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NHS
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DoseAware: A clinical perspective

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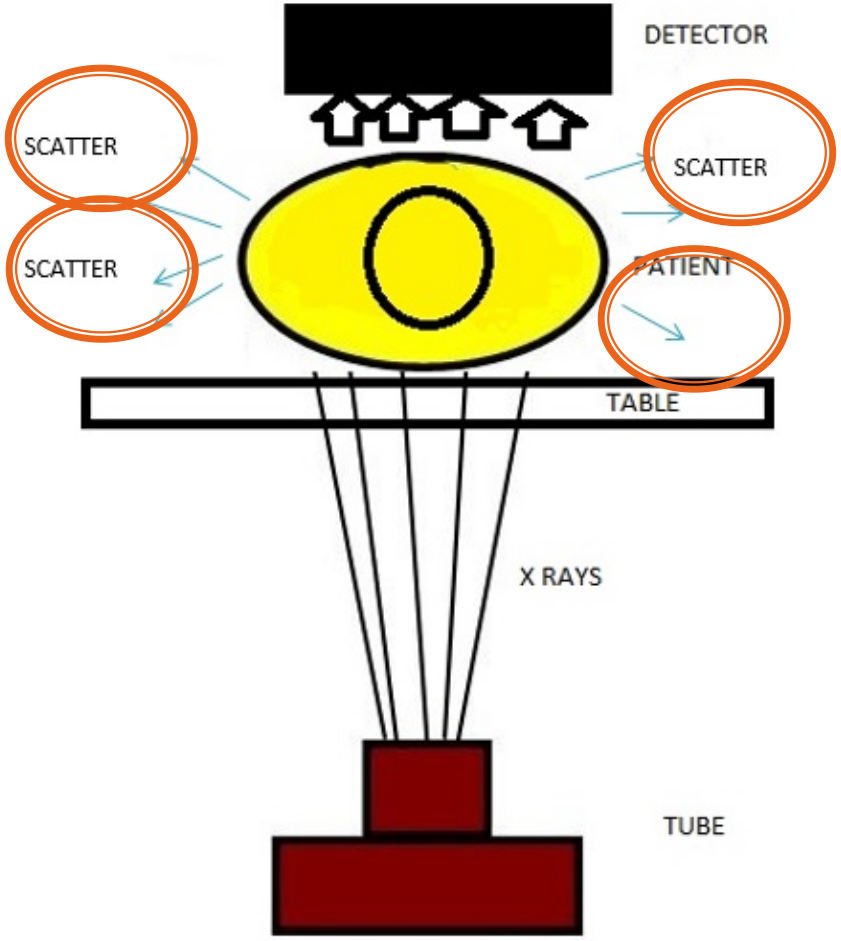
Overview

- X-rays are vital for Interventional procedures but can cause health issues for staff if not managed properly
- Already well documented risks to human body
- 80% of beam gets absorbed into the patient
- 18% scatter
- 2% hits detector/intensifier to generate image

