

Ocular Simulation

“A safer surgical experience for all”

David Lockington

MB BCH BAO (Hons) FRCOphth PhD

Consultant Ophthalmologist, Glasgow, UK

President, UKISCRS

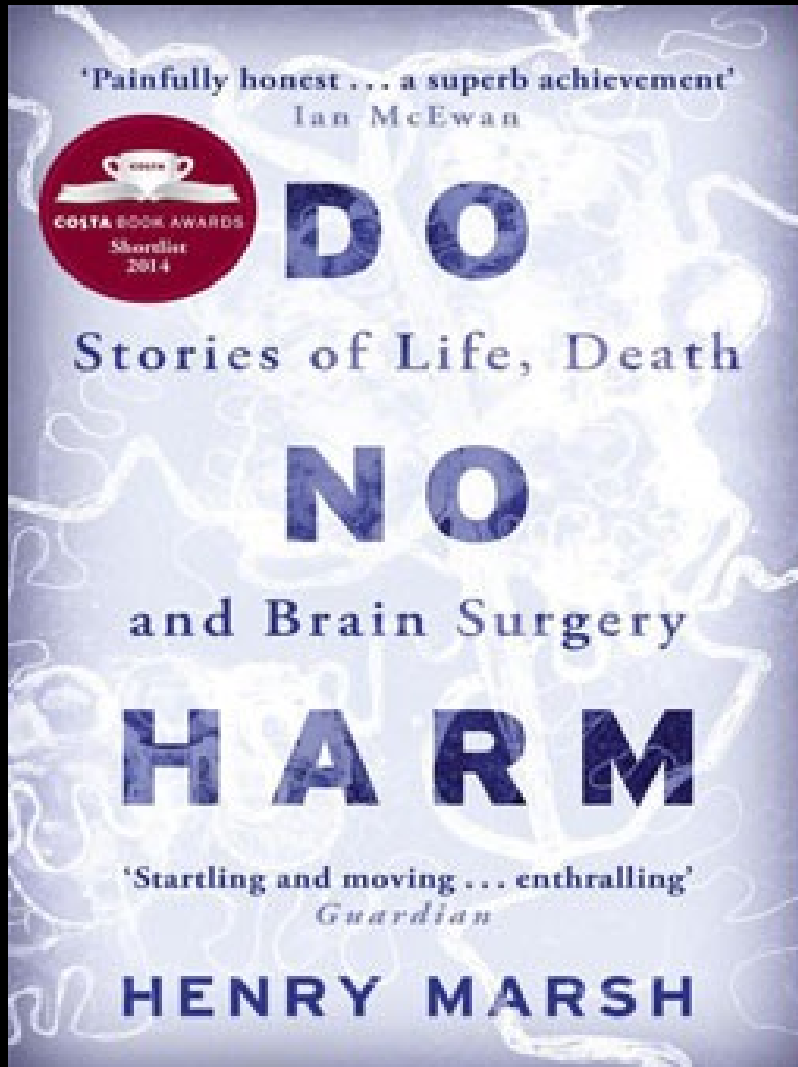
National Simulation Lead, RCOphth

Visiting Professor, VUB

No relevant financial disclosures



First do no harm means...
harm can occur!



Surgeon's dilemma...

SHOULD
What ~~could~~
I do?

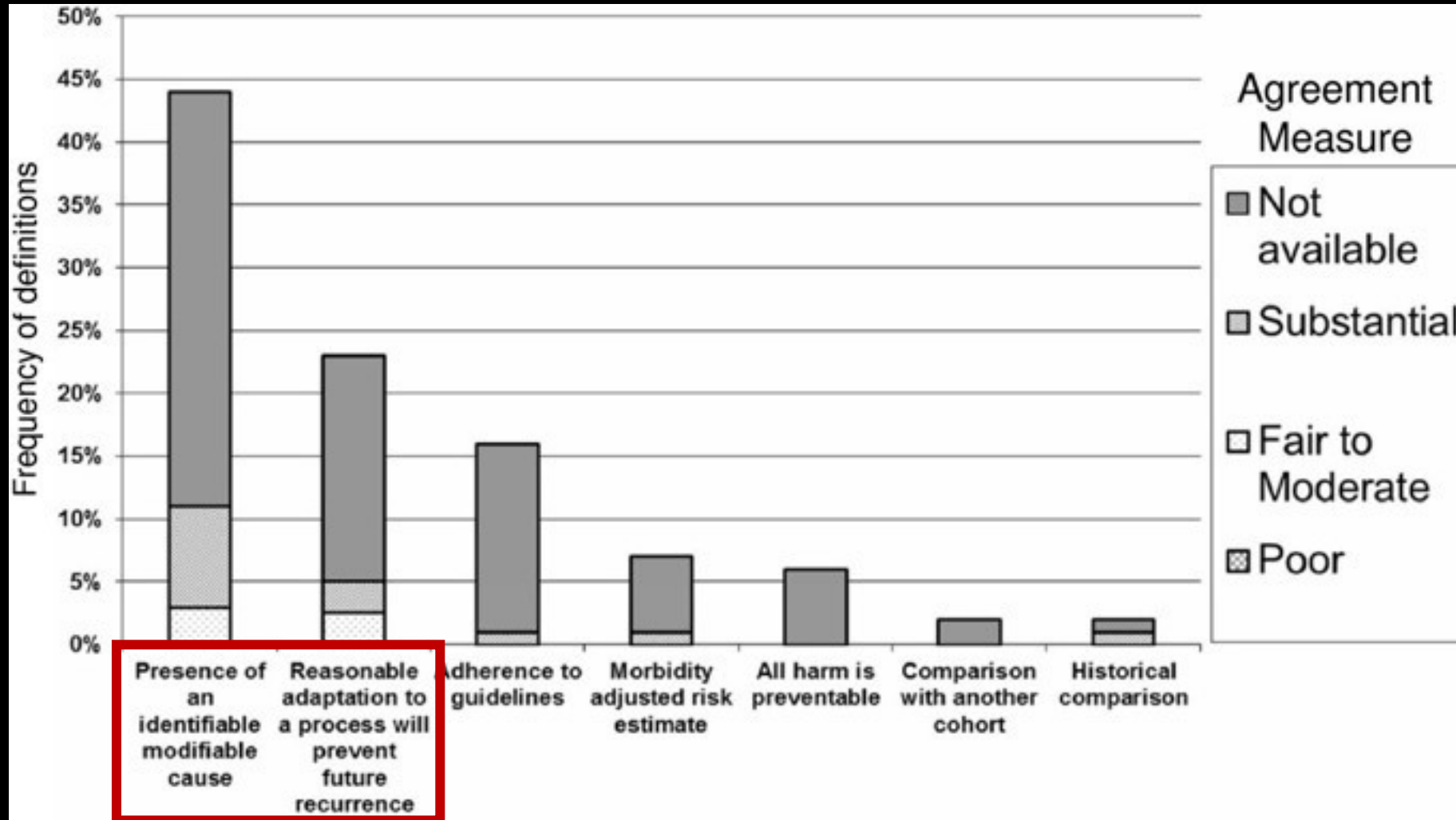
- Good surgeon – **How** to operate
- Better surgeon – **When** to operate
- Best surgeon – **When not** to operate



KRISPY KREME BACON CHEESEBURGER

Just because you can doesn't mean you should

Methods to reduce avoidable harm



Is a trainee an identifiable modifiable risk factor?

Is simulation an adaption to a (training) process to prevent future events?

Trainee surveys of confidence managing complications...

- Wrong focus!
- **Aim should be competence**
- Know what to do, before you do it!
 - Or some eyes will be damaged...

► Eye (Lond). 2019 Nov 21. doi: 10.1038/s41433-019-0673-y. Online ahead of print.

