGED SITTING

- Limit sitting. Breaking up prolonged sitting (at least every 30 min) with short regular bouts of slow walking or simple resistance exercises can improve glucose metabolism.

STEPPING

- An increase of only 500 steps/day is associated with 2-9% decreased risk of cardiovascular morbidity and all-cause mortality.
- A 5- to 6-min brisk-intensity walk per day equates to ~4 years' greater life expectancy.

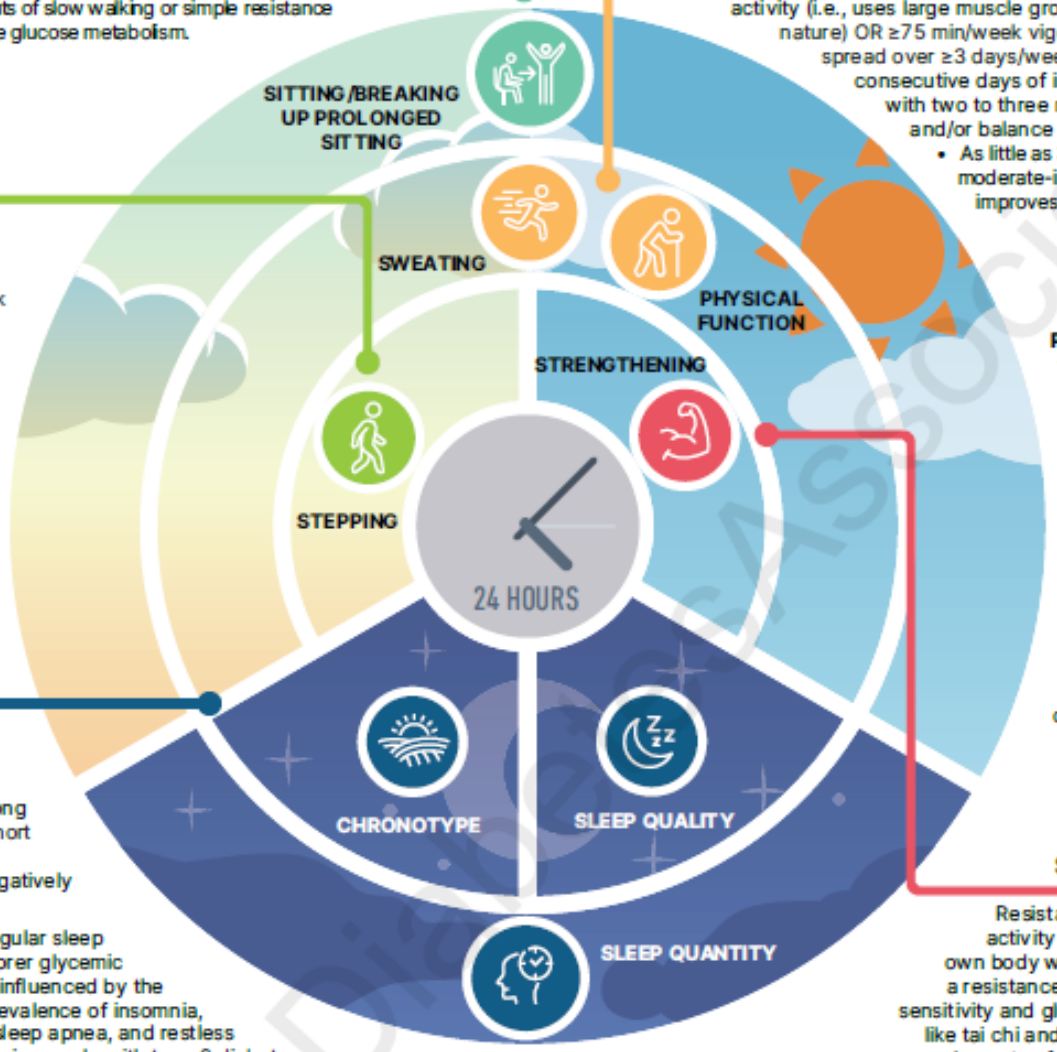
SLEEP

Aim for consistent, uninterrupted sleep, even on weekends.

Quantity - Long (>8 h) and short (<6 h) sleep durations negatively impact A1C.

Quality - Irregular sleep results in poorer glycemic levels, likely influenced by the increased prevalence of insomnia, obstructive sleep apnea, and restless leg syndrome in people with type 2 diabetes.

Chronotype - Evening chronotypes (i.e., night owl: go to bed late and get up late) may be more susceptible to inactivity and poorer glycemic levels than morning chronotypes (i.e., early bird: go to bed early and get up early).



SWEATING (MODERATE-TO-VIGOROUS ACTIVITY)

- Encourage ≥150 min/week of moderate-intensity physical activity (i.e., uses large muscle groups, rhythmic in nature) OR ≥75 min/week vigorous-intensity activity spread over ≥3 days/week, with no more than 2 consecutive days of inactivity. Supplement with two to three resistance, flexibility, and/or balance sessions.
- As little as 30 min/week of moderate-intensity physical activity improves metabolic profiles.

Physical function/ frailty/sarcopenia

- The frailty phenotype in type 2 diabetes is unique, often encompassing obesity alongside physical frailty, at an earlier age. The ability of people with type 2 diabetes to undertake simple functional exercises in middle-age is similar to that in those over a decade older.

STRENGTHENING

Resistance exercise (i.e., any activity that uses the person's own body weight or works against a resistance) also improves insulin sensitivity and glucose levels; activities like tai chi and yoga also encompass elements of flexibility and balance.

Diabetes Care 2024;47(3):331–343 | https://doi.org/10.2337/dci23-0037

Diabetes Care

American Diabetes Association

Waking Up to the Importance of Sleep in Type 2 Diabetes Management: A Narrative Review