Overview

- Standard Fluoro setup



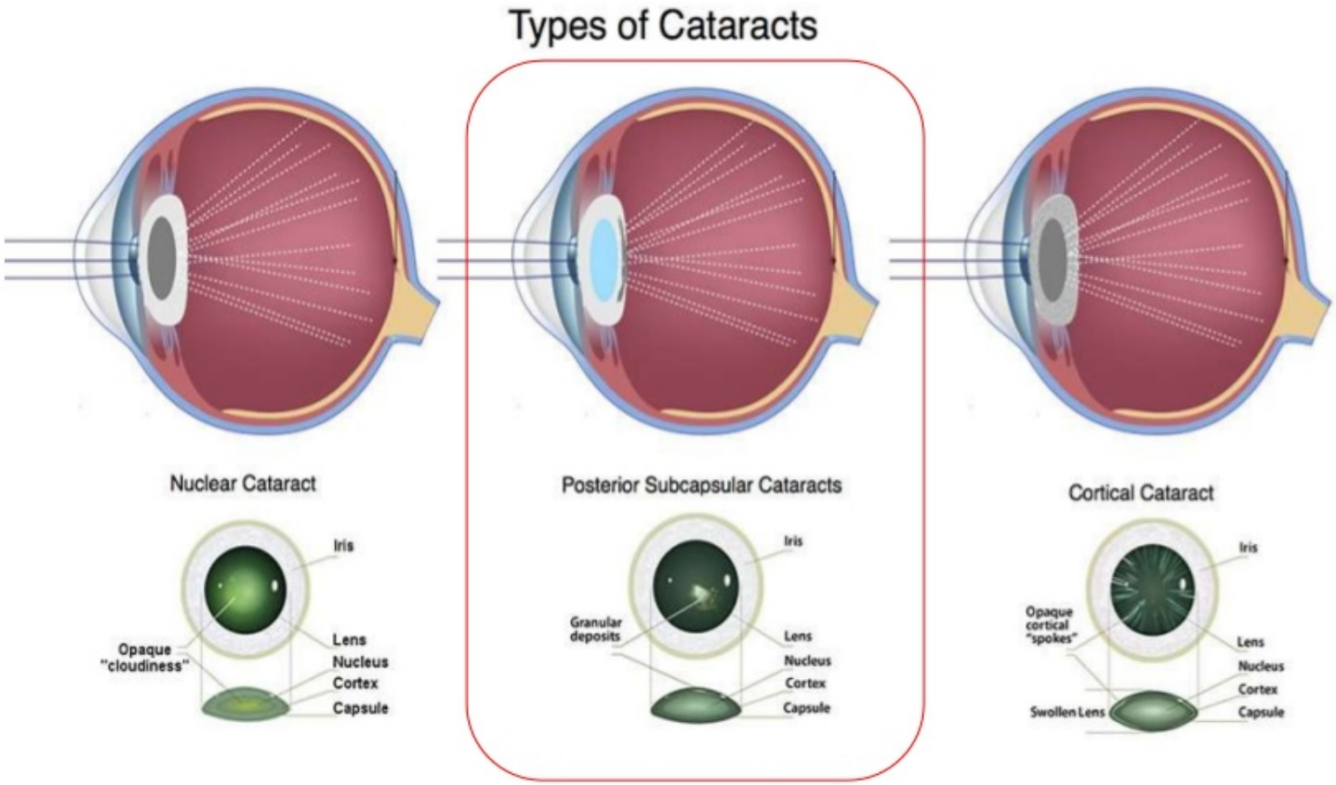
Overview

- It's the 18% of scatter we need to worry about!
- DoseAware helps us visualise what the scattered x-rays are doing
- Many of you will know operators with no hair on their legs!
- Known cases of operators recently with cataracts

Overview

- The lens of the eye is recognised as one of the most radiosensitive tissues in the human body
- Cataracts occur as a result of the accumulation of damaged or dead cells within the lens, the removal of which cannot take place naturally. This occurs after receiving 2 to 10 Gy, but may take years to develop

Overview


Types of Cataracts
Nuclear Cataract
Iris
Opaque "cloudiness"
Lens
Nucleus
Cortex
Capsule
Posterior Subcapsular Cataracts
Iris
Granular deposits
Lens
Nucleus
Cortex
Capsule
Cortical Cataract
Iris
Opaque cortical "spokes"
Lens
Nucleus
Cortex
Swollen Lens
Capsule

Overview

- Lots of operators still don't wear lead glasses!

- We had an operator with skin lesions only on the left side of their face due to prolonged exposure for the last 30 years

Overview

- All Interventional staff are still exposed on a daily basis
- Our job to make sure we minimise the danger to us using all available equipment

- DoseAware can assist with protecting staff and keeping them healthy
- Can be used anywhere where x-rays are used

What is it?

- DoseAware is an active dosimetry system that provides real-time insights about radiation exposure, helping medical staff and physicians evaluate and directly adjust their behaviours
- DoseAware measures and displays an individual's exposure to radiation in real time. It gives staff immediate feedback on their level of scattered X-ray exposure and how their behaviour affects it

What is it?

NORMAL TLD

DOSEAWARE BADGE

Why use it?

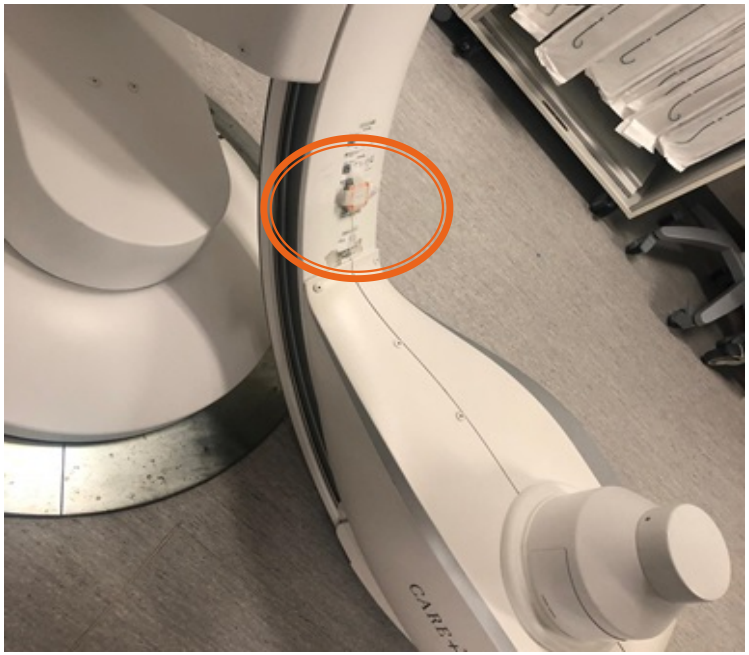
- We wanted to see if we could further improve on our Radiation protection setup, as well as checking for any loopholes in our protection system
- Highlight any “hotspots” in our suite which need addressing
- Comply with CQC and RPA requirements on monitoring

