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Editorial

A Measured Approach to Inpatient Ophthalmologic Screening in the COVID-19 Era: A Multicenter Perspective

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Although many of the early hotspots in the country have noted a downward trend in hospitalized cases with the novel coronavirus disease 2019 (COVID-19), several regions continue to see increasing or resurging rates of community spread.[1] It is likely that this virus will persist in urban centers and spread across the United States in a consecutive fashion for months to come. With hospital systems attempting to limit spread among their own workforce and the added effort of minimizing nonurgent interventions, ophthalmology has found itself tasked with optimizing care while performing a new risk-to-benefit analysis on virus transmissibility and patient and physician exposure. As a byproduct of these new challenges, departments nationwide have had to take a closer look at resource allocation and perform data-driven risk stratification holistically, from routine ophthalmologic examinations to glaucoma surgery. Crises such as COVID-19 allow us to re-evaluate processes that were otherwise reflexive and unsupported by adequate study.

Ophthalmology has found itself tasked with optimizing care while performing a new risk-to-benefit analysis on virus transmissibility and patient and physician exposure.

A screening examination for ocular findings is one of the most common ophthalmologic inpatient consultations for any patient who demonstrates a *Candida* bloodstream infection (candidemia).[2] This occurrence has been particularly common in the recent COVID-19–related intensive care population, many of whom are critically ill with both prolonged intubation and a 26% to 76% mortality rate.[3–5] The imperative for this examination is based on the Infectious Disease Society of America guidelines, which strongly recommend a fundus examination, preferably by an ophthalmologist, within 1 week of positive blood culture results for *Candida*, although the society notes low-quality evidence for this recommendation.[6] However, a recent systematic review found an incidence rate of less than 1% across 38 studies and more than 7000 patients, including more than 1000 who were examined prospectively. A change in management based on ophthalmologic findings was not universal, nor was it associated with success. The mortality rate, regardless of intervention, was 26%.[7]

These findings seem to be consistent with several institutional experiences, including New York-Presbyterian Hospital/Columbia University Irving Medical Center, Vanderbilt University Medical Center, and Johns Hopkins Hospital.[8,9] Considering the low yield, lack of proven benefit, and newfound concerns for patient and healthcare worker safety, our 3 institutions have chosen to defer ophthalmologic screening for *Candida* bloodstream infections unless a patient expresses acute visual symptoms or visible ophthalmic signs. In cases of nonverbal intubation or sedation, features include a visibly erythematous eye, blunted red reflex, pupillary abnormality, anterior chamber cloudiness, or any other opacity or concerning sign, all of which can be appreciated at bedside by a nonophthalmologic clinician. The objective of this approach was 3-fold: (1) to limit resource allocation to examinations, interventions, or both with meaningful and positive clinical impact; (2) to reduce unnecessary exposures between patients and healthcare workers; and (3) to reduce the risk of viral transmissibility across ophthalmic equipment known to lead to mortality in analogous settings.[10] Regardless of COVID-19, the risk versus benefit of asymptomatic screening examinations did not support the prior status quo. Although some regions are recovering from the initial wave of this crisis, there does not seem to be justification for resuming this practice.

Outside of candidemia, it is important to analyze the physician's role in all screening examinations, including cytomegalovirus retinitis, clearance before lung transplantation, and ocular lymphoma. In the era after highly active antiretroviral therapy, for example, the estimated

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incidence of cytomegalovirus end-organ disease is less than 6 per 100 person-years, without a direct correlation with titer levels.[11] Like candidemia, many cases of retinitis are thought to remain asymptomatic because of peripheral involvement and resolution with systemic treatment.[12] Retrospective data from 295 patients found 0 ocular contraindications to lung transplantation in routine pretransplant examinations in this especially vulnerable, immunocompromised population.[13] These findings recently were replicated.[14]

Experience with this pandemic is likely to spur future data-driven studies on the usefulness of ophthalmologic screening for these conditions, or at the very least, a closer inspection of existing data in a systematic fashion. As suggested previously by Oh et al[2] before the COVID-19 pandemic, physicians first must determine nonessential versus essential screening consultation and consider providing a list of nonessential items for consulting services to assist in appropriate triage and resource allocation. Telemedicine has inserted itself as a fixture in many current pandemic-response care models but has yet to be realized in the inpatient setting, or more specifically, inpatient screening (e.g., performing confrontation visual fields for neurosurgical procedures or assessing disc photographs for excluding papilledema).

