iCheckKids, SPOT, iScreen and Plusoptix performance in a high-risk, young pediatric eye practice

Robert W. Arnold, MD, FAAP
M. Diane Armitage, certified orthoptist
Alaska Blind Child Discovery

Disclosures

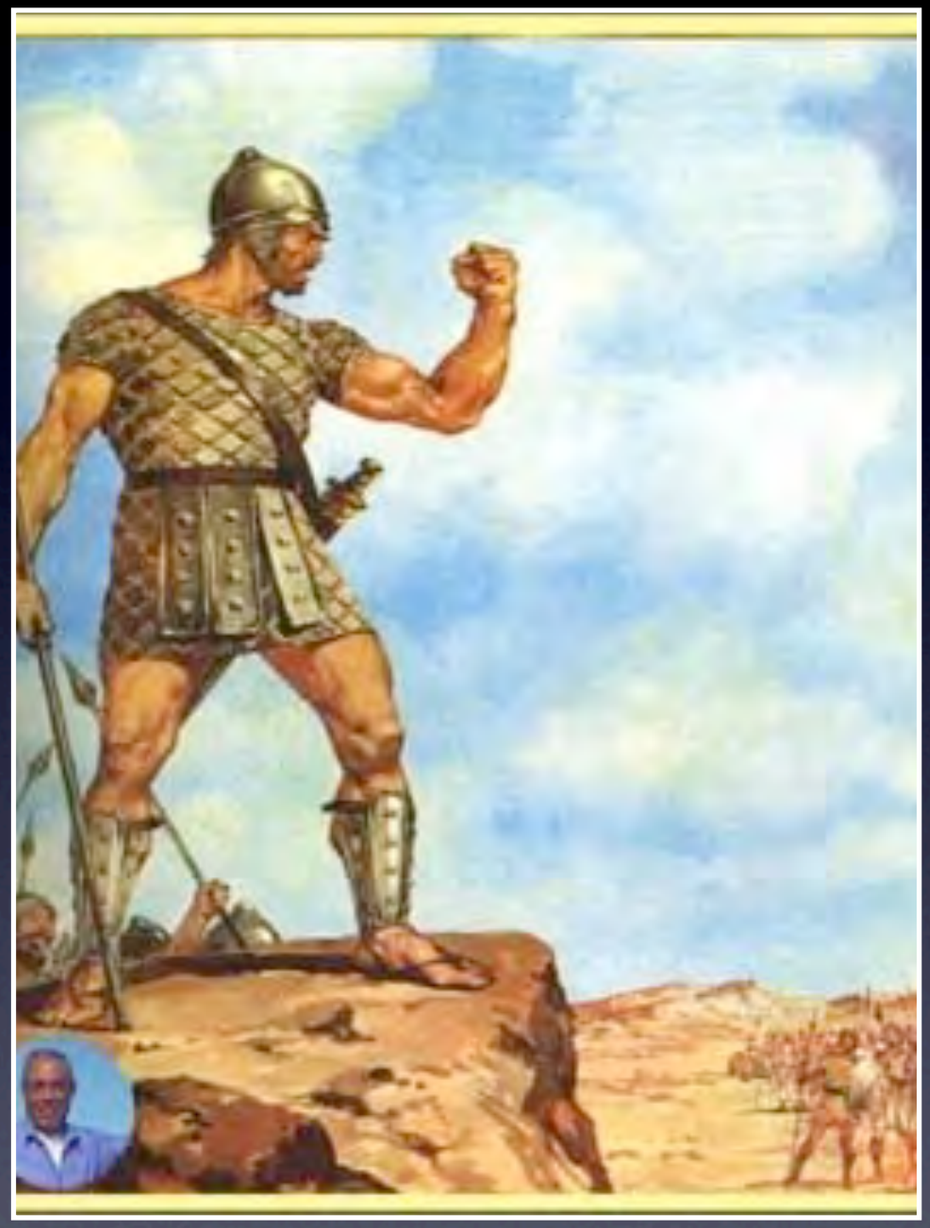
- ABCD has received discounted vision screen technology from several vendors and unrestricted grants from Walmart.
- Neither Dr. Arnold nor Miss Armitage has received direct compensation
- Dr. Arnold on board of Glacier Medical Software marketing ROP-Check
- iCheckkids not yet FDA approved

Historic Battle

- Can Pediatric Ophthalmologists do a better job of battling AMBLYOPIA before it is too late?