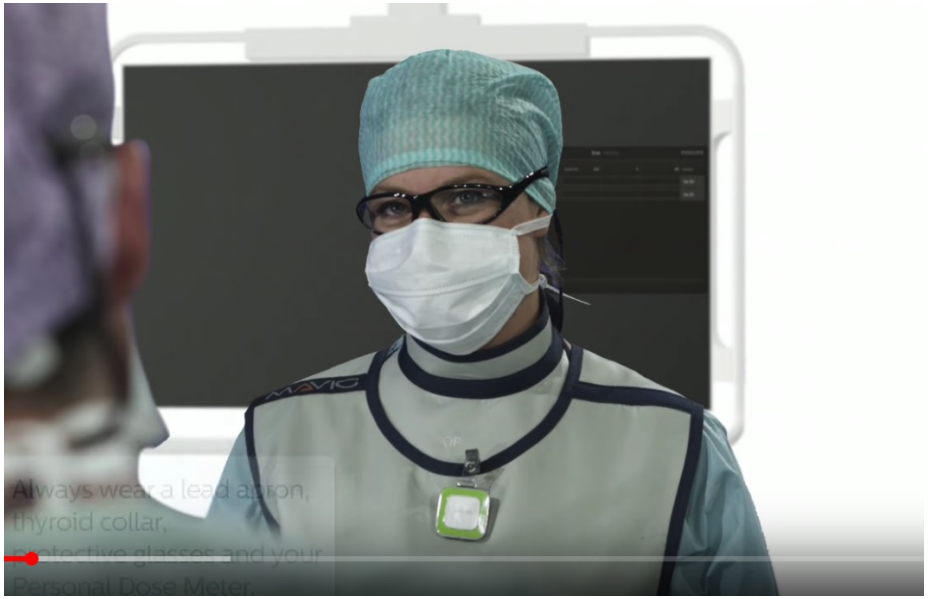
How it works

- 1 display monitor shows all active badges within the room
- Plug and Play
- Each individual can wear as many badges as necessary
- Simple traffic light system
- Green is low dose, amber is medium, red is high
- 1 reference badge on the tube itself

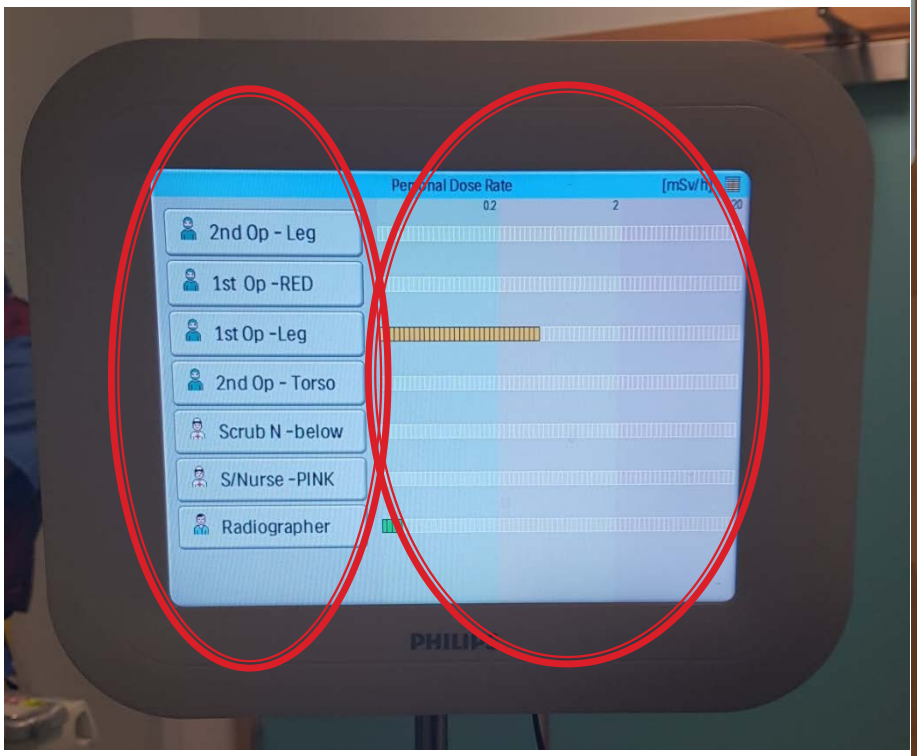
How it works

- Each individual was given a chest badge and a leg badge to assess the differences
- Reference badge must be near tube





