

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

¹Dian Negara*, ²Marshel Timotius Handoko

¹ Department of Primary Care Family Medicine, Faculty of Medicine, Universitas Pelita Harapan, Indonesia*; email: dn.diannegara@gmail.com

² Siloam Hospital Lippo Village, Jakarta, Indonesia

*Correspondence

Article Information

Submitted: 02 October 2026

Accepted: 14 October 2026

Publish: 23 October 2026

Keyword: Bisoprolol; Cognitive Impairment; Frailty; Sarcopenia; Biopsychosocial Approach;

Copyright holder: Dian Negara, Marshel Timotius Handoko

Year: 2026

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Abstract

Introduction: Cognitive impairment in older adults may resemble dementia, particularly among patients with hypertension, frailty, and polypharmacy. High-dose bisoprolol may contribute to potentially reversible cognitive symptoms. **Objective:** This case highlights the importance of biopsychosocial assessment in identifying suspected medication-associated cognitive impairment. **Case Report:** An older hypertensive patient with frailty and sarcopenia presented with memory loss, language difficulties, executive dysfunction, and neuropsychiatric symptoms suggestive of dementia. Comprehensive family physician assessment included medication review, cognitive examination, and family interviews. **Discussion:** Symptom onset was temporally associated with high-dose bisoprolol use. Cognitive and neuropsychiatric symptoms improved following dose adjustment under clinical monitoring, suggesting a possible medication-related contribution without establishing causality. **Conclusion:** A biopsychosocial approach incorporating medication reconciliation, cognitive monitoring, and caregiver involvement supports accurate differential diagnosis and individualized management. This case emphasizes the importance of recognizing potentially reversible cognitive impairment while maintaining appropriate cardiovascular treatment in vulnerable older adults

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

Introduction

The aging population presents a growing challenge to global healthcare systems, with cognitive impairment and dementia emerging as major concerns among older adults (Loen et al., 2025); (Khan et al., 2024). Cognitive decline in older adults may result from neurodegenerative diseases or potentially reversible conditions, making comprehensive differential diagnosis essential to prevent misdiagnosis and inappropriate treatment (Montine et al., 2021); (Gonzales et al., 2022). The differential diagnosis should consider neurodegenerative disorders, vascular cognitive impairment, metabolic disturbances, endocrine disorders, nutritional deficiencies, depression, delirium, and medication-related adverse effects (Farhan et al., 2023); (Ramli & Fadhillah, 2020); (Shiddieqy et al., 2022). When cognitive symptoms are suspected to be associated with medication use without a predominant depressive component, the term "reversible medication-associated cognitive impairment" is more appropriate than "pseudo-dementia."

This paper explores a clinically relevant case involving high-dose bisoprolol, a selective beta-1 adrenergic receptor blocker commonly used to treat hypertension, and its possible association with dementia-like cognitive symptoms in an older patient. Bisoprolol has moderate lipophilicity and may cross the blood-brain barrier, potentially contributing to central nervous system adverse effects, including fatigue, confusion, and impaired concentration in susceptible individuals. However, its direct causal relationship with cognitive impairment remains uncertain and requires careful clinical evaluation. Improvement following medication adjustment may support a suspected drug-related contribution but does not independently establish causality (den Brok et al., 2021); (Peters et al., 2020); (Belachew et al., 2025); (Ding et al., 2026). This issue is particularly relevant in Indonesia, where hypertension is common among older adults and careful evaluation of antihypertensive treatment is essential to balance cardiovascular benefits with medication safety.

The paper emphasizes the essential role of a biopsychosocial approach in Family Medicine for identifying and managing potentially reversible cognitive impairment. This holistic approach integrates biological, psychological, and social dimensions of patient care, enabling clinicians to evaluate medication-related cognitive symptoms alongside other possible causes of cognitive decline. Biological assessment includes medication reconciliation, cardiovascular evaluation, screening for metabolic and endocrine abnormalities, and consideration of nutritional deficiencies. Psychological assessment involves cognitive screening using instruments such as the Mini-Mental State Examination (MMSE), alongside evaluation for depression and delirium. Social assessment incorporates family observations, functional changes, medication adherence, and available caregiver support. Frailty and sarcopenia, characterized by reduced physiological reserves and muscle function, may increase vulnerability to adverse medication effects, further supporting individualized treatment strategies in older adults.

