

**MANDATED**

# **RADIATION DOSE MONITORING: A CALL TO ACTION**

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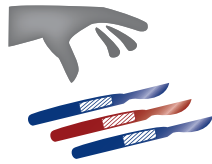
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## DO NO HARM

**MANY YEARS AGO**, I had an instructor tell me that x-ray cannot be seen, heard, felt or tasted. Our inability to detect exposure through our normal sensory systems makes it that much more dangerous. Our autonomic nervous system is designed to react to things that can cause pain and potential harm to our bodies. X-ray does not trigger that system and therefore must be monitored more diligently. In healthcare we actively pursue the mantra of "Do No Harm". We follow this mantra by adhering to stop gaps and assurance checks in many departments. Surgery moves through a process of checking and double checking. Right patient, right part. Pharmacies constantly work to avoid delivering medications with contra-indications or allergy issues, labs move through a series of checks when issuing blood product.



**SURGERY**  
RIGHT  
PATIENT,  
RIGHT PART



**PHARMACY**  
CONFIRM,  
CROSS-CHECK,  
DISPENSE



**LABS**  
PATIENT AND  
ORDER  
VERIFICATION



**MEDICAL  
IMAGING**  
?

We do these things as a result of reducing the risk of a negative outcome to our patients, historical or otherwise. It appears that the lack of a tangible immediate reaction to radiation exposure would prompt us to be more diligent in recording and reporting exposure. By harnessing and optimizing pre and post exam exposure data, the risk factors of a patient is one of actionable insight by the physician and staff to daily healthcare needs and the anticipation of future scenarios and care alternatives. This is done by utilizing concise clinical data that is collected, shared, and maintained for rapid analysis and enhanced clinical awareness.

For years, we in the imaging profession have carefully couched our naïve answers to patients' inquiries about the amount of exposure they will be receiving during any number of procedures in which ionizing radiation is used for providing diagnostic images. Exposure-related questions from our patients and family members are met with analogies of real-life comparative exposures. "Oh, this x-ray is equal to about as much as 30 minutes in the sun." But is this referenced "thirty minutes of sun exposure" in the Rocky Mountains at 10,000 ft lying on a flat rock or on the haze covered beaches of Southern California? The variance between each is considerable. Are these "tongue in cheek" answers the best we can provide to patients? The nasty truth is that historically



we have only been able to roughly estimate exposure rates for individual procedures and remain completely blind to any chance of determining an aggregate exposure for the patient we so vehemently promise to protect.

## **LEGISLATION AND LITIGATION**

**EARLY IN 2011**, the State of California passed legislation requiring facilities utilizing computed tomography to record the procedural dose. My bet is that sweeping legislation is soon to come. Procedural dose benchmarks are being reevaluated; the ACR is engaged in facilitating the movement to capture dose and has enacted a dose registry; the Joint Commission is considering incorporating some radiation dose reporting and monitoring requirements to its accreditation process. While this activity on a national scale begins to develop, we must all ask ourselves realistically, what good comes from recording exposure from a single episode when the issue more likely to cause harm is a patient's aggregate exposure over time?

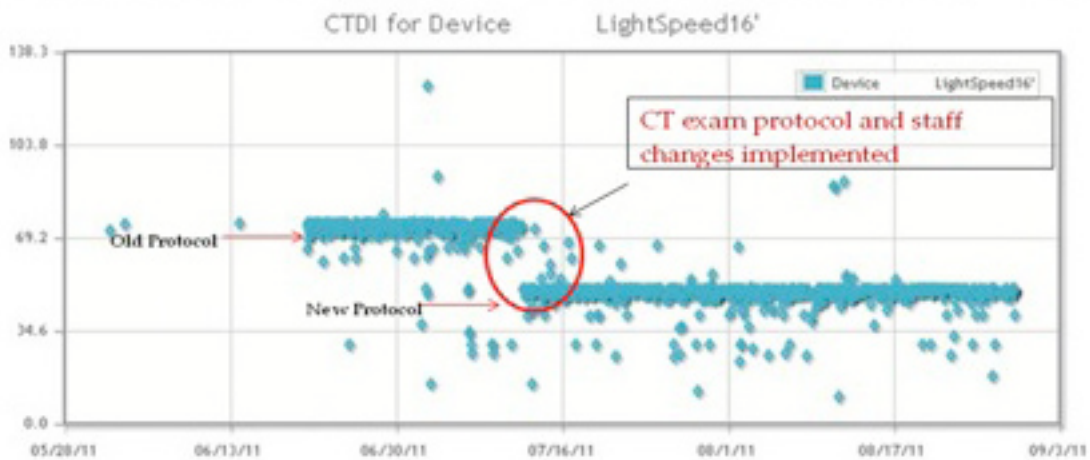
Much like everything else that is a response to a negative outcome, we are waiting for the other shoe to drop. Recent regulatory events are generating activity in beginning effort to set in motion documenting and reporting mechanisms. To the greatest extent possible, we must understand an individual patient's aggregate exposure. If we truly understood what we were doing with each exposure, and moreover what we were doing with an added exposure in addition to a known aggregate dose report, we would be positioned to create a decision support matrix around the benefit of the type and/or protocol of a procedural order. If a patient's cumulative dose is high based on an organization's individually established high/low settings, should we not feel compelled to seek a different modality or procedure for diagnosis? In some events of multiple exposures, should we consider going so far as to issue an informed consent to our patients? Automating this recording and reporting process will be a critical component of imaging operations in the coming years.