How it works


Personal Dose Rate
[mSv/h]
0.2
2
2nd Op - Leg
1st Op -RED
1st Op -Leg
2nd Op - Torso
Scrub N -below
S/Nurse -PINK
Radiographer
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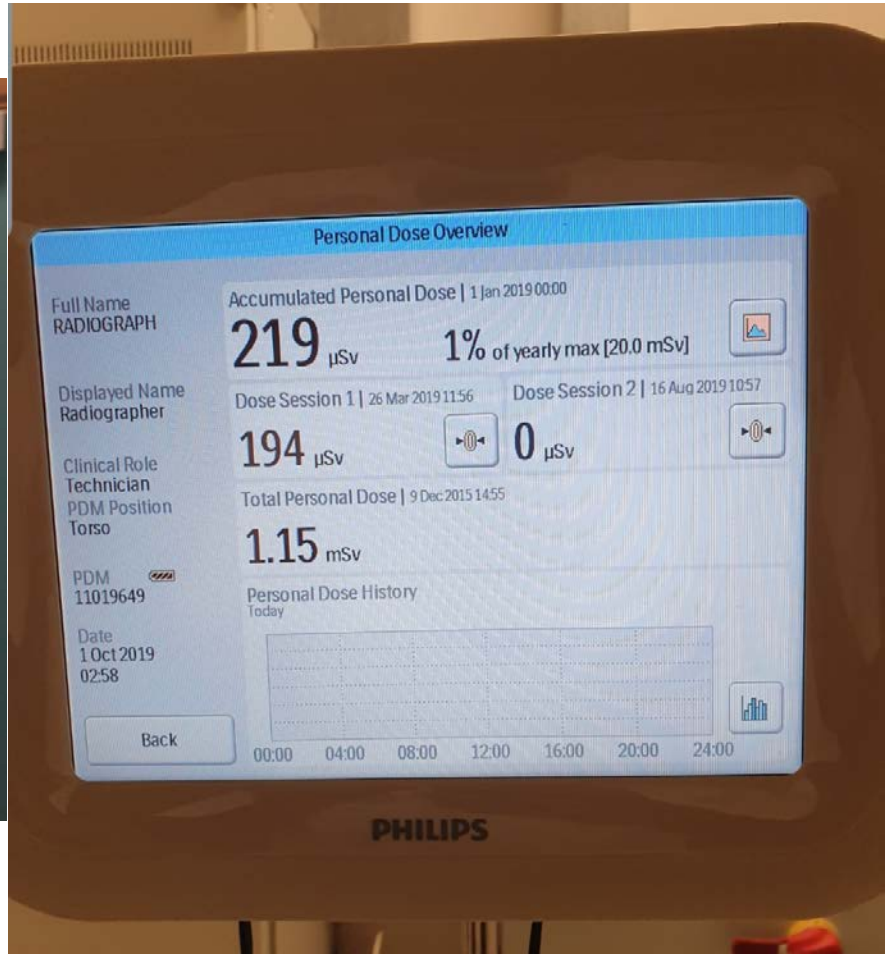
Personal Dose Overview
Full Name
RADIOGRAPH
Accumulated Personal Dose | 1 Jan 2019 00:00
219 µSv
1% of yearly max [20.0 mSv]
Displayed Name
Radiographer
