



The SMART Study

[The Street Medicine Auto-Refractive Technology Study]



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Overview

- The Problem
- The Current Landscape
- A Bit of Brainstorming
- The SMART Study
- Collaborations
- The Future

Learning Objectives

- Discuss the existing gap in vision care among persons experiencing homelessness
- Review the methods and findings of the Street Medicine Auto-Refractive Technology Study
- Highlight the ease-of-use and portability of Auto-Refractive technology for vision screening and correction among rough-sleepers
- To demonstrate feasibility of Auto-Refractive technology as a low barrier access approach for vision correction

The Problem

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- 2.3 billion people worldwide suffer from poor vision due to refractive error
 - Of that, 670 million are considered visually impaired because they lack access to corrective treatment
 - Uncorrected refractive error is the leading cause of vision impairment globally
 - >90% are in low to middle income countries
 - Uncorrected refractive error has been shown to have significant social implications, including limitations in education and employment opportunities
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- When compared to adults in the same age-group, the homeless population has more abnormal ocular findings, most common being refractive error
- Increased functional limitation in individuals with homelessness
- Data is limited

Visual impairment in Individuals experiencing homelessness

Types of Decreased Visual Acuity



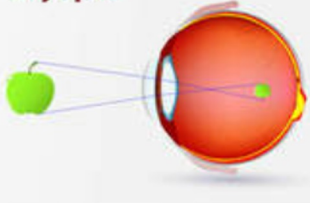
Healthy eye



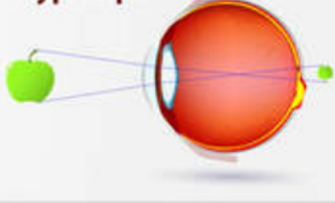
Astigmatism



Myopia



Hyperopia



Refractive error

Hyperopia (farsighted)
Myopia (nearsighted)
Presbyopia
Astigmatism

Non-refractive error

Glaucoma
Cataracts
Strabismus
Amblyopia
Diabetic Retinopathy
Macular Degeneration

Question:

How is visual impairment amongst individuals experiencing homelessness currently addressed in your community?

Current Models for Community Vision Screening

Fixed Site
Clinics



Event-Based Clinics



Variable Location Clinics



Community Outreach Programs

Thought Experiment

Imagine a program to address vision loss in your community

- What conditions do you need to be prepared to treat?
 - What expertise and person power is needed?
 - What equipment is needed?
- What clinics/facilities do you need to partner with?