Comment on: 'Ophthalmology Specialist Trainee Survey in the United Kingdom'. The need to increase familiarity with the management of predictable cataract surgery complications via simulation—ensuring competence to improve confidence

Jonathan Nairn ¹, Larry Benjamin ², David Lockington ³



Traditional attitudes to assess a trainee's ability



Trust?
Hope?

Most use the
Beyonce method

Traditional method to assess a trainee...

- the Beyonce method

Kelly, can you handle this? br
/ Michelle, can you handle
this? br / Beyonce, can you
handle this? br / I don't think
they can handle this

Destiny's Child

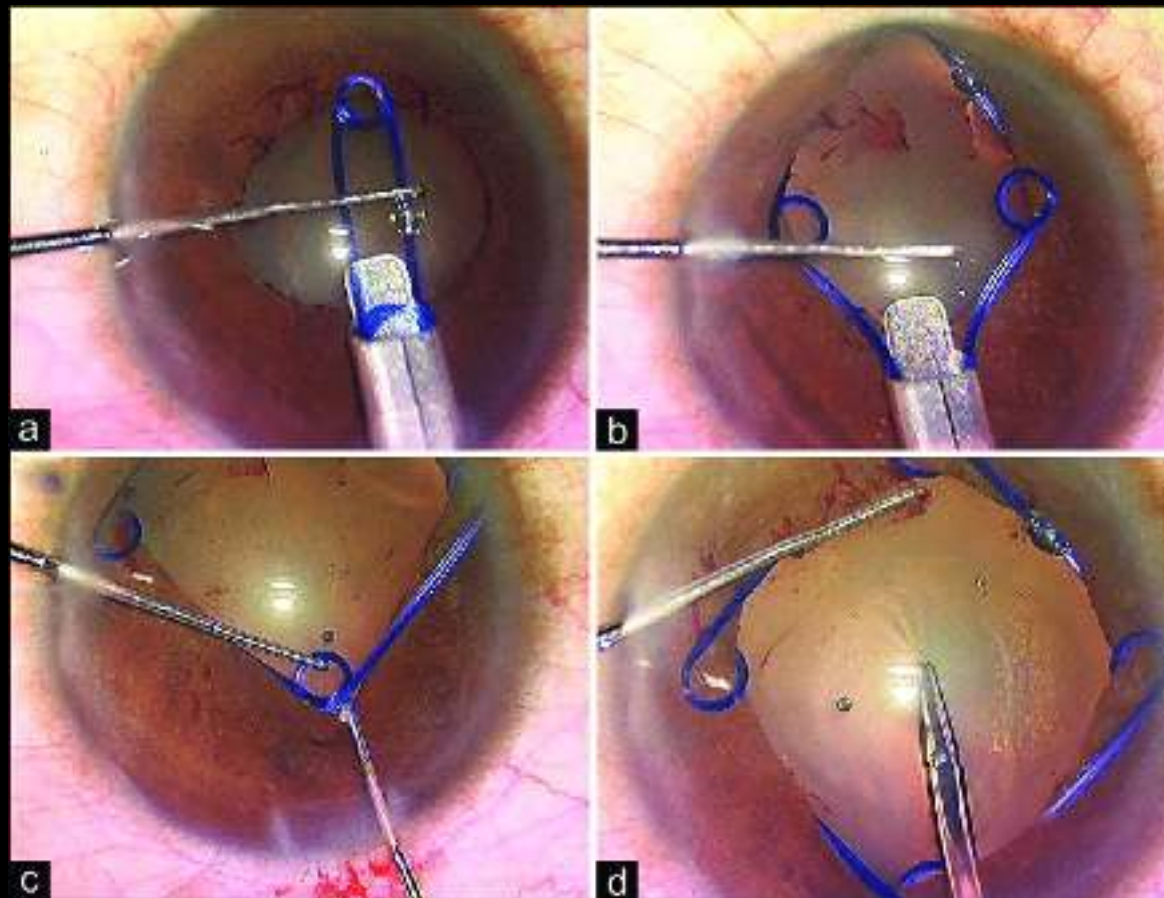
Bootylicious Lyrics

I don't think you're ready for this jelly

I don't think you're ready for this jelly

Destiny's Child

Beyonce and eye surgery



ARTICLE

Modelling floppy iris syndrome and the impact of pupil size and ring devices on iris displacement

David Lockington¹ · Zhaokun Wang² · Nan Qi³ · Boris Malyugin⁴ · Li Cai⁵ · Chenglei Wang³ · Hui Tang^{1,2} · Kanna Ramaesh¹ · Xiaoyu Luo⁶

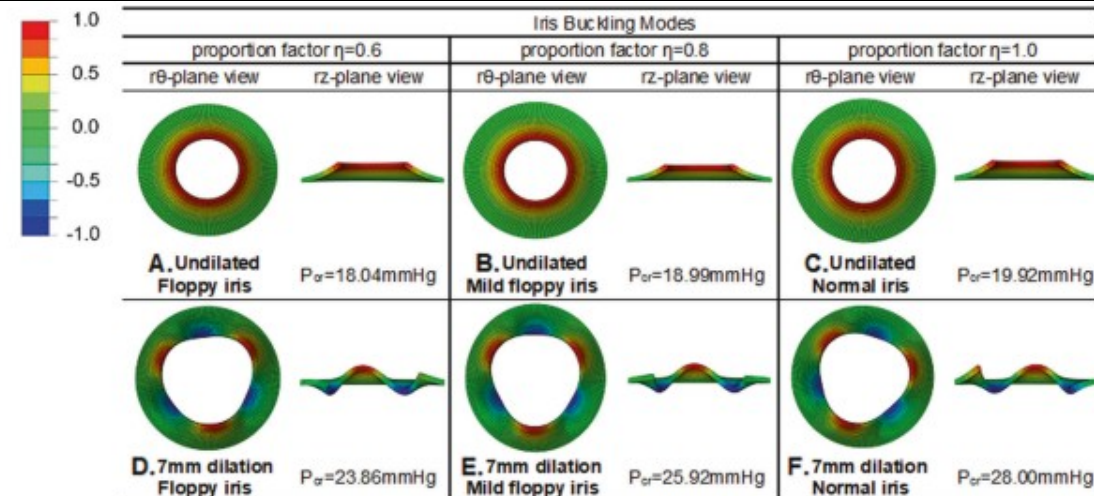
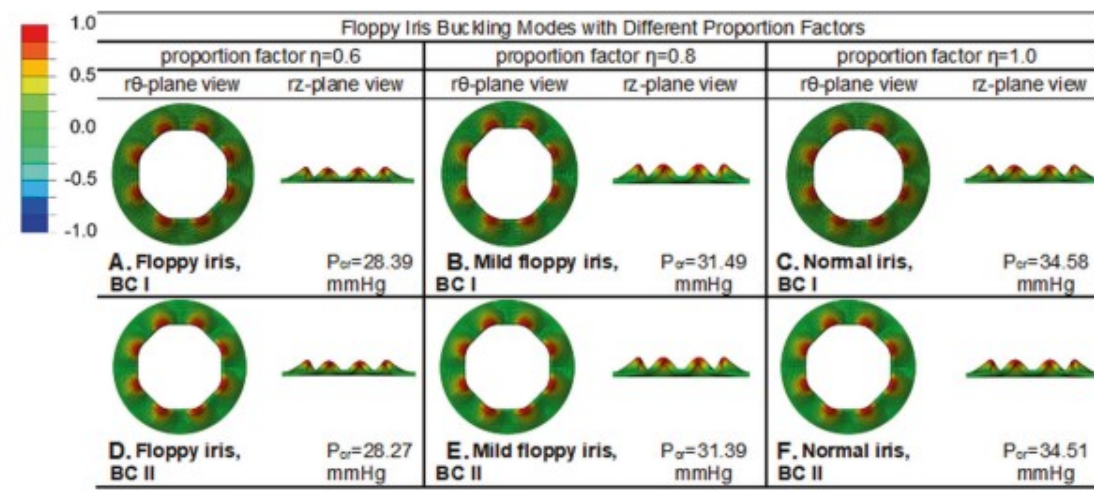


Fig. 3 The buckling modes for the dilated iris with different proportion factors 0.6 (floppy iris), 0.8 (mild floppy iris) and 1.0 (normal iris stiffness). **a–c** are the buckling modes for undilated 5 mm iris models. **d–f** are the buckling modes for pupil dilation 7 mm.