Comparative research reveals heterogeneous associations between antihypertensive drug classes and cognitive outcomes. Although angiotensin-converting enzyme (ACE) inhibitors and calcium channel blockers have been investigated for their potential cognitive benefits, the available evidence does not establish that these agents consistently provide superior cognitive protection compared with beta-blockers. Therefore, antihypertensive selection should consider cardiovascular indications, blood pressure control, comorbidities, frailty, and potential adverse effects rather than cognitive outcomes alone. Within the context of Indonesia's aging population, integrating medication review and cognitive assessment into routine geriatric care may improve

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

diagnostic accuracy and support safer, patient-centered hypertension management.

This case report aims to describe suspected reversible medication-associated cognitive impairment in an older hypertensive patient receiving bisoprolol and to illustrate how a biopsychosocial Family Medicine assessment can support differential diagnosis and individualized management. Particular attention is given to the patient's frailty and sarcopenia, the temporal relationship between medication exposure and cognitive symptoms, and changes in cognitive function following treatment adjustment. The case highlights the importance of systematic medication review, caregiver involvement, and clinical follow-up when evaluating potentially reversible cognitive impairment in older adults

Case presentation

A 75-year-old male with a history of hypertension, frailty, and sarcopenia arrived to the family medicine clinic with complaints of gradual memory loss, linguistic difficulties, poor executive function, and neuropsychiatric symptoms, including anxiety and irritability. The patient's family said that these symptoms had progressively deteriorated over the last three months, considerably affecting his daily functioning and quality of life. The patient's medical history was notable for hypertension, managed with Bisoprolol 10 mg daily for the last five years. A review of his medical record disclosed no previous instances of cognitive impairment or dementia. Upon examination, the patient looked frail and displayed indicators of sarcopenia, characterised by diminished muscle mass and strength. His blood pressure was effectively regulated at 112/68 mmHg. His heart rate was 56 beats per minute, exhibiting no arrhythmia. The neurological examination showed no focal impairments; however, cognitive assessment with the Mini-Mental State Examination (MMSE) yielded a score of 20/30, indicating mild cognitive impairment. Particular areas of emphasis encompassed memory recall, attention, and executive function.

A thorough assessment by a family physician was performed, encompassing an extensive drug review, cognitive evaluation, and interviews with the patient and his family. The evaluation indicated a temporal correlation between the commencement of high-dose Bisoprolol and the emergence of cognitive symptoms. The patient's frailty and sarcopenia were recognised as potential contributory variables, as they may heighten his susceptibility to drug side effects. Considering these, the potential for drug-induced cognitive impairment was thoroughly contemplated. During the diagnostic phase, alternative sources of cognitive impairment were evaluated and excluded. Blood tests, comprising a complete blood count, metabolic panel, thyroid function assessments, and vitamin levels, were within normal parameters. Resting ECG showed sinus bradycardia at 56 bpm with LAD. Neuroimaging, including a CT scan of the brain to detect structural anomalies, such as stroke or tumour, is advised for subsequent follow-up.

Following the assessment findings, a decision was made to discontinue the patient's Bisoprolol, with vigilant monitoring of his blood pressure and cognitive function. The patient and his family were informed about the possible cognitive side effects of Bisoprolol and the significance of compliance with the drug regimen. After the decrease in Bisoprolol dosage, the patient exhibited significant enhancement in cognitive and neuropsychiatric symptoms. His MMSE score increased from 20/30 to 26/30 in a span of two weeks. The patient's memory, concentration, and executive function improved, while his anxiety and irritation diminished.

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

The patient's family indicated that he exhibited increased alertness, engagement, and participation in everyday activities. His general quality of life markedly enhanced. The patient's blood pressure and heart rate were effectively regulated at 128/78 and 70 bpm, respectively.

