



# Facility and Environmental Issues

- ▶ Infection Control
- ▶ Radiation Safety
- ▶ Operator and Staff Health – Ergonomics  
(*Back Pain, Neck Pain, Etc.*)
- ▶ Information Storage and Inventory
- ▶ Equipment Maintenance





# Infection Control Overview

- ▶ **All labs should have sterile/infection control protocols in place.**
- ▶ **Patient preparation**
  - electric clippers for removal of hair
  - antiseptic to the skin
  - Sterile drapes.
- ▶ **Operators: appropriate hand washing, hospital-based scrub attire, sterile gown and gloves.**
- ▶ **Masks, eye shield and protective caps (optional)**
- ▶ **Universal precautions should be followed**

Chambers CE, Eisenhauer MD, McNicol LB, et al. Infection control guidelines for the cardiac catheterization laboratory: society guidelines revisited. CCI 2006;67:78-86.





# Infection Control

## Ancillary Personnel

- ▶ Wear scrub suits, and gloves when within the sterile field. Cap, mask, eye protection are optional

## High Risk Patients (for staff exposure)

- ▶ Screening for blood borne pathogens is not routinely performed
- ▶ Wearing two pairs of gloves reduces inner glove punctures by 60% (not proven to prevent transmission of hepatitis or HIV).
- ▶ Cap, mask, eye protection are encouraged

## Skin Puncture or Laceration

- ▶ Report immediately
- ▶ Established protocol for the management of such event with CDC published guidelines available for guidance

## Vaccination

- ▶ Vaccination for Hepatitis B virus is encouraged





# Infection Control

- ▶ The laboratory should be thoroughly cleaned once a day and spot-cleaned with trash removal between each case
- ▶ The ventilation system should provide at least 20 air exchange/hr. and be cleaned monthly
- ▶ The doors to the catheterization laboratory should be kept closed, except for essential personnel leaving or entering
- ▶ Equipment near the entry site, such as foot switches, should be covered
- ▶ Multi-dose vials should be avoided, unless used with an approved device to protect against backflow
- ▶ Blood-contaminated drapes, gowns, gloves, and sponges should be discarded in containers labeled as health care waste. Needles and blades should be placed in puncture-proof containers.

Chambers CE et al. Infection control guidelines for the cath lab. CCI 2006;67:78-86





# Radiation Safety

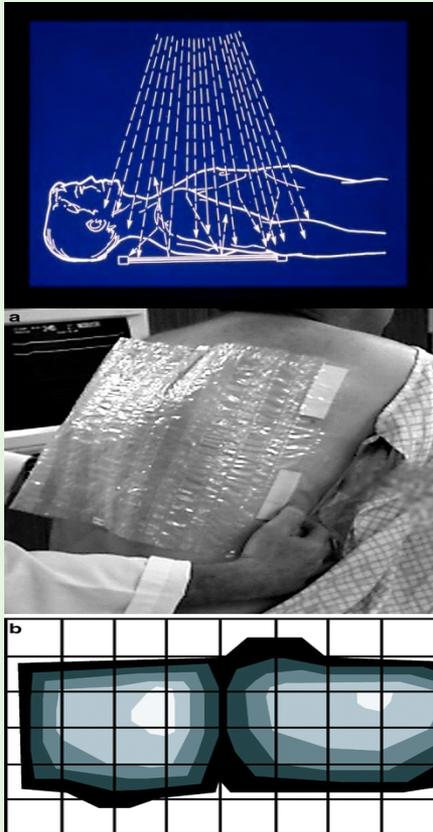
- ▶ Each facility must have a radiation safety program.
- ▶ Documentation of radiation safety training must be provided.
- ▶ Patient radiation dose must be monitored and recorded.
  - Includes fluoroscopic time, total air kerma at the interventional reference point (IRP) ( $Ka,r$ , Gy) and/or air kerma area product (PKA,  $Gycm^2$ ).
  - Peak skin dose (PSD, Gy) should be included.
- ▶ Surveillance for:
  - Total air kerma at the interventional reference point ( $Ka,r$ )  $\geq 5$  Gy or air kerma area product ( $Pka$ ) =  $500 Gycm^2$ , and/or fluoroscopy  $> 60$  minutes.

