The Premium IOL Patient Journey
Important Keys to Success

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Financial Disclosures

Alcon Laboratories: Consultant/Research
Allotex: Consultant/Advisor
Allergan: Consultant/Research
AcuFocus: Consultant/Research
Avsi: Consultant/Research
Bausch Lomb: Consultant/Advisor/Research
BVI Consultant/Advisor/Research
Carl Zeiss Meditec: Consultant/Research
Equinox: Consultant/Investor
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Novartis Pharmaceuticals: Research
Vivor AG: Advisor/Research
Keratonics/Advisor/Consultant

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Oculeve: Consultant/Advisor, Equity Owner
OPHTEC: Consultant/Advisor/Research
Precision Lens: Consultant/Advisor
Treehouse Eyes: Consultant/Investor
Tarsus Rx: Consultant
EyeBrain Medical Inc: Equity Owner
Imprimis: Consultant/Advisor
Mynosys: Consultant/Advisor/Research
EyeGate Pharmaceuticals: Consultant/Research
RxSight: Consultant/Research
TearClear: Consultant/Advisor, Equity Owner
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Over 80 FDA Monitored Trials

- PRK
- PTK
- LASIK
- Phakic IOL’s
- Corneal Inlays
- Collagen Crosslinking
- SMILE
- Light Adjustable Lens
- Multifocal IOL’s
- PRK
- PTK
- LASIK
- Phakic IOL's
- Corneal Inlays
- Collagen Crosslinking
- SMILE
- Light Adjustable Lens
The Comprehensive Refractive Cataract Surgeon 2020
Traditional and Refractive Cataract Surgery
Our #1 Goal in Cataract Surgery

- Make the patient happy
What type of cataract surgery would this patient want...
What type of cataract surgery would this patient want...if they had my knowledge and experience?
Important Cause of Un-Happy Patients

• Same approach for every patient
• Ignores: Different patients have different goals
Patient Centered Approach

Options

• Lost Lens Function Replacement
Patient Centered Approach

Options

• Lost Lens Function Replacement
• How to Handle Residual Refractive Error

<table>
<thead>
<tr>
<th>clarity</th>
<th>reading</th>
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</thead>
<tbody>
<tr>
<td>glasses</td>
<td>no glasses</td>
</tr>
</tbody>
</table>
Patient Centered Approach

Options

- Lost Lens Function Replacement
- How to Handle Residual Refractive Error

Postop

UCVA: 20/20-1  Mrx: +.25 - .75 X 180

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Plano

• Traditional - Glasses
• Advanced - PRK, LASIK, or AK (Corneal Adjustable)
  - Light Adjustable Lens (Optic Adjustable)
Glasses vs No Glasses

• How do you want to visually function comfortably the majority of your day?
Patient Centered Approach

Modern Day Cataract Surgery

Options

- Lost Lens Function Replacement
- How to Handle Residual Refractive Error Postop

Postop

UCVA: 20/20-1  Mrx: +.25 - .75 X 180
Patient Centered Approach

Traditional Cataract Surgery

Night time glare
Decreased image quality in low light

Postop

UCVA: 20/20-1      Mrx: +.25 - .75 X 180
Patient Centered Approach

Traditional Cataract Surgery

Glasses

Postop
UCVA: 20/20-1      Mrx: +.25 - .75 X 180
Patient Centered Approach

Advanced Cataract Surgery

Postop

UCVA: 20/20-1    Mrx: +.25 - .75 X 180
Patient Centered Approach

Advanced Cataract Surgery

Night time glare
Decreased image quality in low light

Postop
UCVA: 20/20-1    Mrx: +.25 - .75 X 180
Patient Centered Approach

Advanced Cataract Surgery

Laser Fine Tune

Postop
UCVA: 20/20-1        Mrx: +.25 - .75 X 180
Patient Centered Approach

Options

• Lost Lens Function Replacement
• How to Handle Residual Refractive Error

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The % of PanOptix patients in the FDA monitored trial on our county’s first Trifocal who said “I would do the same implant again”.