FIRE DRILL

ht unprepared

Why run a fire drill?

- To be prepared
- Know what to do prior to adverse event
- Best outcome from dangerous/high-risk event
- Regular planned simulation/training

Safe road map to competence in any surgical task

- **Background knowledge**
 - Read (books, journals, magazines)
 - Watch (videos, webinars etc)
- **Practice foundations**
 - Simulation (EYESI, dry lab, wet lab)
- **Perform**
 - Under supervision
 - Independently
- **Review and refine**
 - Record surgeries

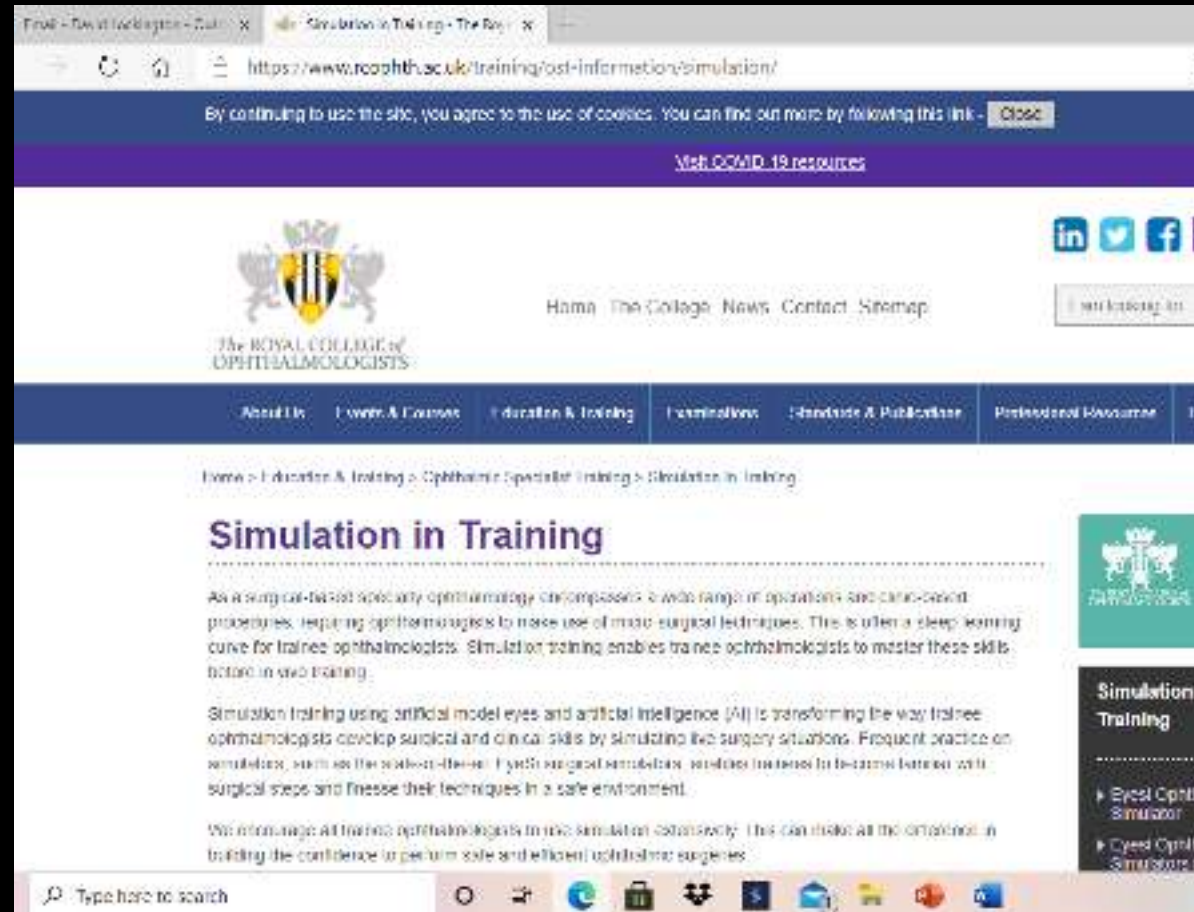


Competence = confidence!



Universal Simulation ideals...

- Surgical skills
- Laser Simulation
- Ocular Simulation
- Situational Awareness
- Immersive Simulation
- Communication Skills



Barriers to engaging with simulation

Time concerns

Resource costs

Pre-existing Culture

Poor understanding of benefits

The hidden trainee/trainer reality?

- Don't want to teach
 - Train competitors
- Don't want to learn
 - Entitlement culture



Trainers...

What is your attitude to training...?

Reward?

- Train next generation, Give opportunities, Support, Develop

Risk?

- Exposure to avoidable complaints
- No real reward, just headache
- Training future competition?
- No dedicated time – who cares?



Trainees...

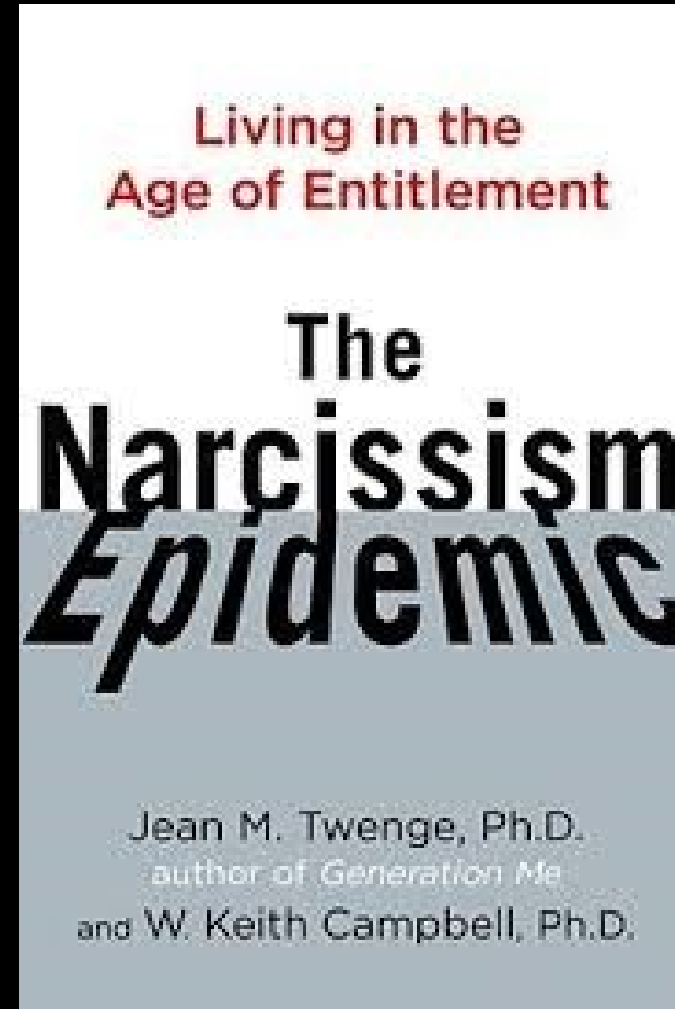
What is your attitude to training...?

Gratitude

- Privilege to operate
- Will put in necessary work

Ingratitude

- Entitlement culture
- You have to give me surgery...



