Entitlement Eligibility Guideline

Sleep-Related Breathing Disorders

Date reviewed: 29 July 2025

Date created: 22 January 2025

ICD-11 **codes:** 7A40, 7A41

VAC medical code:

78050	Obstructive sleep apnea syndrome, central sleep apnea syndrome, mixed sleep apnea syndrome

Definition

Sleep-related breathing disorders are a spectrum of breathing disorders, with most falling into the categories of obstructive sleep apnea (OSA), central sleep apnea (CSA), or sleep-related hypoventilation. OSA is the most common sleep-related breathing disorder and is characterized by pauses of breathing during sleep.

In mixed sleep apnea, individuals experience characteristics of both OSA and CSA; the diagnosis can be challenging to make because symptoms overlap or shift between the two types.

For the purposes of this entitlement eligibility guideline (EEG), the following conditions are included:

- obstructive sleep apnea (OSA)
- central sleep apnea (CSA)
- mixed sleep apnea.

Note:

- For Veterans Affairs Canada (VAC) purposes, equivalent diagnoses for mixed sleep apnea include:
    - treatment-emergent CSA
    - complex sleep apnea.
- Mixed sleep apnea may be entitled using OSA and/or CSA Section A factors.

Exclusions:

- sleep-related hypoventilation
- obesity hypoventilation.

Anatomy and physiology

Normal breathing during sleep involves a rhythmic and regular pattern of inhalation of oxygen and exhalation of carbon dioxide. The respiratory system works to maintain adequate oxygen levels in the body and remove carbon dioxide, promoting a restful and restorative sleep. Sleep-related breathing disorders are conditions that affect the normal pattern of breathing during sleep. These disorders can range from mild to severe and may lead to disruptions in sleep, drops in oxygen levels (called desaturations), and other health complications.

Breathing during sleep involves a complex interplay of respiratory, neurological, and muscular systems. The process is regulated by the brain to ensure proper oxygenation and carbon dioxide elimination. Air enters the mouth or nose during sleep with nasal passages filtering and humidifying the incoming air. The oropharynx (throat) connects the mouth and nose to the larynx, acting as a pathway for air to enter the lungs. The upper airway refers to the portion of the respiratory system that is located above the level of the trachea (windpipe). The diaphragm and intercostal muscles act as the primary muscles for breathing.

OSA results from repetitive closures of the upper airway during sleep, often resulting in snoring and lower oxygen levels. The muscles of the upper airway relax, causing the airway to close during inspiration which can lower the oxygen level in the blood and increase carbon dioxide levels. If vigorous inspiratory efforts continue against an obstructed airway, large swings in intrathoracic pressure occur. The swing in pressure stresses the cardiovascular system, causing brief periods of brain activation and wakening. This awakening is usually so brief that it is not remembered but causes fragmented sleep.

Obstruction of the upper airway can occur when the baseline cross-sectional area of the airway is reduced. Contributors can include enlarged tonsils or soft tissues, alterations in the craniofacial bony structures, and nasal obstruction. Muscles that maintain the upper airway can also be affected by certain drugs, medications, and medical and mental health conditions.

CSA is a less common form of sleep-related breathing disorder caused by intermittent pauses in the brain’s respiratory centres, rather than obstruction of the upper airway. The sensors in the brain controlling breathing during sleep are impacted and interfere with normal ventilation. CSA causes an alternation of hyper and hypoventilation.

Obstructive sleep apnea

Diagnostic standard for obstructive sleep apnea

Diagnosis for obstructive sleep apnea

A diagnosis from a qualified physician, nurse practitioner, or physician assistant (within their scope of practice) is required.

Diagnostic considerations for obstructive sleep apnea

History and physical examination alone are insufficient to make a definitive diagnosis of OSA. Formal sleep testing by polysomnography or home sleep apnea device testing reported by a physician is required for diagnosis.

A definitive diagnosis requires objective evidence based on polysomnography reporting of the apnea-hypopnea index (AHI) or respiratory disturbance index (RDI). Alternatively, home sleep apnea devices reporting the respiratory event index (REI) may also be used.

Diagnostic criteria for obstructive sleep apnea

The *International classification of sleep disorders* provides diagnostic criteria for OSA.

Currently, in adults (> 18 years), OSA is diagnosed when the frequency of obstructive events (apneas, hypopneas or respiratory-event related arousals) is greater than 15 per hour.

The disorder may also be diagnosed when the frequency is greater than five per hour and:

a) symptoms attributable to the disorder (e.g., sleepiness or sleep disruption) are present
b) nocturnal respiratory distress or observed apnea/habitual snoring are reported
c) when hypertension, a mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type two diabetes mellitus are present.

Clinical features for obstructive sleep apnea

OSA involves the repetitive narrowing and collapse of the upper airway during sleep. This results in decreased airflow (hypopnea) or cessation of airflow (apnea) with subsequent sleep disruption and disturbances in the normal breathing gas

exchange. Impaired gas exchange results in lower blood oxygen levels (hypoxemia) and higher blood carbon dioxide levels (hypercapnia).

Individuals with untreated OSA often feel symptoms of being unrested, fatigued, and sleepy during the daytime. Most people with OSA complain of daytime sleepiness, or their bed partner reports loud snoring, gasping, choking, snorting, or interruptions in breathing while sleeping. Up to one third of people with untreated OSA will also report morning headaches, commonly bifrontal and squeezing in quality. While no single symptom or sign can sufficiently predict the diagnosis of OSA, symptoms of OSA tend to increase as OSA severity increases.

