Project TennesSEEwell: Preventing diabetic blindness in Tennessee

Lawrence M. Merin, RBP, FIMI, FOPS, FBCA
Assistant Professor of Ophthalmology and
Director, Vanderbilt Ophthalmic Imaging Center
Nashville, Tennessee

Diabetic retinopathy
Diabetic retinopathy

A progressive complication of diabetes mellitus that damages the retinal microcirculation

Its onset precedes the formal diagnosis of diabetes
Diabetic retinopathy

A progressive complication of diabetes mellitus that damages the retinal microcirculation

Its onset precedes the formal diagnosis of diabetes

Is frequently asymptomatic until severe

Laser treatment is effective in slowing or staunching progression

Leading cause of new blindness among working-age adults
Diabetic retinopathy

A progressive complication of diabetes mellitus that damages the retinal microcirculation.
Its onset precedes the formal diagnosis of diabetes.
Is frequently asymptomatic until severe.
Laser treatment is effective in slowing or staunching progression.
Remains the leading cause of new blindness among working-age adults in US.

Every person with diabetes is at risk of developing diabetic retinopathy.
8% of pre-diabetics have retinopathy.
How is retinopathy detected?

*Traditional method:*
Dilated examination performed by eye specialist

---

Treatment

Laser photocoagulation is >90% effective – improved outcomes only with early detection
Barriers to diabetic eye care

Patients
- Education
- Lack of early symptoms
- Financial burden
- Personal (work, child care, transportation)

Barriers to diabetic eye care

Healthcare system
- Time required for yet another intervention
- Availability/organization of records
- No mechanism for clinical alerts
- Lack of access to specialists
- Poor communication between PCPs and ophthalmologists
Regular ophthalmic care

Undetected illness

Unmet needs for both acute and chronic care

Preventable blindness

Can diabetic eye screening be accurate, consistent, available, efficient and inexpensive?
Chronic care model

- Proactive instead of reactive
- Structured, planned interactions
- Embed evidence-based guidelines into daily clinical practice
- Integrate specialist expertise and primary care
- Facilitate care coordination within and across organizations
- Involve supportive specialists in the primary care of more complex patients

Mobile teleophthalmology diabetic retinal screening program: Methodology
Mobile teleophthalmology diabetic retinal screening program: Methodology

1. Screening in the primary care setting
2. Use of high resolution digital cameras to acquire and upload retinal images to centralized reading center
Mobile teleophthalmology diabetic retinal screening program: Methodology

1. Screening in the primary care setting
2. Use of high resolution digital cameras to acquire and upload retinal images to centralized reading center
3. Mobile service provides equipment and staff
4. Protocol-driven, evidence-based image review and reporting
Screening encounter: Grading and reporting

Multistage expert image grading achieves >90% sensitivity, >90% specificity for sight-threatening diabetic retinopathy

Uses evidence-based International Classification System to stratify risk and recommend referral

Only screen-positives are sent to local eye specialists

What we find: diabetic retinopathy
What we find: diabetic retinopathy
What we find: diabetic retinopathy

What we find: diabetic retinopathy
What we find: diabetic retinopathy

What we find: diabetic retinopathy
What we find: macular degeneration

What we find: possible glaucoma
What we find: hypertension

![Retinal Image]