Surveys of ophthalmic trainees' needs

- Experiences of **managing complications**
 - posterior capsule rupture
 - vitreous loss
- Experiences of **using adjuncts**
 - 3-piece IOLs (for sulcus placement)
 - Capsule tension rings
 - Hooks
 - Malyugin rings

Eye (Lond). 2020 Apr 7. doi: 10.1038/s41433-020-0856-6. Online ahead of print.

Trainee experience with capsular tension rings in Scotland—the need for structured simulation exposure to surgical adjuncts

Carl Mulholland ¹, David Lockington ²

Ground zero in Glasgow 2007-2017

Neglected Tennent Institute library

Is this the best we can offer?



Basic issue:

Need **appropriate training prior** to complex or complicated ocular surgery events

Plan:

Renovate historic Tennent library:

“Teach and Train” hub

- Cataract simulation
- Dry lab facilities
- Seminar room
- Video conferencing
- Research room





Renovate to innovate – new simulation suite and culture
The aim of simulation is **safety – for patient, trainee and trainer**

Nice to be recognised, much better if facility is used!

[Home](#) [Hospitals And Services](#) ▾ [Your Health](#) ▾ [Staff and Recruitment](#) ▾ [About Us](#) ▾ [Contact Us](#) ▾



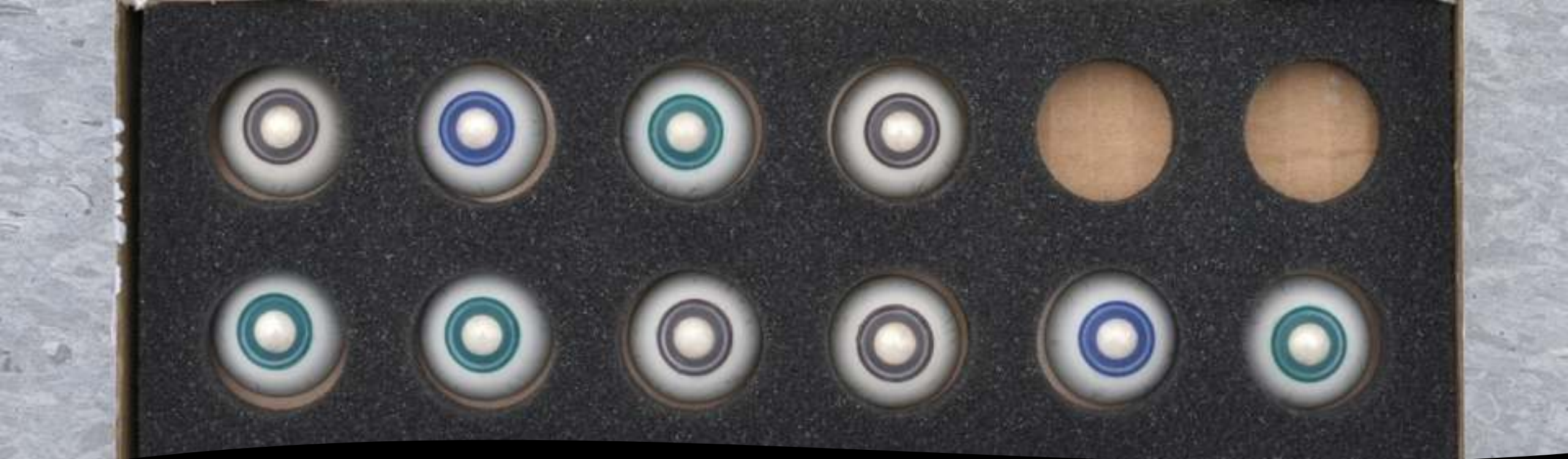
William Cullen Prize for Innovation



Dr David Lockington is a Consultant Ophthalmologist based in Gartnavel General Hospital.

Dr Lockington identified the opportunity to transform unused rooms within the Tennent Institute of Ophthalmology library into a state of the art teaching suite for ophthalmology training. There are now three rooms which consist of an ophthalmic simulation area, a computer room for trainees and a seminar room.





**Start as you
mean to go on**

- **Mandatory Inductions**
- **Mandatory Laser training**
- **Mandatory “Introduction to ocular surgery” courses**
 - **In person or webinars**
- **Equip every new trainee 5 model phaco eyes**
 - **1 eye, multiple procedures concept**

Last on list concept

- Give trainee basic phaco model eye
- Use equipment from last case
- Perform entire operation in theatre
- No need for wet lab



Change culture, engage trainees – Gamification

‘One eye, multiple procedures’ competition lower costs/waste, max benefits

Eye

<https://doi.org/10.1038/s41433-020-01155-9>



The ROYAL COLLEGE of
OPHTHALMOLOGISTS

CORRESPONDENCE



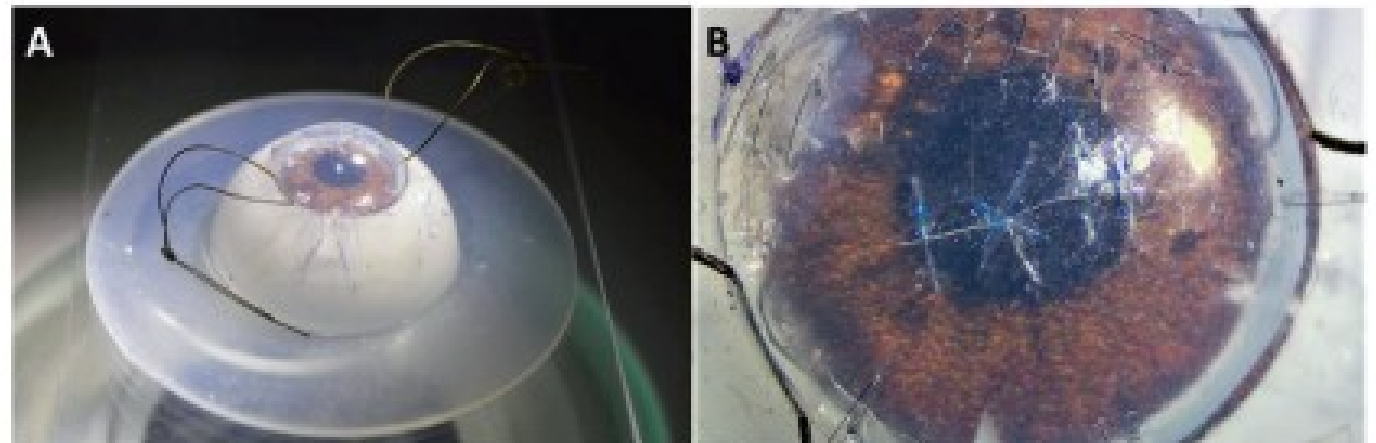
Maximising cost-effectiveness and minimising waste in modern ocular surgical simulation

Jennifer Hind¹ · Magdalena Edington¹ · David Lockington¹

Received: 27 July 2020 / Revised: 14 August 2020 / Accepted: 17 August 2020

© The Royal College of Ophthalmologists 2020

Fig. 2 Photograph of the winning entry. a Macroscopic photo of corneal suturing eye with the above procedures. **b** Microscopic photograph of corneal suturing eye showing tectonic graft superiorly; corneal laceration repair centrally and scleral flap with iridotomy inferiorly.



Cost concerns?