People with untreated OSA may suffer from impairments in vigilance, concentration, cognitive function, social interactions, and quality of life. Diminished daytime function can translate into higher rates of job-related and motor vehicle accidents.

Untreated OSA is associated with an increased risk of developing cardiovascular disease, including difficult-to-control (also called refractory) blood pressure, coronary artery disease, congestive heart failure, arrhythmias, stroke, and metabolic dysregulation which affects glucose control and risk for diabetes. These risks are mitigated with accurate diagnosis and treatment.

OSA is more common in males than females with an approximately two to threefold higher risk for males. OSA tends to be less severe in premenopausal females or females receiving hormone replacement treatment compared to untreated postmenopausal females. While snoring and excessive daytime sleepiness are considered hallmarks of OSA, females are more likely to report non-specific symptoms of sleep apnea including headache, fatigue, depression, anxiety, and sleep disruption which contributes to an underdiagnosis of OSA in females. The prevalence of OSA also varies by ethnicity and with increasing rates of obesity.

Increased OSA risk has been observed in senior officers, army personnel, and those with a history of deployment.

Entitlement considerations for obstructive sleep apnea

Section A: Causes and/or aggravation for obstructive sleep apnea

For VAC entitlement purposes, the following factors are accepted to cause or aggravate OSA **and** mixed sleep apnea, and may be considered along with the evidence to assist in establishing a relationship to service. The factors have been determined based on a review of up-to-date scientific and medical literature, as well as evidence-based medical best practices. Factors other than those listed may be considered, however consultation with a disability consultant or medical advisor is recommended.

The timelines cited below are for guidance purposes. Each case should be adjudicated on the evidence provided and its own merits.

Factors for obstructive sleep apnea

1. Having **trauma or injury resulting in chronic craniofacial or upper airway abnormalities** at the time of the clinical onset or aggravation of OSA and mixed sleep apnea. The upper airway includes the nasal cavity, nasopharynx, oropharynx, hypopharynx, or larynx. Examples of anatomical abnormalities of the upper airway include alterations to the mandibular and maxillary size and position, narrowed nasal cavities, and tonsillar and adenoid hypertrophy.

2. Having **chronic nasal congestion, obstruction, or chronic narrowing** of the upper airway at the time of clinical onset or aggravation of OSA and mixed sleep apnea.

3. Having a **neuromuscular disease** affecting the diaphragm, other respiratory muscles, or upper airway muscles at the time of the clinical onset or aggravation of OSA and mixed sleep apnea. Examples include but are not limited to myasthenia gravis and motor neuron disease.

4. Having **end stage chronic kidney disease** at the time of the clinical onset or aggravation of OSA and mixed sleep apnea. End stage chronic kidney disease means having a glomerular filtration rate (GFR) of less than 15 ml/min/1.73m^2 for at least three months or in need of ongoing dialysis or renal transplantation.

5. Having **congestive heart failure** at the time of clinical onset or aggravation of OSA and mixed sleep apnea.

6. Having a clinically significant **psychiatric condition** prior to clinical onset or aggravation of OSA and mixed sleep apnea.

   Note: For VAC purposes, clinically significant means requiring ongoing treatment and clinical management.

7. Having a history of **moderate to severe** **traumatic brain injury** at time of clinical onset or aggravation of OSA and mixed sleep apnea.

8. Having **class 3/severe obesity** (defined as body mass index [BMI] of 40 or greater) at the time of clinical onset or aggravation of OSA and mixed sleep apnea.

9. Using **medication** from the specified list below before the clinical onset or aggravation of OSA and mixed sleep apnea. The medications include, but are not limited to, the following:

- benzodiazepines
- hypnotics
- opiates.

Note:

- Individual medications may belong to a class of medications. The effects of a specific medication may vary from the class. The effects of the specific medication should be considered.
- If it is claimed a medication resulted in the clinical onset or aggravation of OSA or mixed sleep apnea, the following must be established:

    - the medication was prescribed to treat an entitled condition
    - the individual was receiving the medication at the time of the clinical onset or aggravation of the OSA
    - the current medical literature supports this medication can result in the clinical onset or aggravation of OSA
    - the medication use is long-term, ongoing, and cannot reasonably be replaced with another medication or the medication is known to have enduring effects after discontinuation.

10. Inability to obtain **appropriate clinical management** of OSA and mixed sleep apnea.

Section B: Medical conditions which are to be included in entitlement/assessment of obstructive sleep apnea

Section B provides a list of diagnosed medical conditions which are considered for VAC purposes to be included in the entitlement and assessment of OSA **and** mixed sleep apnea.

- Central sleep apnea (CSA)
- Mixed sleep apnea/treatment-emergent CSA/complex sleep apnea

Section C: Common medical conditions which may result, in whole or in part, from obstructive sleep apnea and/or its treatment

Section C is a list of conditions which can be caused or aggravated by OSA **and** mixed sleep apnea and/or their treatment. Conditions listed in Section C are not included in the entitlement and assessment of OSA and mixed sleep apnea. A consequential entitlement decision may be considered where the individual merits and the medical evidence of the case support a consequential relationship.