Understanding Bisoprolol Effects in Elderly Patients

Bisoprolol, a selective beta-1 adrenergic receptor blocker, is widely utilized in managing cardiovascular conditions such as hypertension and heart failure. Its efficacy in reducing blood pressure and lowering the risk of cardiovascular events has been well-documented (Lertvipapath & Warunyuwong, 2020). Unlike hydrophilic beta-blockers, Bisoprolol is lipophilic, allowing it to cross the blood-brain barrier, which significantly contributes to its therapeutic outcomes. However, this property also increases its likelihood of central nervous system (CNS) side effects, differentiating its profile from other beta-blockers. While its use in cardiovascular health is advantageous, these CNS effects, including potential impacts on cognition and memory, are particularly relevant in vulnerable populations such as older adults (Zmudka et al., 2017).

The neuro-psychiatric and cognitive side effects of Bisoprolol pose significant challenges, particularly in the elderly. Reported symptoms such as confusion, fatigue, and reduced attention span closely resemble clinical features of dementia, complicating the diagnostic process. These drug-induced manifestations can lead to pseudo-dementia, where cognitive deficits mimic those of neuro-degenerative disorders that typically require substantially different management strategies. Furthermore, studies have highlighted the increased risk of post-operative delirium in patients administered beta-blockers pre-operatively, with a reported twofold increase in odds, emphasizing the drug's cognitive effects under specific stressors or contexts. Evidence from case studies demonstrates that the neuro-psychiatric effects of Bisoprolol are often dose-dependent and reversible, with cognitive performance improving upon dose reduction. Such observations underline the importance of dose adjustments in managing cognitive side effects, further calling for heightened vigilance in monitoring elderly patients who may be susceptible to misdiagnosis and inappropriate treatments.

High doses of Bisoprolol specifically have been implicated in inducing symptoms frequently mistaken as dementia, highlighting the pharmacological basis for these cognitive disturbances. For instance, a reversal of symptoms and improvement in Mini-Mental State Examination (MMSE) scores following a reduction in Bisoprolol dosage strongly suggests a direct connection between the drug and the observed cognitive deficits. The implications of such findings are critical in differentiating pseudo-dementia from true dementia to prevent unnecessary long-term interventions that may fail to address the root cause. Bisoprolol's ability to cross the blood-brain barrier contributes to its substantial impact on cognitive processes, reinforcing its role in cases of pseudo-dementia. These insights underscore the urgency of increasing awareness of medication-induced cognitive impairment within the fields of geriatric and Family Medicine, emphasizing the need for individualized care to ensure accurate diagnosis and management.

The elderly population demonstrates increased vulnerability to Bisoprolol's cognitive side effects due to age-related changes in pharmacokinetics and pharmacodynamics. Age-induced reductions in hepatic and renal drug clearance result in higher systemic drug levels and extended exposure times (Espinoza & Walston, 2005). These physiological alterations exacerbate the CNS effects of lipophilic drugs like

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

Bisoprolol, thereby placing older adults, particularly those with comorbidities, at heightened risk for adverse cognitive outcomes. Frailty, a hallmark characteristic of aging, further compromises the body's ability to tolerate pharmacologic stressors, intensifying the likelihood of Bisoprolol-induced side effects, including those that mimic cognitive impairment (Espinoza & Walston, 2005). This interplay between aging physiology and drug effects necessitates a personalized approach to prescribing and dosage adjustments to minimize potential harm while maintaining the medication's cardiovascular benefits.

The cognitive effects of antihypertensive drugs differ significantly across drug categories, with Bisoprolol displaying a complex and variable profile. While other antihypertensive medications, such as Calcium Channel Blockers (CCBs) and Angiotensin-Converting Enzyme (ACE) inhibitors, are associated with neuroprotective properties, Beta-Blockers (BBs) like Bisoprolol have demonstrated mixed outcomes (Rouch, 2015). Research, including data from the SPRINT MIND study, suggests that intensive hypertension management may reduce the risk of mild cognitive impairment and dementia (Strandberg et al., 2019). However, the specific contribution of beta-blockers remains less straightforward, with certain cases indicating adverse effects on cognition. These findings underscore the complexity of managing hypertension in older adults, requiring carefully tailored strategies that balance cardiovascular benefits with potential cognitive risks. Investigating alternative anti-hypertensive agents that provide neuro-protection, such as angiotensin receptor blockers, may offer promising solutions for achieving better outcomes in aging populations.