*Response to the following question on IOLSAT questionnaire (Ver. 1.0, Dec. 20, 2018) at 6 months post-op. “Given your vision today, if you had to do it all over, would you have the same lenses implanted again?”
The % of Monofocal Control patients in the FDA monitored trial on our county’s first Trifocal who said “I would do the same.”
Would I do the same implant again?

99.2% vs 89.0%

Tri-focal vs Mono-focal
Patient Centered Approach

Options

• Lost Lens Function Replacement
• How to Handle Residual Refractive Error

Advanced Cataract Surgery:
• Trifocal
• Light Adjustable Lens

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Trifocal IOL
Presbyopia Patients Demand Solutions to Meet Their Full Visual Range Lifestyle

- Visual quality in the intermediate range is critical with increasing digital device usage
- Bifocal technology provides only distance, and near or intermediate vision ranges (depending on the Add)
- Trifocal technology allows for 3 distinct foci that can provide the full range of vision from near through intermediate to distance
Severe Visual Disturbances on QUVID

Safety-analysis set; first eye, at 6 months post-op

The observed rates of starbursts and halos were higher in the Trifocal IOL group than the Monofocal IOL group

Percentage calculated as \((n/N)\times100\); Severe visual disturbance defined as patient responding “Severe” on QUVID. Error bars represent 95% CI
Patient Satisfaction

All-implanted analysis set; at 6 months post-op

Response to question: in the past 7 days, how satisfied were you with your vision?

<table>
<thead>
<tr>
<th>Response</th>
<th>Trifocal n (%)</th>
<th>Monofocal n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>127</td>
<td>111</td>
</tr>
<tr>
<td>Would you have the same lens implanted again?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1 (0.8)</td>
<td>14 (12.6)</td>
</tr>
<tr>
<td>Yes</td>
<td>126 (99.2)</td>
<td>97 (87.4)</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>110</td>
</tr>
<tr>
<td>Would you recommend the lenses you had implanted to your family or friends?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2 (1.6)</td>
<td>5 (4.5)</td>
</tr>
<tr>
<td>Yes</td>
<td>125 (98.4)</td>
<td>105 (95.5)</td>
</tr>
</tbody>
</table>

* Response to question: in the past 7 days, how satisfied were you with your vision?
Post-Cataract Surgery

Refractive Error
Cataract Surgery Outcomes

Challenge to consistently achieve great results

- 2016 toric meta-analysis\(^1\): ~65% of eyes achieve 20/25 or better
- Limited by ability to predict the post-operative eye

<table>
<thead>
<tr>
<th>Error Source</th>
<th>Contribution*</th>
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</thead>
<tbody>
<tr>
<td>Post-op IOL Position</td>
<td>35%</td>
</tr>
<tr>
<td>Post-Op Corneal Power</td>
<td>15%</td>
</tr>
<tr>
<td>Axial Length</td>
<td>17%</td>
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</tbody>
</table>

\(^1\) Line Kessel, MD, PhD, Et Al. Toric Intraocular Lenses in the Correction of Astigmatism During Cataract Surgery – A Systematic Review and Meta-Analysis Ophthalmology 2016 Feb;123(2):275-86

* Norrby, S. Sources of error in intraocular lens power calculation. JCRS 2008: 368-76
All Implants are Adjustable

At the plant
The power of adjustability inside the eye
Light Adjustable Lenses
UV photosensitive IOL

Post-op adjustment range (any combination):
-2 to +2 diopters (sphere)
0.75 to 2 diopters (cylinder)
Light is adjusted by the surgeon to the light adjustable lens.

Macromers in the path of the light are photopolymerized.

Unpolymerized macromers move into the exposed area, causing precise shape and power change.

The entire lens is exposed to light to polymerize all the remaining macromers.

The outcome is a precise change in the lens power to match the patient's individual prescription.
US FDA Study Results

- LAL eyes achieved UCVA of **20/20 or better** at 6 months postoperatively at approximately **2x the rate** of patients receiving a monofocal lens.
- **91.8%** of LAL eyes achieved result within **0.50 D** of target MRSE (similar to LASIK results).
- Superior Quality of Vision at all measures compared to control lens:
  - Including BCVA, Vision Rating, Driving Difficulty, Dim Light Conditions, Glare, Halos, and all measures of Contrast Sensitivity.