Conditions other than those listed in Section C may be considered; consultation with a disability consultant or medical advisor is recommended.

- Hypertension
- Cardiac arrhythmia
- Ischemic heart disease
- Pulmonary hypertension

Central sleep apnea

Diagnostic standard for central sleep apnea

Diagnosis for central sleep apnea

A diagnosis from a qualified physician, nurse practitioner, or physician assistant (within their scope of practice) is required.

Diagnosis consideration for central sleep apnea

History and physical examination alone are insufficient to make a definitive diagnosis. Formal sleep testing by polysomnography or home sleep apnea device testing reported by a physician is required for diagnosis.

A definitive diagnosis requires objective evidence based on polysomnography reporting of the apnea-hypopnea index (AHI) or respiratory disturbance index (RDI). Alternatively, home sleep apnea devices capable of differentiating OSA from CSA may also be used. Respiratory event index (REI) may be used.

Diagnostic criteria for central sleep apnea

The *International Classification of Sleep Disorders* lists the diagnostic criteria for all subtypes of CSA. The symptoms and polysomnographic features are nearly identical for the various CSA subtypes. Subtypes include primary CSA, CSA with Cheyne-Stokes breathing, CSA due to high-altitude periodic breathing, CSA due to a medication or substance.

The existing diagnostic criteria address CSA as a sole condition. A significant proportion of individuals with CSA, however, have mixed sleep apnea or complex sleep apnea. In mixed sleep apnea, individuals experience characteristics of both OSA and CSA; diagnosis can be challenging to make because symptoms overlap or shift between the two types.

Clinical features for central sleep apnea

CSAs are characterized by a reduction or cessation of airflow due to absent or reduced respiratory effort. Central apnea (cessation of airflow) or hypopnea (reduction in airflow) may occur in a cyclical or intermittent fashion. The key feature of CSA is a lack of drive to breathe while asleep which results in repeated periods of absent airflow. Although common, CSA is less common than OSA and is often associated with other medical conditions, especially congestive heart failure, stroke, and opioid medications.

CSA encompasses various subtypes with different etiologies, pathophysiology, and treatments. The subtypes of CSA disorders diagnosed in adults are:

- primary central sleep apnea
- central sleep apnea with Cheyne-Stokes breathing
- central sleep apnea due to high altitude breathing
- central sleep apnea due to a medication or substance
- central sleep apnea due to a medical disorder without Cheyne-Stokes breathing
- treatment-emergent central sleep apnea.

Excessive daytime sleepiness is a common feature of CSA and can often go unnoticed or underestimated because of its insidious onset and chronicity. In addition to daytime sleepiness, other symptoms of disrupted sleep may be present, including symptoms of poor sleep quality, fatigue, inattention, poor concentration, moodiness, and decreased libido. Morning headaches may be present and bed partners may report periods of apnea.

CSA should be suspected in people with unexplained daytime sleepiness and risk factors for CSA such as heart failure or chronic use of opioids. CSA may occur in a cyclical or intermittent pattern. Individuals with CSA of various etiologies may also exhibit obstructive events, in which case diagnoses of mixed sleep apnea may be given.

The prevalence of symptomatic CSA appears to be higher in older adults, males, and those individuals with certain comorbid medical conditions such as heart failure, and patients who chronically use opioids.

Entitlement considerations for central sleep apnea

Section A: Causes and/or aggravation for central sleep apnea

For VAC entitlement purposes, the following factors are accepted to cause or aggravate CSA **and** mixed sleep apnea, and may be considered along with the evidence to assist in establishing a relationship to service. The factors have been determined based on a review of up-to-date scientific and medical literature, as well

as evidence-based medical best practices. Factors other than those listed may be considered, however consultation with a disability consultant or medical advisor is recommended.

The timelines cited below are for guidance purposes. Each case should be adjudicated on the evidence provided and its own merits.

Factors for central sleep apnea

1. Having a **central nervous system lesion or disorder** at the time of onset or clinical aggravation of CSA and mixed sleep apnea. Central nervous system lesions or disorders can include moderate to severe traumatic brain injuries, spinal cord injuries involving the cervical spine, or tumours/lesions of the cervical spine.

2. Having **congestive heart failure** at the time of clinical onset or aggravation of CSA and mixed sleep apnea.

3. Having a **cerebrovascular accident**, also known as a **stroke**, at the time of clinical onset or aggravation of CSA and mixed sleep apnea.

4. Having **end stage chronic kidney disease** at the time of the clinical onset or aggravation of CSA and mixed sleep apnea. End stage chronic kidney disease means having a glomerular filtration rate (GFR) of less than 15 mL/min/1.73m^2 for at least three months or in need of ongoing dialysis or renal transplantation.

5. Using **medication** from the specified list below before the clinical onset or aggravation of CSA and mixed sleep apnea. The medications include, but are not limited to, the following:

    - benzodiazepines
    - hypnotics
    - opiates.

    Note:

    - Individual medications may belong to a class of medications. The effects of a specific medication may vary from the class. The effects of the specific medication should be considered.
    - If it is claimed a medication resulted in the clinical onset or aggravation of CSA or mixed sleep apnea, the following must be established:

        - the medication was prescribed to treat an entitled condition
        - the individual was receiving the medication at the time of the clinical onset or aggravation of the CSA

- the current medical literature supports the medication can result in the clinical onset or aggravation of CSA
- the medication use is long-term, ongoing, and cannot reasonably be replaced with another medication or the medication is known to have enduring effects after discontinuation.