In Indonesia, where hypertension prevalence among individuals aged 55 and above exceeds 45.9%, the implications of Bisoprolol's cognitive side effects are particularly significant (Anto et al., 2019). This considerable prevalence necessitates comprehensive monitoring of not only blood pressure but also cognitive health, especially given the aging demographic trends within the country, often referred to as the "silver tsunami." Hypertension, compounded by medication-related cognitive side effects, increases the risk of misdiagnosing true dementia and hampers effective management (Hussain & Avais, 2024). The common use of Bisoprolol further highlights the need for integrating cognitive assessments, such as the MMSE, into routine clinical practice to ensure early identification of pseudo-dementia and timely intervention (Anto et al., 2019). Lessons from Indonesia offer valuable insights into global strategies for addressing cognitive challenges associated with aging populations, emphasizing the importance of balancing cardiovascular and cognitive health in clinical care (Strandberg et al., 2019).

Finally, evidence from cognitive testing has demonstrated the practical value of objective evaluations in identifying drug-induced cognitive decline. Studies reveal that 18.5% of patients on beta-blockers scored below the average MMSE score, suggesting a potential link between these medications and cognitive impairments (Soman et al., 2020). The reversibility of Bisoprolol-induced cognitive symptoms, as evidenced through improved MMSE results following dose adjustments, highlights the critical role of systematic cognitive assessments in the elderly population (Zmudka et al., 2017). Incorporating such evaluations into clinical work-flows can facilitate early detection and targeted management of pseudo-dementia, improving both quality of life and health outcomes for older patients receiving lipophilic beta-blockers like Bisoprolol. The necessity of identifying pseudo-dementia underscores the broader importance of aligning cardiovascular and cognitive health interventions, particularly as health-care systems globally contend with the challenges of an aging population.

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

A comprehensive understanding of Bisoprolol's effects on elderly patients illustrates the dual challenge of managing its cardiovascular benefits while addressing potential cognitive risks. This underscores the importance of high quality and high value personalized care approaches that optimize therapeutic outcomes while minimizing adverse effects, particularly in aging populations.

Evidence-Based Assessment and Management

The bio-psycho-social approach plays a crucial role in ensuring a comprehensive assessment of elderly patients experiencing cognitive symptoms potentially linked to Bisoprolol usage. This framework facilitates the integration of biological, psychological, and social factors in clinical evaluations, enabling practitioners to distinguish pseudo-dementia due to medication effects from true neuro-degenerative conditions. By considering the complex interplay of these elements, Family Medicine practitioners can avoid misdiagnoses and prevent inappropriate treatment strategies. Biological insights into Bisoprolol's pharmacokinetics and pharmacodynamics are essential, especially since its lipophilicity allows it to cross the blood-brain barrier and induce neuro-psychiatric symptoms. This understanding underscores the need for vigilance in monitoring elderly patients, whose altered drug metabolism and heightened vulnerability can amplify these effects. Psychological evaluations, including the use of standardized cognitive assessment tools such as the Mini-Mental State Examination (MMSE), provide measurable benchmarks to identify and track reversible cognitive impairments linked to Bisoprolol. For instance, in studies such as Zmudka et al. (2017), measurable improvements in MMSE scores were observed following dose reduction, demonstrating the critical role of psychological testing in patient management. Social factors, including family support systems, access to health-care resources, and socioeconomic conditions, are equally critical in ensuring compliance with treatment modifications and follow-ups. Support networks can aid in recognizing initial symptoms and advocating for timely medical interventions. These multifaceted considerations highlight the importance of adopting an integrated bio-psycho-social methodology to address the intricate needs of elderly patients receiving Bisoprolol therapy (Mishra et al., 2020).