Amblyopia still a GIANT problem

Acuity-detected (age 3-4)
average 20/32 best acuity
Late detected microstrabismus
and eccentric fixation
Many never screened



Anti-Instrument Goliath

Acuity-only proponents
(*not which but WHEN*)
Financial Disclosure advocates =
anti-industry development
Treat amblyopia Late
(*Wait until acuity is lost*)
Single Sensitive preSchool vs
AAP series of specific screens

Who will battle Amblyopia Goliath?

David Guyton

Advanced the merits of Dynamic Retinoscopy and Brückner Test

Amblyopia GOLIATH Fighters

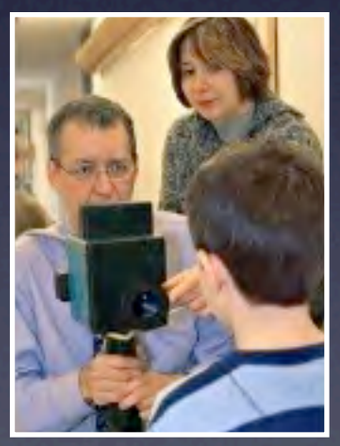
David Coats

David Wallace

David Morrison

David Stager Sr

David Granet



David Hunter

David Rogers

MTI > Welch Allyn Suresight
with David Plager

David Silbert

With Noelle Matta, comparative validation by AAPOS guidelines of emerging photoscreen technology