6. Inability to obtain **appropriate clinical management** of CSA and mixed sleep apnea.

Section B: Medical conditions which are to be included in entitlement/assessment of central sleep apnea

Section B provides a list of diagnosed medical conditions which are considered for VAC purposes to be included in the entitlement and assessment of CSA **and** mixed sleep apnea.

- Obstructive sleep apnea (OSA)
- Mixed sleep apnea/treatment-emergent CSA/complex sleep apnea

Section C: Common medical conditions which may result, in whole or in part, from central sleep apnea and/or its treatment

Section C is a list of conditions which can be caused or aggravated by CSA **and** mixed sleep apnea and/or their treatment. Conditions listed in Section C are not included in the entitlement and assessment of CSA and mixed sleep apnea. A consequential entitlement decision may be considered where the individual merits and the medical evidence of the case support a consequential relationship.

Conditions other than those listed in Section C may be considered; consultation with a disability consultant or medical advisor is recommended.

- Hypertension
- Cardiac arrhythmia
- Pulmonary hypertension

Links

Related VAC Guidance and Policy:

- Adjustment Disorder – Entitlement Eligibility Guidelines
- Anxiety Disorders – Entitlement Eligibility Guidelines
- Bipolar and Related Disorders – Entitlement Eligibility Guidelines
- Depressive Disorders – Entitlement Eligibility Guidelines
- Feeding and Eating Disorders – Entitlement Eligibility Guidelines

- Hypertension – Entitlement Eligibility Guidelines
- Ischemic Heart Disease – Entitlement Eligibility Guidelines
- Posttraumatic Stress Disorder – Entitlement Eligibility Guidelines
- Schizophrenia – Entitlement Eligibility Guidelines
- Substance Use Disorders – Entitlement Eligibility Guidelines
- Traumatic Brain Injury – Entitlement Eligibility Guidelines
- Pain and Suffering Compensation– Policies
- Royal Canadian Mounted Police Disability Pension Claims – Policies
- Dual Entitlement – Disability Benefits - Policies
- Establishing the Existence of a Disability – Policies
- Disability Benefits in Respect of Peacetime Military Service – The Compensation Principle – Policies
- Disability Benefits in Respect of Wartime and Special Duty Service – The Insurance Principle – Policies
- Disability Resulting from a Non-Service Related Injury or Disease – Policies
- Consequential Disability – Policies
- Benefit of Doubt – Policies

References as of 22 January 2025

Abbasi, A., Gupta, S. S., Sabharwal, N., Meghrajani, V., Sharma, S., Kamholz, S., & Kupfer, Y. (2021). A comprehensive review of obstructive sleep apnea. *Sleep Science (Sao Paulo, Brazil)*, *14*(2), 142–154. PMID: 34381578

Alexander, M., Ray, M. A., Hébert, J. R., Youngstedt, S. D., Zhang, H., Steck, S. E., Bogan, R. K., & Burch, J. B. (2016). The National Veteran Sleep Disorder Study: Descriptive Epidemiology and Secular Trends, 2000-2010. Sleep, 39(7), 1399–1410. https://doi.org/10.5665/sleep.5972

American of Sleep Medicine. (2014). *Internal Classification of Sleep Disorders* (3rd Ed). American Academy of Sleep Medicine.

Australian Government Repatriation Medical Authority (2022). Statement of Principles concerning Sleep Apnoea (Balance of Probabilities) (No. 69 of 2022). SOPs - Repatriation Medical Authority

Australian Government Repatriation Medical Authority (2022). Statement of Principles concerning Sleep Apnoea (Reasonable Hypothesis) (No. 68 of 2022). SOPs - Repatriation Medical Authority

Ayub, S., & Won, C. H. (2019). Obstructive Sleep Apnea in Women. Journal of Sleep Medicine, 16(2), 75–80. https://doi.org/10.13078/jsm.190047

Benca, R. M., Krystal, A., Chepke, C., & Doghramji, K. (2023). Recognition and Management of Obstructive Sleep Apnea in Psychiatric Practice. The Journal of Clinical Psychiatry, 84(2), 45191.

Bixler, E. O., Vgontzas, A. N., Lin, H. M., Ten Have, T., Rein, J., Vela-Bueno, A., & Kales, A. (2001). Prevalence of sleep-disordered breathing in women: Effects of gender. American Journal of Respiratory and Critical Care Medicine, 163(3 Pt 1), 608–613. https://doi.org/10.1164/ajrccm.163.3.9911064

Bonsignore, M. R., Baiamonte, P., Mazzuca, E., Castrogiovanni, A., & Marrone, O. (2019). Obstructive sleep apnea and comorbidities: A dangerous liaison. Multidisciplinary Respiratory Medicine, 14, 8. https://doi.org/10.1186/s40248-019-0172-9

Brooker, E. J., Landry, S. A., Mann, D., Prguda, E., Mcleay, S. C., Drummond, S. P., & Edwards, B. A. (2024). The obstructive sleep apnoea endotypes are similar in elderly trauma-exposed veterans with and without diagnosed PTSD. Sleep Medicine.

