

## Case Study RaySafe i3

# Sendai Kosei Hospital Enhances Radiation Safety with RaySafe i3 and Video Monitoring

### Results

- Instantaneous and accumulated dose rates for effective exposure management
- Optimized shielding by combined solution
- Posture impact insights

### Application

Real-time occupational dosimetry for interventional cardiology and vascular surgery.

### Customer

Yoshihiro Haga, Deputy Head Technician at Sendai Kosei Hospital's Radiology Department. Mr. Haga, employed at the hospital since 2004, also serves as a part-time lecturer at Tohoku University Graduate School of Medicine. He is accredited by the Japanese Society of Angiography and Interventional Radiology.

The hospital, relocated in May 2024, offers advanced care in cardiovascular, gastrointestinal, and respiratory medicine, all recognized for excellence in Japan. It features 409 private rooms in a hotel-like setting and comprehensive wellness amenities for staff.

The hospital is equipped with 6 angiography systems, 3 CT and 3 general imaging systems, and 1 CT simulator.

### Challenge

Frequent use of radiation in diagnosis and treatment necessitated better radiation exposure management for both patients and staff. Previous dosimeters (glass badges, eye lens dosimeters, and semiconductor pocket dosimeters) failed to provide real-time data and often underestimated exposure.



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*Frequent use of X-ray for diagnosis and treatment makes exposure management a constant challenge.”*

Yoshihiro Haga, Deputy Head Technician of the Department of Radiology, at the Sendai Kousei Hospital

### Solution

Sendai Kosei Hospital implemented the RaySafe i3 system to enhance radiation exposure management for staff, combining it with video monitoring for detailed analysis to identify the most effective ways to reduce X-ray exposure. Before implementation, the hospital conducted precision testing using multiple RaySafe i3 dosimeters, which delivered more consistent results than previous RaySafe i2 units.

“We chose the RaySafe i3 system primarily for its real-time measurement capabilities during pulsed fluoroscopy, its compact design, and its ability to record dose data and analyze trends over time. Compared to the previous RaySafe i2 system, RaySafe i3 offers notable improvements, such as greater measurement accuracy and a longer lifespan, thanks to its replaceable battery.

Our radiology rooms are also equipped with continuous video monitoring, integrated with RaySafe i3 data to support both exposure management and staff training.”

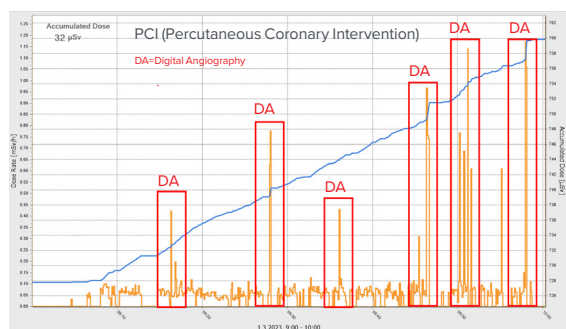
## Result

The Sendai Kosei team can now analyze high-dose events alongside video footage, offering staff a deeper understanding of how specific movements influence exposure. By comparing similar cases, they continue to make incremental procedural improvements—such as minimizing interference with the protective plate caused by C-arm angles thereby reducing scattered radiation from the patient—with the goal of optimizing staff positioning and shielding setup.

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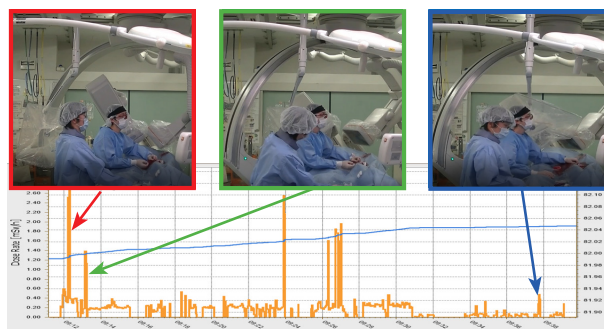
*RaySafe i3 combined with our video monitoring system has helped us to better manage radiation exposure among our medical staff.”*

Yoshihiro Haga, Deputy Head Technician



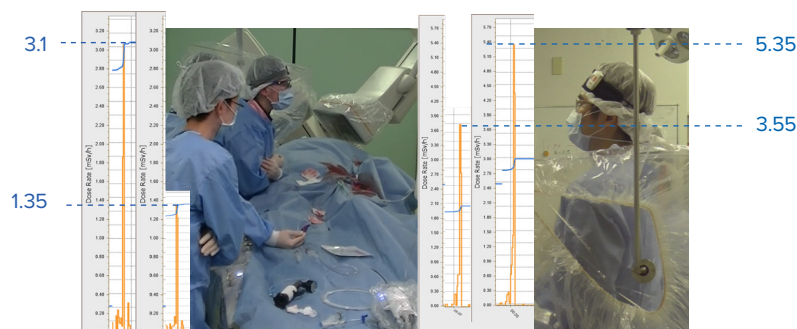
### Test 1: Stand-Alone Use of RaySafe i3 System:

Data from a standard surgery showing instantaneous dose rate (orange curve) and accumulated dose (blue curve). Digital Angiography (DA) typically results in about 10 times the exposure of fluoroscopy, as illustrated in the graph. The diagram shows that the surgeon may be more aware of radiation exposure at the beginning of the procedure, with attention to the risk gradually decreasing as focus shifts to treatment.



### Test 2: Combined Use of RaySafe i3 and Video Monitoring:

During the initial stage of another standard surgery (red arrow), integrating RaySafe i3 with video monitoring revealed high dose rates due to the biplane C-arm angle interfering with the shielding plate, resulting in significant scattered radiation from the patient. In the next image (green arrow), the C-arm angle was adjusted and the surgeon's posture improved, reducing exposure. By the final stage (blue arrow), the shielding plate was properly positioned, effectively minimizing X-ray exposure.



### Test 3: Head and Neck Protection Assessment with RaySafe i3 and Video Monitoring:

The left graph in each image shows dose rate data for the surgeon's head, while the right graph shows data for the neck. In the left photo, the surgeon's head received a higher dose rate compared to the neck due to leaning forward. In the right photo, while standing upright, the surgeon's neck—being closer to the X-ray scattering source—experienced a higher dose rate than the head. The graph indicates that the dose rate to the head remains similar in both forward-tilted and upright postures. For the neck, the data show that the shielding effect of the protective plate varies with posture and is influenced by changes in body positioning.

## RaySafe

*We empower our everyday heroes to focus only on protecting lives.*

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