Dose Session 1 | 26 Mar 2019 11:56
194 µSv
Dose Session 2 | 16 Aug 2019 10:57
0 µSv
Clinical Role
Technician
PDM Position
Torso
Total Personal Dose | 9 Dec 2015 14:55
1.15 mSv
PDM
11019649
Personal Dose History
Today
Date
1 Oct 2019
02:58
Back
00:00
04:00
08:00
12:00
16:00
20:00
24:00
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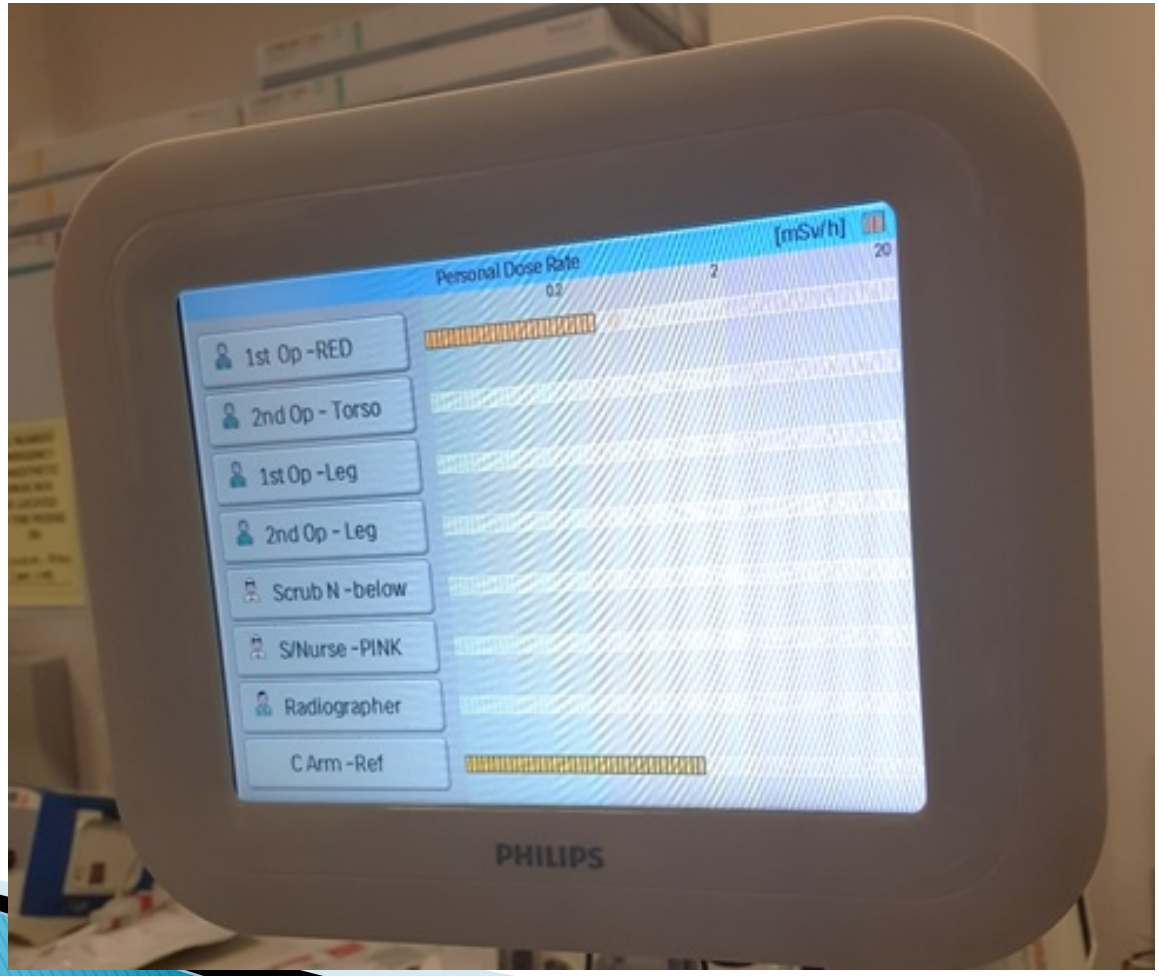
What we found

