



Background

Glaucoma is a complex, progressive neurodegenerative disease of the optic nerve, commonly found in the elderly. Patients usually do not understand the complexities of the disease and struggle to find answers from different glaucoma sources and sites which may be difficult to understand. AI chatbots such as ChatGPT® have recently emerged as a useful tool to gather information on any medical question. However, the role of ChatGPT in generating answers to glaucoma treatment questions is not well documented.

Health literacy is defined as the basic reading and mathematical skills required to find, understand, and use health-related information. The average reading level among US adults is 7th-8th grade; however, most medical information is often written at a higher reading level. The purpose of this study was to determine whether ChatGPT can tailor responses to glaucoma treatment questions based on patient health literacy levels.

Hypothesis

We hypothesize that ChatGPT may satisfactorily tailor answers to glaucoma questions based on patient health literacy level.

Methods

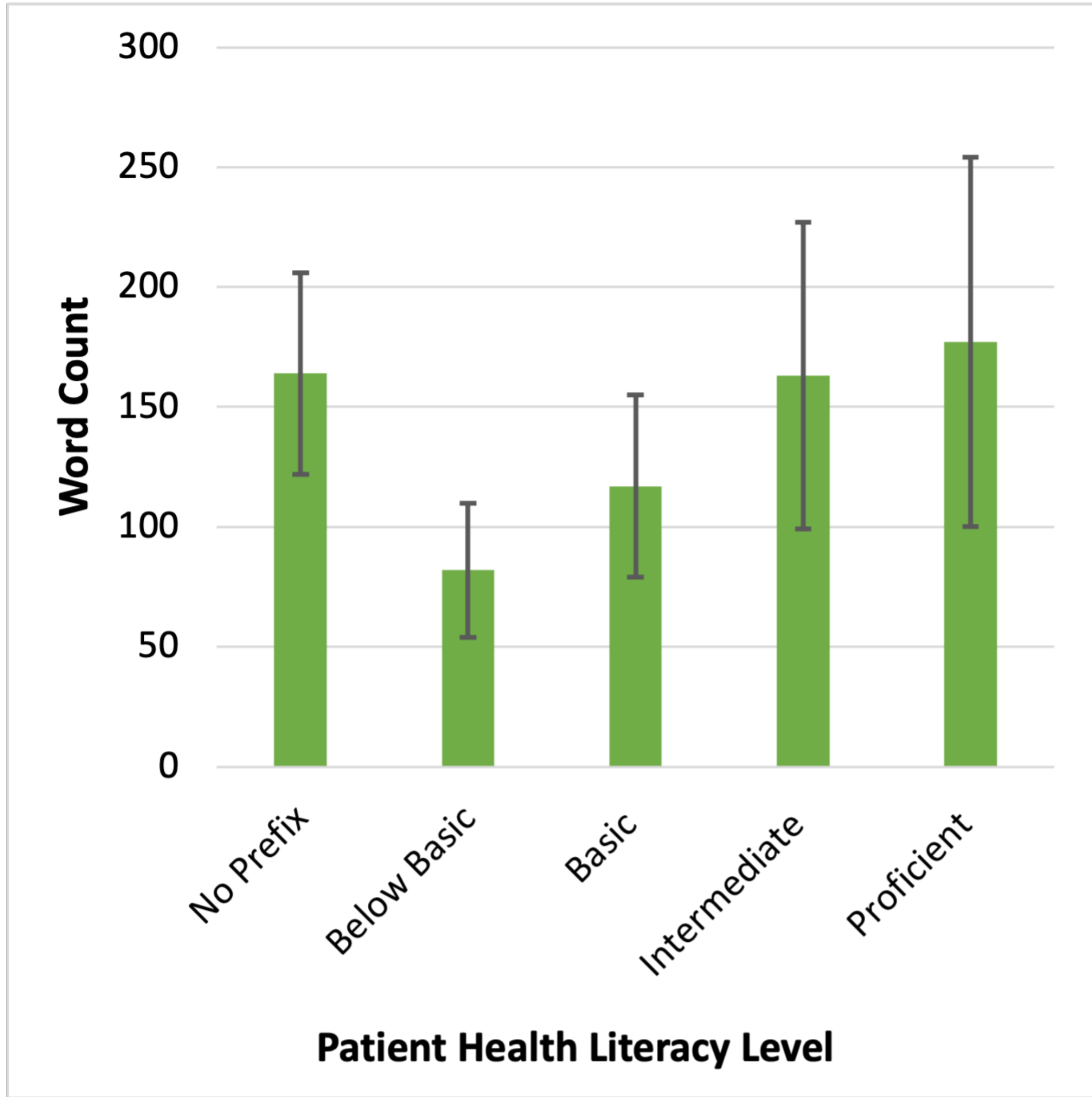
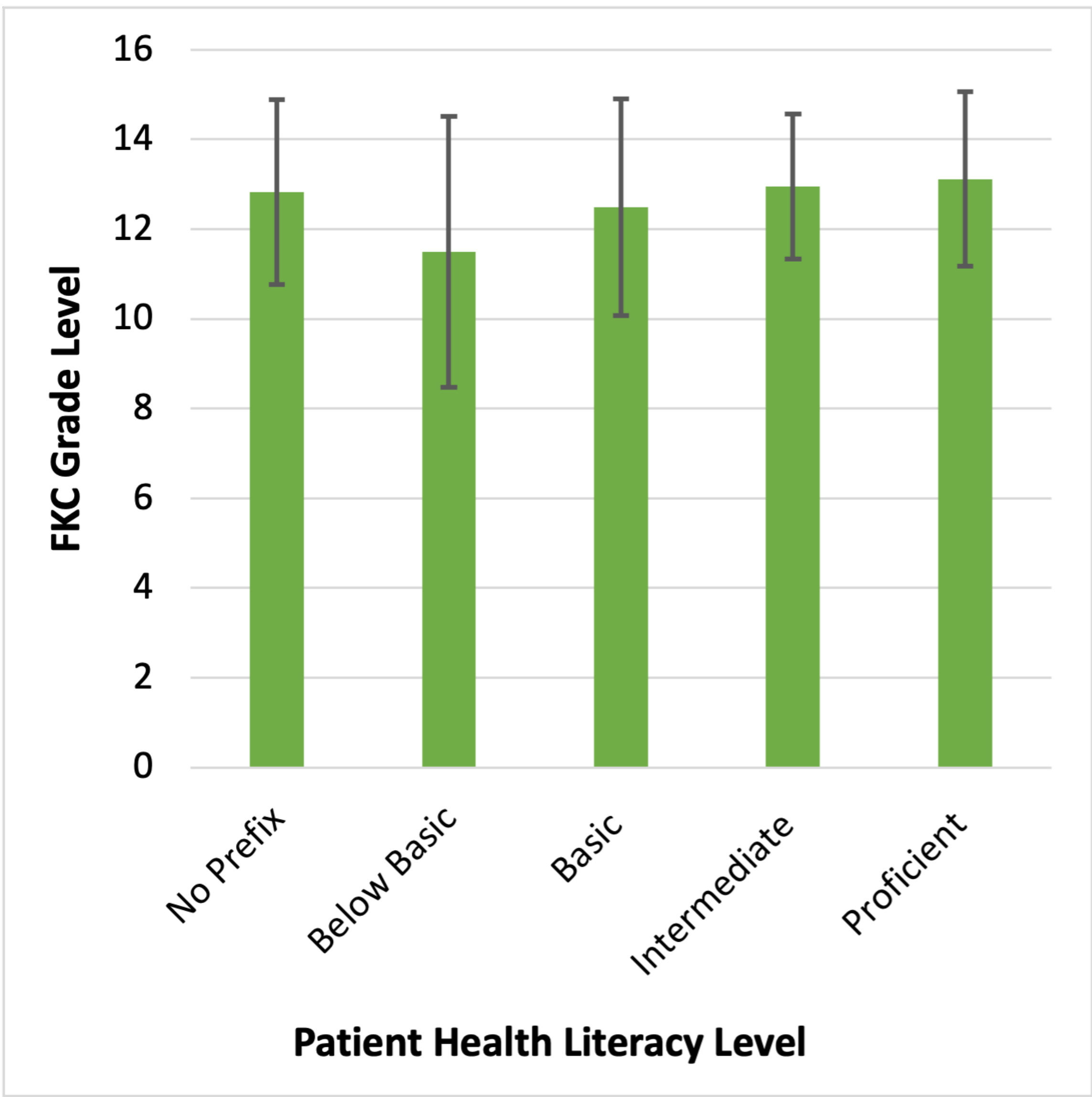
We selected 27 common questions relating to glaucoma medications, lasers, and surgical treatments. The questions were inputted into ChatGPT, first without instructions. Then, ChatGPT was instructed to tailor responses to 4 health literacy levels based on the US National Assessment of Health Literacy: below basic (BB), basic (B), intermediate (I), and proficient (P). Responses were analyzed using Flesch-Kincaid (FKC) grade level [0-18+] corresponding to years of education, word count, and syllables. Kruskal-Wallis rank sum tests were used to analyze the data.