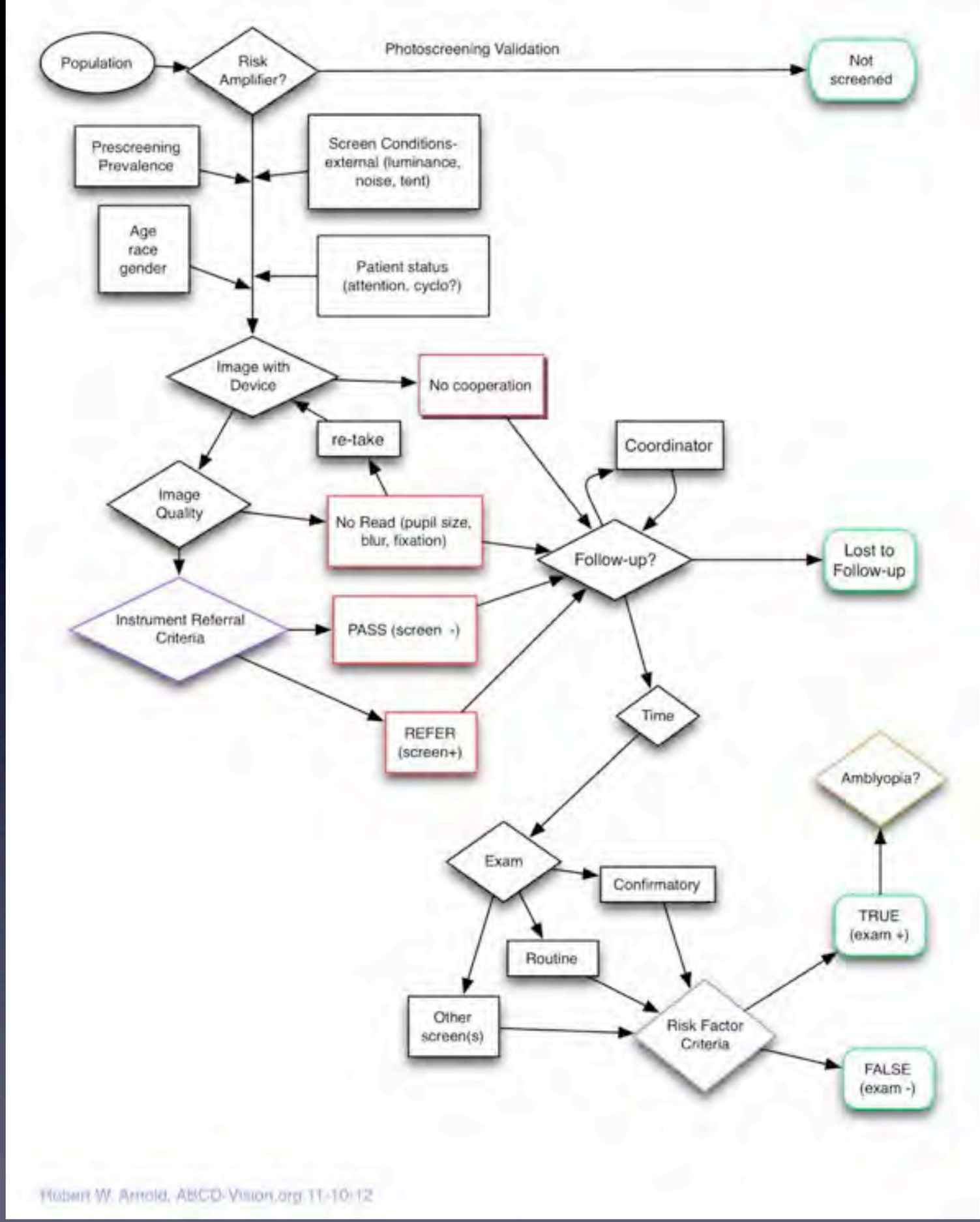
Methods

- HIPAA - IRB compliant
- AAPOS 2003 Validation Guidelines
- Consecutive children in pediatric eye practice
- Did not exclude developmental delay

Photoscreeners

- PlusoptiX A-09
- Pediavision SPOT (version 1.0.3, software 1.1.51)
- iScreen 3000
- iCheckKids iPhone 4s

Photoscreeners



Robert W. Arnold, ABCO-Vision.org 11-10-12

Validation Statistics

	Exam +	Exam -
Screen +	A	B
Screen -	C	D

sensitivity A/(A+C)
specificity D/(B+D)
PPV A/(A+B)
NPV D/(C+D)