QUANDO STILE DI VITA VUOL DIRE ANCHE CURA DEL SONNO

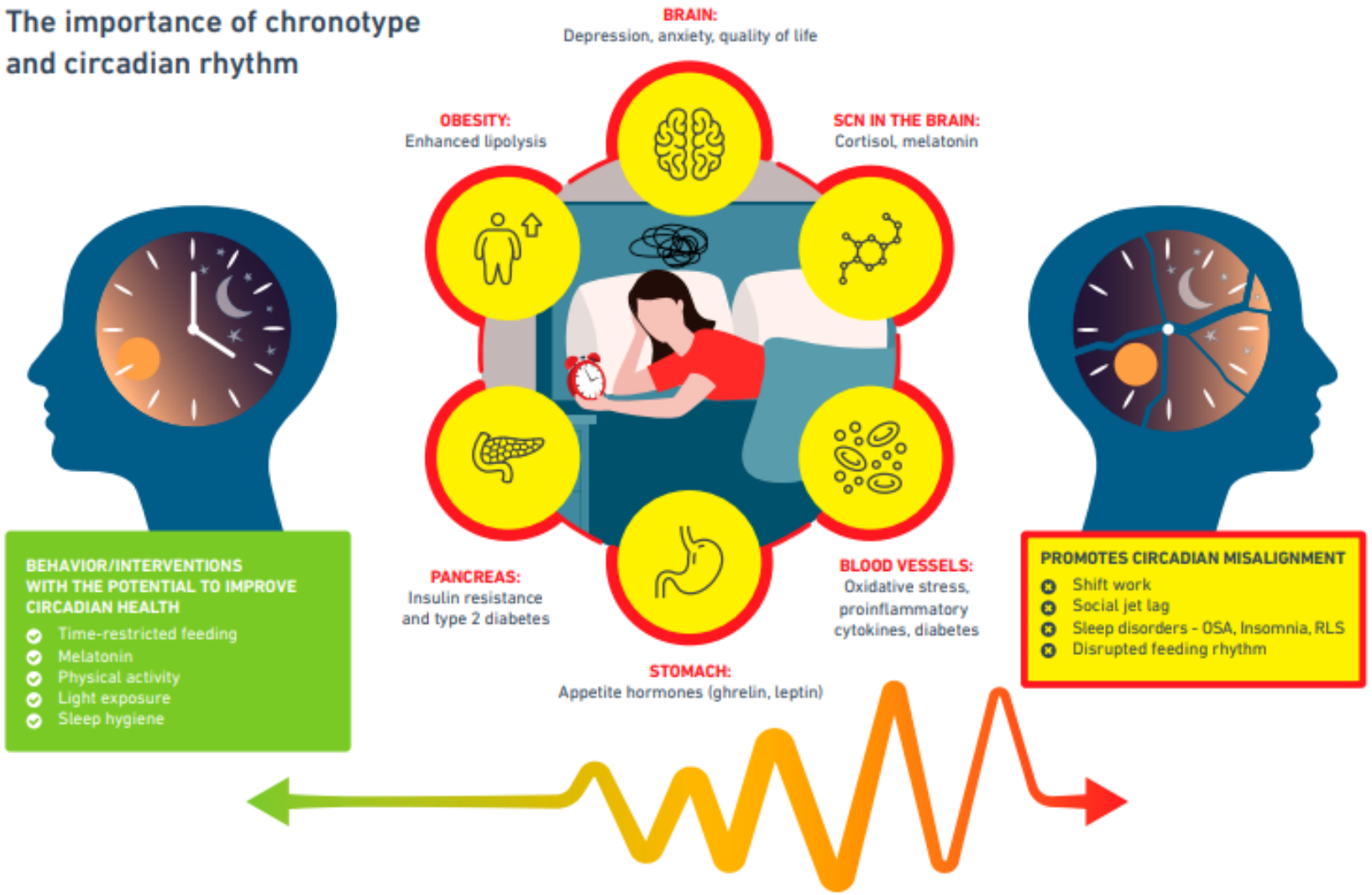


Figure 2—Impact of circadian misalignment on health outcomes in type 2 diabetes. RLS, restless leg syndrome; SCN, suprachiasmatic nucleus.

RIPETUTE INTERRUZIONI DEL SONNO NOTTURNO
→ DEBITO DI SONNO
→ SONNOLENZA DIURNA
→ IRRITABILITA', AGGRESSIVITA'
→ PERDITA CONTROLLO DELLA FAME
→ IPERFAGIA

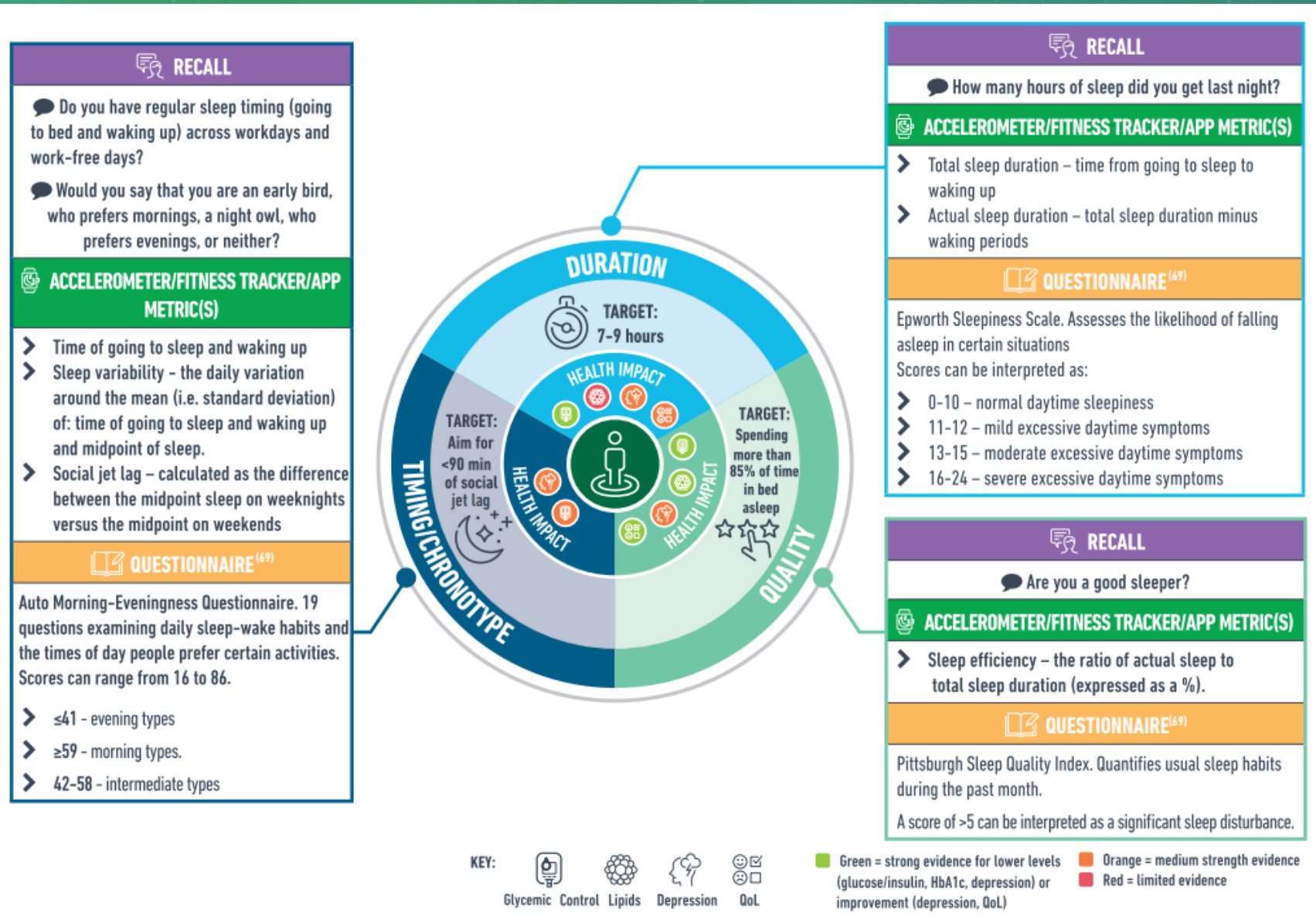
JET LAG SOCIALE

LAVORO TURNI

Diabetes Care 2024;47(3):331–343 | https://doi.org/10.2337/dci23-0037

Diabetes Care
American Diabetes Association

Waking Up to the Importance of Sleep in Type 2 Diabetes Management: A Narrative Review



Diabetes and sleep disturbances: findings from the Sleep Heart Health Study

Resnick HE, Redline S, Shahar E, et al. Diabetes and sleep disturbances: findings from the Sleep Heart Health Study. Diabetes Care 2003; 26: 702

DIABETE E' ASSOCIATO A RESPIRAZIONE PERIODICA
TOLLERANZA DEL GLUCOSIO ANOMALA NEI PAZIENTI CON AHI > 15
OSA SONNO REM ASSOCIATA INSULINORESTENZA

Obstructive sleep apnea and type 2 diabetes: is there a link?