- Our protection system is very good but not perfect.
- Some of our equipment includes:
- Leads
- Lead table skirt
- Floating shield
- Adept Starboard
- Thyroid Shields
- Lead Glasses

What we found

- Cath Lab



What we found

- Substantial differences in amounts of scatter with regards to:
- Angulation

We now avoid steep angles when possible.

LAO Cranial showed the highest spike to Operator 1as the tube is closest to legs.

This was with the main lead apron in place (0.50Pb Kenex)

What we found

- Pt Habitus

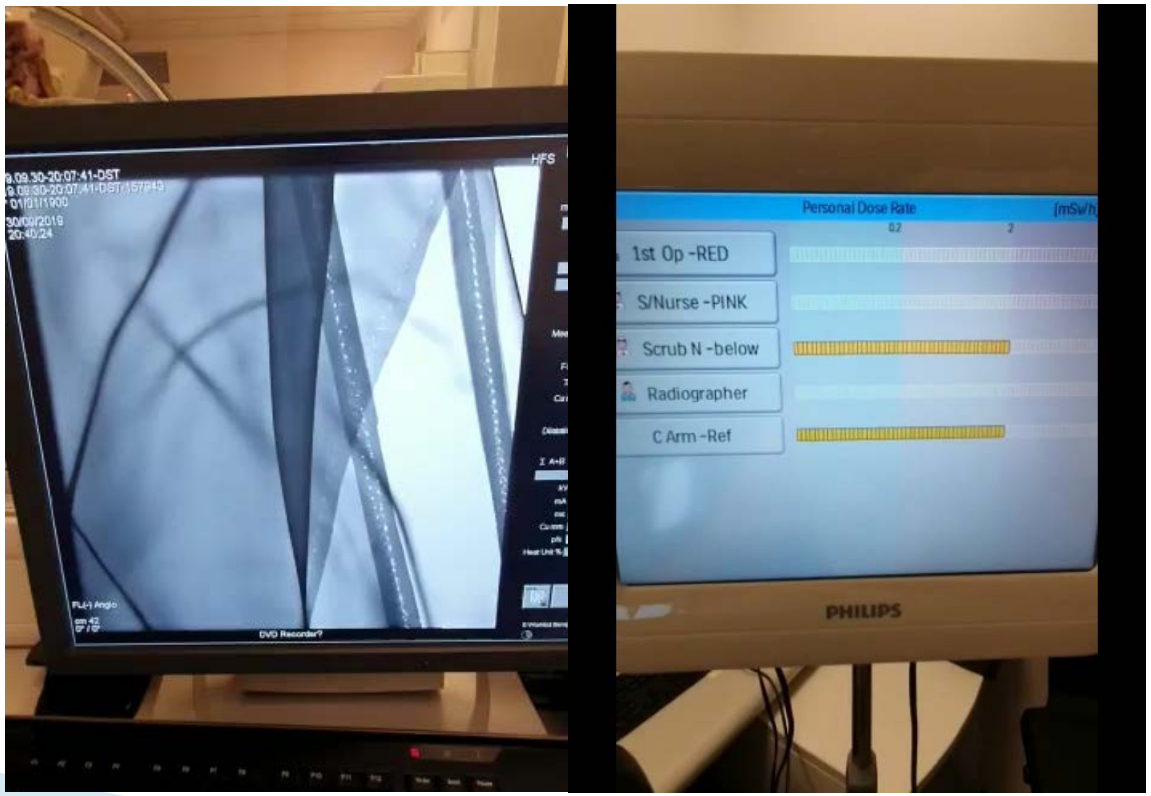
This cannot be changed of course but the differences in scatter levels was clearly lower