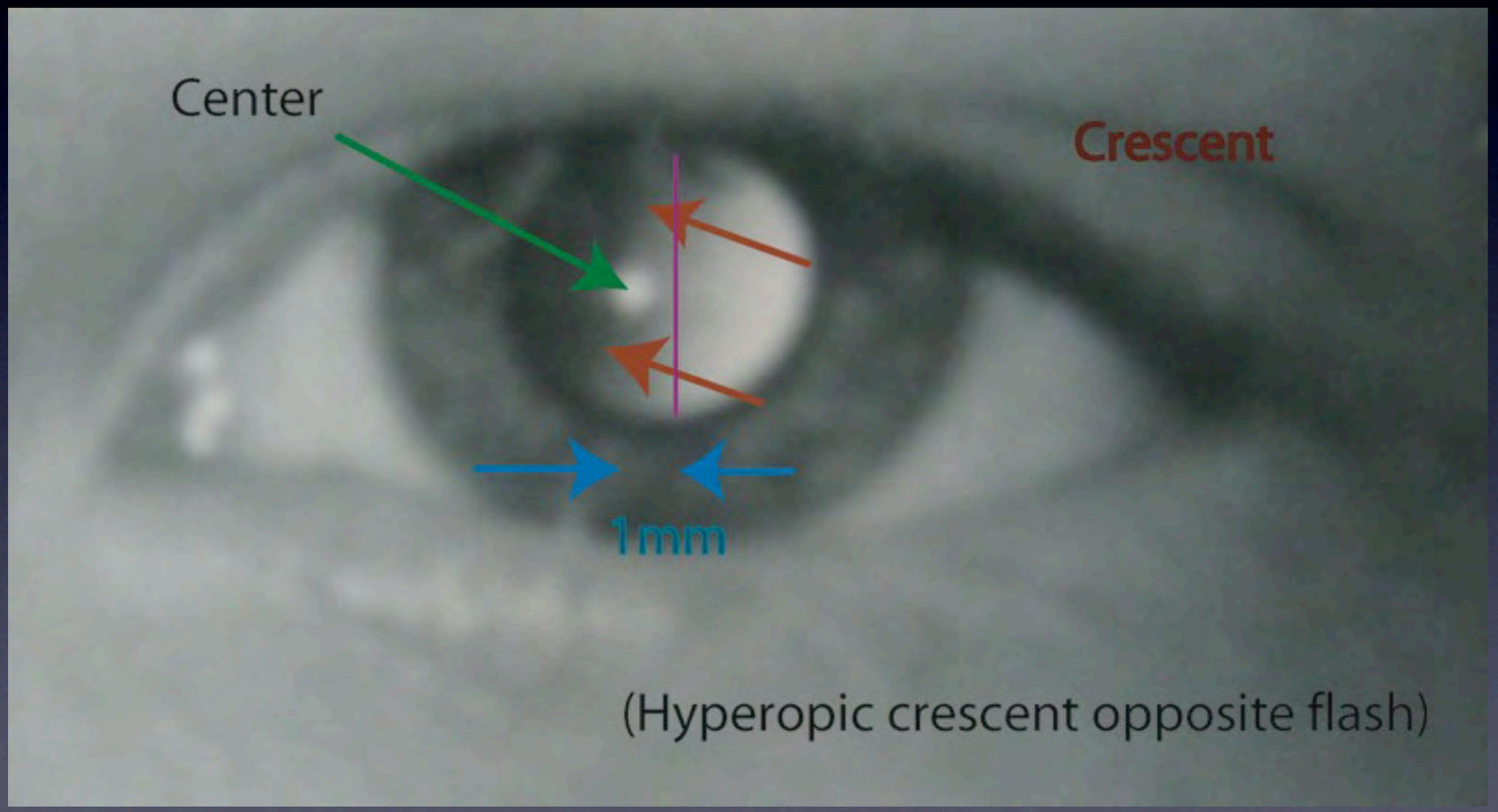
Validation Statistics

	Exam +	Exam -
Screen +	A	B
Screen -	C	D
Screen i	E	F

sensitivity A/(A+C)
specificity D/(B+D)
PPV A/(A+B)
NPV D/(C+D)

ABCD sensitivity A/(A+C+E+F)
ABCD specificity D/(B+D+E+F)
ir sensitivity (A+E)/(A+C+E)
ir specificity (D+F)/(B+D+F)

Delta-Center Crescent



iCheckKids on iPhone 4s

Results

- n=108
- Age: mean 47 months (9-146 months)
- Pre-screen Probability 56% (normal 21%)
- Autism/Delays 10%

Risk Factors

- Refraction:
  - average +0.5 + I cyl
    - spherical equivalent from -22 to +6
    - Anisometropia: n=10 over 2.0 diopters
- Strabismus: 11, Nystagmus: 1.

“False negatives”

- Intermittent strabismus (10-30 PD): n=9
- small 1mm cataract: SPOT-, Plusoptix-?, iScreen and iCheckKids-refer