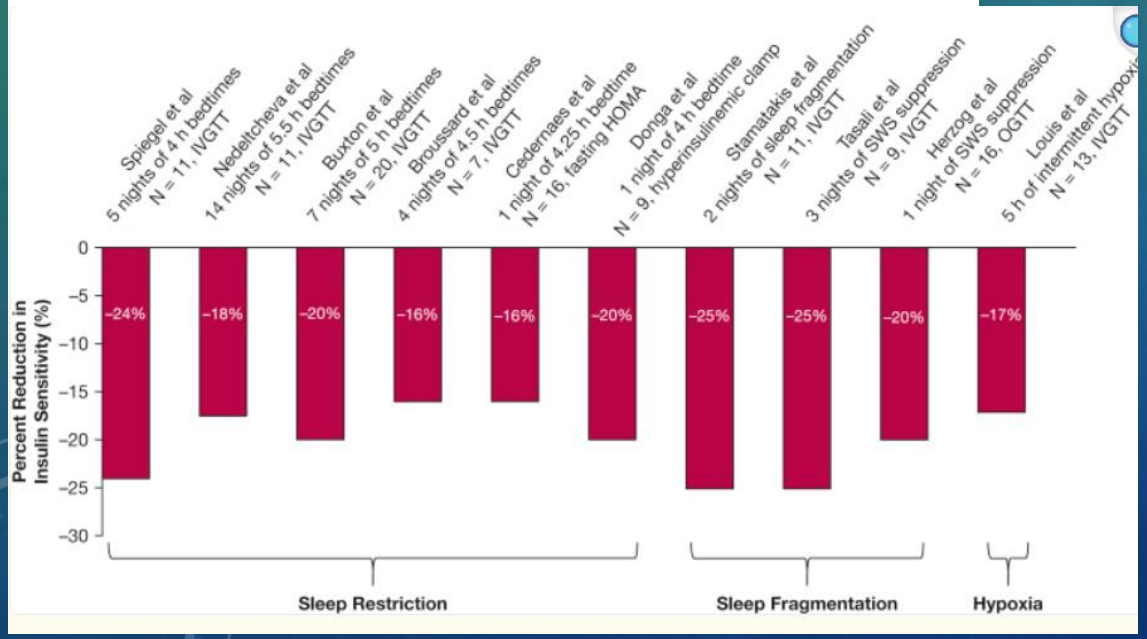
Sushmita Pamidi[1] and Esra Tasali[2]*

Frontiers in Neurology | Sleep and Chronobiology
August 2012 | Volume 3 | Article 126 | **4**

Prospective studies examining the incidence of type 2 diabetes in patients with OSA: type 2 diabetes is more prevalent among patients with OSA compared to those without OSA, independent of shared risk factors.

Obstructive Sleep Apnea and Diabetes
A State of the Art Review

Sirimon Reutrakul, MD; and Babak Mokhlesi, MD



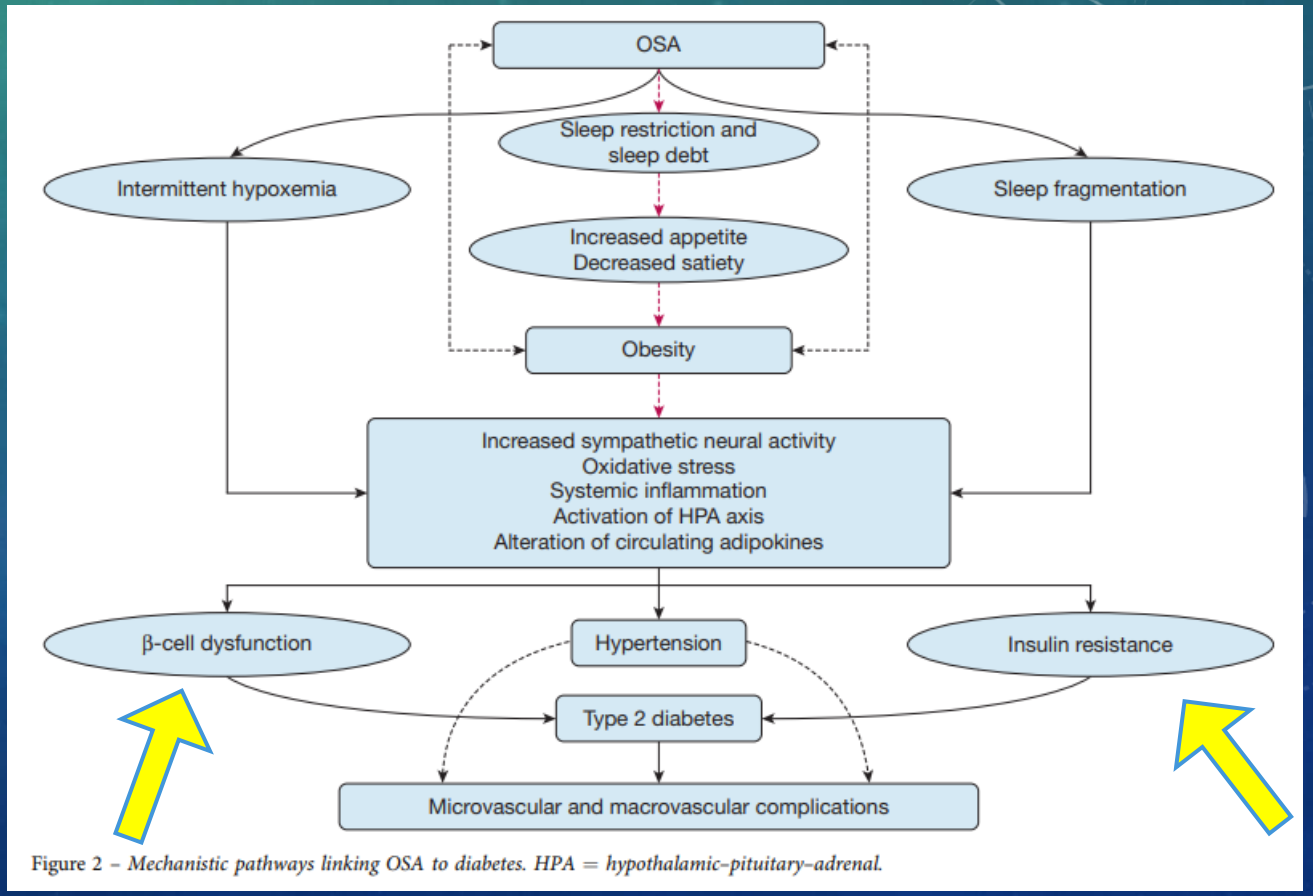


Figure 2 – *Mechanistic pathways linking OSA to diabetes. HPA = hypothalamic–pituitary–adrenal.*

Sleep Disorders Reshape the Cardiovascular Risk Prediction Value of Systemic Inflammation: A NHANES Cohort Study (2005-2018)

Yuan Zhou, MD # · Xiaoyu Zhang, MD # · Wenting Gui, MD # · ... · Jiaxiang Chen, MD · Yi Song, MD · Runwei Ma, MD ...

https://doi.org/10.1016/j.numecd.2026.104800

Sleep Disorders Modify the Cardiovascular Prognostic Value of Systemic Inflammation

Study Population

NHANES 2005–2018

Adults ≥ 18 years

Mortality Analysis
n = 26,477

Fatal cardiovascular events Analysis
n = 23,722
Baseline CVD-Free

Baseline Inflammatory Biomarkers

Exposures

No Sleep Disorder | Sleep Disorder

Systemic Inflammation

- CRP
- NLR
- SII
- Inflammation Score

Statistical Analysis Framework

①Survey-weighted Cox regression
②Sleep status – stratified analyses
③Multiplicative interaction testing
④Quartile-based dose response analysis
⑤DAG-informed mediation analysis
⑥Multiple sensitivity analyses

Outcomes

All-Cause Mortality

Cardiovascular Mortality

Fatal cardiovascular events

Key Findings:

- Inflammation more strongly linked to outcomes in those with sleep disorders
- No significant mediation effect observed
- Consistent patterns across multiple inflammatory markers