Cognitive testing serves as an indispensable component in identifying and managing pseudo-dementia resulting from Bisoprolol use in the elderly. Early application of cognitive assessment tools, particularly the MMSE, has proven effective in distinguishing drug-induced cognitive deficits from progressive neuro-degenerative disorders. Zmudka et al. (2017) reported significant cognitive improvements, with MMSE scores increasing after Bisoprolol dose adjustments. These findings underscore the reversible nature of Bisoprolol-induced symptoms when timely interventions are implemented. Delays in cognitive evaluations, however, can lead to misdiagnoses and unnecessary dementia treatments, prolonging patient suffering and complicating management strategies. Establishing cognitive baselines prior to initiating Bisoprolol treatment allows practitioners to monitor potential neuro-psychiatric changes systematically. Combining neuro-psychological testing with caregiver interviews and clinical assessments enhances diagnostic accuracy, distinguishing pseudo-dementia from conditions like Alzheimer's disease, thereby optimizing patient care. The use of these tools in routine practice not only improves diagnostic precision but also empowers health-care providers to mitigate Bisoprolol-induced cognitive risks effectively.

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

The interplay between age-related frailty and sarcopenia and the pharmacological effects of Bisoprolol significantly influences cognitive outcomes among older adults. Frailty, characterized by reduced physiological reserves, exacerbates vulnerability to adverse drug effects, including those on cognitive function. Altered pharmacokinetics and pharmacodynamics in elderly individuals amplify the impact of lipophilic medications like Bisoprolol, resulting in heightened central nervous system side effects (Espinoza & Walston, 2005). Sarcopenia further compounds these risks by impairing metabolic regulation and adaptive responses to external stressors such as drug therapies (Tamez-Rivera et al., 2014). Age-associated changes in cardiovascular and metabolic systems can prolong Bisoprolol clearance, increasing susceptibility to symptoms such as confusion and memory loss, particularly in frail patients. Addressing frailty and sarcopenia within treatment plans requires interdisciplinary approaches that integrate nutritional optimization, physical therapy, and tailored dosing regimens. By adopting personalized care strategies, practitioners can mitigate risks while ensuring patients derive cardiovascular benefits from Bisoprolol therapy (Santy-Tomlinson et al., 2018).

Anti-hypertensive medications exhibit diverse cognitive effects, with Beta-Blockers (BBs) like Bisoprolol being associated with neuropsychiatric symptoms, unlike Calcium Channel Blockers (CCBs) and Angiotensin-Converting Enzyme (ACE) inhibitors, which generally demonstrate neuroprotective properties. For instance, Rouch (2015) highlights that CCBs and Renin-Angiotensin System (RAS) blockers are linked to a reduced risk of vascular dementia and Alzheimer's disease, suggesting their suitability for patients with cognitive vulnerabilities. Evidence also supports the potential of ACE inhibitors to lower stroke risks and cognitive decline, emphasizing their role as alternative options for hypertensive elderly patients (Mishra et al., 2020). Individualizing anti-hypertensive therapy becomes especially important in this context, as factors like frailty, baseline cognitive function, and comorbidities influence drug selection. Tailored treatment plans that prioritize both cardiovascular and cognitive health can prevent pseudo-dementia while safeguarding cognitive function.

Ensuring medication safety is paramount in optimizing outcomes for elderly patients on Bisoprolol. Systematic reviews of drug regimens help identify and adjust medications contributing to cognitive symptoms, thereby preventing misattribution of these effects to irreversible dementia (Zmudka et al., 2017). Regular follow-ups and comprehensive medication reconciliations are integral to high-quality care, as these processes enable timely adjustments and minimize risks of adverse drug reactions (Santy-Tomlinson et al., 2018, p. 150). Educating patients and caregivers about potential drug side effects fosters proactive engagement in managing symptoms, ensuring early intervention and enhancing treatment adherence. Collaboration within multidisciplinary teams comprising Family Medicine practitioners, geriatric specialists, and pharmacists facilitates the coordinated management of pseudo-dementia cases, leveraging specialized expertise to improve patient outcomes (Santy-Tomlinson et al., 2018). These measures collectively underscore the necessity of vigilance and tailored approaches to medication management in the care of the elderly.