What we find: plaques

![Retinal Image]
What we find: plaques

What we find: POHS
What we find: CHRPE

What we find: talc retinopathy
What we find: and several other conditions

360.20 Degenerative disorder of globe, unspecified
360.21 Progressive high (degenerative) myopia
360.23 Siderosis of globe
360.24 Other malformations of globe
360.31 Primary hypotony of eye
360.32 Ocular fistula causing hypotony
360.33 Hypotony of eye, unspecified
360.44 Leukocoria
Background diabetic retinopathy
360.12 Exudative retinopathy
360.14 Retinal microaneurysms NOS
361.15 Retinal telangiectasis
362.16 Retinal neovascularization NOS
362.18 Retinal vasculitis
362.21 Retinal detachment
362.29 Other non-diabetic proliferative retinopathy
362.30 Central serous retinopathy
362.42 Serum detachment of retinal pigment epithelium
362.43 Hemorrhagic detachment of retinal pigment epithelium
362.52 Exudative serous macular degeneration of retina
362.53 Cystoid macular degeneration
362.54 Macular cyst, hole, or pseudohole
362.55 Toxic maculopathy
362.74 Pigmentary retinal dystrophy
362.76 Dystrophies primarily involving the retinal pigment epithelium
362.81 Retinal hemorrhage
362.82 Retinal exudates and deposits
362.83 Retinal edema
362.85 Retinal nerve fiber bundle defects
362.89 Other retinal disorders
363.00 Focal choroiditis, unspecified
363.01 Focal choroiditis and chorioretinitis, juxtapapillary
363.03 Focal choroiditis and chorioretinitis of other posterior pole
363.04 Focal choroiditis and chorioretinitis, peripheral
363.05 Focal retinitis and retinochoroiditis, juxtapapillary
363.06 Focal retinitis and retinochoroiditis
363.07 Focal retinitis and retinochoroiditis of other posterior pole
363.08 Focal retinitis and retinochoroiditis, peripheral
363.10 Disseminated choroiditis, unspecified
363.11 Disseminated choroiditis and chorioretinitis, posterior pole
363.12 Disseminated choroiditis and chorioretinitis, peripheral
363.13 Disseminated choroiditis and chorioretinitis, generalized
363.14 Disseminated retinitis and retinochoroiditis, metastatic
363.15 Disseminated retinitis and retinochoroiditis, pigment epitheliopathy
363.20 Chorioretinitis, unspecified
363.30 Choroidal neovascularization
363.31 Solar retinopathy
363.32 Other macular scars of retina
363.33 Other scars of posterior pole of retina
363.40 Choroidal detachment
363.41 Glaucoma associated with chamber angle anomalies
363.42 Glaucoma associated with other anomalies of iris
363.43 Glaucoma associated with other anterior segment anomalies
363.44 Glaucoma associated with other ocular surface anomalies
363.45 Glaucoma associated with other eyes
365.00 Pre‐glaucoma, unspecified
365.01 Open angle with borderline glaucoma
365.02 Anatomically narrow angle borderline glaucoma
365.03 Open angle with borderline glaucoma findings
365.04 Chronic open angle glaucoma, unspecified
365.05 Primary open angle glaucoma
365.10 Open angle with borderline glaucoma
365.11 Open angle with borderline glaucoma findings
365.12 Open angle with borderline glaucoma
365.13 Open angle with borderline glaucoma findings
365.14 Pigmentary glaucoma
365.15 Chronic open angle glaucoma
365.16 Primary angle closure glaucoma
365.17 Angle closure glaucoma
365.18 Secondary angle closure glaucoma
365.19 Secondary angle closure glaucoma
365.20 Secondary angle closure glaucoma
365.30 Central serous retinopathy
365.31 Central serous retinopathy
365.32 Central serous retinopathy
365.33 Central serous retinopathy
365.40 Angle closure glaucoma
365.41 Angle closure glaucoma
365.42 Angle closure glaucoma
365.43 Angle closure glaucoma
365.44 Angle closure glaucoma
365.45 Angle closure glaucoma
365.50 Pseudoexfoliation glaucoma
365.51 Pseudoexfoliation glaucoma
365.52 Pseudoexfoliation glaucoma
365.53 Pseudoexfoliation glaucoma
365.54 Pseudoexfoliation glaucoma
365.55 Pseudoexfoliation glaucoma
365.56 Pseudoexfoliation glaucoma
365.57 Pseudoexfoliation glaucoma
365.58 Pseudoexfoliation glaucoma
365.59 Glaucoma associated with other lens disorders
365.60 Glaucoma associated with unspecified ocular disorder
365.61 Glaucoma associated with pupillary block
365.62 Glaucoma associated with tumors or cysts
365.63 Glaucoma associated with vascular disorders
365.64 Glaucoma associated with tumors or cysts
365.65 Glaucoma associated with ocular trauma
365.66 Glaucoma associated with ocular inflammation
365.67 Glaucoma associated with ocular inflammation
365.68 Glaucoma associated with ocular inflammation
365.69 Glaucoma associated with ocular inflammation
365.70 Glaucoma associated with ocular inflammation
365.71 Glaucoma associated with ocular inflammation
365.72 Glaucoma associated with ocular inflammation
365.73 Glaucoma associated with ocular inflammation
365.74 Glaucoma associated with ocular inflammation
365.75 Glaucoma associated with ocular inflammation
365.76 Glaucoma associated with ocular inflammation
365.77 Glaucoma associated with ocular inflammation
365.78 Glaucoma associated with ocular inflammation
365.79 Glaucoma associated with ocular inflammation
365.80 Glaucoma associated with ocular inflammation
365.81 Hypersecretion glaucoma
365.82 Glaucoma with other ocular complications
365.83 Glaucoma with other ocular complications
365.84 Glaucoma with other ocular complications
365.85 Glaucoma with other ocular complications
365.86 Glaucoma with other ocular complications
365.87 Glaucoma with other ocular complications
365.88 Glaucoma with other ocular complications
365.89 Glaucoma with other ocular complications
365.90 Glaucoma with other ocular complications
365.91 Glaucoma with other ocular complications
365.92 Glaucoma with other ocular complications
365.93 Glaucoma with other ocular complications
365.94 Glaucoma with other ocular complications
365.95 Glaucoma with other ocular complications
365.96 Glaucoma with other ocular complications
365.97 Glaucoma with other ocular complications
365.98 Glaucoma with other ocular complications
365.99 Glaucoma with other ocular complications
365.900 Glaucoma with other ocular complications
365.999 Glaucoma with other ocular complications