**Adjusted for NHANES survey design and sensitivity analyses.*

JET LAG SOCIALE

I DISTURBI DEL SONNO PREDICONO IN MODO INDPENDENTE LA MORTALITA' CARDIOVASCOLARE

RAPPRESENTANO UN FATTORE DI RISCHIO DI MORTALITA' CARDIOVASCOLARE

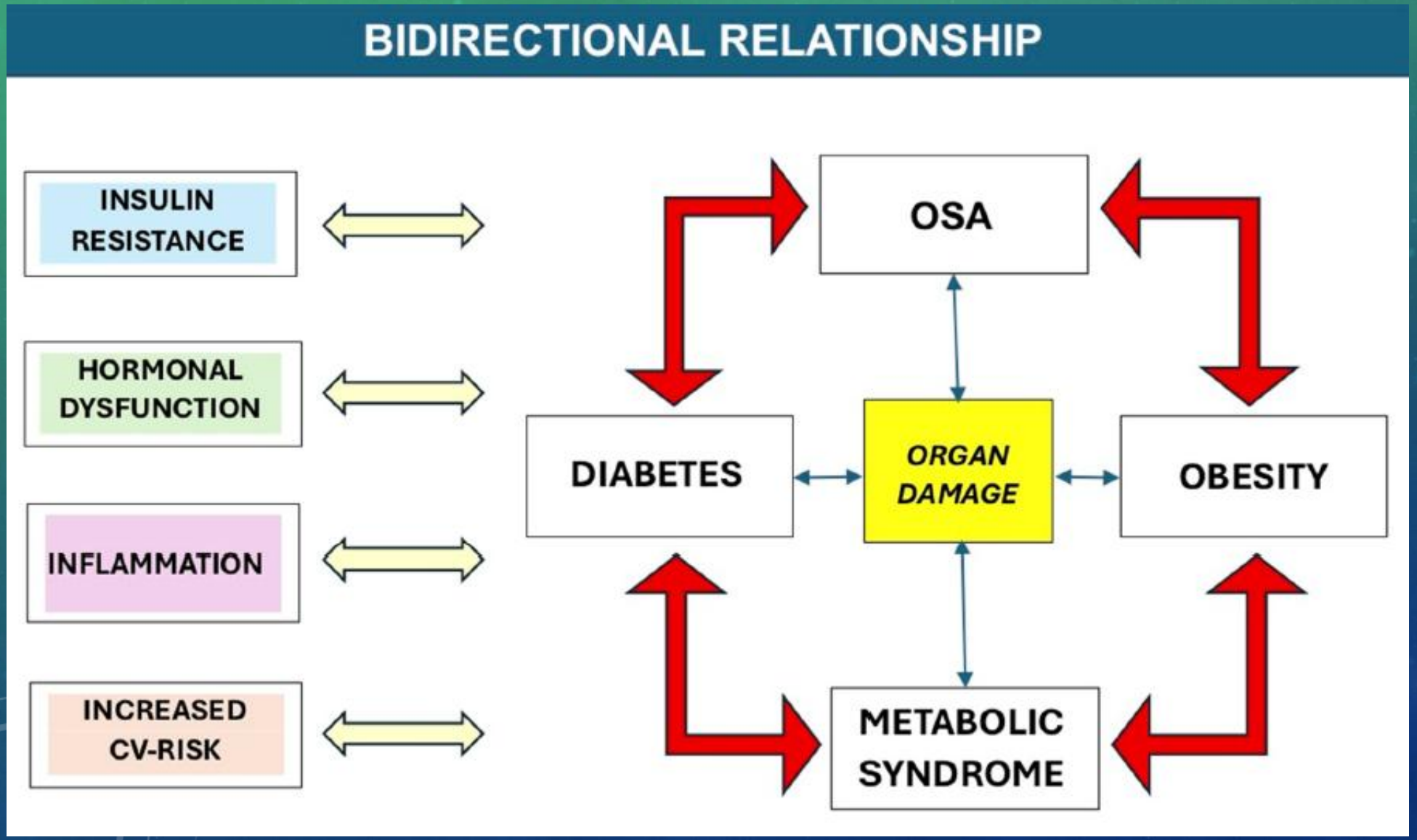
rispetto a 7 h/die
<4 h sonno/die AUMENTO
41 % MORTALITA' TUTTE LE CAUSE
54 % MORTALITA' CARDIOVASCOL.

Review

Obstructive Sleep Apnea and Type 2 Diabetes: An Update

Sandro Gentile [1,2], Vincenzo Maria Monda [3], Giuseppina Guarino [1,2], Ersilia Satta [2], Maria Chiarello [2], Giuseppe Caccavale [2], Edi Mattera [1], Raffaele Marfella [4] and Felice Strollo [5,*]

OSA MOLTO FREQUENTE FRA I PAZIENTI DIABETICI CHE HANNO UN ALTO RISCHIO DI SVILUPPARLA NEL CORSO DEGLI ANNI



OSA (polisonnografia)

18 % ASSI. PRIMARIA
58 % ANZIANI
86 % OBESI + DM2

J. Clin. Med. **2025**, 14, 5574

Review

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J. Clin. Med. **2025**, 14, 5574

INSULINO RESISTENZA

L'IPOSSIA INTERMITTENTE NEI MODELLI ANIMALI RODITORI HA FORNITO PROVE DI INSULINO-RESISTENZA

- CELL B (nei topi diminuisce sensibilità insulina, ostacola proliferaz. Cell. B, la conversione proinsulina in insulina)
- EPATOCITI (aumenta glicogeno cell. e gluconeogenesi)
- ADIPOCITI (aumenta adiposità)
- INFIAMMAZIONE (segnali pro-infiammatori, citochine IL-1beta, IL-6, proteina infiammatoria dei macrofagi)
- ORMONALE (aumento cortisolo)

- **NEGLI UMANI**
- **PAZ. CON OSA DI NUOVA DIAGNOSI: LIVELLI DI GRELINA AUMENTATI E CORRELATI POSITIVAMENTE A AHI**
- **PAZ. OBESI CON OSA HANNO LIVELLI DI CORTISOLO AUMENTATI CHE DIMINUISCONO CON LA CPAP**

LA FRAMMENTAZIONE DEL SONNO INDOTTA SPERIMENTALMENTE COMPROMETTE

- **NEI SOGGETTI SANI LA SENSIBILITA' ALL' INSULINA INDIPENDENTEMENTE DA ETA' E OBESITA'**
- **NEI PAZIENTI CON OSA O DIABETE TIPO 2 L' OMEOSTASI GLUCOSIO**

Review

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J. Clin. Med. **2025**, 14, 5574

COMPENSO METABOLICO

OSA MODERATA - GRAVE E' ASSOCIATA A SCARSO CONTROLLO METABOLICO

AGGRAVA LE MALATTIE CARDIOVASCOLARI (stress ossidativo, infiammazione, coagulabilità)

PUO' DETERMINARE PROGRESSIONE DELLE COMPLICANZE D'ORGANO DEL DIABETE TIPO 2

Continuous Positive Airway Pressure Effect on Progression of Retinal Disease in Patients with Sleep Apnea and Nonproliferative Diabetic Retinopathy: A Randomized Clinical Trial

doi: 10.1513/AnnalsATS.202304-296OC

RETINOPATIA

CORRELAZIONE TRA OSA GRAVE E PEGGIORAMENTO RETINOPATIA DIABETICA

CORRELAZIONE OSA ED EDEMA MACULARE DIABETICO (80 % vs 45 %)

TRATTAMENTO A LUNGO TERMINE CON CPAP PUO' RALLENTARE LA PROGRESSIONE DELLA RETINOPATIA, sebbene possa indurre un aumento microemorragie

