

Are visual disturbances (excluding diabetic retinopathy) more common in geriatric DM patients? Are they risks factor for the progression of disability?

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1. RECOMMENDATIONS

- A. Geriatric DM patients should undergo regular, annual, comprehensive eye examinations to measure visual functioning and assess diabetic retinopathy and associated complications, as well as other frequent eye disorders (e.g., dry eyes, keratopathy, cataract, glaucoma, age-related macular degeneration) for which both aging and DM are important risk factors.
- B. Most geriatric DM patients have a high risk of cardiovascular and cerebrovascular thromboembolism. Thus, if a clinically significant diabetic macular edema is diagnosed in one or both eyes, the first recommended line of therapy is intravitreal administration of long-acting corticosteroid drugs.
- C. More attention should be paid to vision rehabilitation programs that minimize the impact of visual loss on cognitive functioning and quality of life, which many visually impaired geriatric DM patients experience.
- D. The management of DM patients can be improved through the use of multidisciplinary, multi-specialist care networks that systematically apply Artificial Intelligence (AI)-based procedures, especially for diabetic retinopathy screening and for developing treatment algorithms for diabetic macular edema.

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2. STRENGTH OF THE RECOMMENDATIONS

The quality of the evidences is moderate to high. Recommendations are supported by published evidences and best practice (supported by expert opinion).

3. SUPPORTING EVIDENCE

See appendix.

4. AREAS OF UNCERTAINTY AND FUTURE PERSPECTIVES

Until now, the study of visual disturbances in patients with DM have mainly addressed the cause-and-effect relationships between the complications

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of diabetic retinopathy and the losses of best-corrected visual acuity (BCVA), but few data are available to draw attention on the other vision-threatening diabetic comorbidities among geriatric patients, as well as to better estimate their real-life vision abilities beyond BCVA. In geriatric DM patients with or without diabetic retinopathy, new investigations are warranted to understand whether vision decline is a result of ongoing neurodegeneration and its role in determining or exacerbating cognitive decline. Conventional tests are not wholly able to assess sight in its physiological complexity, especially considering some key visual functions which, similarly to BCVA, are closely related to vision-related quality of life, such as reading speed of continuous text and visual acuity in variable luminance setting. In the context of patient's empowerment aimed to improve the quality of ageing of people with chronic degenerative diseases, the methodological overcoming of "the traditional BCVA-based approach emphasizes the growing relevance of large-scale collection of poly-sensory real-world data. The innovative multifunctional tests for an enhanced vision's examination should be characterized by high levels of standardization and automation, minimum operator-patient interaction, easy and fast execution, low running costs, finally including a dataset arrangement predisposed to AI-based analyses.

APPENDIX

Loss of vision is a serious health problem among older people. In the general population of industrialized countries, about one third of people aged 65+ have some form of eye disease that compromises vision. The most common causes of sight loss in older people are cataract, age-related macular degeneration, glaucoma, and diabetic eye complications^{1,2}.

There is a high prevalence of vision loss in geriatric DM patients, yet it continues to be under-diagnosed and under-treated³⁻⁵. Both cross-sectional and longitudinal studies have indicated that loss of vision is related to cognitive decline, and early interventions can minimize the clinical manifestations and progression of cognitive decline. Indeed, visual deterioration in older persons can be negatively associated with cognitive functioning, while maintaining good visual function can be an important intervention strategy to mitigate age-related cognitive and functional decline⁶⁻⁸.

There are several causes of impaired vision that arise from DM in geriatric patients, some directly due to changes in blood glucose concentration (hyperglycemia or hypoglycemia) that affect refraction by modifications in the shape and curvature of the crystalline lens, others secondary to eye pathologies such as complications

related to diabetic retinopathy or different disorders, for which both aging and DM are important risk factors. DM in geriatric patients can be associated with dry eye syndrome, corneal diseases, cataract, glaucoma, age-related macular degeneration, retinal artery occlusion, retinal vein occlusion, and nonarteritic anterior ischemic optic neuropathy⁹⁻¹⁹.

On the other hand, as diabetes duration is one of the main risk factors for diabetic retinopathy, geriatric patients should be considered at high risk of developing DM-related retinal alterations that cause visual impairment, such as macular edema, vitreous hemorrhage, and retinal detachment, which can especially occur in poorly monitored patients²⁰⁻²².

Diabetic macular edema is the main cause of irreversible central vision loss in DM patients. However, in recent years, the large-scale application of therapeutic protocols consisting of repeated intravitreal injections of corticosteroids and/or drugs acting against vascular endothelial growth factor (anti-VEGF) has replaced laser photocoagulation as the standard treatment for most patients with diabetic macular edema. In fact, these intravitreal treatments have been able to dramatically improve patients' visual prognosis, either by increasing their central vision or by preventing further visual loss. Repeated intravitreal administrations of long-acting corticosteroid drugs for treating geriatric patients with chronic diabetic macular edema should be recommended considering that i) the most common comorbidities for DM include microangiopathic disorders (retinopathy, neuropathy, and nephropathy) and macroangiopathic disorders (myocardial infarction, cerebrovascular stroke, and other severe thromboembolic events); ii) the latest guidelines suggest the use of corticosteroids and, in particular, dexamethasone implants, as first-line treatment in diabetic macular edema patients with high cardiovascular risk, and iii) there is insufficient evidence to definitively exclude an increased mortality risk or cardiovascular and cerebrovascular incidents among patients treated with anti-VEGF drugs because affected by diabetic macular edema²³⁻³¹.

DM is associated with an increased risk of falls due to frailty. Together with aging, DM can significantly contribute to loss of vision and other sensory perceptions, becoming a critical factor for the management of geriatric patients during clinical practice, especially among those who also experience cognitive decline^{32,33}. However, in many cases, early multidisciplinary care inclusive of personalized therapeutic and/or rehabilitation pathways can effectively address the patient's problem or prevent it from worsening.

In the case that a geriatric DM patient exhibits a visual disturbance despite having good levels of traditionally-measured BCVA, a more in-depth assessment

should be carried out to assess contrast sensitivity, reading speed, post-glare and lowluminance BCVAs, but also considering that visual disturbances reported by the patient might be easily solved with lubricating eye drops or by prescribing new corrective glasses, for example. On the other hand, visual disturbances may also be due to diabetic retinopathy or to one of other eye diseases that are often misdiagnosed even if frequently associated with DM in geriatric patients³⁴⁻³⁶.

In the short- to medium-period, the clinical management of geriatric DM can be improved by initiating multidisciplinary, multi-specialist care networks, in which ophthalmologists and orthoptist/ophthalmic assistant are involved to develop: i) tele-medicine procedures for the screening of diabetic retinopathy and other diabetes-related eye disorders using either conventional or innovative AI-based approaches³⁷⁻³⁹; ii) algorithms for personalized treatments of diabetic macular edema as well as other eye disorders frequently present in geriatric DM patients, analyzing their outcomes also using AI-equipped systems⁴⁰⁻⁴²; iii) multidisciplinary rehabilitation programs that can meet the needs of the visually impaired DM persons among geriatric population⁴³⁻⁴⁶.

Ethical consideration

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Conflict of interest

The Author declares no conflict of interest.

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<p>This statement is:</p> <p><input checked="" type="checkbox"/> Recommendation (supported by published evidence)</p> <p><input checked="" type="checkbox"/> Best practice (supported by expert opinion)</p>	<p>Quality of the evidence (in the case of recommendation):</p> <p><input type="checkbox"/> Low</p> <p><input checked="" type="checkbox"/> Moderate</p> <p><input type="checkbox"/> High</p>
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