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Nikhil  
Gupta



Ellen  
Chang



Elizabeth  
Wang &  
Hershey



Dr. Tyson  
Kim, MD,  
PhD

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# QUARANTINED AT HOME

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01

## Significance

Why at-home monitoring?

02

## Current Solutions

What exists right now?

What is being researched?

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## Future

How can we improve?

# SIGNIFICANCE

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Why should we monitor  
patients at home during  
the quarantine?

01

# Significance of Remote Monitoring

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Freeing up Hospital  
& ICU Capacity



Reduce Risk of  
Infection Spread



More COVID Data  
for Research



Early Warning System  
for Patients

# DEVICES

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What technology  
currently exists? Are they  
good ideas?

02

# Pulse Oximeter - Important COVID-19 Monitoring Tool

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- Fingertip Pulse Oximeters
  - Continuous Pulse Oximeters
  - Pulse Oximetry Technology
- Wrist
  - Hand Held
  - Tabletop/Bedside
- Oxitone Wearable Vitals Monitor
  - Masimo MightSat Rx finger pulse oximeter

# Limitations of Pulse Oximetry

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- Accurate measurements disrupted by different factors
  - E.g. body movements, strength of arterial pulse
  - Tremors
  - Poor circulation due to peripheral vascular disease
    - E.g. Raynaud's

# Testing @ Home

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## POC Diagnostic

- Simple to use
- Fast results
- Cheap
- Lucira Health, Abbot ID NOW™

## At-home collection and send out

- 5 companies w/ FDA EUA
- Nasal swab/saliva sample
- Results in 1-3 days
- \$100-\$150

# ECG - High Risk Cardiac Patients



## Hospital Grade

- More akin to hospital setting
- Must be user friendly

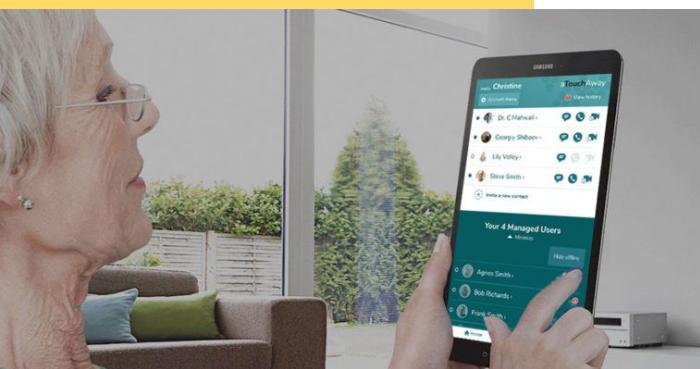


## Continuous Monitoring

- Multi-day sensing
- Compact
- Multiple metrics

# Telehealth enables remote monitoring!

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- Remotely collect, store and report accurate health information anywhere
- Monitor exposed workers for 14 days

# CMS expands telehealth services & reimbursements

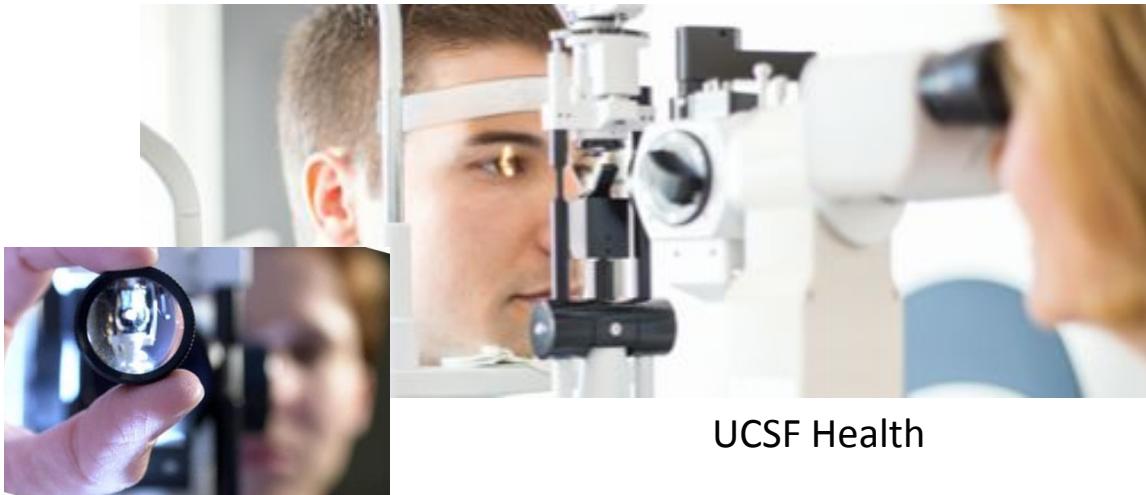
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- 80+ additional services for Medicare patients
- Updated E&M CPT Codes
- Limitations:
  - User friendliness for older patients
  - Lack of access for low socioeconomic patients
  - Difficulty for physical exams