Obstructive Sleep Apnea and Diabetic Nephropathy

A cohort study — Diabetes Care 36:3718–3725, 2013

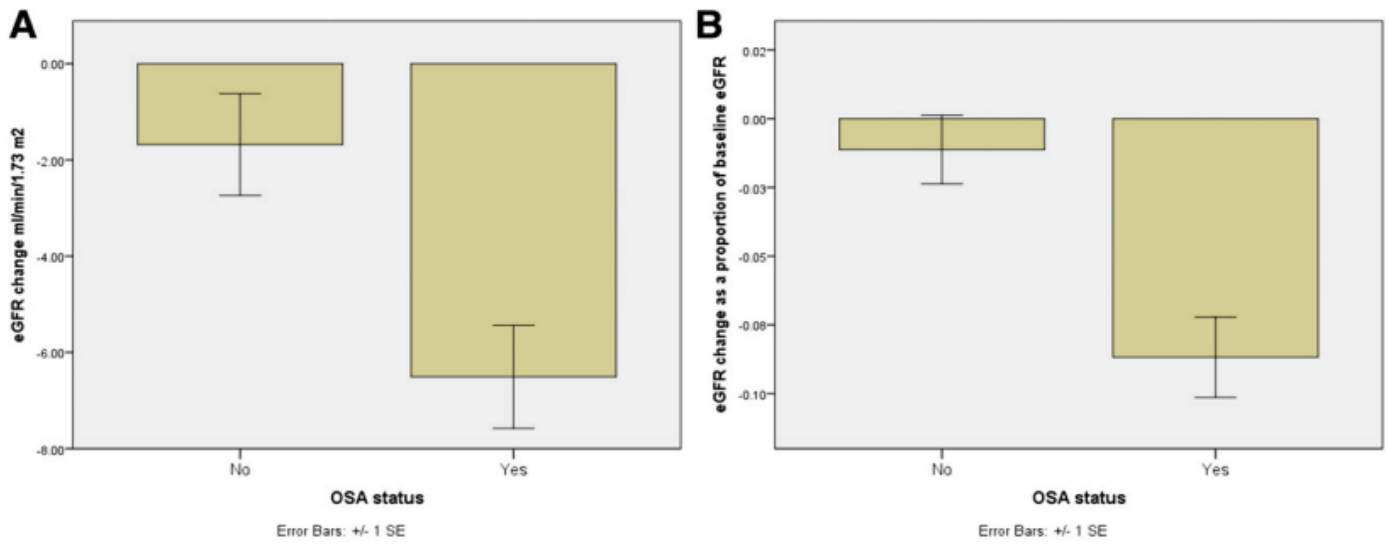


Figure 2—*The longitudinal impact of OSA on eGFR in patients with type 2 diabetes presented as eGFR change from baseline (A) and percentage of baseline eGFR (B and C). Data presented as mean and SEM.*

NEFROPATIA

OSA DECLINO eGFR > 10 % IN 2,5 ANNI

25 % PAZ . OSA = DECLINO > 16 %

OSA E' ASSOCIATA IN MODO INDIPENDENTE ALLA NEFROPATIA DIABETICA

eGFR DECLINA PIU' VELOCEMENTE IN PAZIENTI CON OSA

PAZIENTI CHE HANNO MAGGIORE COMPLIANCE ALLA CPAP HANNO UN DECLINO eGFR PIU' LENTO RISPETTO AI NON ADERENTI ALLA CPAP

Obstructive Sleep Apnea, a Risk Factor for Cardiovascular and Microvascular Disease in Patients With Type 2 Diabetes: Findings From a Population-Based Cohort Study

STUDIO DI COORTE DI CURE PRIMARIE UK 2005-18

SCOPO STUDIO: VALUTARE IL RISCHIO DI COMPLICANZE MICROVASCOLARI CARDIOVASCOLARI E MORTALITA' IN PAZIENTI DABETICI TIPO 2 CHE SVILUPPAVANO OSA RISPETTO A QUELLI SENZA OSAS

OUTCOME COMPOSITO CARDIOVASCOLARE, COMPLICANZE MICROVASCOLARI E MORTALITA' TUTTE LE CAUSE

I PAZENTI AFFETTI DA DIABETE TIPO 2 CHE SVILUPPAVANO OSA AVEVANO UN RISCHIO AUMENTATO DI

- **COMPLICANZE MACROVASCOLARI: CAD, SCOMPENSO CARDIACO, ICTUS/TIA, PAD, AF**
- **COMPLICANZE MICROVASCOLARI: NEUROPATIA PERIFERICA, RETINOPATIA, ALBUMINURIA**
- **MORTALITA' PER TUTTE LE CAUSE**

QUESTI PAZIENTI RAPPRESENTANON UNA POPLAZIONE AD ALTO RISCHIO
SULLA QUALE OCCORRE IMPLEMENTARE STRATEGIE DI SCREENING E PREVENZIONE DELL' OSA,
PER MASSIMIZZARE ANCHE GLI INTERVENTI DI PREVENZIONE CARDIOVASCOLARE.

Effects of continuous positive airway pressure therapy on glucose metabolism in patients with obstructive sleep apnoea and type 2 diabetes: a systematic review and meta-analysis

Eur Respir Rev 2023; 32: 230083

Jonas Herth et Al, Department of Pulmonology, University Hospital Zurich

CPAP e COMPENSO

Study	Treatment n	Treatment Mean±SD	Control n	Control Mean±SD	MD (95% CI)	Weight (%)
Banghøj *et al.*, 2020 [19]	29	−0.10±0.44	31	0.10±0.47	−0.20 (−0.43–0.03)	14.59
Zamarron *et al.*, 2022 [17]	76	−0.30±1.31	74	0.10±1.30	−0.40 (−0.82–0.02)	9.61
Chasens *et al.*, 2022 [16]	44	−0.25±0.84	39	0.16±0.89	−0.41 (−0.78–−0.04)	10.69
Lam *et al.*, 2017 [23]	30	−0.30±0.80	31	−0.20±1.09	−0.10 (−0.58–0.38)	8.31
Martínez-Cerón *et al.*, 2016 [15]	24	−0.30±0.63	24	0.00±0.27	−0.30 (−0.57–−0.03)	13.31
Shaw *et al.*, 2016 [13]	119	−0.20±0.44	137	−0.10±0.39	−0.10 (−0.20–0.00)	17.84
Zhao *et al.*, 2022 [18]	30	−1.60±1.57	30	−0.37±0.65	−1.23 (−1.84–−0.62)	6.18
West *et al.*, 2007 [26]	19	−0.02±1.50	21	0.10±0.70	−0.12 (−0.86–0.62)	4.71
Bakker *et al.*, 2020 [27]	26	0.13±0.46	23	0.03±0.33	0.10 (−0.12–0.32)	14.76
Overall					−0.24 (−0.43–−0.06)	

Heterogeneity: t^2=0.05, I^2=71.25%, H^2=3.48

Test of $\theta_i = \theta_j$: Q(8)=22.35, p<0.01

Test of θ=0: z=−2.59, p=0.01

Random-effects REML model

IL TRATTAMENTO DEVE INCLUDERE CAMBIAMENTO DELLO STILE DI VITA , DIETA, CPAP USATA IN MODO REGOLARE E PROLUNGATO – NON SOLO TERAPIA RESPIRATORIA

REVISIONE SISTEMATICA STUDI RANDOMIZZATI-CONTROLLATI FINO 2022 964 PAZIENTI CON OSA E DM2:
6 MESI CPAP MIGLIORANO DI 0,24 % EMOGLOBINA GLICATA MA STRETTAMENTE CORRELATA ALLE ORE DI UTILIZZO PER NOTTE

Review

Obstructive Sleep Apnea and Type 2 Diabetes: An Update

Sandro Gentile [1,2], Vincenzo Maria Monda [3], Giuseppina Guarino [1,2], Ersilia Satta [2], Maria Chiarello [2], Giuseppe Caccavale [2], Edi Mattera [1], Raffaele Marfella [4] and Felice Strollo [5,*]

J. Clin. Med. **2025**, 14, 5574

CPAP e PREVENZIONE

NEL PRE-DIABETE LA CPAP INFLUENZA POSITIVAMENTE IL METABOLISMO DEL GLUCOSIO, MIGLIORANDO SENSIBILITA' ALL' INSULINA INDIPENDENTEMENTE DA OBESITA'

NECESSITA' DI DIAGNOSI PRECOCE DELL' OSA
COSTANTE ADERENZA AL TRATTAMENTO NEI SOGGETTI A RISCHIO DI DIABETE TIPO 2

CPAP Use Tied to Reduced Mortality in T2D and Sleep Apnea

Jonas Agholme, MD, Linköping University, Sweden,, 15-19-09-2025

EASD 2025 VIENNA

CPAP e MORTALITA'

12,388 PAZIENTI DIABETE TIPO 2 e OSA AI QUALI PRESCRITTA CPAP
73,911 PAZIENTI DIABETICI SENZA USO DI CPAP

GRUPPO CPAP ERA PIU' GIOVANE (58 aa vs 65) E BMI MAGGIORE (34 vs 30)

FOLLOW-UP 14 ANNI PER VALUTARE RISCHIO MORTALITA' PER TUTTE LE CAUSE :
6 % DECESSI GRUPPO CPAP vs 29 % GRUPPO NON CPAP

PAZIENTI CHE HANNO UTILIZZATO CPAP CON RISCHIO DI MORTALITA' INFERIORE DEL 26 %
RISPETTO AI PAZIENTI CON DIABETE TIPO 2 CHE NON L'HANNO UTILIZZATA

Sodium-glucose transporter 2 inhibitor for obstructive sleep apnea in patients with type 2 diabetes mellitus: A systematic review and meta-analysis

Ruifeng Yang, Sg*leep Medicine Vol. 138, February 2026, 108708*

GLIFOZINE E OSA

MAGGIORE EFFICACIA SGLT2i NEL RIDURRE AHI E AUMENTARE SpO2 PIU' BASSA RISPETTO ALTRI IPOGLICEM.