Brown, C. A., Berry, R., & Schmidt, A. (2013). Sleep and Military Members: Emerging Issues and Nonpharmacological Intervention. Sleep Disorders, 2013, 1–6. https://doi.org/10.1155/2013/160374

Cairns, A., Sarmiento, K., & Bogan, R. (2017). Utility of home sleep apnea testing in high-risk veterans. Sleep & breathing = Schlaf & Atmung, 21(3), 647–655. https://doi.org/10.1007/s11325-017-1467-8

Caldwell, J. A., Knapik, J. J., Shing, T. L., Kardouni, J. R., & Lieberman, H. R. (2019). The association of insomnia and sleep apnea with deployment and combat exposure in the entire population of US army soldiers from 1997 to 2011: a retrospective cohort investigation. Sleep, 42(8), zsz112.

Caldwell, J.A., Knapik, J. J., & Lieberman, H. R. (2017). Trends and factors associated with insomnia and sleep apnea in all United States military service members from 2005 to 2014. Journal of sleep research, 26(5), 665-670.

Capaldi, V. F., & Simonelli, G. (2023). Sleep Disorders. Veteran and Military Mental Health: A Clinical Manual, 329-345.

Capener, D. C., Brock, M. S., Hansen, S. L., Matsangas, P., & Mysliwiec, V. (2018). An Initial Report of Sleep Disorders in Women in the U.S. Military. Military medicine, 183(9-10), e266–e271. https://doi.org/10.1093/milmed/usx116

Chao, L. L., Abadjian, L. R., Esparza, I. L., & Reeb, R. (2016). Insomnia Severity, Subjective Sleep Quality, and Risk for Obstructive Sleep Apnea in Veterans With Gulf War Illness. Military medicine, 181(9), 1127–1134. https://doi.org/10.7205/MILMED-D-15-00474

Chapleau, R. R., & Regn, D. D. (2022). Integrating the precision, sleep, and aerospace medicine fields: a systematic review of the genetic predisposition for obstructive sleep apnea in military aviation. Sleep and Breathing, 1-8.

Chen, W., Cai, X., Yan, H., & Pan, Y. (2021). Causal effect of obstructive sleep apnea on atrial fibrillation: a Mendelian randomization study. Journal of the American Heart Association, 10(23), e022560.

Chinoy, E. D., Carey, F. R., Kolaja, C. A., Jacobson, I. G., Cooper, A. D., & Markwald, R. R. (2022). The bi-directional relationship between post-traumatic stress disorder and obstructive sleep apnea and/or insomnia in a large US military cohort. Sleep Health, 8(6), 606-614.

Colvonen, P. J., Masino, T., Drummond, S. P., Myers, U. S., Angkaw, A. C., & Norman, S. B. (2015). Obstructive Sleep Apnea and Posttraumatic Stress Disorder among OEF/OIF/OND Veterans. Journal of clinical sleep medicine: JCSM : official publication of the American Academy of Sleep Medicine, 11(5), 513–518. https://doi.org/10.5664/jcsm.4692

Creamer, J. L., Brock, M. S., Matsangas, P., Motamedi, V., & Mysliwiec, V. (2018). Nightmares in United States Military Personnel With Sleep Disturbances. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine, 14(3), 419–426. https://doi.org/10.5664/jcsm.6990

Crump, C., Sundquist, J., Winkleby, M. A., & Sundquist, K. (2019). Cardiorespiratory fitness and long-term risk of sleep apnea: A national cohort study. Journal of sleep research, 28(6), e12851. https://doi.org/10.1111/jsr.12851

During, E. H., & Kushida, C. A. (Eds.). (2021). Clinical sleep medicine : a comprehensive guide for mental health and other medical professionals (First edition.). American Psychiatric Association Publishing.

Dursunoglu, N., Ozkurt, S., & Sarikaya, S. (2009). Is the clinical presentation different between men and women admitting to the sleep laboratory? Sleep &

Breathing = Schlaf & Atmung, 13(3), 295–298. https://doi.org/10.1007/s11325-008-0243-1

Foster, S. N., Hansen, S. L., Capener, D. C., Matsangas, P., & Mysliwiec, V. (2017). Gender differences in sleep disorders in the US military. Sleep health, 3(5), 336–341. https://doi.org/10.1016/j.sleh.2017.07.015

Garbarino, S., & Magnavita, N. (2019). Sleep problems are a strong predictor of stress-related metabolic changes in police officers. A prospective study. PLoS One, 14(10), e0224259.

Garcia, A., Reljic, T., Pogoda, T. K., Kenney, K., Agyemang, A., Troyanskaya, M., Belanger, H. G., Wilde, E. A., Walker, W. C., & Nakase-Richardson, R. (2020). Obstructive Sleep Apnea Risk Is Associated with Cognitive Impairment after Controlling for Mild Traumatic Brain Injury History: A Chronic Effects of Neurotrauma Consortium Study. Journal of neurotrauma, 37(23), 2517–2527. https://doi.org/10.1089/neu.2019.6916

Giampá, S. Q., Lorenzi-Filho, G., & Drager, L. F. (2023). Obstructive sleep apnea and metabolic syndrome. Obesity, 31(4), 900-911.

Good, C. H., Brager, A. J., Capaldi, V. F., & Mysliwiec, V. (2020). Sleep in the United States military. Neuropsychopharmacology, 45(1), 176-191.