- Prevention, rather than management and follow up, of a complication is always more cost-effective
- Simulation is cost effective, cost saving + vision saving

Quantifying the real-world cost saving from using surgical adjuncts to prevent complications during cataract surgery

Jameson, Larry Benjamin & David Lockington

2010)

018-0133-0

ation

Let's diseases

Received: 09 March 2010

Revised: 28 April 2010

Accepted: 16 May 2010

Published: 05 June 2010

Royal College of Ophthalmologists' National Ophthalmology Database study of cataract surgery: report 6. The impact of EyeSi virtual reality training on complications rates of cataract surgery performed by first and second year trainees

Alex D. Faria¹, Paul H. Donachie², Robert J. Johnson³, Ruth Barnes², Martina Clatier⁴, John M. Spence⁴

Affiliations: + expand

PMID: 31142453 DOI: 10.1136/bjophthalmol-2018-312817

Abstract



Royal College of Ophthalmologists' National Ophthalmology Database study of cataract surgery: report 6. The impact of EyeSi virtual reality training on complications rates of cataract surgery performed by first and second year trainees

John D Ferris¹, Paul H Donachie², Robert L Johnston¹, Beth Barnes², Martina Olaitan², John M Sparrow³

Correspondence to John D Ferris, Ophthalmology, Gloucestershire Hospitals NHS Foundation Trust, Cheltenham GL53 7AN, UK;

john.ferris2@nhs.net

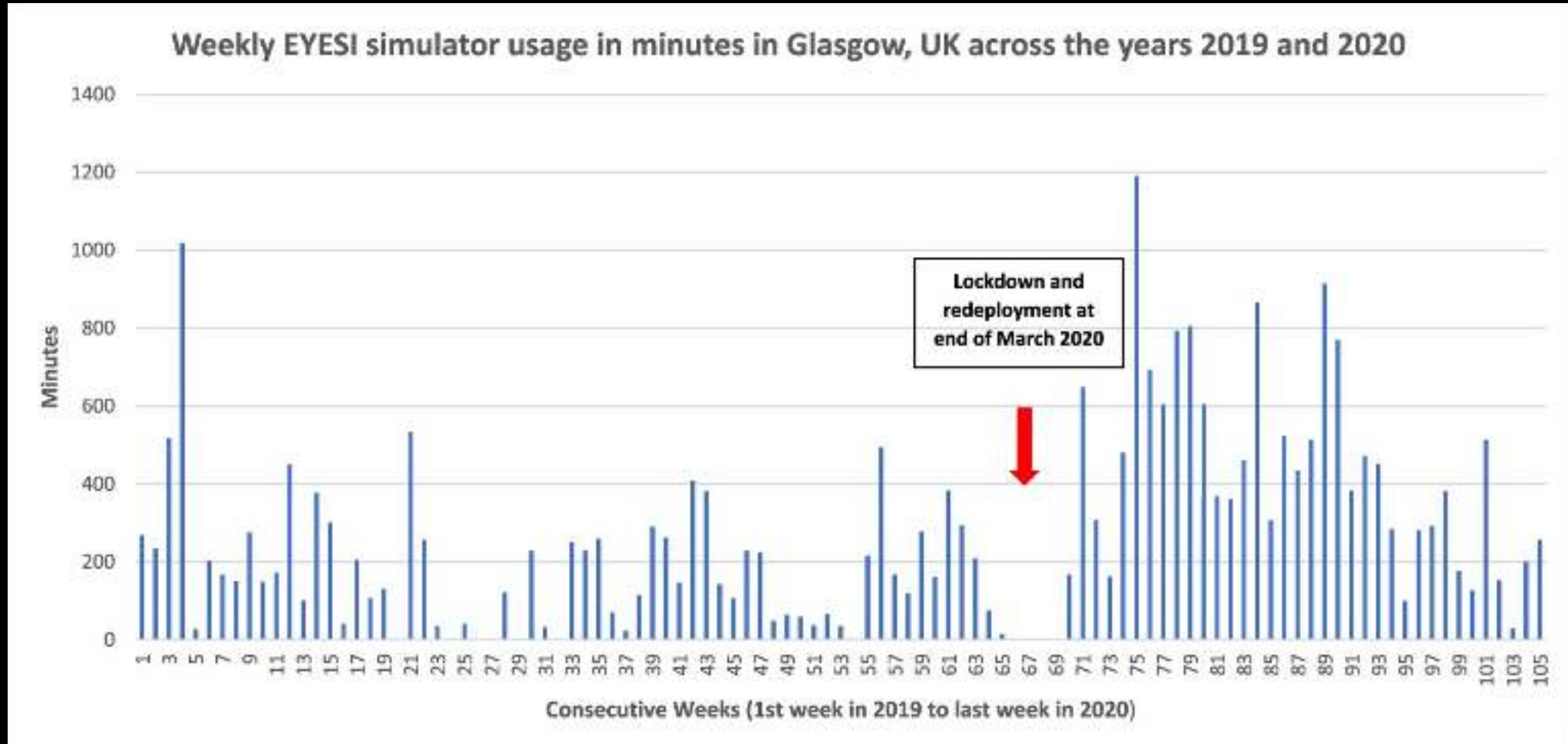
Results Two-hundred and sixty five first and second year trainee surgeons performed 17 831 cataract operations. 6919 (38.8%) operations were performed before access to an EyeSi, 8648 (48.5%) after access to an EyeSi and 2264 (12.7%) operations by surgeons with no access to an EyeSi. Overall, there was a 38% reduction in the first and second year surgeon's unadjusted PCR rates from 4.2% in 2009 to 2.6% in 2015 for surgeons with access to an EyeSi, and a 3% reduction from 2.9% to 2.8% for surgeons without access to an EyeSi. The overall first and second year unadjusted PCR rates for before, after and no access to EyeSi were 3.5%, 2.6% and 3.8%, respectively. The decrease in the with-access to an EyeSi group PCR rate was similar for surgeons with access to an EyeSi 'on site' or 'off site'.

Conclusions First and second year trainee surgeons' unadjusted PCR rates have decreased since 2009 which has significant benefits for patients undergoing cataract surgery. This 38% reduction in complication rates aligns with the introduction of EyeSi simulator training.

New relevance in COVID with suspension of training



Need identified = More users, more frequent use



Campbell S, Hind J & Lockington D. Engagement with ophthalmic simulation training has increased following COVID-19 disruption—the educational culture change required?. Eye (2021)



Many Simulation opportunities exist – filling training gaps?
RCOphth, Industry, UKISCRS, Phacomentors.com, ESASO, SOE, RANZCO, cataractcoach.com, simulatedocularsurgery.com etc

Simulation thoughts

- **Logbooks** record what you did
 - not what you may need
- **Surveys** identify gaps
- Simulation provides facilities to meet needs
- Simulation = **safe skill development without harm**
- Just need juniors (and seniors) to use it!