IN PAZ. CON DIABETE TIPO 2 TERAPIA CON SGLT2i (DAPAGLIFOZIN) HA RIDOTTO DEL 50 % RISCHIO RELATIVO INSORGENZA DI OSA RISPETTO AL PLACEBO

Cardiovascular Outcomes With SGLT-2 Inhibitors in Patients With Type 2 Diabetes and Obstructive Sleep Apnoea: A Real-World Analysis

Reuben L. Odai et Alt. USA*Diabetes, Obesity and* Metabolism, 2026

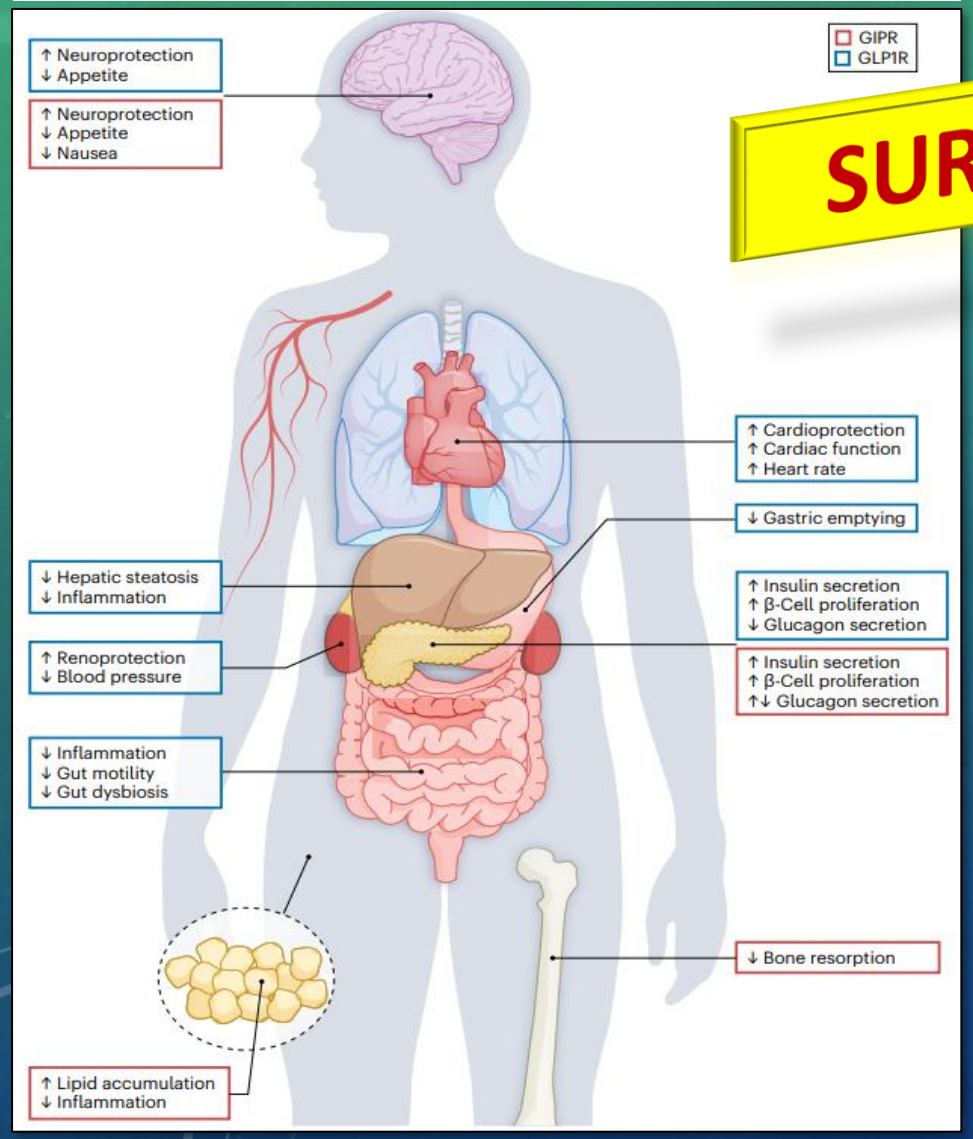
Outcome	SGLT-2i incidence risk	DPP-4i incidence risk	Hazard ratio (95% CI)	*p*
Primary outcomes				
All-cause mortality	0.066	0.135	0.590 (0.563–0.619)	<0.001
MACE	0.155	0.195	0.914 (0.874–0.956)	<0.001
Secondary outcomes				
Heart failure exacerbation	0.116	0.148	0.902 (0.861–0.946)	<0.001
Ischemic stroke/TIA	0.041	0.057	0.862 (0.804–0.923)	<0.001
Haemorrhagic stroke	0.005	0.008	0.779 (0.651–0.931)	0.006
Acute ischemic heart disease	0.054	0.072	0.911 (0.857–0.968)	0.002
PE/DVT	0.036	0.051	0.839 (0.781–0.902)	<0.001
AF/flutter	0.062	0.078	0.952 (0.896–1.011)	0.103
Lower limb amputations	0.007	0.010	0.860 (0.736–1.005)	0.057

105 ORGANIZZAZIONI SANITARIE
USA 2023-2025
MACE 3P
RIDUZIONE RISCHIO A 5 ANNI

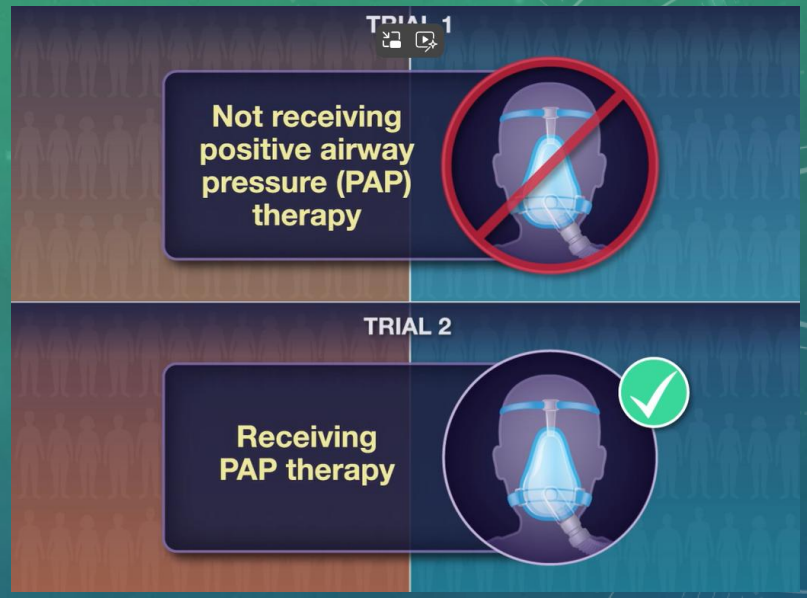
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Tirzepatide for the Treatment of Obstructive Sleep Apnea and Obesity



SURMONT-OSA



2 TRIALS PHASE 3, 469 ADULTS WITH **MODERATE-SEVERE OSA** (AHI > 15 events/hour)
OBESITY (BMI > 30) **WITHOUT DIABETES TIPE 2**, RANDOMISED, DOUBLE-BLIND, PLACEBO CONTROLLED TO EVALUATE THE EFFICACY and SAFETY of TIRZEPATIDE (10 mg or 15 mg) FOR 52 WEEK