![Graph showing UCVA at 6 Months Post Op](image)
US FDA Study Results

- In the largest-ever study of 143,000 patients in Europe, nearly 45% were left with refractive error ≥0.5 diopters

European Cataract Outcomes Study

6X Reduction With LAL!
- In LAL PMA only 8.2% had ≥0.5 diopter error
Light Adjustable Lens Process

Standard cataract implant procedure

Residual refractive error is determined using standard phoropter

Refractive error is entered into Light Delivery Device

Desired light profile delivered by machine

Polymerization

Modified Shape

Lockin

Light exposure
First Ever “Patient Trial” of final outcome
Patient previews different refractions
Refraction optimized after healing is complete and ocular media clear
Increase Optometric (OD) engagement
Adjustable Monovision

Surgery
• Bilateral LAL implantation

Pre-Adjustment
• Ocular dominance and anisometropia tolerance re-evaluated after cataract removal and before LDD adjustments

Adjustments
• Binocular vision can be optimized by adjusting distance and near sphere targets
• Potential to reverse if not satisfied
Improved Toric Accuracy

- LAL will provide superior reduction in astigmatism
  - No corneal marking
  - No unpredictable toric rotation
  - Treats corneal and surgically induced astigmatism postoperatively
  - Spherical correction for free!
Post Corneal Refractive Eyes

- Post-LASIK population is increasingly entering the age range for cataract surgery

- Refractive results in this group are inferior to those in non-LASIK eyes because of:
  - Inaccuracy in determining the total corneal refractive power due to reshaped cornea

- LAL should dramatically improve results in this group due to post-operative adjustability

FDA IDE study currently fully enrolled to evaluate the LAL these challenging eyes
62 y.o. female
1/11/19 Refractive Consult

- 2006 Hyperopic LASIK  OD: +3.00  OS: +4.00
- 2008 Lift flap and laser  OD: +1.00-.50 X 166  OS: +1.00
- 2010 AK OD Lift and laser OS  OD: +.50-1.00 X 166  OS: +1.00
62 y.o. female
1/11/19 Refractive Consult

- 2006 Hyperopic LASIK  +3.00  
- 2008 Lift flap and laser  +1.00-.50 X 166  
- 2010 AK OD  Lift and laser OS  +.50-1.00 X 166

Exam 1/11/19
UCVA:
OD: 20/30-2  
OS: 20/30-2
MRx:
+.75-50x 150 20/25-2  
+1.00 20/25-2
BAT:
20/60  
20/60
Dx: NS cataracts OU
Wants multifocal implants
Epithelial Thickness Map
62 y.o. female

1/11/19 Refractive Consult

• 2006 Hyperopic LASIK +3.00 +4.00
• 2008 Lift flap and laser +1.00 -0.50 X 166 +1.00
• 2010 AK OD Lift and laser OS +0.50 -1.00 X 166 +1.00

Exam 1/11/19

UCVA: OD: 20/30 -2
OS: 20/30 -2

MRx: +0.75 -50x 150 20/25 -2 +1.00 20/25 -2

BAT: 20/60 20/60

Dx: NS cataracts OU

Wants multifocal implants

OD: plano
OS: -1.00
Cornea: 0.040 0.070 0.080 0.116
Extended Depth of Focus

Surgery

• Bilateral LAL implantation with post-operative emmetropic target OU

Advantages

• Full cylinder and residual cylinder correction OU enhances UCVA and reduces dysphotopsias

• Centration on undilated pupil overcomes one of drawbacks of traditional multifocal IOLs (susceptibility to IOL decentration)

• Small diameter of the EDF light treatment preserves both UCDVA and BCDVA

• No splitting of light, so minimal, to no loss of contrast

Caution: EDF is Investigational in the U.S. Limited by Federal Law to investigational use.
How?
Want vs. Need
"The doctor will see you now."
The Differentiator