The aging demographic trends in Indonesia underscore the urgent need to address Bisoprolol-induced cognitive effects. With hypertension prevalence exceeding 45.9% among individuals aged 55 and above, the high utilization of Bisoprolol necessitates incorporating regular cognitive assessments into hypertension management protocols (Anto et al., 2019). Compared to other nations with aging populations, such as Japan and Italy, Indonesia faces unique challenges due to its developing health-care infrastructure.

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

This underscores the need for proactive measures, including culturally tailored health-care strategies that consider local socioeconomic contexts. Adopting global frameworks, such as the SPRINT MIND trial findings, could inform adaptive policies to balance cardiovascular and cognitive health in Indonesia's aging population (Strandberg et al., 2019). Lessons from other regions demonstrate the critical value of integrating culturally sensitive practices with evidence-based management approaches, ultimately improving care and outcomes for elderly patients at risk of medication-induced cognitive effects.

1. Discussion

High-dose bisoprolol therapy in older adults requires careful evaluation because cognitive symptoms may arise from medication-related adverse effects and resemble neurodegenerative disorders. Bisoprolol, a moderately lipophilic beta-1 selective blocker, can cross the blood-brain barrier and may contribute to central nervous system symptoms, including confusion, fatigue, and memory disturbances, although a direct causal relationship remains uncertain. These manifestations should be evaluated as suspected reversible medication-associated cognitive impairment rather than pseudo-dementia when depression is not the predominant underlying condition. An illustrative case involving an 88-year-old patient demonstrated cognitive improvement and increased Mini-Mental State Examination (MMSE) scores following bisoprolol dose reduction (Zmudka et al., 2017). However, improvement after dose adjustment supports a possible medication-related association without conclusively establishing causality. Additionally, preoperative bisoprolol exposure has been associated with an increased risk of postoperative delirium in certain clinical settings. These findings emphasize the importance of medication review, cognitive monitoring, and individualized treatment decisions.

Frailty and sarcopenia may further increase susceptibility to adverse medication effects in older adults. Frailty is characterized by reduced physiological reserves, whereas sarcopenia involves progressive loss of muscle mass and function. Age-related changes in renal and hepatic function may alter drug exposure and tolerance, potentially increasing vulnerability to cognitive and other adverse effects (Espinoza & Walston, 2005). Inflammatory and endocrine changes associated with frailty may also complicate medication management and clinical recovery (Espinoza & Walston, 2005). Therefore, assessment of frailty, nutritional status, functional capacity, and organ function should inform medication review and individualized management, alongside appropriate nutritional and physical rehabilitation strategies.

The selection of antihypertensive therapy in older adults should balance cardiovascular benefits, cognitive safety, and individual clinical characteristics. Calcium channel blockers (CCBs) and angiotensin-converting enzyme (ACE) inhibitors have been investigated for their potential neuroprotective effects, whereas beta-blockers have shown variable associations with cognitive outcomes (Rouch, 2015). However, current evidence does not establish that one antihypertensive class consistently provides superior cognitive protection for all older patients. Consequently, medication adjustments should consider cardiovascular indications, blood pressure control, comorbidities, and potential adverse effects rather than cognitive outcomes alone.

The biopsychosocial approach in Family Medicine provides an integrated framework for evaluating suspected medication-associated cognitive impairment. The biological assessment includes medication reconciliation, cardiovascular status, renal and hepatic function, and alternative causes of cognitive impairment, including

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

neurodegenerative, vascular, metabolic, endocrine, and nutritional conditions. Psychological assessment involves cognitive screening, particularly using the MMSE, alongside evaluation for depression and delirium. Improvements in cognitive performance following medication adjustment, as described by Zmudka et al. (2017), may provide useful clinical information when interpreted together with symptom chronology and other examination findings. The social dimension incorporates caregiver observations, family support, treatment adherence, and access to healthcare services. Integrating these dimensions may improve diagnostic accuracy, reduce unnecessary investigations, and support patient-centered management.