- Collimation

The most obvious improvement when looking at the live monitor, scatter instantly drops as soon as cones come in, moving from red to green immediately

What we found

- We are always taught to collimate as tight as possible when screening but physically seeing the benefits of it is fantastic reassurance



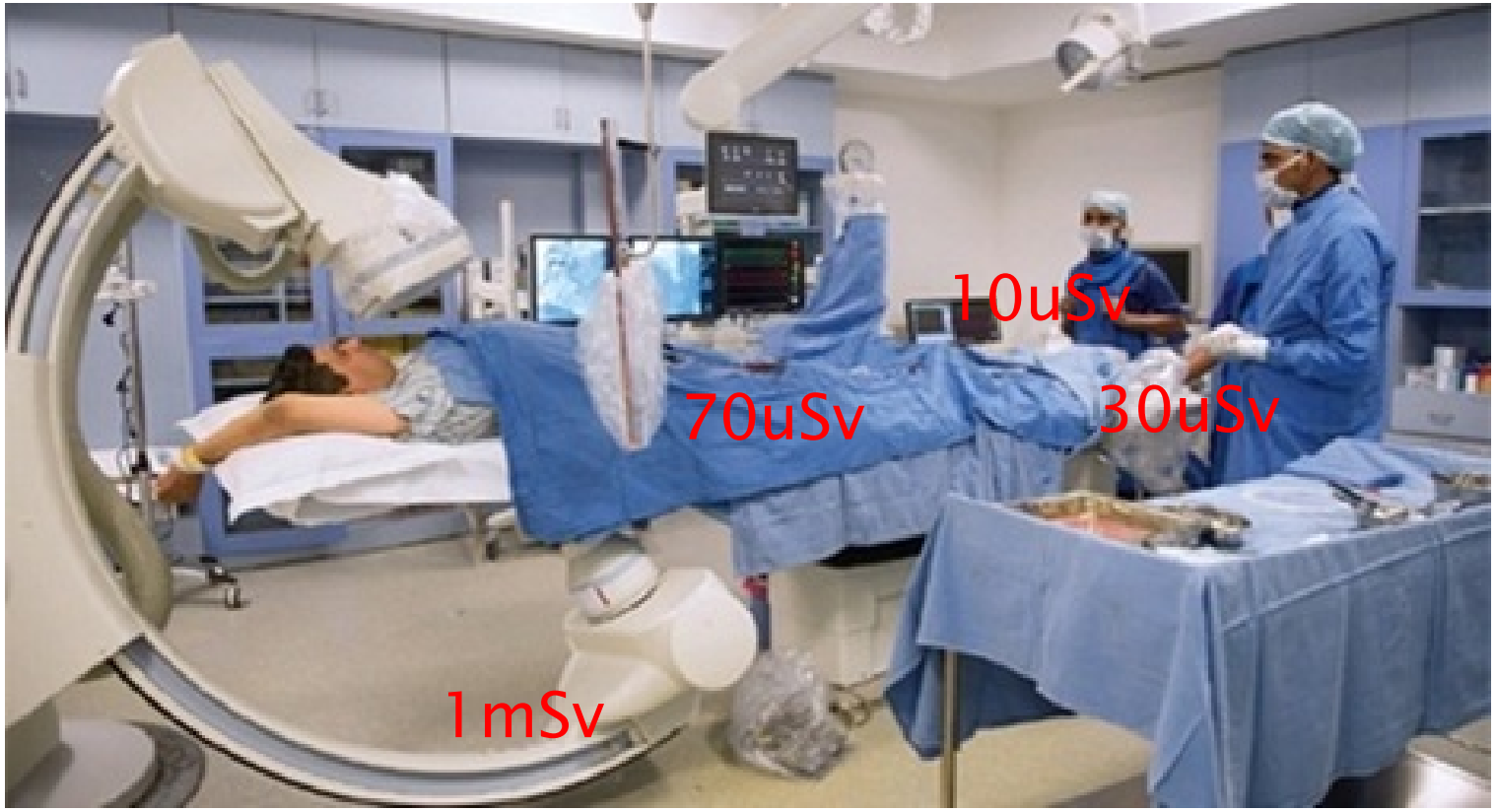
What we found

- Distance

We compared the doses from the reference badge on the c-arm to Operator 1, Scrub nurse and the Radiographer

- Over the course of the first week the reference monitor accumulated 1 mSv
- Operator 1's chest dose was 70 uSv (1 mSv is equivalent to 1000 uSv)
- This equates to roughly 14x the radiation if protection were not in place

What we found



What we found

- Scrub nurse recorded a chest dose of 30 uSv, roughly 33x less than the reference dose
- The Radiographer barely registered a dose all week, clocking in around 10 uSv
- This highlights the importance of
  D I S T A N C E when working under Flouro.
- Scrub nurses were receiving a chest dose 3x higher than the Radiographer even though we are stood next to each other

What we found

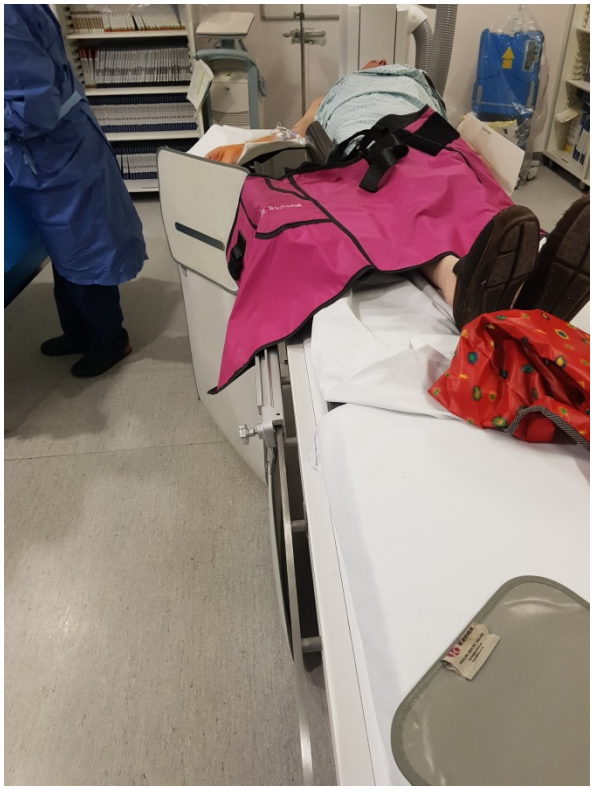
- This was especially evident on Straight LAO and LAO Cranial projections
- This makes sense as tube is closest to the operator in these projections
- Important to remember these figures are not actual dose received, but a theoretical dose were we not protected

Improvements made

- Upon assessment after a case we noticed a small gap in our setup
- This was due to the design of the table

Improvements made

- We trialled an old lead skirt horizontally across the patient to cover the gap and see if it makes any difference