ENDPOINT: CHANGE IN AHI FROM BASELINE TO WEEK 52

n engl j med 391;13 nejm.org October 3, 2024

The NEW ENGLAND JOURNAL of MEDICINE

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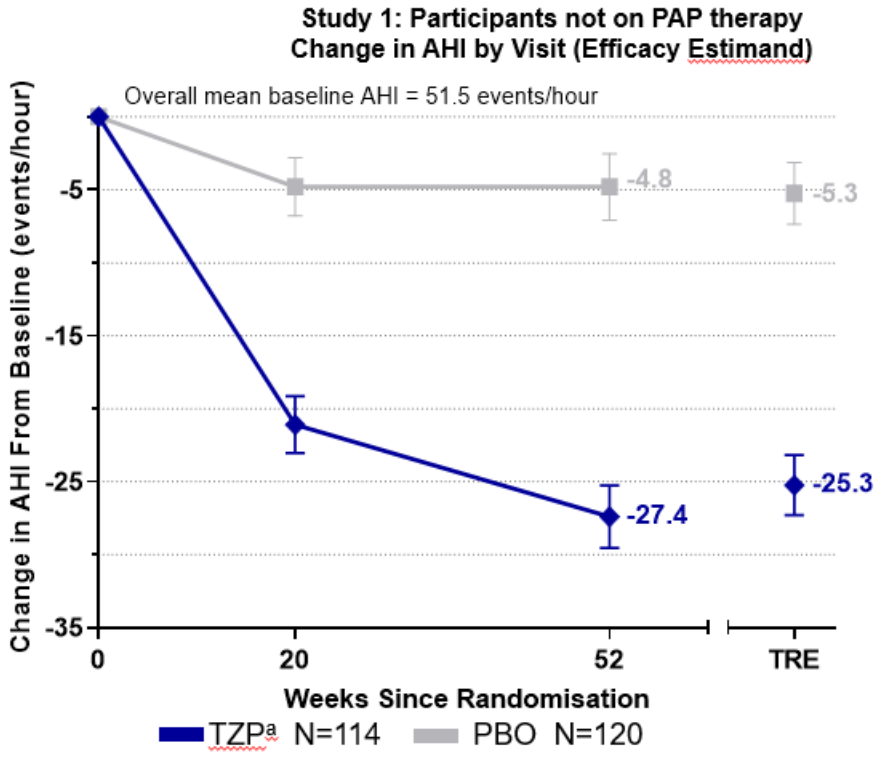
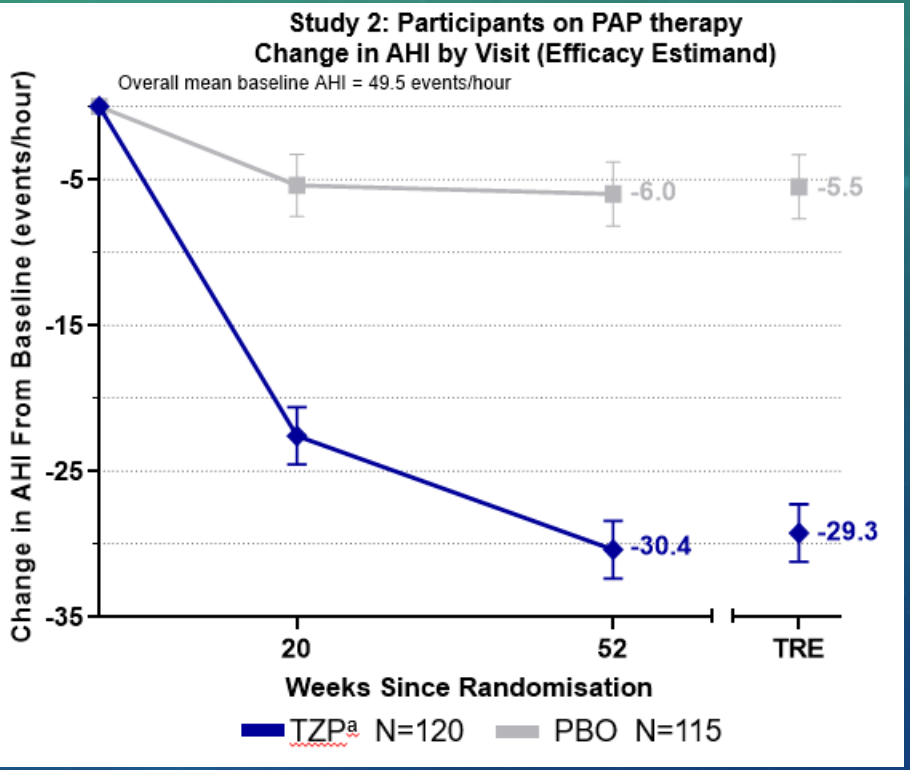


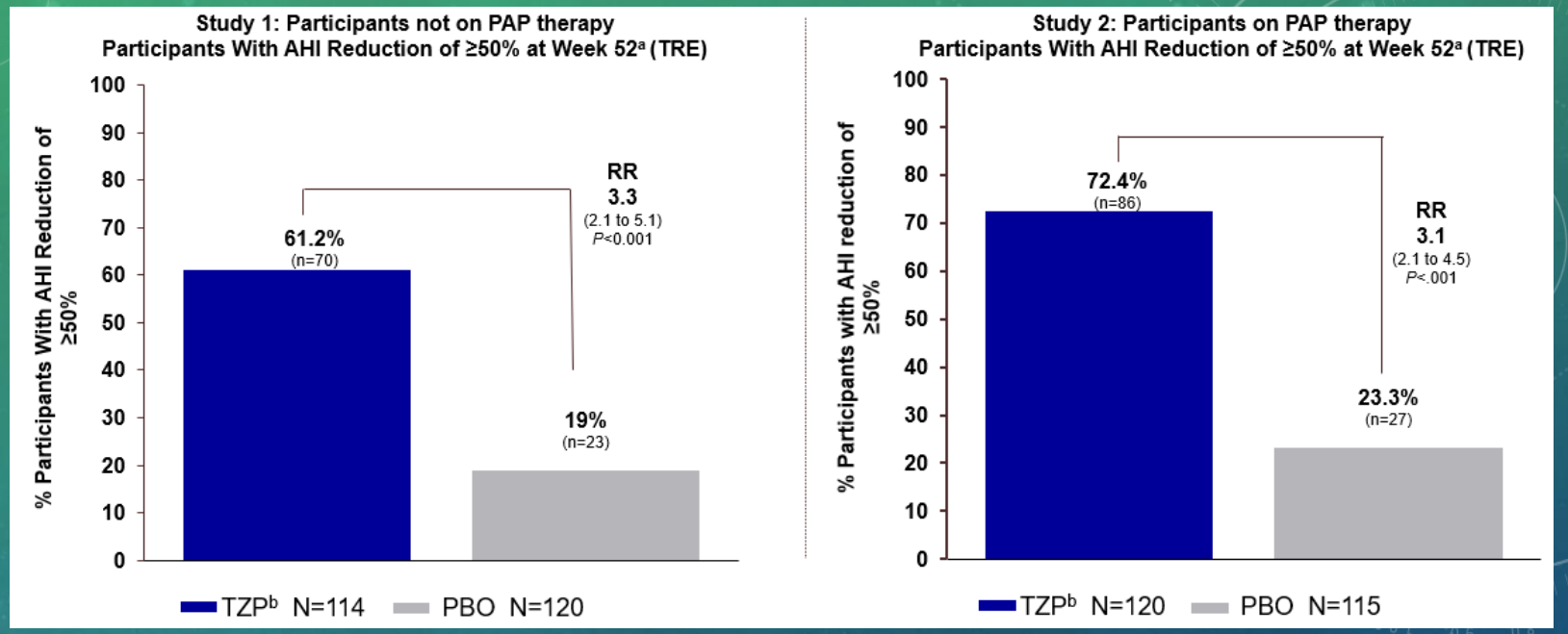


Adults with moderate-to-severe OSA and obesity demonstrated a significant and clinically relevant[a] decrease in AHI with TZP treatment compared to PBO

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Tirzepatide for the Treatment of Obstructive Sleep Apnea and Obesity