2003 AAPOS

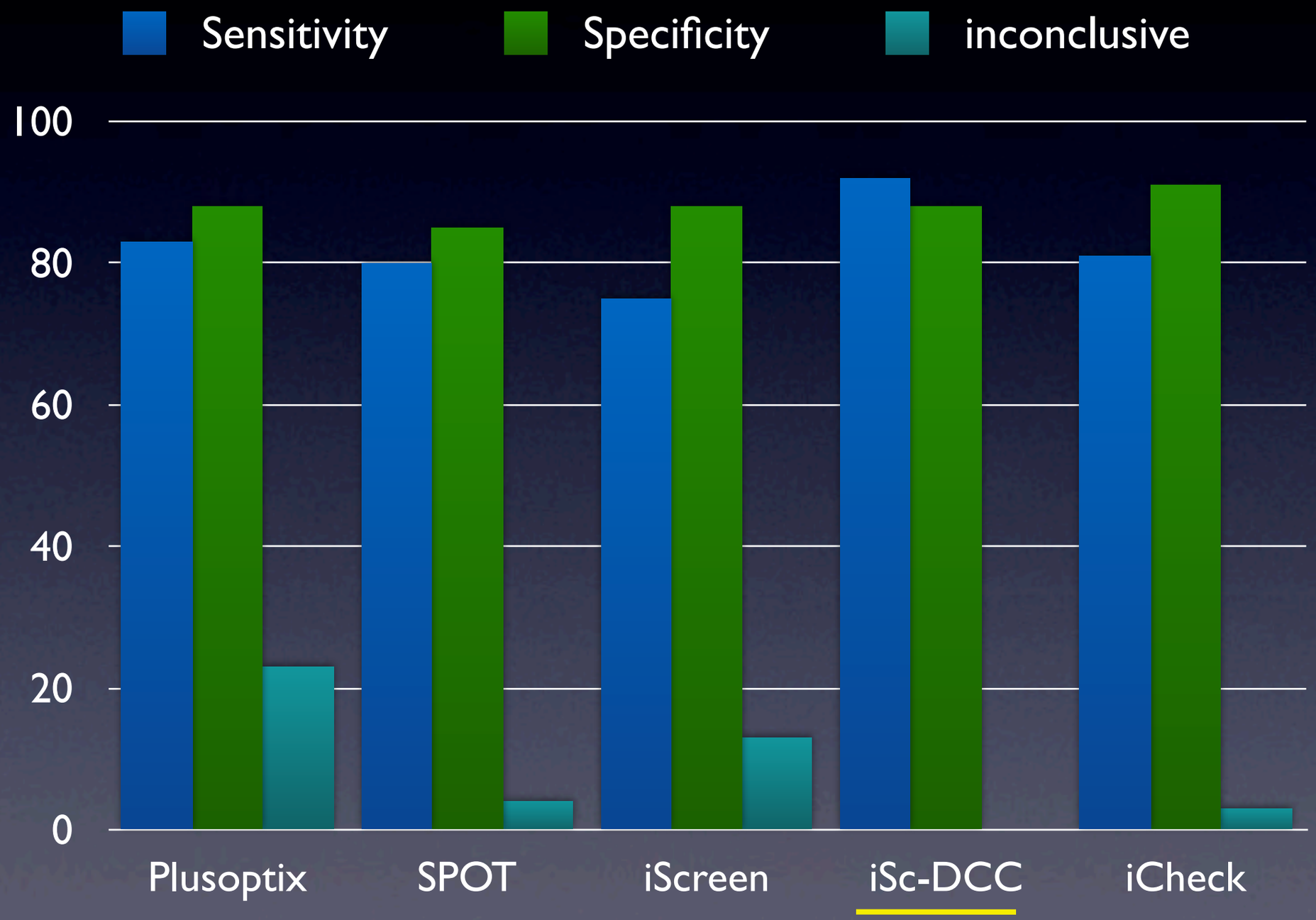
	Plusoptix	SPOT	iScreen	iSc-DCC	iCheck
A	34	45	40	55	47
B	5	7	5	6	4
C	7	11	13	5	11
D	37	41	36	42	43
E	19	4	7	0	2
F	6	0	7	0	1
Sensitivity	83%	80%	75%	92%	81%
Specificity	88%	85%	88%	88%	91%
PPV	87%	87%	89%	90%	92%
NPV	84%	79%	73%	89%	80%
ABCD Sensitivity	52%	75%	60%	92%	77%
ABCD Specificity	55%	79%	65%	88%	86%
irSens	88%	82%	78%	92%	82%
irSpec	77%	85%	75%	88%	90%

sensitivity =A/(A+C)
specificity =D/(B+D)
positive predictive value =PPV=A/(A+B)
negative predictive value =NPV=(D/C+D)
prescreen probability=(A+C)/(A+B+C+D)
false positive= B/(A+B)
False negative= C/(C+D)
ABCD specificity=D/(B+D+E+F)
ABCD sensitivity=A/(A+C+E+F)