"It's about people"
The Experience Economy
Work Is Theatre &
Every Business a Stage
B. Joseph Pine II
James H. Gilmore

SECRET SERVICE
Hidden Systems That Deliver Unforgettable Customer Service
John R. DiJulius III

Raving Fans
A Revolutionary Approach to Customer Service
Ken Blanchard Sheldon Bowles
Foreword by Harvey MacKay
Which face looks more attractive?
The Science of Nice
The People Experience
The Key to Thriving in Modern Day Practice
Team Comes First

• Patients Come Second
HIPPOCRATIC OATH

I SWEAR by Apollo the physician and Asclepius and Hygeia and Panacea, invoking all the gods and goddesses to be my witnesses, that I will help the sick according to the best of my powers and of my judgment. I will look upon him who shall have taught me this art as on my own parents. I will share with him my substance and help his necessities if he be in need. I will regard his offspring even as my own brethren, and will teach them this art if they desire to learn it without fee or covenant.

I WILL IMPART it by precept, by lecture and by all other manner of teaching, not only to my own sons but also to the sons of him who has taught me, and to disciples bound by covenant and oath according to the law of the physicians and by none other.

THE REGIMEN I adopt shall be for the benefit of the patient in the best of my power and judgement, not for their injury or for any wrongful purpose. I will not give a deadly drug to any one, though he be in my care, either for money or for any reason whatso’er. If I should be called in to see a patient and should find him suffering from some disease, I will not keep that knowledge to myself, for my aim is to benefit the sick and not to do them harm.

WHATEVER HOUSE I enter, I enter to help the sick. If I should receive a fee for that service, or if I should be called in to see a patient and should find him suffering from some disease, I will not keep that knowledge to myself, for my aim is to benefit the sick and not to do them harm.

I will fulfill my oath and confirm it not, let it be written and sealed. I will keep good repute among all men for all time to come. I will transmit and violate my oath.

FIRST DO NO HARM
YOU HAVE TO REALLY LOVE YOUR PEOPLE TO GET THE MOST OUT OF THEM

- JOHN WOODEN
I Care So Much About My Co-Worker That:
I Care So Much About My Co-Worker That:

- I am kind to them. Yes No
- I think of them as work family Yes No
- I care about what they care about (example: their family) Yes No
- Every day when I first see them I say hi and smile with eye contact…and mean it. Yes No
- I interview others thinking about their influence on them Yes No
- When I am deciding to close the clinic for a holiday I am thinking of their joy and not my cost. Yes No
I Care So Much About My Co-Worker That:

• When they make an honest mistake I accept their apology and don’t lose my temper  Yes  No

• If I lose my temper I don’t feel right until I apologize  Yes  No

• When they stop by the office to introduce their loved one or child I drop everything to talk and meet them  Yes  No

• When I hear something nice about them I tell them.  Yes  No

• I encourage them when they seem down.  Yes  No
When they make an honest mistake I accept their apology and don’t lose my temper  Yes  No

If I lose my temper I don’t feel right until I apologize  Yes  No

When they stop by the office to introduce their loved one or child I drop everything to talk and meet them  Yes  No

When I hear something nice about them I tell them.  Yes  No

I encourage them when they seem down.  Yes  No

If my team answers these questions for me they would say I treat these situations like I say I do.  Yes  No
Improving the Customer Experience

• You need to know what your customer values
Improving the Customer Experience

- You need to know what your customer values
- You need to know what your customer expects
Improving the Customer Experience

- You need to know what your customer values
  - Motivator
- You need to know what your customer expects
Improving the Customer Experience

• You need to know **what your customer values**  
  **Motivator**

• You need to know **what your customer expects**  
  **Hygiene Factor**
Improving the Customer Experience

Hygiene Factors

Motivators
Improving the Customer Experience

**Hygiene Factors**

- Technology
- Talent
- Experience
Improving the Customer Experience

**Hygiene Factors**
- Technology
- Talent
- Experience

**Motivators**
- How I made them see
- How your staff treats them
- How you treat them
- Patient call backs by surgeon
- Thank you notes