Results

The mean FKC grade level of ChatGPT responses without any instructions about health literacy levels was 12.83, corresponding to a 12th-grade or “fairly difficult to read” level.

When instructed to tailor responses, the mean FKC grade level of BB, B, I, and P responses were 11.50, 12.49, 12.95, and 13.12 (p<0.001), respectively.

The mean word count of BB, B, I, and P answers (82, 117, 163, 177, respectively) correspondingly increased (p<0.001).



ChatGPT Responses: Below Basic vs. Proficient Health Literacy

**You**

Answer the following question at the level of below basic health literacy: What are the risks of trabeculectomy?

**ChatGPT**

Trabeculectomy is a surgery that helps treat glaucoma, which is a condition that can damage the optic nerve in the eye. Like any surgery, trabeculectomy has some risks. These risks include:

- Bleeding:** There may be some bleeding during or after the surgery.
- Infection:** There is a small chance of getting an infection in the eye after the surgery.
- Vision changes:** Your vision might change after the surgery. It could get better, stay the same, or, in rare cases, get worse.
- Eye pressure issues:** The surgery is done to reduce eye pressure, but sometimes it can lead to too low eye pressure, which might affect vision.
- Cataract development:** In some cases, a cataract (clouding of the eye's lens) may develop after the surgery.
- Need for additional surgery:** Sometimes, additional surgeries may be needed to manage complications or to improve the results.

It's important to talk to your doctor about the specific risks and benefits of trabeculectomy for your individual situation. They can provide more detailed information based on your health and the severity of your glaucoma.

**You**

Answer the following question at the level of proficient health literacy: What are the risks of trabeculectomy?

**ChatGPT**

Trabeculectomy is a surgical procedure used to treat glaucoma, a condition characterized by increased intraocular pressure that can lead to optic nerve damage and vision loss. While trabeculectomy is generally considered a safe and effective treatment, it does carry certain risks, as with any surgery. Here are some of the potential risks associated with trabeculectomy:

- Infection:** There is a risk of infection following surgery. Patients are typically prescribed antibiotics to minimize this risk.
- Bleeding:** Some bleeding may occur during or after the surgery. Excessive bleeding can lead to complications and may require additional treatment.
- Changes in Vision:** Trabeculectomy can result in changes in vision, including blurred or double vision. These changes are often temporary but may persist in some cases.
- Low Eye Pressure (Hypotony):** The surgery aims to lower intraocular pressure, but in some cases, it may lead to excessively low eye pressure, known as hypotony. This can affect vision and may require further intervention.
- Cataract Formation:** Trabeculectomy may accelerate the development of cataracts in some individuals, leading to clouding of the eye's lens.
- Scarring:** Scar tissue formation around the surgical site can occur, affecting the success of the procedure. Additional treatments or surgeries may be needed to manage scarring.
- Choroidal Detachment:** In rare cases, fluid may accumulate between the layers of the eye, leading to a choroidal detachment. This can affect vision and may require further medical attention.
- Persistent or Worsening Glaucoma:** Despite the surgery, there is a small risk that glaucoma may persist or worsen over time.

It's important for individuals considering trabeculectomy to discuss these risks and potential complications with their ophthalmologist. The decision to undergo surgery should be based on a careful consideration of the potential benefits and risks, taking into account the individual's specific health condition and needs. Regular follow-up appointments with the eye surgeon are crucial to monitor post-operative progress and address any concerns promptly.

Conclusion

ChatGPT in its current form is unable to provide easy to comprehend responses to glaucoma questions for the public. Future AI chatbots may need to be trained on not only the specific databases, such as medical, conversational, computer science, and finance, but to be able to provide easily understandable answers at all levels of health literacy to cater to a wider sector of society.

References

1.Secinaro S, et al. The role of artificial intelligence in healthcare: a structured literature review. *BMC Med Inform Decis Mak.* 2021;21(1):125. doi:10.1186/s12911-021-01488-9  
2. Cutilli CC, Bennett IM. Understanding the health literacy of America: results of the National Assessment of Adult Literacy. *Orthop Nurs.* 2009 Jan-Feb;28(1):27-32; quiz 33-4. doi: 10.1097/01.