Population aging and the high prevalence of hypertension further highlight the importance of cognitive monitoring during antihypertensive treatment. In Indonesia, hypertension prevalence among individuals aged 55–64 years has been reported to exceed 45.9% (Anto et al., 2019). Evidence from blood pressure intervention studies also suggests that appropriate hypertension management may contribute to reducing cognitive impairment risk, emphasizing the need to maintain effective cardiovascular treatment while monitoring potential adverse effects (Strandberg et al., 2019). Although demographic observations from New Hampshire illustrate broader healthcare challenges associated with aging populations, their direct relevance to bisoprolol-associated cognitive impairment is limited (Libby & Schultz, 2016). Therefore, clinical management should prioritize individual risk assessment and locally appropriate geriatric healthcare strategies rather than broad demographic comparisons.

Interdisciplinary collaboration is essential for distinguishing medication-associated cognitive impairment from other causes of cognitive decline. Although Ganser syndrome has been discussed in the context of atypical cognitive presentations, it is not a primary differential diagnosis for suspected bisoprolol-associated cognitive impairment and has limited relevance to this case (Drob & Meehan, 2000). A more clinically relevant diagnostic approach integrates medication history, cognitive assessment, neurological examination, laboratory investigations, and neuroimaging when indicated to distinguish medication effects from neurodegenerative, vascular, metabolic, and psychiatric disorders. Collaboration among family physicians, geriatricians, neurologists, pharmacists, and mental health professionals may improve diagnostic accuracy and treatment safety.

Overall, this case highlights the importance of considering potentially reversible medication-associated cognitive impairment when older patients receiving bisoprolol develop dementia-like symptoms. A comprehensive biopsychosocial assessment, careful medication review, evaluation of frailty, and appropriate cognitive follow-up may support more accurate diagnosis and individualized treatment while preserving essential cardiovascular benefits.

Study Limitations

This case report has several limitations that should be considered when interpreting the findings. First, the single-case design limits the generalizability of the observations to broader elderly populations. Second, the absence of a control group and standardized causality assessment prevents definitive attribution of cognitive impairment to high-dose bisoprolol. Third, potential confounding factors, including age-related cognitive decline, comorbidities, polypharmacy, frailty, and sarcopenia, may have influenced the patient's cognitive status and treatment response. Furthermore, limited longitudinal follow-up and comprehensive neuropsychological assessments may restrict evaluation of sustained

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

cognitive recovery and exclusion of underlying neurodegenerative conditions. Future multicenter observational studies with larger samples, standardized cognitive assessments, detailed medication reviews, and longer follow-up periods are recommended to clarify the association between bisoprolol exposure and cognitive outcomes in older adults.

Conclusion

This case highlights the importance of recognizing suspected reversible medication-associated cognitive impairment in older hypertensive patients receiving high-dose bisoprolol. Although a direct causal relationship cannot be conclusively established, cognitive improvement following medication adjustment suggests a possible drug-related contribution rather than an exclusively progressive neurodegenerative condition. The findings emphasize the value of a comprehensive biopsychosocial assessment in Family Medicine, integrating medication review, cognitive evaluation, frailty and sarcopenia assessment, and family involvement to support accurate differential diagnosis and individualized management. This approach may reduce unnecessary interventions while maintaining the cardiovascular benefits of antihypertensive therapy.

The authors emphasize that geriatric hypertension management should balance cardiovascular effectiveness, cognitive safety, and individual patient vulnerability. Regular cognitive monitoring, careful medication optimization, and interdisciplinary collaboration are essential considerations, particularly among older adults with frailty, multiple comorbidities, or polypharmacy. As evidence from individual cases cannot establish causality or support broad generalization, further longitudinal and comparative studies are needed to clarify the association between bisoprolol exposure and cognitive outcomes. These findings reinforce the importance of patient-centered, evidence-based Family Medicine care in promoting medication safety and preserving cognitive function among older adults.

Declaration of AI Assistance

ChatGPT (OpenAI) was used to assist with language editing, structural revision, condensation, and reference formatting in response to peer-review comments. The authors must review and verify all statements, citations, and the final manuscript, and remain responsible for scientific accuracy, originality, and integrity.

