Joslin Vision Network
Diabetes Eye Care Program

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**Research**
- Sections are basic and clinical
- $310 million over past 20 years
- 60% of NIH grant applications approved, 20% is usual
- 140 MDs/PhDs in training: 1/3 MD, 1/3 PhD, 1/3 both degrees

**Clinic**
- Founded by Dr. Elliott P. Joslin in 1898
- Largest center in the world for treatment and education of patients with diabetes
- Over 87,000 patient visits a year to experts in adult and pediatric diabetes, kidney disease, eye care, mental health and pregnancy

**Strategic Initiatives**
- Extends Joslin products, services and assets to the global marketplace
- Healthcare Services, Professional Education, Affiliated Programs, International Programs

**Joslin Ventures**
- Provides an active framework that will seed new ideas
- Partner technologies for co-development with other companies
- Brings selected Joslin technologies to a commercially ready stage for spin-out opportunities and joint ventures
The World Relies on Joslin

Largest institution in the world devoted exclusively to diabetes research, care and education

Affiliated with Harvard Medical School

Highest patient population on insulin pumps in the world

Database of medical data stretching back decades

Best record for saving kidneys, legs and eyesight potentially lost to diabetes

More than 40,000 patients cared for by the Joslin Vision Network

More than 100,000 patients seen each year at 41 Affiliated Centers

Highest concentration of diabetes educators in the world

Sets the standard of care and education with 250,000+ patients treated

World’s largest team of board-certified physicians treating diabetes
How Severe is the Problem?
Global Projections for the Diabetes Epidemic: 2011-2030

M = million, AFR = Africa, NAC = North America and Caribbean, EUR = Europe, SACA = South and Central America, MENA = Middle East and North Africa, SEA = South-East Asia, WP = Western Pacific

Diabetes Worldwide

Persons with Diabetes 2011:
366 million (8.3% of world’s adult population)

Persons with Diabetes 2030:
552 million (51% increase)
Prevalence of Diabetic Complications

Centers for Disease Control and Prevention, 2008
Global Retinopathy Evaluation Need

Based on current estimates

3 million eyes per day

at least will need to be

evaluated by 2030
Why Focus on Diabetic Eye Disease?
Clinical Stages of Diabetic Retinopathy

- Pre-Clinical Changes
  - NPDR (Nonproliferative Diabetic Retinopathy)
  - BDR (Background)
  - PPDR (Preproliferative)

- Clinical Stages
  - None
  - Mild to Moderate
  - Moderate to Severe Neovascularization

- Severity
  - less common
  - MACULAR EDEMA
  - more common

Vision Loss from Diabetic Retinopathy

Retinal Vascular Proliferation

(Proliferative Diabetic Retinopathy - PDR)
Vision Loss from Diabetic Retinopathy

Retinal Vascular Proliferation

Traction Retinal Detachment - TRD
Vision Loss from Diabetic Retinopathy

Vitreous Hemorrhage

Normal Retina

Vitreous Hemorrhage
Vision Loss from Diabetic Retinopathy

Macular Edema

Normal Retina

Macular Edema
Diabetic Retinopathy

A Leading Cause Of:

Severe visual loss

Moderate visual loss

New onset blindness
How Well Can We Treat Diabetic Eye Disease?
Panretinal Laser Photocoagulation
Effective Evidence Based Eye Care

Visual Acuity less than 5/200 at each visit
Proliferative Diabetic Retinopathy

60-96% reduction in moderate & severe visual loss

Extensive evidence based data upon which to develop evaluation & treatment approaches
# Visual Outcomes at the Joslin Diabetes Center 2006 – 2010 (N=14,597 patients)

<table>
<thead>
<tr>
<th>Best Corrected VA, median (Q1, Q3)*</th>
<th>20/20 (20/16,20/25)</th>
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<tbody>
<tr>
<td>Change in BCVA, mean (SD)†</td>
<td>- 0.5 (± 7) letters</td>
</tr>
<tr>
<td>20/20 or better (N)</td>
<td>72% (10,535)</td>
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<tr>
<td>20/40 or better (N)</td>
<td>92% (13,414)</td>
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<tr>
<td>20/200 or worse (N)</td>
<td>1% (153)</td>
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61% with DR, 18% with PDR, 22% with DME, 6% with CSME