## CAPTURING AND REPORTING ACTIONABLE DATA

**SOME THINGS TO THINK ABOUT** as it relates to the ability to capture and report data that would be useful for real-time decision support would include:

- *The ability for a dose reporting system to look historically into a PACS database and seek the full patient jacket for all codified dose data*
- *The ability to gather and notify aggregate dose exposure at the time of order so that decision support can occur before the study is completed*
- *The ability to provide "on demand" comparative dose reports individualized to a single patient or group of patients*
- *The ability to calculate aggregate dose and create an HL7 message to activate a halt feature on the ordering system until the case is reviewed in the decision support process*
- *The ability to compare and contrast different vendors' equipment for dose output*
- *The ability to provide automated output data to the ACR registry*
- *The ability to cross reference scan protocols between scanners for dose output*



This table is an example of the ability to use technology for optimizing device protocols with a net decrease in radiation. The data points represent studies completed on a single device. Changes were made to the spiral pitch with a resulting drop in exposure to all patients scanned with this particular device. The use of technology can and should be far reaching in the controlling, monitoring, and reporting dose.



## UTILIZING TECHNOLOGY AND BEST PRACTICES

**THESE SYSTEMS** should automate what would normally be a manual process of compiling the data by using individual exam reports where the procedure dose may or may not have been documented. I do not know of any organization that has engaged a workflow to seek out, correlate and record exposure data as a part of the ordering process. The amount of manual effort to accomplish this would be daunting especially if the department is part of a larger organization where patients can seek care at different facilities.

The fact is that in order to have an effective dose monitoring process. Organizations must be able to utilize technology capable of mining the exposure data in our clinical systems. PACS images store exposure information in the DICOM header of the procedure. Automating the process of retrieving this data and reporting total exposure to the patient pending an x-ray emitting exam before additional exposure is a much more sensible process than merely capturing the procedural dose and doing nothing with it. So many questions related to process will emerge as dose reporting requirements continue to evolve. How does the organization deal with high exposure values once the data is aggregated to reflect "Total Dose"? Where will the data enter the decision support model? Will capital equipment purchases incorporate any consideration to the vendor's device exposure index?

In the next few years, dealing proactively with radiation dose exposure will be an operational issue requiring a viable technology mirrored by well thought out workflow and process. These efforts will be exacerbated as healthcare systems seek interoperability with non affiliated hospitals and outpatient imaging providers. It won't be too long before aggregate dose reporting will incorporate the entire patient's exposure history regardless of where the exposure was initiated. In the meantime, it is time to consider getting our houses in order and start becoming proactive around the issue of medical x-ray exposure.

## TRENDS AND STRATEGY

**WE HAVE ONLY JUST NOW BEGUN THE JOURNEY** that will meander through the medical imaging landscape collecting artifacts related to radiation dose along our path. The fevered pitch that will ultimately echo through the mahogany halls of the legislature and the C-suites of healthcare organizations is yet to reach an audible level. Once there, imaging departments will be scrambling once again to soothe the tyranny of the urgent. I recommend we pay very close attention to the trends and seek to create a strategy on how dose will be captured, recorded, managed, reported and used as a critical decision support tool for prescribing x-ray emitting procedures.



## ABOUT THE AUTHOR



**SHAWN MCKENZIE** is a frequent author and national speaker on the topic of healthcare transformation. As the President and CEO of Ascendian Healthcare Consulting, he is passionate and dedicated to sustainable and effective healthcare solutions: focused on Clinical Operations, Workflow & Dataflow, Process and Procedural Review & Improvement. Medical Informatics, Information Technology Implementation and Resource Education and Management. Shawn is an accomplished healthcare professional with over three decades of progressive healthcare operations management and implementation experience within business and clinical information systems. As a former Administrative Director of Radiology and Diagnostic Cardiology, and with a history of successfully directing a range of service lines from small community hospitals, large complex trauma center operations to outpatient services, he has a broad knowledge base of the entire care continuum that has enabled him to assist large delivery networks achieve project successes in the implementation of clinical systems.

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