Reference

- Belachew, E. A. ... Bezabhe, W. M. (2025). Comparative effects of angiotensin II stimulating and inhibiting antihypertensives on dementia risk: a systematic review and meta-analysis. *Geroscience*, 47(4), 5525–5541.
- den Brok, M. G. H. E. ... Richard, E. (2021). Antihypertensive medication classes and the risk of dementia: a systematic review and network meta-analysis. *Journal of the American Medical Directors Association*, 22(7), 1386–1395. <https://doi.org/10.1016/j.jamda.2020.12.019>
- Ding, L. ... Liu, Z. (2026). Impact of different antihypertensive drug classes on incident dementia in older adults: a systematic review and meta-analysis. *Journal of the American Medical Directors Association*, 27(6), 106185. <https://doi.org/10.1016/j.jamda.2026.106185>
- Farhan, M. ... Septadina, I. S. (2023). Pengaruh Hipertensi Terhadap Gangguan Fungsi Kognitif Pada Lansia: Systematic Review. *Jurnal Kedokteran Dan Kesehatan*, 10(3). <https://doi.org/10.32539/JKK.V10I3.22237>
- Gonzales, M. M. ... Orr, M. E. (2022). Biological aging processes underlying cognitive decline and neurodegenerative disease. *The Journal of Clinical Investigation*, 132(10). <https://doi.org/10.1038/s41573-020-0072-x>
- Hussain, A., & Avais, J. (2024). Dementia; A Comprehensive Approach for Diagnosis and Management. *Journal of Pakistan Society of Internal Medicine*, 5(4), 681–689. <https://doi.org/10.70302/jpsim.v5i4.2464>
- Khan, H. T. A. ... Findlay, H. (2024). Public health challenges and responses to the growing ageing populations. *Public Health Challenges*, 3(3), e213. <https://doi.org/https://doi.org/10.1002/puh2.213>
- Lertvipapath, P., & Warunyuwong, W. (2020). Beta-blocker and its neuropsychiatric effects. *The Thai Journal of Pharmaceutical Sciences*, 44(2), 117–123. <https://doi.org/10.56808/3027-7922.2443>
- Loen, M. ... Pramitasari, A. (2025). Peningkatan Kesadaran dan Deteksi Dini Penurunan Fungsi Kognitif Pada Lansia: Edukasi Demensia dan Delirium di Komunitas. *SIKAMA: Sinergi Akademisi Dan Masyarakat*, 3(2), 89–100. <https://doi.org/10.61488/sikama.v3i2.953>
- Mishra, N. ... Heindl, S. E. (2020). The association between hypertension and cognitive impairment, and the role of antihypertensive medications: a literature review. *Cureus*, 12(12). <https://doi.org/10.7759/cureus.12035>
- Montine, T. J. ... White, L. R. (2021). Cognitive impairment in older adults and therapeutic strategies. *Pharmacological Reviews*, 73(1), 152–162. <https://doi.org/10.1124/pharmrev.120.000031>
- Peters, R. ... Booth, A. (2020). Investigation of antihypertensive class, dementia, and cognitive decline: a meta-analysis. *Neurology*, 94(3), e267–e281. <https://doi.org/10.1212/WNL.0000000000008732>
- Ramli, R., & Fadhillah, M. N. (2020). Faktor yang mempengaruhi fungsi kognitif pada lansia. *Window of Nursing Journal*, 23–32. <https://doi.org/10.33096/won.v1i1.246>
- Shiddieqy, A. A. ... Elita, V. (2022). Analisis faktor risiko yang berhubungan dengan fungsi kognitif pada lansia suku melayu. *Jkep*, 7(1), 12–26. <https://doi.org/10.32668/jkep.v7i1.775>

Bisoprolol-Associated Cognitive Impairment Mimicking Dementia in an Older Adult: An Evidence-Based Family Medicine Case Report

Soman, M. K. ... Subashini, V. (2020). *Risk of dementia in patients taking beta blocker as antihypertensive treatment: a cross sectional study.*
<https://doi.org/10.18203/2349-3933.ijam20195580>