Mobile teleophthalmology reduces disparities

- Improves access to care for populations that suffer disparities associated with race, ethnicity, socioeconomic status and geography
- A practical improvement in rural and high-risk urban public health
Mobile teleophthalmology reduces disparities

Improves outcomes by providing a uniform quality standard (equity of care)

_Missed Diagnosis of Proliferative Retinopathy_

<table>
<thead>
<tr>
<th>Group</th>
<th>Missed Diagnosis Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internists</td>
<td>52%</td>
</tr>
<tr>
<td>Medical Residents</td>
<td>50%</td>
</tr>
<tr>
<td>Diabetologists</td>
<td>33%</td>
</tr>
<tr>
<td>General ophthalmologists</td>
<td>9%</td>
</tr>
<tr>
<td>Retinal Specialists</td>
<td>0%</td>
</tr>
</tbody>
</table>

Diagnosis of diabetic retinopathy: Sussman EJ, Tsiaras WQ, Soper KA. JAMA 1982

Project TennesSEEwell

2007: Awarded grant from TN Dept. of Health to screen uninsured diabetic patients throughout the state in both community health and county health department clinics
Project TennesSEEwell

Two fixed cameras, all others served by mobile camera service
Patients appointed in advance
Capacity of 50+ patients per day

Project TennesSEEwell: 2007-8

Two fixed cameras, two mobile cameras connect to reading center by state e-Health broadband network
Project TennesSEEwell: 2008-9

Two fixed cameras, two mobile cameras connect to reading center by state e-Health broadband network
One VOIC mobile camera

Project TennesSEEwell: 2010

Two fixed cameras, two mobile cameras connect to reading center by state e-Health broadband network
One VOIC mobile camera
Second VOIC mobile camera
Project TennesSEEwell: 2007-2010

5,000 patients screened in 27 community health centers and 47 county health departments

Increased compliance for retinal screening from ~5% to >80%

Project TennesSEEwell: 2010

Metro Nashville Consortium of Safety Net Providers: Diabetes Improvement Project

Service to TennCare subscribers at physician clinics, covered by either VUMC-Insurer master contracts or by fee-for-service agreements
Summary

• Mobile teleophthalmic diabetic eye screening increases access to care in resource-limited settings
• Specialist care can be provided in general clinical venues
• Geography is no longer an impediment
• Implications for the new national healthcare landscape

“If you always do what you have always did, you will always get what you have always got.”
- Jackie "Moms" Mabley