Still, many may ask, "What is the harm of an eye examination?" Part of the answer lies in the mindful approach to evaluation and care that ophthalmologists provide. Physicians should recognize that the nature of performing routine examinations harbors an associated risk of simple human-to-human contact, the weight of which may support a *deferral* of care as *better* care in select cases. The rise of hospital-acquired infections before the COVID-19 pandemic, some more occult than others, that include *Candida auris*, methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus*, and *Clostridium difficile* are some of the many other deadly and communicable pathogens, and their transmission should be minimized when possible.[15–17] Ophthalmologists are at particularly high risk for contracting COVID-19, possibly because they are in close proximity to patient respiratory secretions during the ophthalmologic examination.[18] Although data regarding spread of COVID-19 infection from inpatient screening consultation currently are limited, the study population was exclusively residents,[18] who typically perform many of these consultations. A focused and intelligent selection for ophthalmologic screening examinations based on signs and symptoms in this context is a most reasonable approach moving forward, given known previous mortalities from adenoviral infection even when screening has been appropriate and necessary.[10] It will remain important to monitor the efficacy of this proposal and adjust it if needed, both throughout and beyond this crisis.

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References

1. Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19): cases in the U.S. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html; 2020. Accessed 29.07.20.
2. Oh DJ, Kanu LN, Chen JL, et al. Inpatient and emergency room ophthalmology consultations at a tertiary care center. *J Ophthalmol*. 2019:7807391. https://doi.org/10.1155/2019/7807391. eCollection 2019.
3. Grasselli G, Zangrillo A, Zanella A, et al. Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy region. *Italy*. JAMA. 2020;323(16):1574–1581.
4. Richardson S, Hirsch JS, Narasimhan M, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA*. 2020;323(20):2052–2059.
5. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020;395(10229):1054–1062.
6. Pappas PG, Kauffman CA, Andes DR, et al. Clinical practice guideline for the management of candidiasis: 2016 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2016;62(4):e1–e50.
7. Breazzano MP, Day HR, Bloch KC, et al. Utility of ophthalmologic screening for patients with *Candida* bloodstream infections: a systematic review. *JAMA Ophthalmol*. 2019;137(6):698–710.
8. Vinikoor MJ, Zoghby J, Cohen KL, Tucker JD. Do all candidemic patients need an ophthalmic examination? *Int J Infect Dis*. 2013;17(3):e146–e148.
9. Dozier CC, Tarantola RM, Jiramongkolchai K, Donahue SP. Fungal eye disease at a tertiary care center: the utility of routine inpatient consultation. *Ophthalmology*. 2011;118(8):1671–1676.
10. Sammons JS, Graf EH, Townsend S, et al. Outbreak of adenovirus in a neonatal intensive care unit: critical

importance of equipment cleaning during inpatient ophthalmologic examinations. *Ophthalmology*. 2019;126(1):137–143.
11. Jabs DA, Van Natta ML, Holbrook JT, et al. Longitudinal study of the ocular complications of AIDS: 1. Ocular diagnoses at enrollment. *Ophthalmology*. 2007;114(4):780–786.
12. Wei LL, Park SS, Skiest DJ. Prevalence of visual symptoms among patients with newly diagnosed cytomegalovirus retinitis. *Retina*. 2002;22(3):278–282.
13. Seré M, Ouwens JP, van de Bij W, Hardus PL. The value of routine ophthalmological tests in the screening for lung transplantation. *Transpl Int*. 2004;17(12):859–861.
14. Nanda T, Breazzano MP, Bearelly S. Clinical utility of pretransplant ophthalmic consultation for lung transplant recipients: implications in the COVID-19 pandemic era. *Graefes Arch Clin Exp Ophthalmol*. 2020;22:1–3.
15. Blot K, Hammami N, Blot S, et al. Increasing burden of *Escherichia coli, Klebsiella pneumoniae*, and *Enterococcus faecium* in hospital-acquired bloodstream infections (2000–2014): a national dynamic cohort study. *Infect Cont Hosp Ep*. 2019;40(6):705–709.
16. Chowdhary A, Sharma C, Meis JF. *Candida auris*: a rapidly emerging cause of hospital-acquired multidrug-resistant fungal infections globally. *PLoS Pathog*. 2017;13(5):e1006290.
17. Breazzano MP, Tooley AA, Godfrey KJ, et al. *Candida auris* and endogenous panophthalmitis: clinical and histopathological features. *Am J Ophthalmol Case Rep*. 2020;19:100738.
18. Breazzano MP, Shen J, Abdelhakim AH, et al. New York City COVID-19 resident physician exposure during exponential phase of pandemic. *J Clin Invest*. 2020:139587.