# Expanded Need: Ophthalmic Telemedicine

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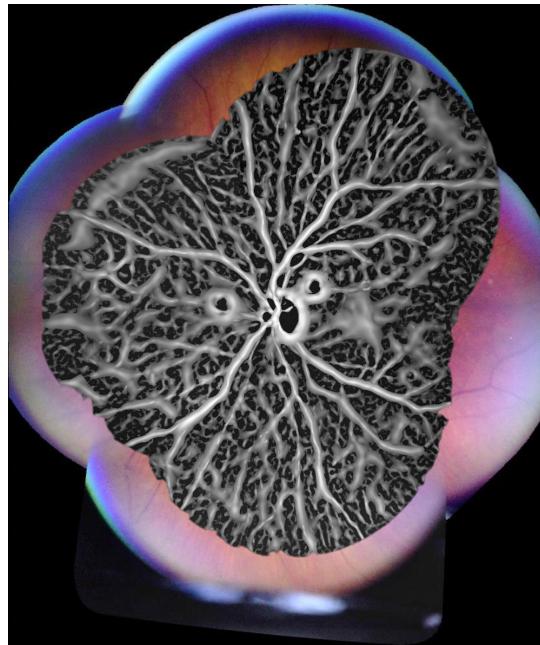
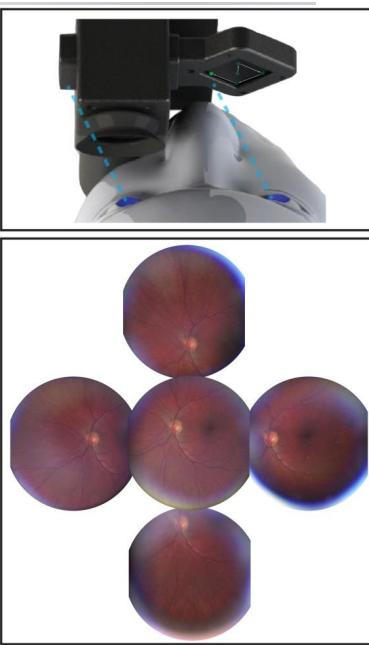
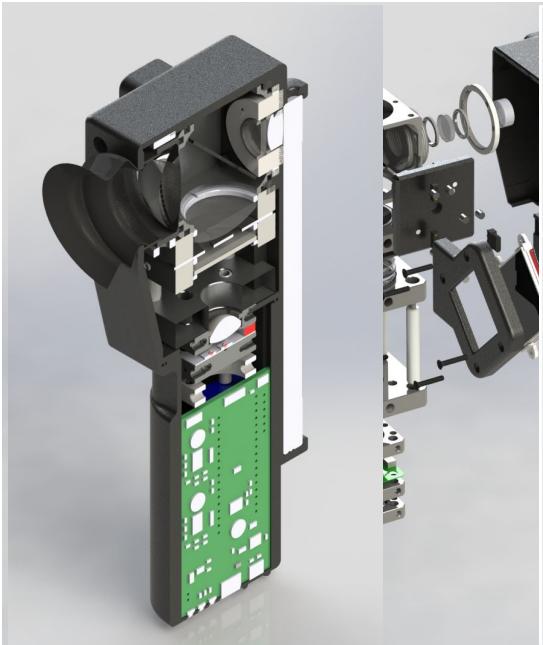


UCSF Health

- Widespread acceptance of ophthalmic telemedicine was spurred by COVID-19
- Established reimbursement through identical E&M coding as in clinic encounters
- Scope of ophthalmic telemedicine is currently limited by examination

# Solution: Easy and Intelligent Retinal imaging

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# High Quality Retinal Imaging

Ruptured Macroaneurysm



Rhegmatogenous RD



Peripapillary Myelinated NFL



Morning Glory Anomaly



tvst

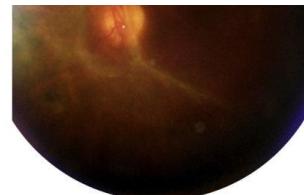
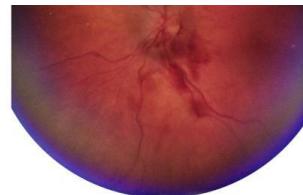
<https://doi.org/10.1167/tvst.7.5.21>

