

# **A New Device to Markedly Reduce Personnel Radiation Exposure in the Cardiac Cath Lab**

Robert F. Wilson, MD  
John PN Gainor, BME, MBA  
James Montague  
Betsy V Wilson, MA  
University of Minnesota

**ICI** meeting **2017**

December 3-5, 2017 | Tel Aviv, Israel



[www.icimeeting.com](http://www.icimeeting.com)

- I, Robert F. Wilson, DO have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.
- I am a Founder and CEO of Egg Medical, Inc.

**ICI** meeting **2017**

December 3-5, 2017 | Tel Aviv, Israel



[www.icimeeting.com](http://www.icimeeting.com)

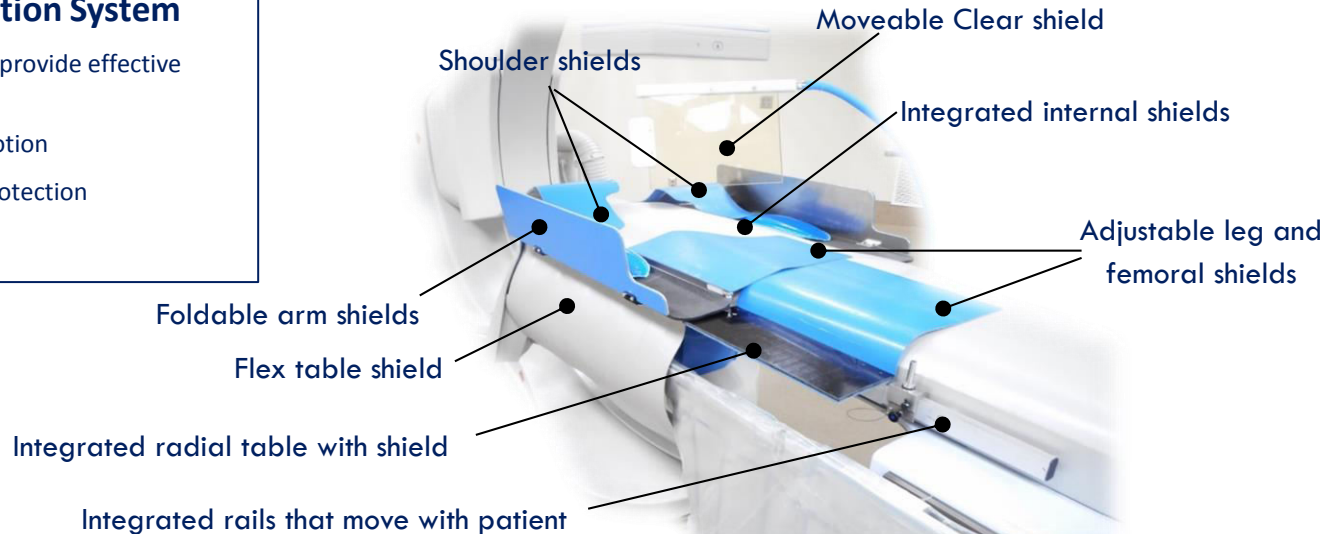
# The EggNest-XR™ System

## Carbon fiber sled platform

## Flex Shield Radiation Protection System

- ◆ Conforms to the patient's body to provide effective shielding
- ◆ Flexes to allow full X-ray gantry motion
- ◆ Radial, femoral and neck access protection

## Integrated ECG wiring



**ICI** meeting **2017**

December 3-5, 2017 | Tel Aviv, Israel



[www.icimeeting.com](http://www.icimeeting.com)



# Methods- Measurement of Scatter Radiation

## Experimental set-up

- Toshiba Infinix (2014) fixed C-arm x-ray system: **70 keV fluoroscopy at 15 fps**
- US Department of Energy **calibrated human anthropomorphic phantom**
- Scatter radiation measured with RaySafe X2 radiation meter (Fluke Biomedical)