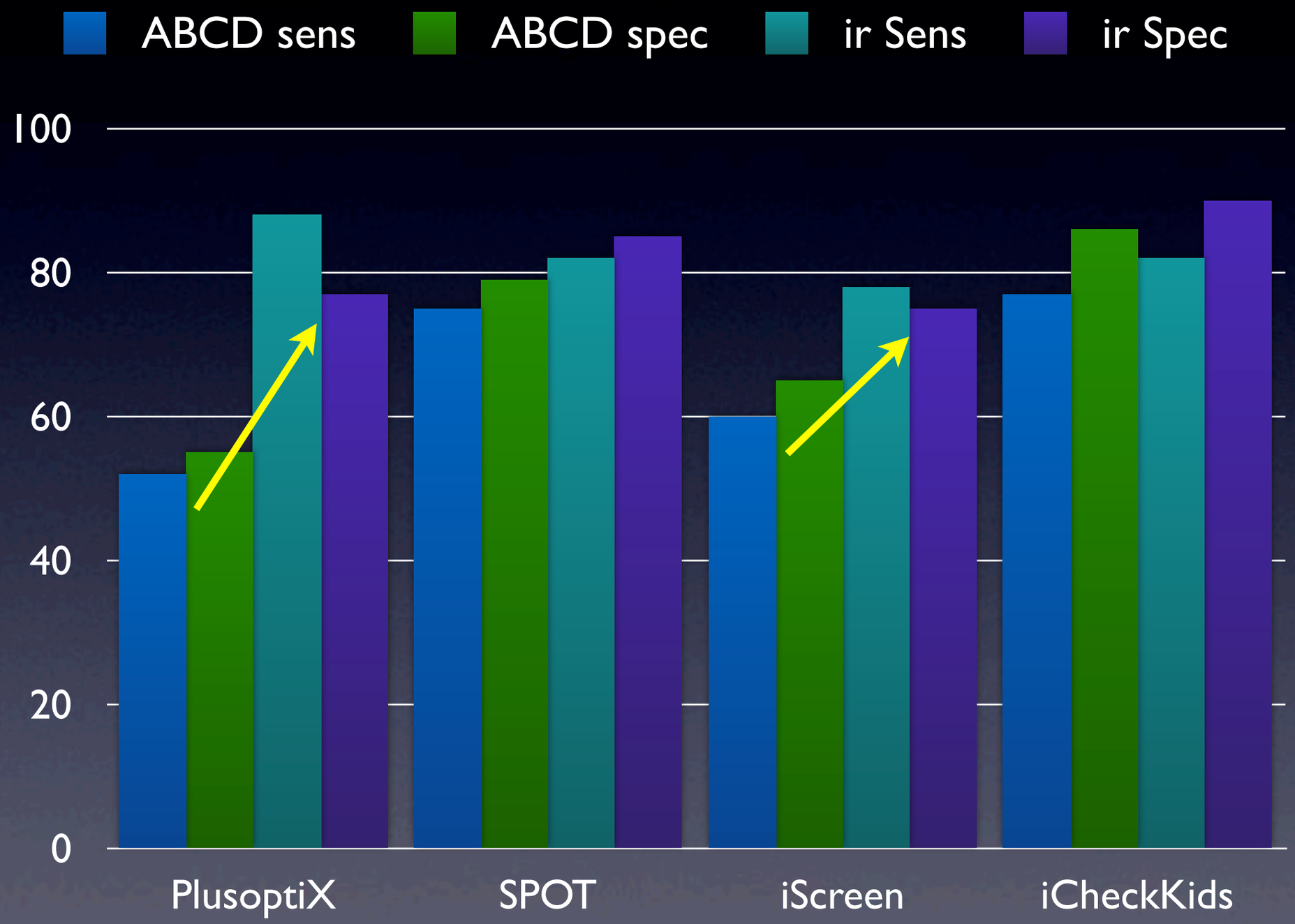
	Exam +	Exam -
Sc +	A	B
Sc -	C	D
Sc i	E	F

irSens = (A+E)/(A+C+E)
irSpec = D/(B+D+F)