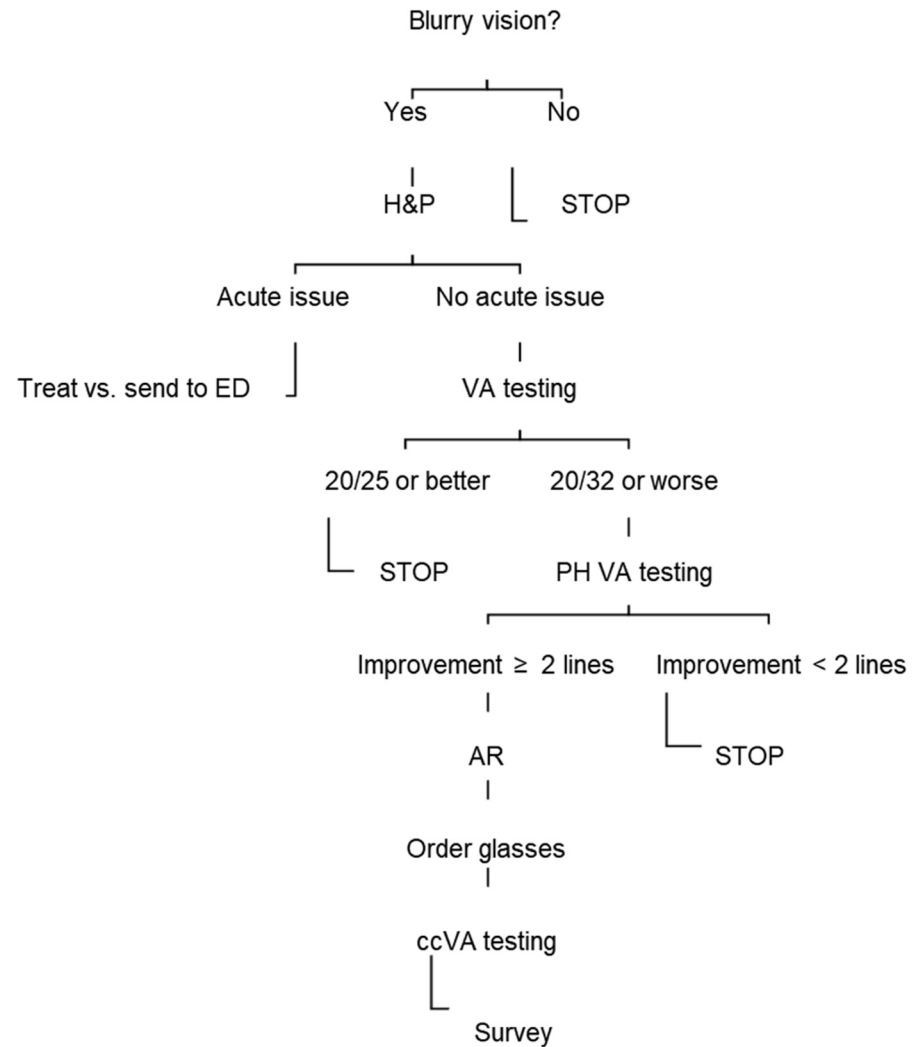
The SMART Study

- Built on the principles of Street Medicine:
 - Meeting individuals where they are
 - Overcoming barriers that lead to a gap in care
 - Building relationships that foster continued interaction with providers and health care delivery
 - Returning a piece of humanity to individuals experiencing homelessness
- All screenings were completed by the street medicine team: internal medicine physicians, nurses and CHWs



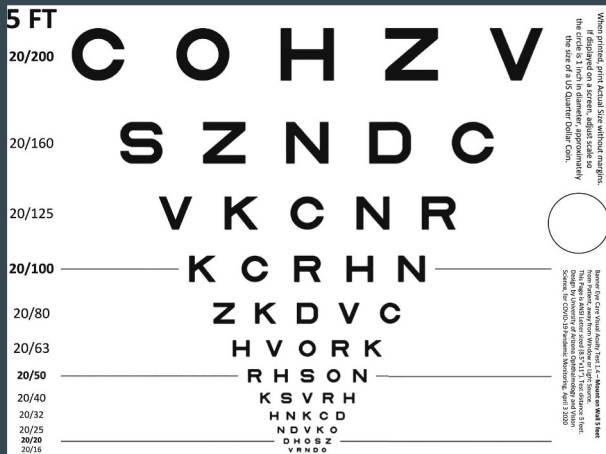
Our solution

The street medicine team identifies individuals experiencing homelessness with visual impairment, whether on the street, in camps, in shelters, or visiting drop-in centers



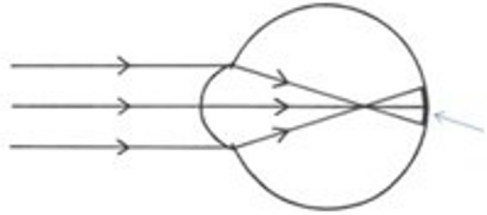
Eye Chart

- A validated Early Treatment Diabetic Retinopathy Study (ETDRS) chart developed by University of Arizona and Banner of Health was put in public domain
 - Validated at distance of 5 feet
 - Printable on a standard 8.5 × 11 inches paper
 - Calibrated with a US quarter coin

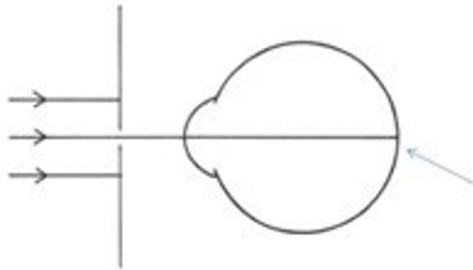


Pinhole Aperture

A simple way to parse out refractive vs non-refractive error



In refractive error the scattered beams of light are not refracted correctly onto the retina. This creates a 'blur circle' on the retina.