Chambers et al. Radiation Safety program for the Cardiac Catheterization Laboratory. CCI 2011:





# Assessment of Patient Dose



- ▶ **Fluoroscopic Time** not a useful descriptor of patient dose.
- ▶ **Total Air Kerma at the Interventional Reference Point ( $K_{a,r}$ , Gy):** x-ray energy delivered to air 15cm from iso-center
  - Required since 2006 for patient dose burden for deterministic skin effects.
- ▶ **Air Kerma Area Product (PKA, Gy cm<sup>2</sup>):** product of air kerma and x-ray field area. Estimates potential stochastic effects (radiation induced cancer)
- ▶ **Peak Skin Dose (PSD, Gy):** maximum dose received by any local area of patient skin.
  - No established method to measure PSD
  - Can be estimated if air kerma and x-ray geometry are known
  - Joint Commission Sentinel event, >15 Gy.





# Radiation Safety: Pre-Procedure

## ▶ Assessment of Risk

- Consider the obese patient
- Complex PCI/CTO
- Repeat procedures within 30-60 days
- Other radiation-related procedures

## ▶ Informed Consent

- should include the following issues:
  - Procedures use ionizing radiation
  - Physicians will deliver the dose necessary for the procedure
  - Although both short- and long-term risk is present with radiation exposure, this rarely results in significant short or long term injury
  - In complex cases, local tissue damage to the skin or even underlying layers may occur that may require additional follow up and treatment.





# Post Procedure Issues

- ▶ Document radiation dose with Fluoroscopic Time, and interventional reference point (IRP) Cumulative Air Kerma , and/or Cumulative Kerma Area Product (CKAP, Gy $\cdot$ cm<sup>2</sup>) in procedure report.
  - Especially if IRP Cumulative Air Kerma (CAKIRP) doses  $\geq$  5 Gy.
- ▶ Follow up is required by thirty days for IRP Cumulative Air Kerma (CAKIRP) of 5-10 Gy. Phone calls with an office visit as needed.
- ▶ For IRP Cumulative Air Kerma (CAKIRP) >10 Gy, health physics should perform a detailed analysis.
  - An office visit at < 4 weeks is recommended for examination of these patients.
  - Hospital risk management should be contacted within 24 hrs if a calculated peak skin dose > 15 Gy
- ▶ **Adverse Tissue Effects is best assessed by history and physical exam.**
  - Biopsy – only for uncertain diagnosis
  - Wound from the biopsy may result in a secondary injury potentially more severe than the radiation injury.





# Cath Lab Equipment

- ▶ Imaging equipment and archival storage.
- ▶ Multichannel physiologic monitoring (minimum of 2 pressure and 3 ECG channels) with real-time and archived physiologic, hemodynamic and rhythm monitoring.
- ▶ Inventory of disposable supplies.
- ▶ Facilities performing PCIs must have a adequate inventory for the scope of services provided.
- ▶ Emergency management equipment.
- ▶ Documenting of preventive maintenance and testing of laboratory equipment.
  - For radiographic systems this includes but is not limited to
    - a) image quality
    - b) dynamic range
    - c) modulation transfer function
    - d) fluoroscopic spatial
    - e) resolution
    - f) fluoroscopic field of view size accuracy
    - g) record and fluoro mode automatic exposure control and
    - h) maximum table-top exposure rate
- ▶ Documentation of the safe operation of infrequently-used equipment.





# Information Storage and Inventory

- ▶ Should link reporting system with the hospital information system.
- ▶ Linking inventory and billing creates a seamless interface to provide an accessible report , enhanced inventory management and can verify billing .
- ▶ Compliance with the 1996 Health Insurance Portability and Accountability Act (HIPAA) is required.
- ▶ Disaster recovery is essential to any archival storage system.

