Transcription errors in ophthalmology: Current burden and the opportunity for digital technologies

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BACKGROUND

- Pre-operative work-up conducted prior to cataract surgery is an intensive and complex process
- Ensuring accuracy is crucial to avoid errors in intraocular lens (IOL) implantation and/or poor refractive outcomes

OBJECTIVE

- The purpose of this literature review was to understand the burden of transcription errors in ophthalmology and the impact of recent digital technologies

METHODS

- A targeted search was performed and screened using the following strategy and criteria:

Database:	• MEDLINE
Date range:	• January 1, 2001 – September 30, 2021
Search terms:	• "ophthalmology", "cataract", "errors", "artificial intelligence", "AI", "cloud", "telemedicine", "digitally assisted", "transcription"
Key inclusion criteria (screening):	• Reported errors and a digital technology or digital solution used in ophthalmology • English language

- A grey literature search was also conducted

RESULTS

- Of 417 sources screened, 9 reported on transcription errors and 17 were related to digital solutions in ophthalmology[1-26]

Errors in Ophthalmology

- Transcription errors leading to incorrect IOL selection and/or power calculation were a commonly reported cause of incorrect IOL implantation. Other recurring root-error causes included:[1-3]
  - Handwriting misinterpretations
  - Wrong patient data
  - Failure to refer to source documents


Due to wrong implant, 19% of the analyzed cases had permanent injury (severity of Injury Score - 3 and 4)[3]


Due to wrong IOL events, one third (33%) of the analyzed cases reported moderate-to-severe harm[2]


Incorrect IOL implants have been associated with an average liability of $57,514 USD (€58,785 EUR)[1]

- A retrospective review comparing patient safety incidents from 2003-2010 (n=164) to 2010-2014 (n=178) revealed that incidence of wrong IOL implant due to transcription error (9% vs 15%) and eye confusion (3% vs 5%) increased over time, while the incidence due to biometry error decreased (18% vs 3%)[2]
- In a retrospective review of source documentation of a multicenter randomized controlled trial (ROSA), out of 22 hospitals evaluated, only 5 had complete accuracy in recording letter scores for visual acuity and only 1 had complete accuracy in recording calculated logMAR scores[4]
- A review of patient safety incidents identified mismatching of clinical documents and mistakes in transcription of IOL choice from biometry data to be the leading sources of incident reports[2]
  - Unclear documentation ('+3' instead of ' -3' dioptric powers) and data errors ('29' power versus '19')

Digital Solutions

- Studies indicate that algorithms and machine learning models may be developed to provide benefits to ophthalmology through:
  - Automating care processes and tele-screening[5]
  - Improving calculation, prediction and annotation accuracy[6-9]
  - Improving efficiency[7-10]
- Review articles have noted the potential of artificial intelligence-integration to:
  - Optimize and improve the accuracy of IOL power calculation formulas[11,12]
  - Reduce opportunities for human error[8,10]

CONCLUSION

- Transcription errors are associated with wrong IOL selection, but digital technologies may support improved accuracy through optimization and error reduction
- Future studies should explore how technological advancements can further streamline ophthalmic surgeries

REFERENCES

1. Parikh et al. 2020. Ophthalmology, 127(3), 296-302.
2. Steeples et al. 2016. Eye (Lond), 30(8), 1049-1055.
3. Simon, 2007, Trans Am Ophthalmol Soc., 105, 513-529.
4. Hughes & West. 2020. Eye (Lond), 34(8), 1438-1440.
5. de Pennington et al. 2021. JMIR Res Protoc., 10(7), e27227.
6. Wang et al. 2020. Int J Med Inform., 133, 104007.
7. Alexeeff et al. 2020. Perm J., 25, 1.
8. Lecuyer et al. 2020. Int J Comput Assist Radiol Surg., 15(4), 673-680.
9. Carmona González et al. 2021. Eye (Lond)., 35(2), 517-522.
10. Li et al. 2021. Prog Retin Eye Res., 82, 100900.
11. Goh et al. 2020. Asia Pac J Ophthalmol (Phila)., 9(2), 88-95.
12. Siddiqui et al. 2020. Curr Opin Ophthalmol., 31(4), 253-260.
13. Academy Committee on Medical Information Technology (2015) EyeNet Magazine (November 2015).
14. Ahmadi & Aslani .2018. Acta Inform Med., 26 (1), 24-28.
15. Caceres V .2019. Ophthalmology Management 23 (January 2019), 36-39.
16. Giardini & Livingstone .2020. Adv Exp Med Biol 1260., 161-174.
17. Hakansson et al. 2001. Acta Ophthalmol Scand., 79 (5), 518-523.
18. Kim et al. 2021. Asia Pac J Ophthalmol (Phila)., 10(4), 381-387.
19. National Institute for Health and Care Excellence. (2017). Cataracts in adults: management. Accessed: 2019/02/19.
20. Neily et al. 2018. J Patient Saf., 14 (1), 49-53.
21. Park et al. 2017. Can J Ophthalmol., 52(5), 503-507.
22. Paull et al. 2015. Am J Surg., 210 (1), 6-13.
23. Schein et al. 2012. Ophthalmology, 119 (10), 2059-2064.
24. Shorstein et al. 2017. J Cataract Refract Surg., 43 (3), 318-323.
25. Stephenson .2012. Review of Ophthalmology (January 2012).
26. The Royal College of Ophthalmologists. (2018). The Way Forward: Options to help meet demand for the current and future care of eye disease. Accessed: 2019/02/26.

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