Safe exposure to risk?! – for surgeon and patient



The need for all cataract surgeons to run a regular vitreous loss fire drill

Eye advance online publication, 7 April 2017;
doi:10.1038/eye.2017.58

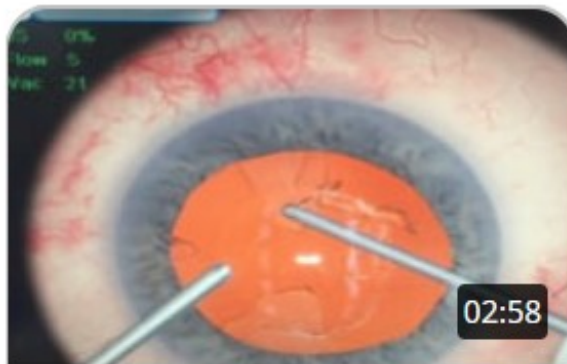
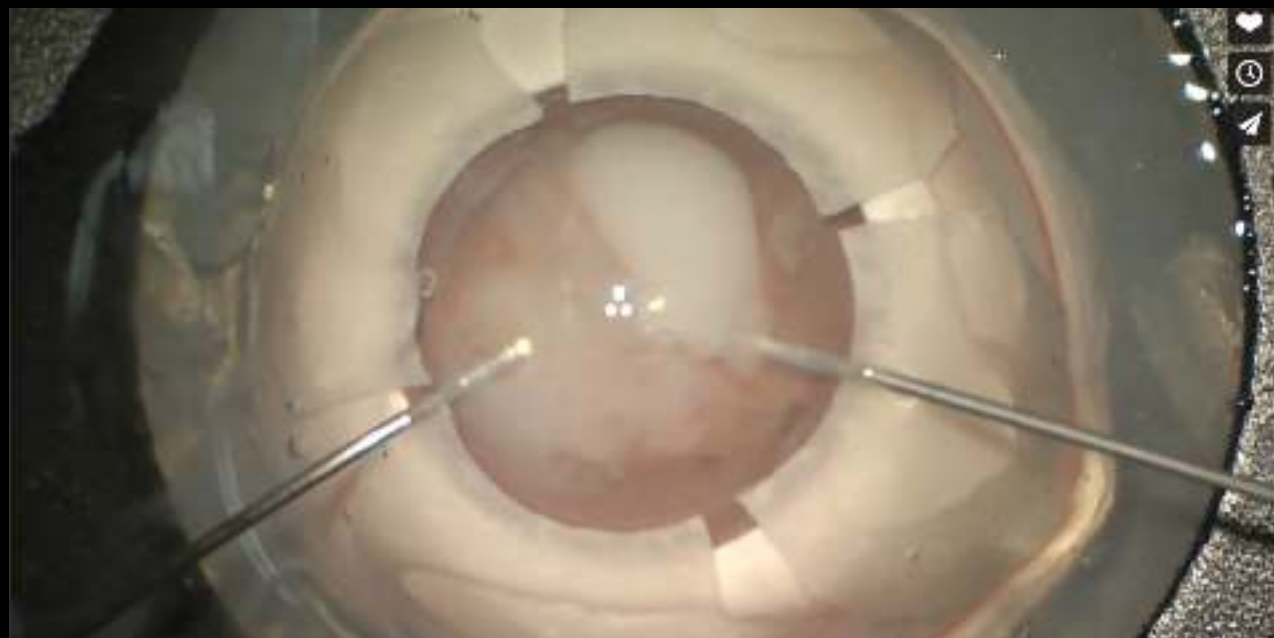
Calling all cataract surgeons! Is your low vitreous loss rate storing up future problems for your staff or trainees? Vitreous loss is a rare but inevitable complication of cataract surgery, occurring in ~2% of phacoemulsification surgeries, yet the predicted probability for this complication can range from <0.75 to >75%, depending on the patient's risk profile.¹ Despite risk stratification, these numbers can be unduly influenced and confounded in a training university hospital environment by the experience level of the surgeon and the degree of supervision provided.

lack of familiarity can be magnified with new trainees, a rapid turnover of theatre staff, or a new theatre environment.

The best way to address this situation is to regularly run a 'vitreous loss practice drill'; to educate and evaluate the surgical team's ability to anticipate and deal with this event.

To test this theory, ophthalmologists attending a recent West of Scotland postgraduate teaching session were surveyed regarding their level of experience of cataract surgery. Subsequently, they were asked to identify any additional items required to perform an anterior vitrectomy and specify their location in the theatre suite. There were 22 responses in total, comprising 13 consultants

Situational immersive simulation



EYESI - PCR and Anteri...
By John Ferris



Anterior vitrectomy tra...
By John Ferris



How to fill SOS catarac...
By John Ferris

AIMS

Evaluate impact of simulation training

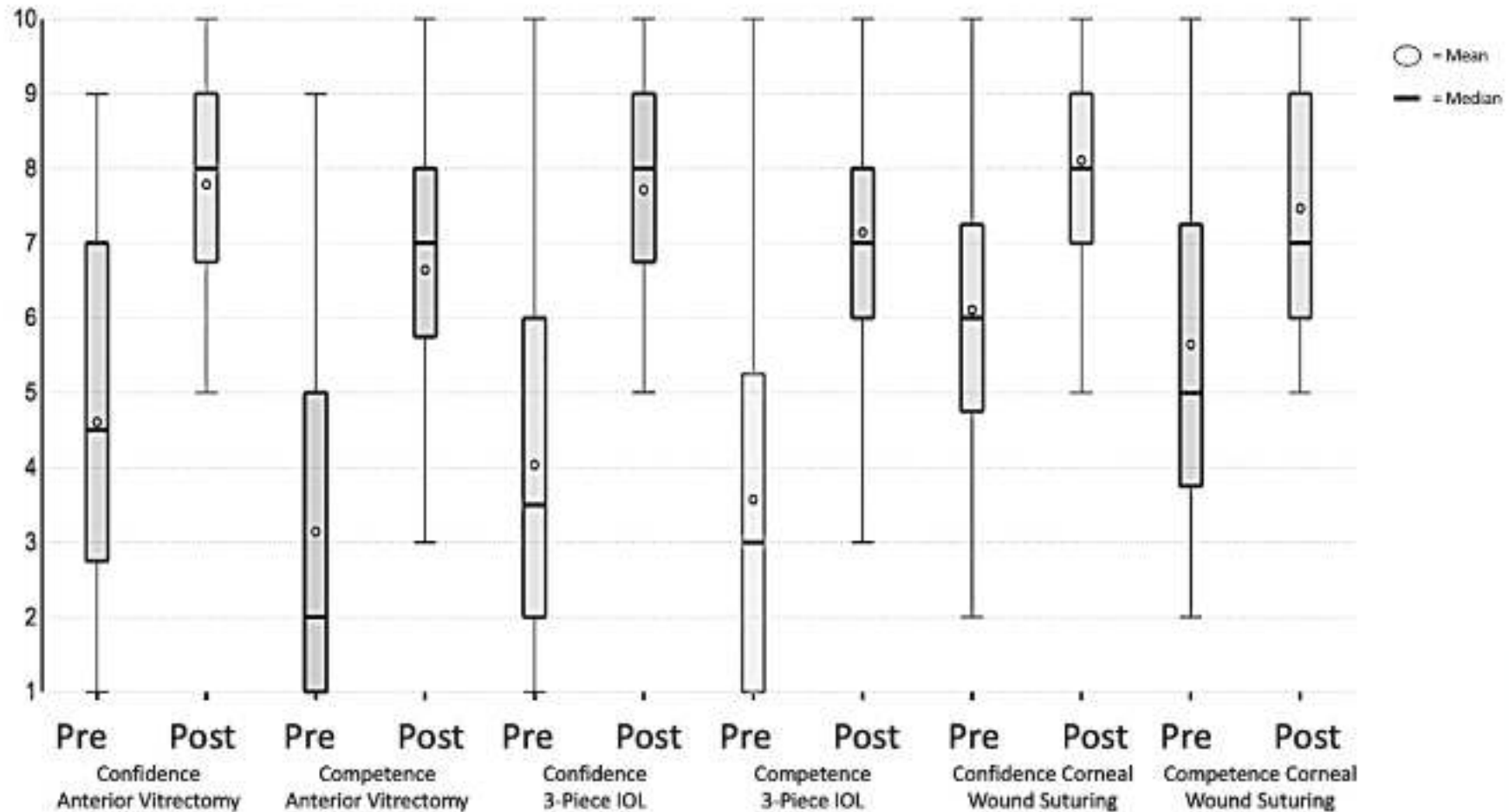
Anterior Vitrectomy

3-Piece IOL

Corneal Wound Suturing



ALL TRAINEE CONFIDENCE & COMPETENCE SCORES



Important message to share.... Or not?!

Eye

- Submitted to EYE (RCOphth national UK journal)
- 4 months later...

To the author of Manuscript EYE-22-2166, "Vitreous loss fire drills – ophthalmic simulation improves trainee surgical competence and confidence with posterior capsule rupture scenarios"

Thank you for submitting the above manuscript to Eye. I have now received the referee's report and regret that, unfortunately, they think the paper has a low priority for publication. I therefore give confirmation that Eye has relinquished all copyright on this manuscript.

REFeree NOTES:

ASSOCIATE EDITOR NOTES:

Apologies for the delay in returning a decision on this submission.