Haynes, Z. A., Stewart, I. J., Poltavskiy, E. A., Holley, A. B., Janak, J. C., Howard, J. T., ... & Collen, J. F. (2022). Obstructive sleep apnea among survivors of combat-related traumatic injury: a retrospective cohort study. Journal of clinical sleep medicine, 18(1), 171-179.

Horan, K. A., Schlenk, M. A., Collette, T. L., Channer, B. C., Sanchez-Cardona, I., & Moore, B. A. (2023). Expanding Behavioral and Occupational Health Research in Military Police. Military Medicine, usad312.

Huang, Y., Xu, J., Zheng, S., Xu, S., Wang, Y., Du, J., Xiao, L., Zhang, R., Wang, H., Tang, Y., & Su, T. (2021). The risk factors for insomnia and sleep-disordered breathing in military communities: A meta-analysis. PLOS ONE, 16(5), e0250779. https://doi.org/10.1371/journal.pone.0250779

Jara, S. M., Phipps, A. I., Maynard, C., & Weaver, E. M. (2020). The Association of Sleep Apnea and Cancer in Veterans. Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery, 162(4), 581–588. https://doi.org/10.1177/0194599819900487

Kapur, V. K., Auckley, D. H., Chowdhuri, S., Kuhlmann, D. C., Mehra, R., Ramar, K., & Harrod, C. G. (2017). Clinical Practice Guideline for Diagnostic Testing for Adult Obstructive Sleep Apnea: An American Academy of Sleep Medicine Clinical Practice Guideline. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine, 13(3), 479–504. https://doi.org/10.5664/jcsm.6506

Klawe, J. J., Laudencka, A., Miskowiec, I., & Tafil-Klawe, M. (2005). Occurrence of obstructive sleep apnea in a group of shift worked police officers. Journal of Physiology and Pharmacology, 56, 115.

Kline, L.R. (2023). Clinical presentation and diagnosis of obstructive sleep apnea in adults.

Knapik, J. J., Caldwell, J. A., Steelman, R. A., Trone, D. W., Farina, E. K., & Lieberman, H. R. (2023). Short sleep duration is associated with a wide variety of medical conditions among United States military service members. Sleep Medicine, 101, 283-295.

Kumar, S., Anton, A., & D'Ambrosio, C. M. (2021). Sex differences in obstructive sleep apnea. Clinics in Chest Medicine, 42(3), 417-425.

Kushida, C. A. (2009). Handbook of sleep disorders. (2nd ed.). Informa Healthcare. https://doi.org/10.3109/9781420019926

Lande R. G. (2014). Sleep problems, posttraumatic stress, and mood disorders among active-duty service members. The Journal of the American Osteopathic Association, 114(2), 83–89. https://doi.org/10.7556/jaoa.2014.021

Langton, R. S., Neyra, J., Downs, J. W., & Niebuhr, D. W. (2016). The relationship between enlistment body mass index and the development of obstructive sleep apnea in the US Military. Military medicine, 181(8), 913-919.

Lettieri, C. J., Eliasson, A. H., Andrada, T., Khramtsov, A., Raphaelson, M., & Kristo, D. A. (2005). Obstructive sleep apnea syndrome: are we missing an at-risk population?. Journal of Clinical Sleep Medicine, 1(04), 381-385.

Li, D., Kuang, B., Lobbezoo, F., de Vries, N., Hilgevoord, A., & Aarab, G. (2023). Sleep bruxism is highly prevalent in adults with obstructive sleep apnea: a large-scale polysomnographic study. Journal of Clinical Sleep Medicine, 19(3), 443-451.

Lindberg, E., Benediktsdottir, B., Franklin, K. A., Holm, M., Johannessen, A., Jögi, R., Gislason, T., Real, F. G., Schlünssen, V., & Janson, C. (2017). Women with symptoms of sleep-disordered breathing are less likely to be diagnosed and treated for sleep apnea than men. Sleep Medicine, 35, 17–22. https://doi.org/10.1016/j.sleep.2017.02.032

Liu, W. N., Lin, K. H., Tsai, K. Z., Chu, C. C., Chang, Y. C., Kwon, Y., & Lin, G. M. (2023). High risk for obstructive sleep apnea and risk of hypertension in military personnel: The CHIEF sleep study. World Journal of Clinical Cases, 11(30), 7309-7317.

Martin, J. L., Carlson, G., Kelly, M., Fung, C. H., Song, Y., Mitchell, M. N., ... & Yano, E. M. (2021). Sleep apnea in women veterans: results of a national survey of VA health care users. Journal of Clinical Sleep Medicine, 17(3), 555-565.

Miles, S. R., Silva, M. A., Lang, B., Hoffman, J. M., Venkatesan, U. M., Sevigny, M., & Nakase-Richardson, R. (2021). Sleep apnea and posttraumatic stress after traumatic brain injury (TBI): A Veterans Affairs TBI Model Systems study. Rehabilitation psychology, 66(4), 450.