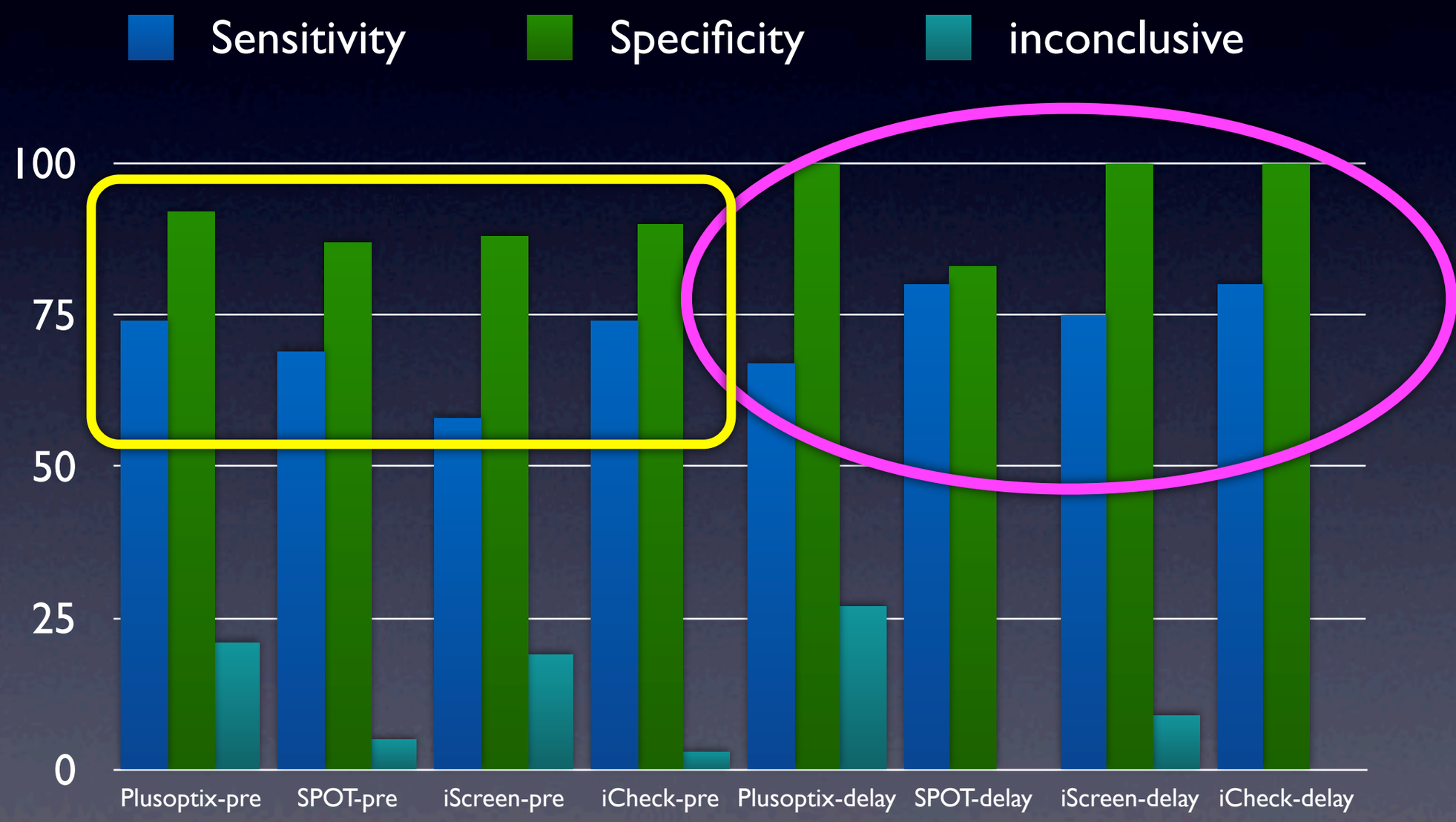
Photoscreen Validation



Inconclusives



preSchool and Delays



Discussion

- All 4 photoscreeners effective
- iScreen particularly useful in children with difficult fixation and attention
- iCheckKids yielded useful photoscreen images
- Inconclusive images best considered as “referrals”
- Similar to Matta / Silbert validation studies

Limitations

- High prescreening probability (56% vs 21%)
- Special Needs
- Some older (autistic)
- Same examiner and interpret (DCC)
- Initial experience with iCheckKids

Summary

- New photoscreeners can hit their target, even in high-risk young and special- needs children
- Combined with CPT 99174 and new AAP photoscreen endorsement, effective weapons against the Amblyopia Goliath

David Huang

Adapted iPhone technology to obtain valid photoscreen images. Developing interpretation software.

Davids vs Goliath

Turning Point in the Photoscreener Battle:

Charitable Research

20 years

Practical Reimbursed Pediatric Tool

Goliath vs non-Davids

Howard Freedman still using objective technology that was spurred by his development of the MTI photoscreener

Goliath vs non-Davids

Jack Bellows founded iScreen and invested to obtain CPT 99174.

Goliath vs non-Davids

Sean Donahue:
Vanderbilt Ophthalmic Image Center, MTI and many photoscreeners, AAPOS Uniform Guidelines