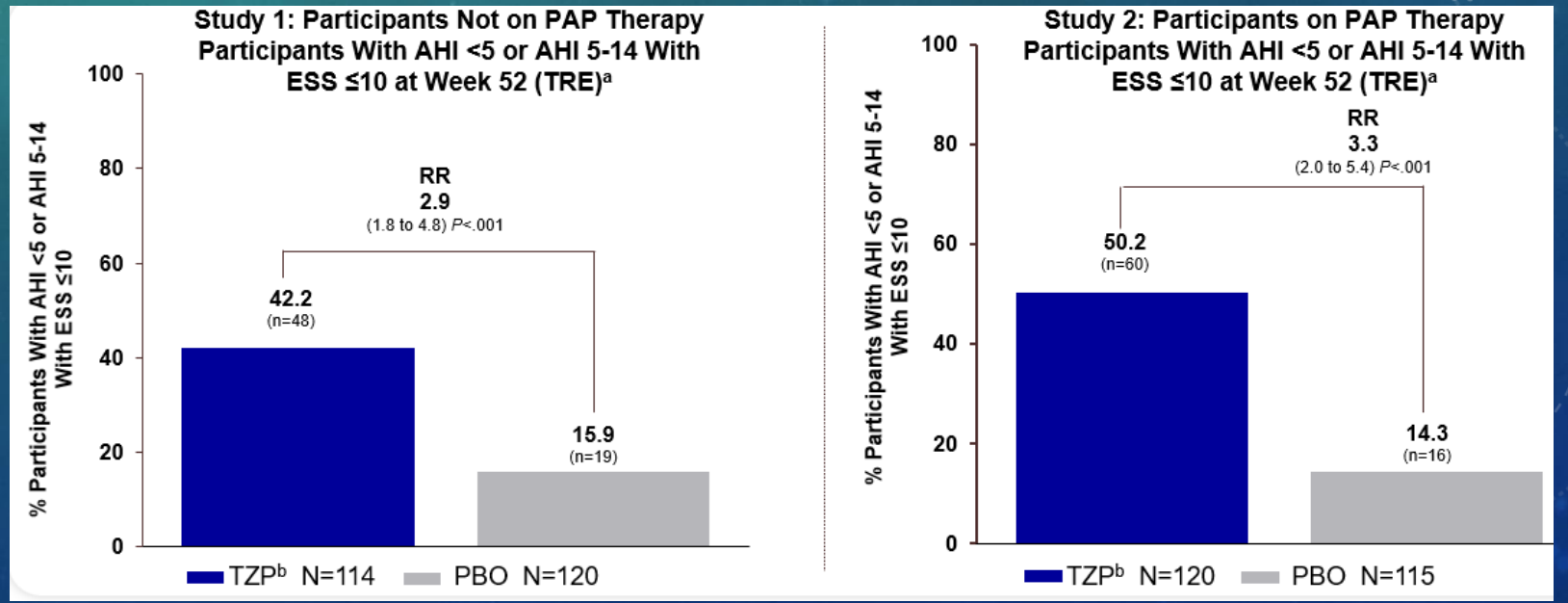
FDA U.S. FOOD & DRUG ADMINISTRATION

FDA NEWS RELEASE

FDA Approves First Medication for Obstructive Sleep Apnea

For Immediate Release: December 20, 2024

ZEBOUND RECEIVED FAST TRACK, PRIORITY REVIEW and BREAKTHROUGH THERAPY DESIGNATIONS FOR THIS INDICATION FROM FDA



ALCUNI DUBBI RIMANGONO….

QUANTO L' ASPETTO ORGANIZZATIVO DI SISTEMA E' CRUCIALE PER LA CURA DEI PAZIENTI DIABETICI COMPLESSI ?

QUANTO PUO' ESSERE AFFIDATO ALLA MEDICINA DI BASE E TERRITORIALITA' ?

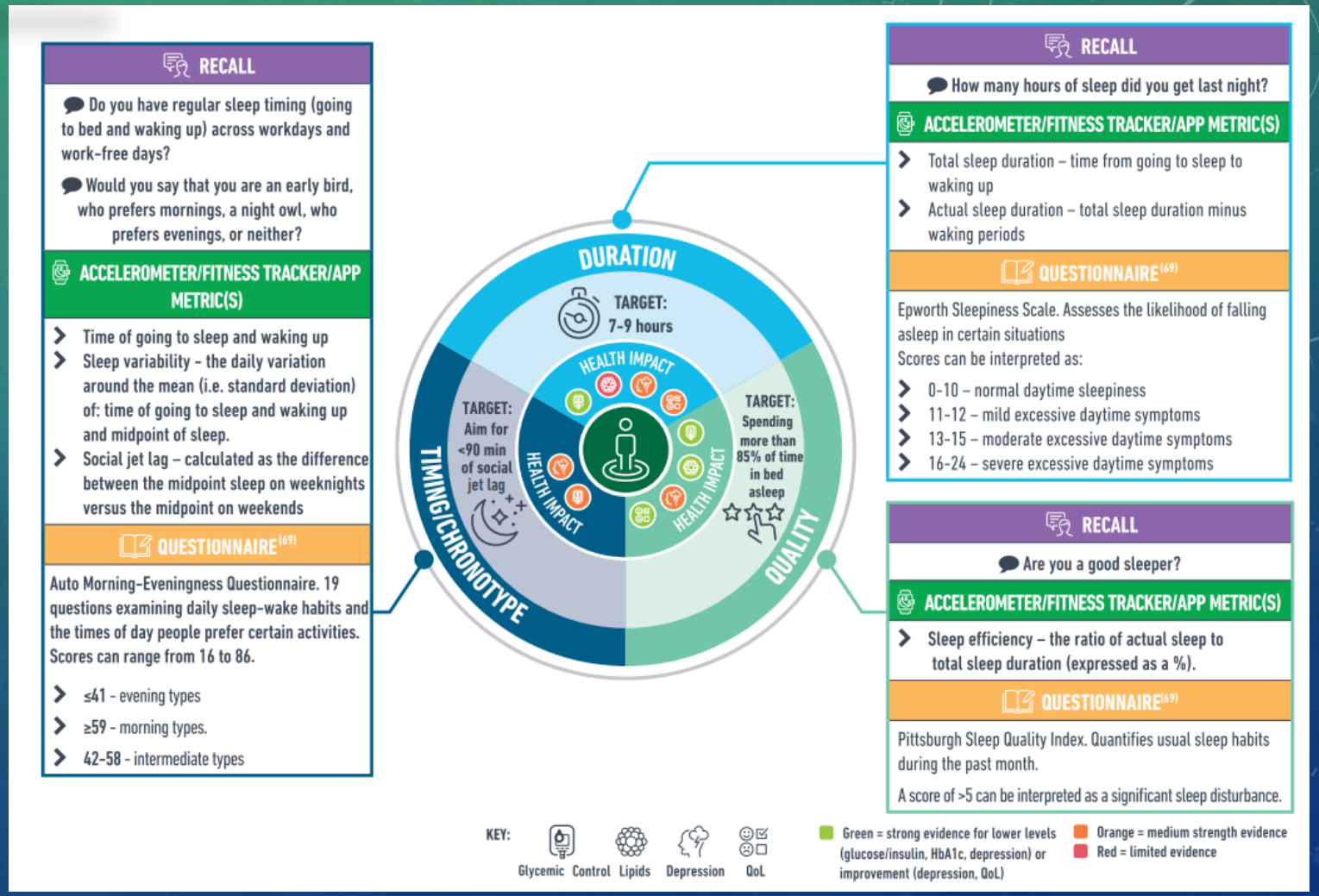
LA TERAPIA EDUCATIVA ? …..infermieri comunità ? Quale formazione ?.....

E' SUFFICIENTE UN PDTA A GOVERNARE LE LISTE d' ATTESA ?

I PAZIENTI SONO DISPOSTI DAVVERO AD ASCOLTARE E CAMBIARE LE ABITUDINI NON SALUTARI ????

Diabetes Care — American Diabetes Association

Waking Up to the Importance of Sleep in Type 2 Diabetes Management: A Narrative Review



GRAZIE PER L'ATTENZIONE !!