Mitra, A. K., Bhuiyan, A. R., & Jones, E. A. (2021). Association and Risk Factors for Obstructive Sleep Apnea and Cardiovascular Diseases: A Systematic Review. Diseases, 9(4), 88. https://doi.org/10.3390/diseases9040088

Molnar, M. Z., Mucsi, I., Novak, M., Szabo, Z., Freire, A. X., Huch, K. M., Arah, O. A., Ma, J. Z., Lu, J. L., Sim, J. J., Streja, E., Kalantar-Zadeh, K., & Kovesdy, C. P. (2015). Association of incident obstructive sleep apnoea with outcomes in a large cohort of US veterans. Thorax, 70(9), 888–895. https://doi.org/10.1136/thoraxjnl-2015-206970

Monin, J., Guiu, G., Reybard, C., Bompaire, F., Bisconte, S., Perrier, E., & Manen, O. (2022). Prevalence of sleep disorders in a large French cohort of aircrew members and risk of in-flight sleepiness. Sleep medicine, 100, 183–189. https://doi.org/10.1016/j.sleep.2022.08.013

Moore, B. A., Tison, L. M., Palacios, J. G., Peterson, A. L., & Mysliwiec, V. (2021). Incidence of insomnia and obstructive sleep apnea in active duty United States military service members. Sleep, 44(7), zsab024.

Mustafa, M., Erokwu, N., Ebose, I., & Strohl, K. (2005). Sleep problems and the risk for sleep disorders in an outpatient veteran population. Sleep and Breathing, 9, 57-63.

Mysliwiec, V., Brock, M. S., Pruiksma, K. E., Straud, C. L., Taylor, D. J., Hansen, S., ... & Peterson, A. L. (2022). A comprehensive evaluation of insomnia, obstructive sleep apnea and comorbid insomnia and obstructive sleep apnea in US military personnel. Sleep, 45(12), zsac203.

Mysliwiec, V., Brock, M., Matsangas, P., Pruiksma, K., Powell, T., Hansen, S., ... & Peterson, A. (2023). 0734 Gender Differences in US Military Personnel with Insomnia, Obstructive Sleep Apnea & Comorbid Insomnia and Obstructive Sleep Apnea. Sleep, 46(Supplement_1), A323-A323.

Mysliwiec, V., Gill, J., Lee, H., Baxter, T., Pierce, R., Barr, T. L., & Roth, B. J. (2013). Sleep disorders in US military personnel: a high rate of comorbid insomnia and obstructive sleep apnea. Chest, 144(2), 549-557.

Mysliwiec, V., Matsangas, P., Baxter, T., McGraw, L., Bothwell, N. E., & Roth, B. J. (2014). Comorbid insomnia and obstructive sleep apnea in military personnel: correlation with polysomnographic variables. Military medicine, 179(3), 294-300.

Mysliwiec, V., Matsangas, P., Gill, J., Baxter, T., O'Reilly, B., Collen, J. F., & Roth, B. J. (2015). A comparative analysis of sleep disordered breathing in active duty service members with and without combat-related posttraumatic stress disorder. Journal of Clinical Sleep Medicine, 11(12), 1393-1401.

Netzer, N. C., Eliasson, A. H., & Strohl, K. P. (2003). Women with sleep apnea have lower levels of sex hormones. Sleep & Breathing = Schlaf & Atmung, 7(1), 25–29. https://doi.org/10.1007/s11325-003-0025-8

Orr, J. E., Smales, C., Alexander, T. H., Stepnowsky, C., Pillar, G., Malhotra, A., & Sarmiento, K. F. (2017). Treatment of OSA with CPAP Is Associated with Improvement in PTSD Symptoms among Veterans. Journal of clinical sleep medicine : JCSM : official

publication of the American Academy of Sleep Medicine, 13(1), 57–63. https://doi.org/10.5664/jcsm.6388

Peker, Y., Akdeniz, B., Altay, S., Balcan, B., Başaran, Ö., Baysal, E., & Yıldırır, A. (2023). Obstructive Sleep Apnea and Cardiovascular Disease: Where Do We Stand?. Anatolian journal of cardiology, 27(7), 375.

Pilakasiri, A., & Mahakit, P. (2018). Prospective study of the prevalence and co-morbidities of obstructive sleep apnea in active-duty army personnel in the three southernmost provinces of Thailand using questionnaire screening. Military Medical Research, 5(1), 1-8.

Platon, A. L., Stelea, C. G., Boișteanu, O., Patrascanu, E., Zetu, I. N., Roșu, S. N., & Palade, D. O. (2023). An Update on Obstructive Sleep Apnea Syndrome—A Literature Review. Medicina, 59(8), 1459.

Pouliot, Z., Peters, M., Neufeld, H., Delaive, K., & Kryger, M. H. (2003). Sleep disorders in a military population. Military medicine, 168(1), 7-10.

Rajaratnam SM, Barger LK, Lockley SW, Shea SA, Wang W, Landrigan CP, O'Brien CS, Qadri S, Sullivan JP, Cade BE, Epstein LJ, White DP, Czeisler CA, Harvard Work Hours, Health and Safety Group (2011) Sleep disorders, health, and safety in police officers. JAMA 306, 2567–78.

Rezaeitalab, F., Mokhber, N., Ravanshad, Y., Saberi, S., & Rezaeetalab, F. (2018). Different polysomnographic patterns in military veterans with obstructive sleep apnea in those with and without post-traumatic stress disorder. Sleep and Breathing, 22, 17-22.

Ruchała, M., Bromińska, B., Cyrańska-Chyrek, E., Kuźnar-Kamińska, B., Kostrzewska, M., & Batura-Gabryel, H. (2017). Obstructive sleep apnea and hormones—A

novel insight. Archives of Medical Science: AMS, 13(4), 875–884. https://doi.org/10.5114/aoms.2016.61499

Rogers, A. E., Stahlman, S., Hunt, D. J., Oh, G. T., & Clark, L. L. (2016). Obstructive sleep apnea and associated attrition, active component, U.S. Armed Forces, January 2004-May 2016. MSMR, 23(10), 2–11.