## Protocol

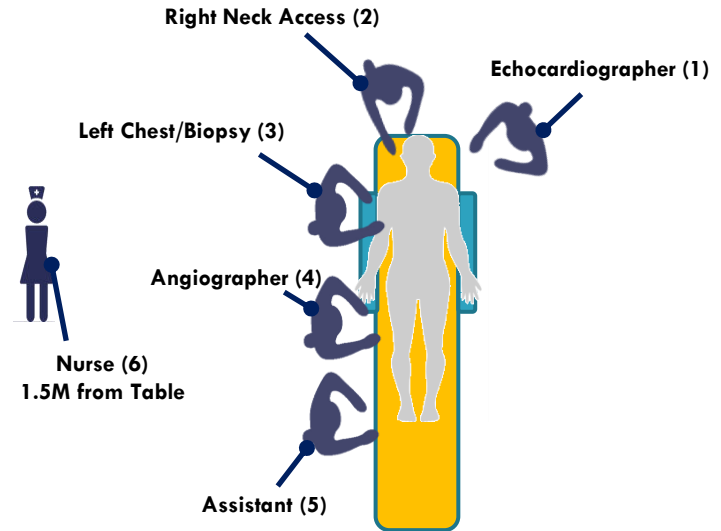
Scatter radiation measured:

- At **6 positions** around the cath lab
- In **5 angiographic views**

Measurements taken from **20 cm to 200 cm from the floor** in each position

Measurement obtained with **three levels of radiation protection**

- **No shielding**
- **Standard shielding** consisting of a hanging shield and table shield, both 0.5 Pb equivalent
- **The EggNest**



**ICI** meeting **2017**

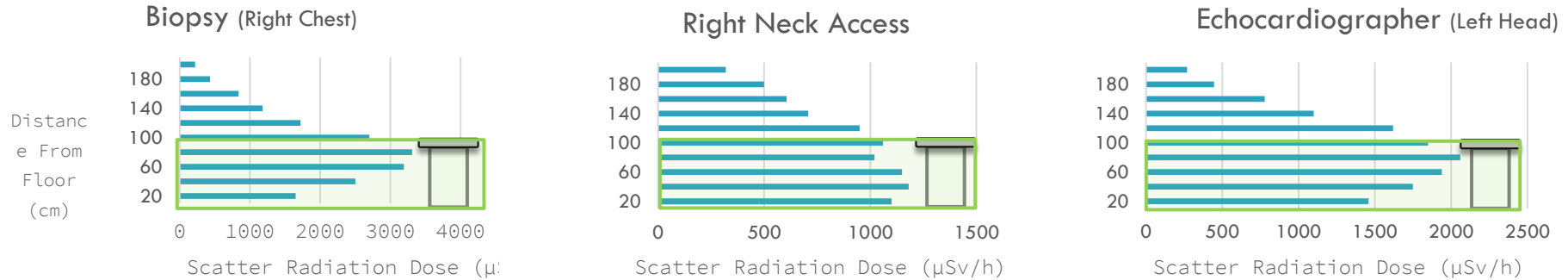
December 3-5, 2017 | Tel Aviv, Israel



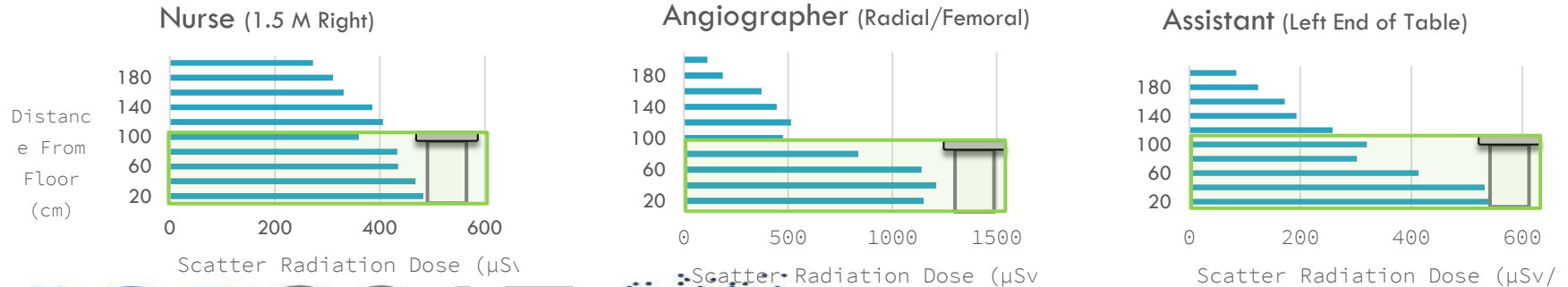
[www.icimeeting.com](http://www.icimeeting.com)