**How you made them feel**
What Technology For My Eye?
What **Vision** Do You Want?
“what type of cataract surgery would this patient want if they knew what I knew?”
A Refractive Surgery Mindset
Do you need a laser to do premium IOL’s?
What You Tell Your Patient

Pre-experience Expectations
What You Tell Your Patient

**Multiple Steps-Plus Time**

1. Advanced implant
2. Laser fine tune
3. YAG Laser capsulotomy
Sometimes 20/20 is Not Enough

- Small corrections matter...show them...they can decide
- Dry eye matters
- Surface irregularities matter
- Gas perm over-refraction
The Accuracy of Fine Tunes
Lessons from LASIK: UCVA Drives Satisfaction

- Schallhorn, AECOS 2016
Multiple Steps-Plus Time

- Advanced implant
- Laser fine tune
- YAG Laser capsulotomy Not a lot different than traditional
Multiple Steps-Plus Time

• Advanced implant
• Laser fine tune
• YAG Laser capsulotomy

Neural adaptation starts after 20/20 achieved
Multiple Steps - Plus Time

1. Advanced implant
2. Laser fine tune
3. YAG Laser capsulotomy

3 Steps + 1 Year

Neural adaptation

What You Tell Your Patient
Comprehensive Refractive Surgery 2020

- Cornea
- Phakic IOL
- Crystalline Lens
Low Light Image Quality
Diagnosis of Early Cataract
Clarity and Accommodation
47 year old female…Nuclear Cataracts

- OD: -0.75-.50 X 166 20/20-3 BAT: 20/100
- OS: -1.00-.75 X75 20/25 BAT: 20/100
- Ok with bifocals… “worn them since age 40…”
47 year old female...Nuclear Cataracts

- OD: -0.75-.50 X 166  20/20-3  BAT: 20/100
- OS: -1.00-.75 X 75  20/25  BAT: 20/100
- Ok with bifocals... “worn them since age 40…”

- Cataract surgery aspheric Monofocal implants OU (Tecnis ZCBOO)
- **3 months Post Op:**
  - OD: -.75-.25X170  20/20
  - OS: -.50-.50X79  20/20

  “Why didn’t you talk me into that fancy implant?”
Do any of you talk about early cataracts helping patients with reading range?

**Age-Related Changes in Ocular Aberrations and the Yamagata Study (Funagata).**

**Study of ocular aberrations with age.**
$y = \frac{7.083}{1+e^{(0.2031 \times (\text{age}-36.2) - 0.6109)}}$

- Ostrin, et al. 2004
- Wold, et al. 2003
- Hamasaki, et al. 1956

Sigmoidal Function
LOESS Function
61 year old male

- Truck driver
- Vision not too bad...some night time glare...examining doctor said he didn’t pass his driving test
- OD: -1.25 20/25    BAT: 20/50
- OS: -1.25 20/25-1 BAT: 20/50

Very Upset with “Loss of Near Vision”
61 year old male

- Truck driver
- Vision not too bad…some night time glare…examining doctor said he didn’t pass his driving test
- OD: UCVA: Distance: 20/60 Near: J1 Mrx: -1.25 20/25 BAT: 20/50
- OS: UCVA: Distance: 20/60 Near: J1 Mrx: -1.25 20/25-1 BAT: 20/50
- Cataract surgery aspheric Monofocal implant (Tecnis ZCBOO)
- Post Op:
  - OD: -1.25-.25X180 20/20
  - OS: -1.25 20/20

Very Upset with “Loss of Near Vision”
Near

Clarity
Enhancement Decisions

- Challenging
56 yo Caucasian Female...Consult

- Cataract Consult 2018
- “Can’t get a clear image at distance or near with glasses or contacts”
- OD: -4.25-.25x12  20/25  BAT:20/50
- OS: -4.75-.75x159  20/25-2  BAT:20/50
- She doesn’t want monovision and wants the reading range of a multifocal but worried about night time glare.
56 yo Caucasian Female...Exam

