Primary Objective

“The purpose of this session is to allow vendors to present their solutions and describe how their product can empower the clinician and supporting staff to make more informed decisions relating to dose management towards minimization of risk during fluoroscopy guided procedures.”

Risks of Ionizing Radiation

Dose Metrics

- Detector Exposure – nGy (Drives AERC)
- Organ Dose / Effective Dose – mSv (Patient Dose)
- Peak Skin Dose (PSD) – mGy (Patient Dose)
- Air Kerma at Reference Point* - mGy (Machine Output)
- Kerma Area Product (KAP) – Gy cm² (Machine Output)

*21CFR1020.32 – Mandatory for Fluoroscopic Equipment after 6/10/2006; Accuracy Tolerance ± 35%

Inverse Square Law
60 cm vs 65 cm = 20%

What’s Missing?

No Source-to-Skin Distance Corrections
No Spatial Information (All Dose Summed as if Occurred at a Single Point in Space; No C-Arm Angulation or Table Movement)
Dose to Air, Not Dose to Tissue (No Patient Support Attenuation/Scatter, Tissue Absorption Factor, Backscatter)
Compared to Fluoro Time: Individual Variability Reduced to a Factor of ~2x

Transition Towards Meaningful Dose Information

Reference Air Kerma (Kerma at Reference Location)
Real-Time Patient Dose Tracking System (DTS) (Estimated Skin Dose on Patient Graphic)
System Information:
- kVp, mA, ms, frame rate, field of view, collimator position, beam filter, acquisition mode, AKR

Position Information:
- c-arm angulation, table position, source to image distance

Other Considerations:
- Patient support attenuation/scatter, tissue absorption factor, backscatter

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**DTS | VALIDATION**

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**DTS | VALIDATION – EXAMPLE RESULTS**

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*VK Rana et al, “A tracking system to calculate patient skin dose in real-time during neurointerventional procedures using a biplane x-ray imaging system,” Med Phys 43(9), 5131-5144 (2016)  
*Bednarek et al., “Verification of the performance accuracy of a real-time skin-dose tracking system for interventional fluoroscopy procedures” SPIE 796127-1 (2011)  
DTS | PATIENT MODELS AND POSITIONING

*Skin dose to arms is of secondary value due to smaller body part thickness and variability in position on patient support.

DTS | BIPLANE CONFIGURATIONS

DTS | BODY VERSUS HEAD

Body Backscatter Factor
Head Backscatter Factor (0.80 – 0.85)
Local Storage of Last 500 Reports (2D and 3D Maps)
Export to: USB, Windows Networked Drive; External Server via FTP
Deterministic Effect | A CASE REPORT

➢ 46 Year Old Male
➢ FGI: Cerebral angio with transvenous coil and glue embolization
➢ Procedure Time: 150 minutes
➢ Exposure Time: 67 minutes
➢ Peak Skin Dose: 2.9 Gy
➢ Two weeks: nonscarring alopecia
➢ Four months: complete hair regrowth

Dose Management | DURING A PROCEDURE

➢ 6 months pre / post DTS display in exam room
➢ 16 operators free to choose all imaging parameters
➢ 1,077 consecutive procedures

Procedures exceeding 3 Gy

Control 2.7%
DTS 0.7%

Dose Management | DURING A PROCEDURE

➢ 5 months pre / post DTS display in exam room
➢ Single operator
➢ 323 consecutive procedures
**Dose Management | DURING A PROCEDURE**

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Procedure Description</th>
<th>Total Cases</th>
<th>&gt; 1 Gy</th>
<th>&gt; 2 Gy</th>
<th>&gt; 5 Gy</th>
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<td>Radiation therapy</td>
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</tr>
</tbody>
</table>

**State of Practice:** 1 in 5 exceed threshold dose

**Study Population:** <1 in 100 exceed threshold dose

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**DoseRite | SUMMARY**

- 36 dose modes
- Grid pulse
- Dynamic trace
- Auto zoom
- VIRTUAL ROI
- Low dose 3D
- RDSR
- SUMMARY
- 100 kW tube

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**Thursday @ 7:30AM, TH-AB-205-1, “Advancements in Radiation Dose Monitoring and Management”**

*Made For Life*

For over 100 years, the Canon Medical Systems Made For Life philosophy remains as our ongoing commitment to humanity. Generations of inherited passion create a legacy of medical innovation and service that continues to evolve as we do by engaging the brilliant minds of our team. We continue to set the benchmark, because we believe quality of life should be a given, not the exception.