# Distribution of Scatter Radiation by Position Around Table and Height From Floor (PA projection)

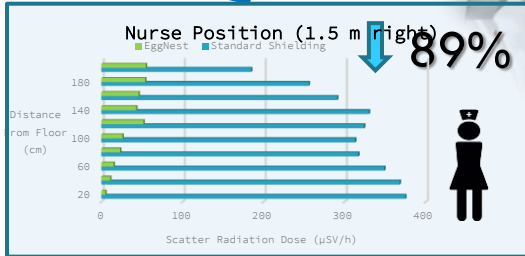
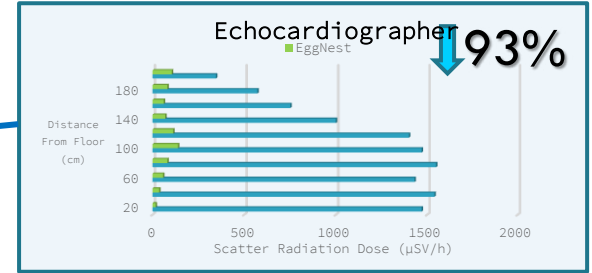
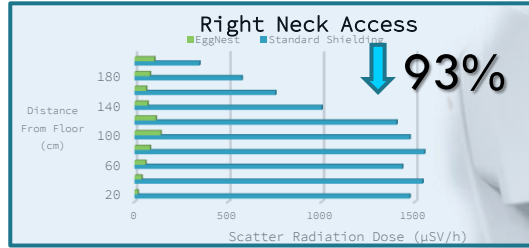