- OD Dominant
- Tear Lab:
  - OD: 312
  - OS: 315
- Slit Lamp Exam:
  - Lower permanent plugs OU
  - Pushed on lids and some MGD
  - Corneas: clear, no stain
  - Discussed Lipiflow
HOA [μm]: Cornea@3.87mm

Total, Internal@3.87mm / Order = 4

<table>
<thead>
<tr>
<th>T.Sph</th>
<th>T.Coma</th>
<th>T.Tre</th>
<th>HO</th>
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<tbody>
<tr>
<td>0.064</td>
<td>0.080</td>
<td>0.310</td>
<td>0.120</td>
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Cornea: 0.040 0.070 0.080 0.116
56 yo Caucasian Female

- Cataract Surg. 11/13/18 & 11/20/18 Ref goal
  - OD: Symfony ZXROO. - .25
  - OS: Tecnis Multifocal ZKBOO. Plano

* Three Month Postop (even though co-managed 100 miles away)
  - OD: 20/25-2. J8
  - OS: 20/20 J2
  - OD: +.75-.75x115. 20/15
  - OS: +.50-.25x90. 20/15

“Near not good enough...distance a bit fuzzy”

Called at one month postop: “Thank you for calling I am blurry and not happy” Call ended great
56 yo Caucasian Female

- Cataract Surg. 11/13/18 & 11/20/18 Ref goal
  - OD: Symfony ZXROO. -.25
  - OS: Tecnis Multifocal ZKBOO. Plano

- Three Month Postop (even though co-managed 100 miles away)
  - OD: 20/25-2. J8
  - OS: 20/20 J2
  - OD: +.75-.75x115. 20/15
  - OS: +.50-.25x90. 20/15

Ultimately wanted both eyes enhanced even though we did just OD first...Because of image quality and feeling near still not that good after enhancing just OD.

Drifted away for a year
56 yo Caucasian Female

- 11/26/19
- Not happy. Can’t see numbers and can’t see computer +2.00 readers

- Exam:
  - OD: 20/30 J12 +.25-.50x16 20/30-2
  - OS: 20/25 J8 +.25 20/25-2
  - Slit lamp looks quite good
  - Does have upper plugs now also
  - She is super frustrated.

Gas Permeable Contact Lens
Over-refraction
OD: 20/20 Crisp
OS: 20/20 Crisp
56 yo Caucasian Female

- 11/26/19
- Not happy. Can’t see numbers and can’t see computer without +2.00 readers

Exam:
- OD: 20/30 J12 +.25-.50x16. 20/30-2
- OS: 20/25 J8 +.25 20/25-2
- Slit lamp looks quite good
- Does have upper plugs now also
- She is super frustrated.

PTK OU

OD: 20/20 Crisp J3
OS: 20/20 Crisp J2
OU: 20/15 Crisp J1
Sometimes 20/20 is Not Enough

- Small corrections matter...show them...they can decide
- Dry eye matters
- Surface irregularities matter

Uncorrected Visual Acuity

Gas permeable contact lens over-refraction
A lot of Information…Repeat…Keep In Touch
Visual Lifestyle Monitor

**Sensors**
- Distance
- Ambient light and color
- Accelerometer (Head motion)
- Gyroscope (Head positioning)
- Magnetometer

**Interface**
- Low-energy Bluetooth
- Button
- Buzzer
- Indicator

(Head motion)
(Head positioning)
Distance and Temporal Report

Measurements can be mapped on two-dimensional distribution of viewing distances

Example shows the distribution of typical vision needs in the office
Different User Profiles

User 1
User 2
User 3
User 4
User 5
User 6
User 7
User 8
User 9
Do you talk about **Neural Adaptation** after cataract surgery?

- Quick phase: seconds-minutes
- Longer phase: months-year
Multiple Steps - Plus Time

1. Advanced implant
2. Laser fine tune
3. YAG Laser capsulotomy

3 Steps + 1 Year

Neural adaptation
The Premium IOL Patient Journey

Important Keys to Success

Thank You!

Vance Thompson, MD
Founder, Vance Thompson Vision
Professor of Ophthalmology, University of South Dakota, Sanford School of Medicine
Sioux Falls, South Dakota, USA