Rush, T., Leard Mann, C. A., & Crum-Cianflone, N. F. (2016). Obesity and associated adverse health outcomes among US military members and veterans: Findings from the millennium cohort study. Obesity (Silver Spring, Md.), 24(7), 1582–1589. https://doi.org/10.1002/oby.21513

Schulman, D. (2023). Polysomnography in the evaluation of sleep-disordered breathing in adults. *UpToDate*.

Shepertycky, M. R., Banno, K., & Kryger, M. H. (2005). Differences between men and women in the clinical presentation of patients diagnosed with obstructive sleep apnea syndrome. Sleep, 28(3), 309–314.

Siaki, L., Hasslen, S., Hoffecker, L., & Trego, L. L. (2021). Sleep Health in U.S. Military Women: A Scoping Review of the Literature, 2000-2019. Women's Health Issues: Official Publication of the Jacobs Institute of Women's Health, 31 Suppl 1, S22–S32. https://doi.org/10.1016/j.whi.2021.03.001 .

Snyder, B., & Cunningham, R. L. (2018). Sex differences in sleep apnea and comorbid neurodegenerative diseases. Steroids, 133, 28–33. https://doi.org/10.1016/j.steroids.2017.12.006 .

Soreca, I., Tighe, C. A., & Bramoweth, A. D. (2019). The Intersection of Sleep Apnea and Severe Mental Illness in Veterans. Psychosomatics, 60(5), 481–487. https://doi.org/10.1016/j.psym.2019.01.007

Stansbury, R. C., & Strollo, P. J. (2015). Clinical manifestations of sleep apnea. Journal of Thoracic Disease, 7(9), E298-310. https://doi.org/10.3978/j.issn.2072-1439.2015.09.13

Stuck, B. A., Maurer, J. T., Schlarb, A. A., Schredl, M., & Weess, H.-G. (2021). Practice of sleep medicine : sleep disorders in children and adults. Springer. https://doi.org/10.1007/978-3-030-17412-5

Szaulińska, K., Pływaczewski, R., Sikorska, O., Holka-Pokorska, J., Wierzbicka, A., Wichniak, A., & Śliwiński, P. (2015). Obstructive sleep apnea in severe mental disorders. Psychiatria Polska, 49(5), 883–895. https://doi.org/10.12740/PP/32566

Taylor, D. J., Pruiksma, K. E., Mintz, J., Slavish, D. C., Wardle-Pinkston, S., Dietch, J. R., ... & Consortium to Alleviate PTSD. (2023). Treatment of comorbid sleep disorders and posttraumatic stress disorder in US active duty military personnel: A pilot randomized clinical trial. Journal of Traumatic Stress.

Thomas, R. J., Bhat, S., & Chokroverty, S. (2023). Atlas of Sleep Medicine (3rd ed.). Springer International Publishing AG. https://doi.org/10.1007/978-3-031-34625-5

Verde-Tinoco, S., Santana-Miranda, R., Gutiérrez-Escobar, R., Haro, R., Miranda-Ortiz, J., Berruga-Fernandez, T., ... & Poblano, A. (2017). Sleep architecture in night shift workers police officers with obstructive sleep apnea-hypopnea syndrome. Sleep Science, 10(4), 136.

Warner, C. H., & Castro, C. A. (Eds.). (2023). Veteran and military mental health : a clinical manual (1st ed. 2023.). Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-031-18009-5

Watson, N. F., & Vaughn, B. V. (2006). Clinician's guide to sleep disorders. Taylor & Francis. https://doi.org/10.3109/9780849374494

Wimms, A., Woehrle, H., Ketheeswaran, S., Ramanan, D., & Armitstead, J. (2016). Obstructive Sleep Apnea in Women: Specific Issues and Interventions. BioMed Research International, 2016, 1764837. https://doi.org/10.1155/2016/1764837

World Health Organization. (2019). *International statistical classification of diseases and related health problems* (11th Revision). https://icd.who.int/

Wu, D., Zhao, Z., Chen, C., Lu, G., Wang, C., Gao, S., ... & Liang, W. (2023). Impact of obstructive sleep apnea on cancer risk: A systematic review and meta-analysis. Sleep and Breathing, 27(3), 843-852.

Yeghiazarians, Y., Jneid, H., Tietjens, J. R., Redline, S., Brown, D. L., El-Sherif, N., Mehra, R., Bozkurt, B., Ndumele, C. E., & Somers, V. K. (2021). Obstructive Sleep Apnea and Cardiovascular Disease: A Scientific Statement From the American Heart Association. Circulation, 144(3), e56–e67. https://doi.org/10.1161/CIR.0000000000000988

Young, T., Skatrud, J., & Peppard, P. E. (2004). Risk factors for obstructive sleep apnea in adults. Jama, 291(16), 2013-2016.

Zhang, L., Ou, X., Zhu, T., & Lv, X. (2020). Beneficial effects of estrogens in obstructive sleep apnea hypopnea syndrome. Sleep & Breathing = Schlaf & Atmung, 24(1), 7–13. https://doi.org/10.1007/s11325-019-01896-2