Pinholes eliminate all but straight beams of light which fall directly on the retina giving a clear image.



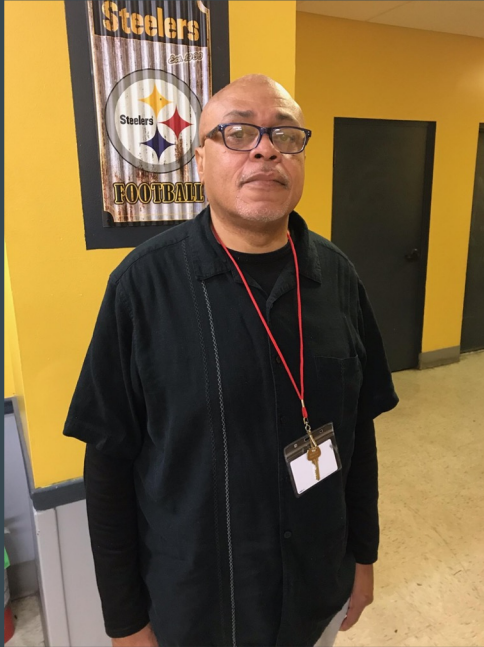
Auto refractor

- Auto-refractor (AR) is a device that measures refractive error of an individual based on how light enters the eye.
- In 2021, Samanta et al. looked at all portable AR in the market and determined QuickSee by PlenOptika was the most accurate portable AR with measurements similar to clinical manifest refraction, the gold standard.