Unfortunately, the reviewer felt this to be **insufficiently novel for publication in Eye** and suggested that the 'Simulation in Healthcare' journal might be a suitable alternative.

“Insufficiently novel”

My Response –

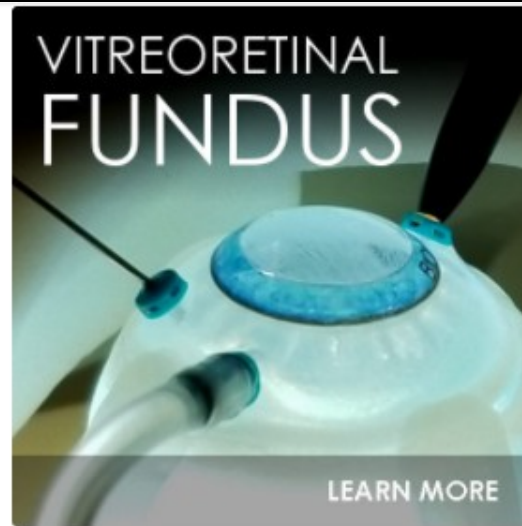
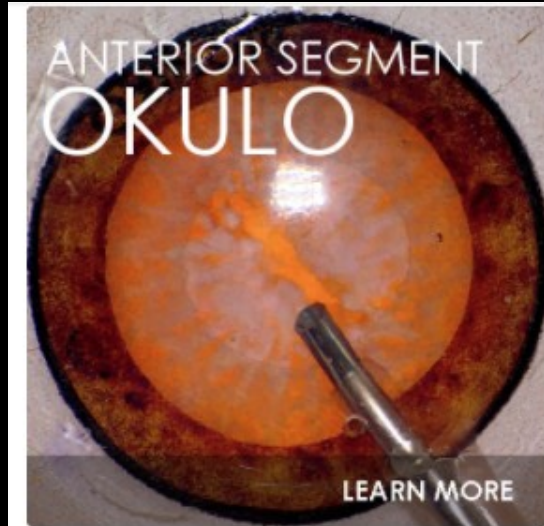
- Please send me list of all publications on this subject if you say it is already published and not novel
- *Still waiting...!*
- **Culture issue to simulation remains...**

Increasing simulation options = greater complexity

Phillips eye studio, Kitaro



Bespoke models now available Bioniko, Simul-EYE Industry can launch new devices safely (MIGS etc)



Better viewing systems

BRIEF COMMUNICATION

A pilot project evaluation of a novel heads-up viewing system compared to desktop microscopes commonly used for ophthalmic simulation

Jennifer Hind¹, Chloe Shipton¹ and David Lockington^{1,2}

© The Author(s), under exclusive licence to The Royal College of Ophthalmologists 2023

Eye: <https://doi.org/10.1038/s41433-023-02414-1>

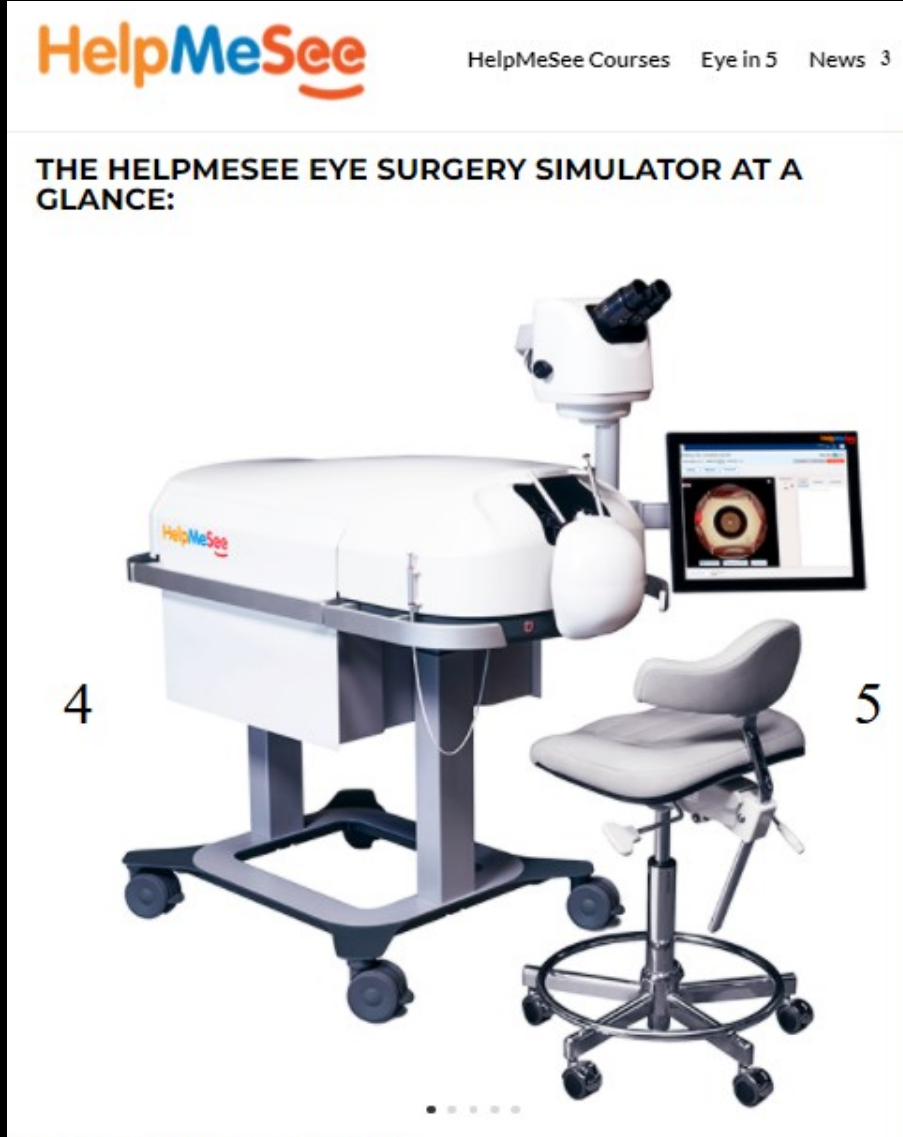
DRV vs STEMI desktop microscope

- More ergonomic
- 3D without glasses
- Preferred by trainees and trainers



Fig. 1 Photo illustrating viewing equipment currently used for ophthalmic simulation in Glasgow. Note the larger image and heads up display of the DRV system compared to the smaller STEMI microscope.

Higher tech costs, but higher benefits...



EyeSi cataract simulator

- 4 modules (A-D)
- Pass each exercise 3x in a row
- Increasing complexity

MODULE	A	B	C	D
	AC navigation	Capsulorhexis	Divide and Conquer	Weak structures
	Intracapsular navigation	Intracapsular tissue	Irrigation and Aspiration	Capsular plaques
	Instruments	Stop and chop	Capsulorhexis (tension)	White cataracts
		IOL insertion	Toric IOLs	Anterior Vitrectomy



At the Annual Congress

The ESCRS Moving Simulator will be in Vienna and freely available for you to try out the exclusive ESCRS curriculum during a free practice session.

Note: You will need to register for a regular ESCRS 2023 Wetlab to be able to register for a 1-hour slot to use the Simulator via the online wetlab registration portal.

The Simulator will be set up in the Free Practice Session room in the Wetlab section of the Congress venue. You will therefore have to book one of the available "Free Practice Session" wetlab slots (first come, first served). Depending on the remaining available space you may also be able to register in person for one Free Practice session onsite, but register now to avoid missing out!