**70% of scatter radiation comes from below the table mat surface**





# Effect of EggNest on Scatter Radiation: Head and Nurse Positions



**Compared to Standard Shielding**

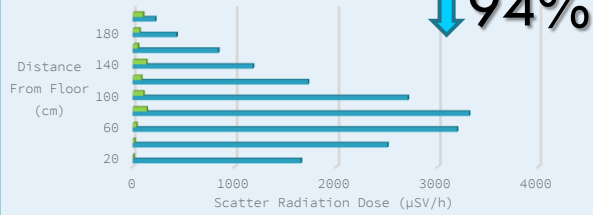




# Effect of EggNest on Scatter Radiation: Right Table Operator Positions

## Biopsy (Right Chest)

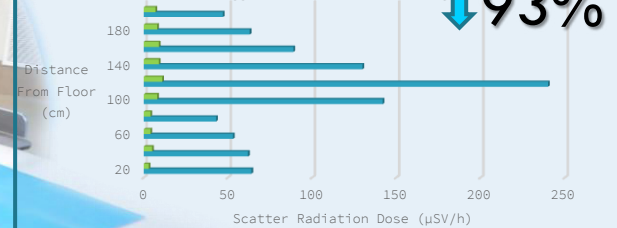
■ EggNest ■ Standard Shielding



## Compared to Standard Shielding

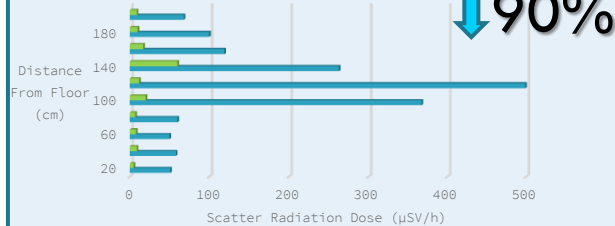
## Assistant

■ EggNest ■ Standard Shielding



## Angiographer (Radial/Femoral)

■ EggNest ■ Standard Shielding



**ICI** meeting **2017**

December 3-5, 2017 | Tel Aviv, Israel

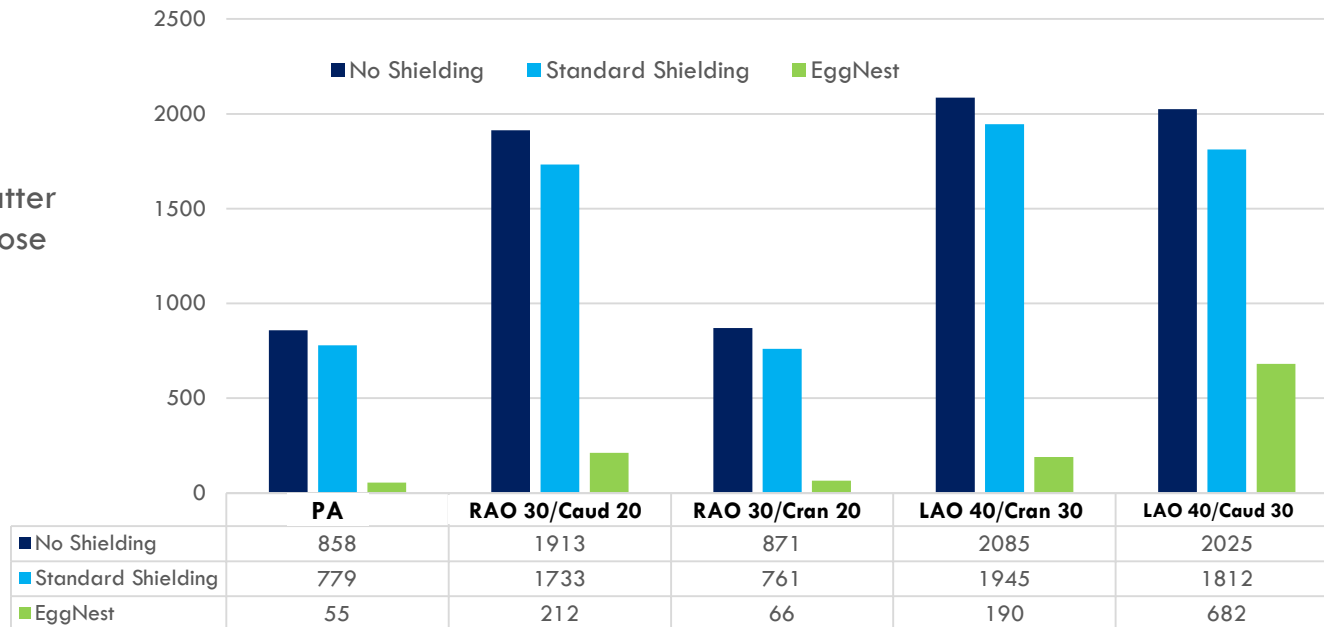


[www.icimeeting.com](http://www.icimeeting.com)



# Average Scatter Radiation In Angulated X-ray Views is Markedly Attenuated By the EggNest

Average Scatter Radiation Dose ( $\mu\text{Sv/h}$ )



\*Average scatter radiation dose for all heights and positions for each angulation





# EggNest Reduction in Scatter Radiation Compared to Standard Shielding

Position Around Table	PA	RAO 30 Caudal 20	RAO 30 Cranial 20	LAO 40 Cranial 30	LAO 40 Caudal 30
Echocardiographer	93%	95%	91%	96%	41%
Right Neck	93%	71%	94%	90%	81%
Biopsy	94%	95%	92%	88%	74%
Angiographer	90%	43%	80%	86%	5%
Assistant	93%	92%	87%	84%	17%
Nurse	89%	91%	88%	91%	53%
<b>Average</b>	<b>93%</b>	<b>88%</b>	<b>91%</b>	<b>90%</b>	<b>62%</b>

**ICI** meeting **2017**



\*Average scatter radiation dose for all heights for each angulation

[www.icimeeting.com](http://www.icimeeting.com)



# Conclusions

- ◆ The majority of x-ray scatter radiation in any angiographic projection comes from below the mattress top
- ◆ Standard shielding provides modest protection for the angiographer positioned at the radial/femoral access sites, but *no protection for the remainder of the staff or for procedures with head access*
- ◆ Angulated views significantly increase staff radiation exposure and standard shielding provides limited protection from scatter radiation
- ◆ The EggNest provides significantly more complete protection for both the physician and the staff in the room without comprising imaging flow
  - ❖ Better protection in all positions around the table
  - ❖ Better protection in all angiographic views tested