*14,511 (99.4%) with measured BCVA, 12 patients with light perception or worse vision in the better-seeing eye
† Mean follow-up of 1.9 years
Effective Diabetes Eye Care

- Identification of diabetes
- Assessment of the eyes for retinopathy
- Determination of retinopathy severity
- Routine lifelong eye care
- Coordinated medical care
  - Blood glucose, hypertension, lipids
- Patient education
- Prompt treatment when indicated

Can be addressed using Telemedicine
How Well Are We Addressing Identification and Care Delivery?
% of Diagnosed Diabetes Patients Who Said They had a Dilated Eye Exam in the Past Year

- United Kingdom: 74%
- United States: 64%
- Germany: 63%
- France: 55%
- Netherlands: 54%
- Italy: 43%
- Spain: 42%
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<th>Discrepancies in Access to Eye Care</th>
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<tr>
<td>285,000,000 individuals with diabetes</td>
</tr>
<tr>
<td>160,000 ophthalmologists</td>
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<tr>
<td>54% increase in diabetes population</td>
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<tr>
<td>&lt; 2% growth in the number of ophthalmologists</td>
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Telemedicine Approach

- Brings exam to patient
- Within cultural context
- Flexible timing
- Avoid dilation
- Combined with education
- Apply disease management
- Facilitate clinical trials
Telemedicine Approach

- Extends disease identification and provides medical resource triage
- Extends delivery of evidence-based diabetes eye care
- Integrate diabetes eye care and education into the total care of each person with diabetes
Joslin Vision Network: Validated Telemedicine Program for DR

- Digital stereoscopic images
- Undilated pupils
- Image/data transfer & storage
- Clinical Level of DR
- Non DM retinal findings
- EMR interface
- Equivalent to retinal exam for diabetic retinopathy but does not replace a comprehensive eye exam
Primary Care Practice
Joslin Ocular Telehealth Program

Provider requests spontaneou referral for retinal imaging

Patient Care Coordinator pre-schedules patient with DM for retinal imaging

Patient scheduled for appropriate eye exam

Reports read immediately if certified imager identifies findings that may be URGENT

Primary provider receives final report with diagnosis and eye care recommendation

All other reports read by certified graders within 1-2 business days

URGENT FINDINGS
Patient scheduled for prompt Eye Exam

NON-URGENT or OVERDUE
Patient scheduled for appropriate eye exam

Patient Education
Joslin Vision Network Deployment

Clinical Programs in point-of-care setting

• Indian Health Service
  • Approximately 78 sites in 22 states
• Veteran’s Administration
  • Approximately 15 sites - up to 2000 patients/month
• Department of Defense
  • Approximately 10 sites [Army & Air Force]
• Academics: 4 Boston sites (BWH, MGH, BIDMC, JDC)
• Venezuela-JVN Pediatric Program
• Frequent requests for additional clinical deployments (Domestic and International)
Can Joslin Vision Network Make a Difference?
Overall IHS Diabetic Retinopathy Examination Rate 1992-2003
Diabetic Retinopathy
PIMC Telemedicine Impact

Annual rates of retinal screening and laser treatment

Laser treatment rate
Retinal exam rate

JVN Telemedicine Program

+50%

Year
1999 2000 2001 2002 2003

Laser Therapy per 1000 diabetic person-years
Retinal exams per 100 diabetic person-years
Impact on Telemedicine Programs for Retinopathy Assessment

- Telemedicine diabetic retinopathy assessment is feasible and effective

- Telemedicine provides convenient, expanded management of diabetic patients in the primary care setting and may reduce risk of vision loss through early and routine surveillance for diabetic retinopathy

- Telemedicine systems may increase surveillance and timely treatment rates for diabetic retinopathy