MOVING SIMULATOR

EUROPEAN SOCIETY OF CATARACT
& REFRACTIVE SURGEONS

ARTICLE



Cost and time resourcing for ophthalmic simulation in the UK: a Royal College of Ophthalmologists' National Survey of regional Simulation Leads in 2021

David Lockington¹✉, George M. Saleh², Anne Fiona Spencer³ and John Ferris⁴

© The Author(s), under exclusive licence to The Royal College of Ophthalmologists 2021

INTRODUCTION: Ophthalmic simulation is cost-effective in complication prevention. However, there is no consistent resource allocation to provide the necessary time and finance to sustain such activities. We wished to identify the current support for the regional Simulation Leads in the UK.

METHODS: An online SurveyMonkey questionnaire was sent to all 26 UK ophthalmic regional Simulation Leads in February 2021 regarding current simulation activity and the degree of time and resource support available.

RESULTS: There were 22 responses within 1 month (84.6% response rate). 72.7% run regular simulation induction events for new trainees. 60% run mandatory laser simulation events. 38.1% run immersive simulation (vitreous loss fire drill). 47.6% run yearly sub-specialty events. 45.5% were required to make additional work arrangements to run simulation events. 77.3% had no job plan time allocation for simulation. 59.1% dedicated >1 hr/week to simulation. 68.2% EYESI simulators were purchased via charity/endowments. 72.7% had access to dedicated dry lab simulation (40.9% wet lab). 40.9% used deanery funds to purchase initial model eyes (supplemented by charity (36.4%) and endowments (31.8%)). 65% used unspent study leave budgets for ongoing model eyes, yet 15% reported trainees purchasing their own.

CONCLUSION: Nearly all ophthalmic simulation in the UK is undertaken via goodwill and personal commitment to excellence by the regional Simulation Leads. There is minimal allowance of time or finance for these vital activities, which is sporadic at best, and unsustainable. We call for the necessary investment and dedicated time allocation to permit ophthalmic simulation to be supported and maintained.

Eye: <https://doi.org/10.1038/s41433-021-01796-4>

ISSUES

- Run on good will
- Minimal/no time or finance allowance
- Needs resourced properly to succeed

Beware Social Media!

Soundbite vs reality?!

THANKS TO THE OPHTHALMOLOGIST MAGAZINE FOR
THE INTERVIEW ON HOW WE CAN HELP ERADICATE
BLINDNESS AROUND THE WORLD!

@THEOPHTHALMOLOGISTMAG

@HELPMESSEE



"The HelpMeSee simulator feels more like a real eye than an actual eye does.

The haptic feedback and the ability to feel as though you are actually inside the eye makes the real-life operating room feel like second nature after simulation-based training."

Dr. Jay Arora



www.helpmesee.org @HelpMeSee

@drjayarora

LINK IN BIO (CRINGE)

VRMagic = Haag Streit Simulation



- EYESI cataract + VR
- Indirect for adults
- Indirect ROP simulator
- Slit lamp simulator





AND

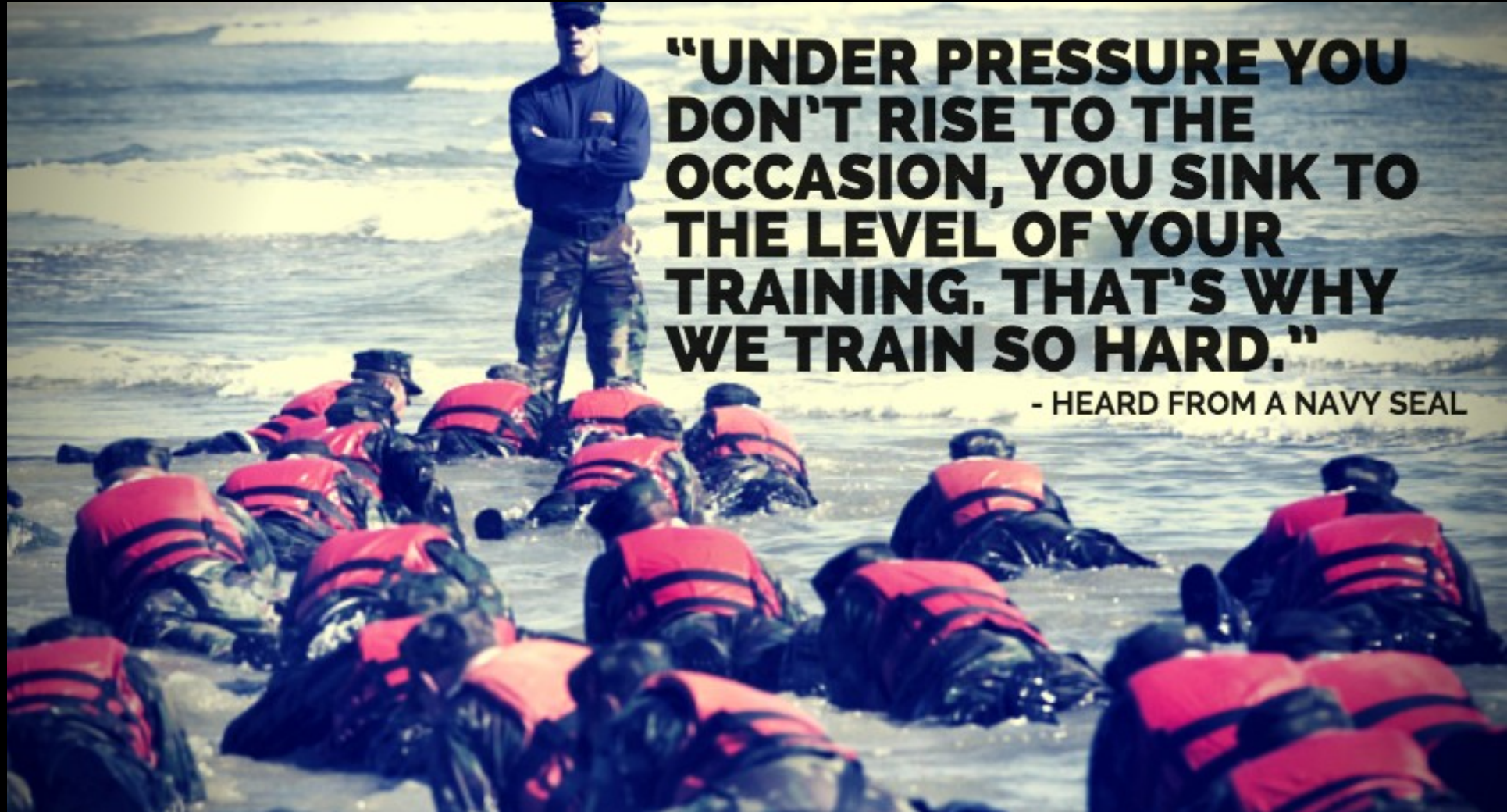
FUNDAMENTALVR



Today, surgeons are using VR training platforms like **FundamentalVR** to practice life-changing eye surgeries.



What is your attitude towards complex surgery?



**"UNDER PRESSURE YOU
DON'T RISE TO THE
OCCASION, YOU SINK TO
THE LEVEL OF YOUR
TRAINING. THAT'S WHY
WE TRAIN SO HARD."**

- HEARD FROM A NAVY SEAL



**Practice
improves
outcomes**

**Simulation takes the
patient out of the
learning journey**

Dr. Ivo Ferreira, Mexico City, Mexico

"We truly believe & see that perfecting surgical technique in the simulator shortens surgical learning curve & decreases complication rates."

Dr. Bruna Ventura, Recife, Brazil

"Engaging with surgical simulation provides a safer experience for the trainee, trainer & the patient (most importantly)."

Dr. David Lockington, Glasgow, UK

"Virtual reality simulation is the ultimate forum for deliberate practice, the first step to expert performance."

Dr. Rahn Byrne, Melbourne, Australia

"Our resident's hands & minds have never been as well prepared for surgery. There is no any justification for a resident's first operative experience to be with a live patient."

Dr. Evan Waxman, Pittsburgh, USA