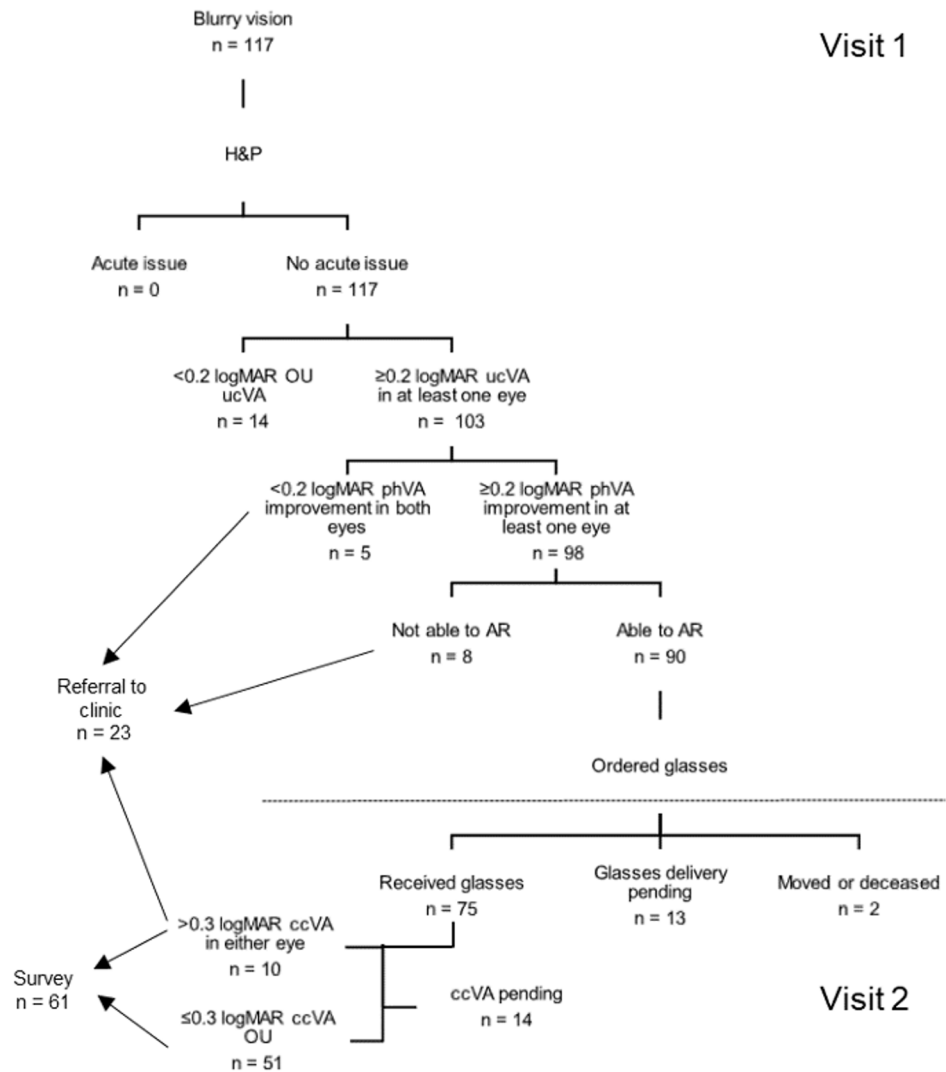


Glasses

Glasses were purchased from an online retailer, Zenni Optical, for an average cost of \$26.48



Results



Results

Does it work?

- 117 patients have been screened so far
- o 103/117 (88%) had VA equal to or worse than 20/32
- o 98/103 (95.1%) showed improvement with PH in at least 1 eye
- o 90/98 (91.8%) were able to do the AR
- o 75/90 (83.3%) have received their glasses

Glasses improved visual acuity by ~5 lines on the eye chart for both the right and left eyes ($p < 0.001$)

Simulated Vision



0.6

Simulated Vision



0.1

Results

Do people like it?

- Surveys shows patients are satisfied with auto-refraction (4.7/5) and the VA testing (4.6/5)
 - Patients see better with prescribed glasses (4.8/5) and believe it will help with daily activities (4.7/5)
 - Most patients would not have been able to obtain glasses without the SMART study (4.7/5)
-

Results

Referrals

- 23 patients referred to ophthalmology clinic
 - 9 completed appointments
 - 5/23 referred for non-refractive error (VA did not improve with PH)
 - 8/23 unable to complete AR
 - 10/23 had VA worse than 20/40 after glasses
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- Conditions Referred
 - Glaucoma
 - Cataracts → 2 successful surgeries
 - Severe myopia
 - Enucleation
 - Unidentified non-refractive error

Results

The intangibles



- “I can see everything!”
 - “This is better than even going to the eye doctor”
 - “I had given up on being able to see”
 - “These glasses are better than what you get in the store”
 - “It’s amazing how much more clearly I can see!”
 - “I’m totally satisfied with these glasses. I’m overjoyed. Y'all made me like glasses”
-
- One person was able to get his CD license because of his new glasses and improved vision
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Collaborations

- UPMC Mercy Ophthalmology
 - Dr. Evan “Jake” Waxman
- Guerilla Eye Service
 - Mission based/fixed site ophthalmology access
- Mobile Eye Unit
 - Combined street medicine/optho partnership
 - Completed 1st joint venture in March 2023
 - 7 patients assessed and treated at encampments and drop in center



Options for Glasses Ordering

- Our study used low cost purchasing from Zenni Optical
 - 6 preselected frame styles
 - Delivery time 1-2 weeks
- Other free options include:
 - New Eyes - Glasses for those in Need (<https://new-eyes.org>)
 - OneSight - EssilorLuxottica Foundation (<https://changinglifethroughlenses.org>)

The Future

Addressing the Challenges:

- Reliable referral system with ophthalmology
- Individuals with both refractive and non-refractive error
- Ensuring adequate follow-up for delivery of glasses
- Troubleshooting issues the Auto-Refractive Device
 - Immediate damage or loss of glasses

The Incredible Benefits We've Seen



- The ease of use of the study materials with minimal training
- The wide applicability of the study design allowed delivery of vision screening to virtually any location
- Gives back an often overlooked piece of humanity back to those who feel less than human
- Functions as a positive, simple experience to develop a relationship with individuals experiencing homelessness

Take Home Points

- Visual Acuity Testing with Pinholing is a quick and effective way to screen for refractive and non-refractive error in homeless populations
 - Provides a method for prioritizing patients for ophthalmology referrals
- Portable Auto-Refractometry represents a low barrier way to provide prescription glasses in encampments and shelters
- Portable AR requires limited training and is highly effective
- Vision Screening and portable AR are satisfying for patients
- Providing glasses to persons experiencing homelessness improves functional outcomes and is dignifying

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Thank you for coming!

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Simulated Vision



Simulated Vision