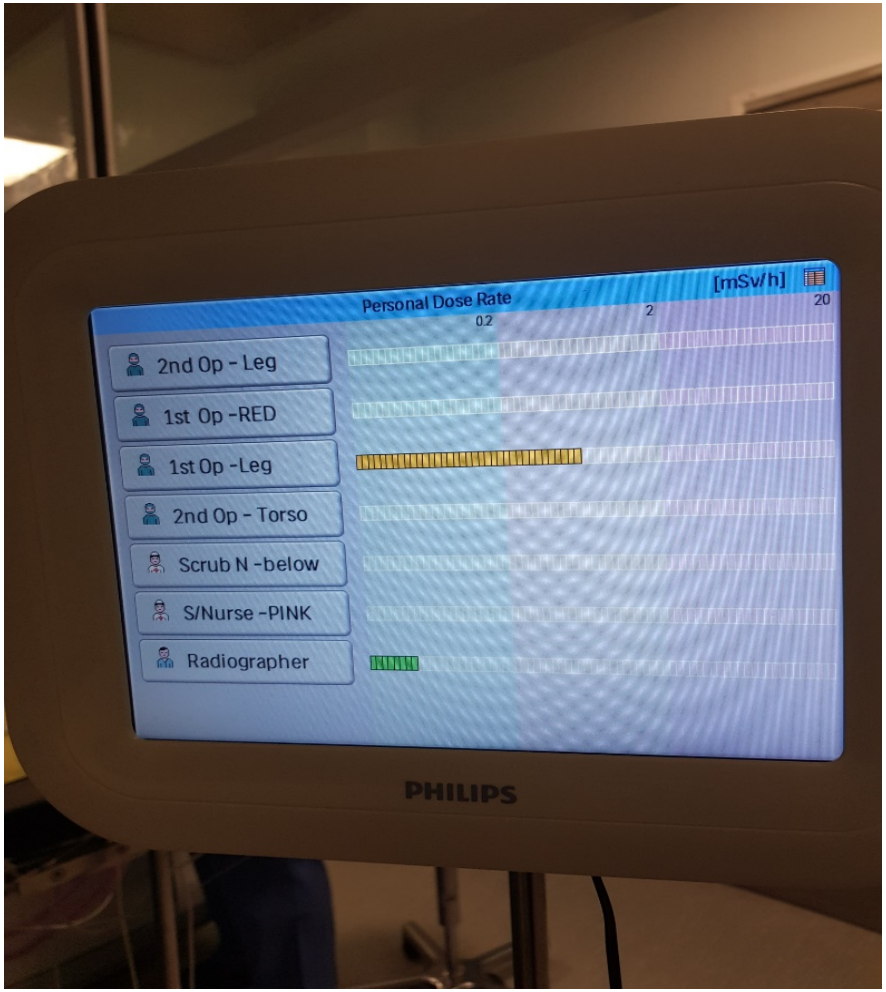
Improvements made

- This had an immediate and profound effect on Operator 1's chest dose, dropping from 70uSv to 20uSv in the following week
- There was also no spike at all in LAO and LAO Cranial
- Identifying this gap in our protection would be very difficult without DoseAware
- Going forward we are looking at more permanent solutions i.e. the RadPad

Other areas used

- Vascular theatre

We found the badges give completely different readings dependant on which area you work in

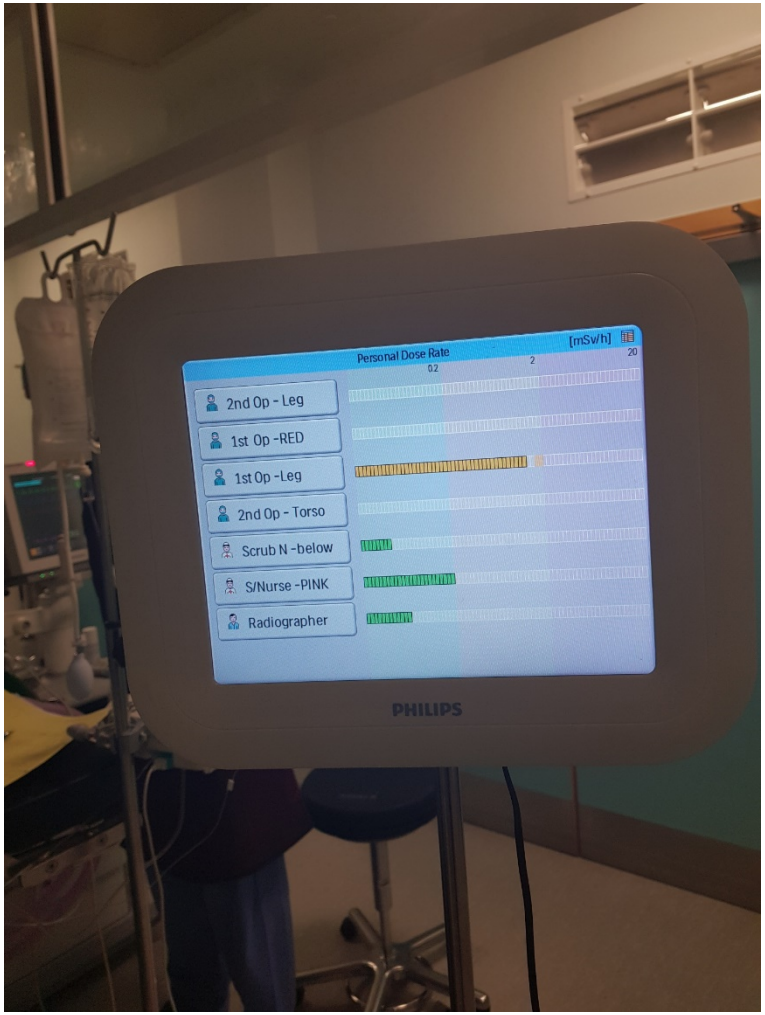


Other areas used

- Standard operating table with no lead skirt, floating shield or starboard

Other areas used

- Interventional Suite
- Again, DoseAware highlights where potential issues are



Conclusion

- DoseAware gives us real time information and makes us question our practices
- Far superior to “normal” TLDs
- Can be used anywhere

- Are we safe?
- Are there any adjustments we can make?
- Do we need to purchase further protection?

- Thank you for listening!