Article

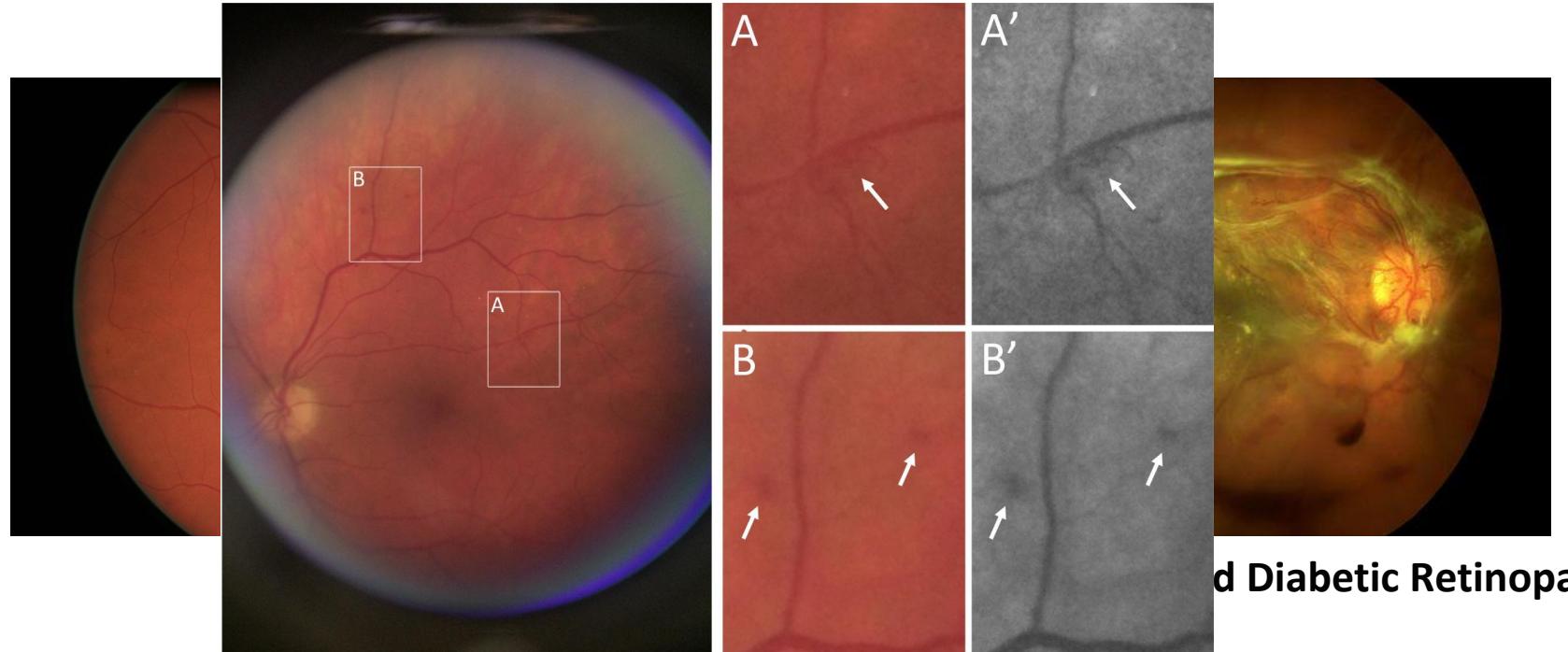
## A Smartphone-Based Tool for Rapid, Portable, and Automated Wide-Field Retinal Imaging

Tyson N. Kim<sup>1,2,3</sup>, Frank Myers<sup>2</sup>, Clay Reber<sup>2</sup>, PJ Loury<sup>2</sup>, Panagiota Loumou<sup>2</sup>, Doug Webster<sup>2</sup>, Chris Echanique<sup>2</sup>, Patrick Li<sup>1</sup>, Jose R. Davila<sup>1</sup>, Robi N. Maamari<sup>2,4</sup>, Neil A. Switz<sup>5</sup>, Jeremy Keenan<sup>3</sup>, Maria A. Woodward<sup>1</sup>, Yannis M. Paulus<sup>1</sup>, Todd Margolis<sup>4</sup>, and Daniel A. Fletcher<sup>2,6</sup>

Preretinal Fibrovascular Membrane



# Excellent Detection of Referable Disease



- Device resolves **early** signs of referral-warranted diabetic retinopathy
- 94% Sensitivity, 75% Specificity for referral-warranted DR (n=72 patients)

# Automated Grading of DR

## Image Enhancement



Eye

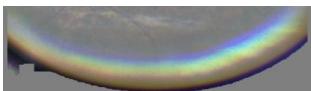
<https://doi.org/10.1038/s41433-020-0849-5>

ARTICLE



## Comparison of automated and expert human grading of diabetic retinopathy using smartphone-based retinal photography

Tyson N. Kim<sup>1,2</sup> · Michael T. Aaberg<sup>1</sup> · Patrick Li<sup>1</sup> · Jose R. Davila<sup>1</sup> · Malavika Bhaskaranand<sup>3</sup> · Sandeep Bhat<sup>3</sup> · Chaithanya Ramachandra<sup>3</sup> · Kaushal Solanki<sup>3</sup> · Frankie Myers<sup>4</sup> · Clay Reber<sup>4</sup> · Rohan Jalalizadeh<sup>1</sup> · Todd P. Margolis<sup>5</sup> · Daniel Fletcher<sup>ID 4</sup> · Yannis M. Paulus<sup>1,6</sup>



Acquisition of retinal fundus images

LensApp analysis engine

Image interpretation algorithms on cloud



Screening recommendation

# THANKS!

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