Medical Response Planning for Nuclear/Radiological Emergencies:
Roles of the Medical Physicist

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Outline

• Nuclear/Radiological Emergencies
• Medical and Public Health Response
• Role of Medical Physicists
  - Workplace
  - Community
• Resources

Potential Nuc/Rad Events

• Transportation
• Power Plant
• Weapons
• Laboratory
• Industrial
• Medical
• Space
• Terrorism

Terrorism Scenarios

• IND – Improvised Nuclear Device
• RDD – Radiological Dispersal Device
  – may or may not involve explosion
• RED – Radiological Exposure Device
  A device whose purpose is to expose people to radiation, rather than to disperse radioactive material. “silent source”

Learning from Past Experiences

Nuclear vs. Radiological Events

• A nuclear event involves nuclear detonation

• A radiological event does not involve nuclear detonation
  – may be accompanied by an explosion and release of radioactivity
Example: Goiânia, Brazil
September 1987

Goiânia Radiological Accident

• Junkyard worker opened canisters revealing blue powder

137Cs

1375 Curies

obsolete radiotherapy machine

abandoned cancer clinic

Goiânia Public Health Impacts

• 249 exposed; 54 hospitalized
• Eight with ARS
• Four people died
• 3,500 m³ of waste

Goiânia Public Health Impacts

• 112,000 people monitored (>10% of total population)
  – Over a 2-month period

• Psychosocial Impacts

National Response Plan

• ESF #8 – Public Health and Medical Services

• Nuclear/Radiological Incident Annex

Emergency Scenarios

• The Homeland Security Council National Planning Scenarios (April 2005)
  – 15 scenarios

• “FOR OFFICIAL USE ONLY”

• Available from the Washington Post website!
Scenario 1: Nuclear Detonation – 10-kiloton Improvised Nuclear Device

- Casualties
  - Hundreds of thousands

- Evacuations/Displaced Persons
  - 100,000 in affected area seek shelter in safe areas (decontamination needed)
  - 250,000 instructed to shelter-in-place as plume moves across region(s)
  - 1 million+ self-evacuate from major urban areas

Scenario 11: Radiological Attack – Radiological Dispersal Devices

- Casualties
  - 180 fatalities; 270 injuries; 20,000 detectible contaminations (at each site)

- Evacuations/Displaced Persons
  - 10,000 evacuated to shelters in safe areas (decontamination needed)
  - 25,000 in each city are given shelter-in-place instructions
  - Hundreds of thousands self-evacuate from major urban areas in anticipation of future attacks

Public Health Issues After Any Disaster

- Rapid Assessment of Community Health/Medical Needs
- Delivery of Health and Medical Care
- Pharmaceutical Supply
- Potable Water, Safe Food, and Sanitation and Hygiene
- Injury and Illness Surveillance
- Vector Control
- Solid Waste
- Hazardous Materials
- Registry
- Mental Health
- Sheltering and Housing
- Mass Congregation
- Handling of the Deceased (humans and animals)
- Staffing
- Rumor Control
- Public Service Announcements/Media

In a radiation emergency:

Medical and public health practitioners need to work closely with radiation experts.

New Orleans 2005

Communities Affected Post Katrina

www.epodunk.com/top-10/diaspora/index.html
MEDICAL MANAGEMENT
PRINCIPLES

- Addressing contamination issues should not delay treatment of life-threatening injuries.
- It is highly unlikely that the levels of radioactivity associated with a contaminated patient would pose a significant health risk to care providers.

MEDICAL MANAGEMENT
PRINCIPLES (cont.)

- In certain rare instances, the presence of imbedded radioactive fragments or large amounts of external contamination may require expedited decontamination.
- Include in-house radiation professionals on the response team

STAFF PROTECTION

- Use standard precautions.
- N95 masks are recommended.
- Survey hands and clothing at frequent intervals with a radiation meter.
- Due to fetal sensitivity to radiation, assign pregnant staff to other duties.

Throughout the incident...

communication will be a key component of everything that is done. Health officials will need to be able to communicate with...
- the public
- policy makers
- the media

Hospital Preparedness

- Planning
  - Working with community partners
  - Coordinating with the state radiation control authority
  - Communication plan
- Training, exercises
  - essential to competence and confidence
- Using in-house resources
  - Radiation safety/health physics
  - Medical physics
  - Radiation oncology
  - Nuclear medicine
  - Research
Hospital Radiation Staff Have Key Roles

- Planning
- Training
- Responding
  - Receipt/treatment of patients
  - Protection of care providers
  - Radiation screening
  - Communication
  - Etc.

Hospital Incident Command System

- Internal Scenarios
- External Scenarios
  - Matching National Planning Scenarios
  - Includes nuclear detonation and RDD

Potential candidates for HICS Command Positions

- Safety Officer
  - Medical/Technical Specialist(s)
    - Radiation Safety Officer
    - Nuclear Medicine
    - Health Physics

Preparedness

- Need familiarity with
  - HICS
  - Relevant State/Federal guidance documents
  - Relevant training materials for clinicians

- Provide technical consultation
  - H&S of hospital staff and operations
  - Situational assessment
  - Communication with command staff; dispel rumors
  - Interpretation of technical guidance
    - Screening criteria
    - Decorporation agents
    - Serving as technical liaison
    - “Translator”

Example: Exposure vs Contamination

- Appreciating the difference important in patient care.
  - www.bt.cdc.gov/radiation/contamination.asp
Example:
Concerns with Intake of Radioactivity

• What are potential health consequences of ingesting:
  – 12 Bq (720 dpm)?
  – 5500 Bq (330,000 dpm)?

Radiation Medical Countermeasures Currently in CDC’s Strategic National Stockpile

• Potassium Iodide (KI)
• Prussian Blue
• Ca-DTPA, Zn-DTPA
• Neupogen®

REMM
Radiation Event Medical Management
http://www.remm.nlm.gov/

• HHS launched new toolkit for medical responses to radiation emergencies
• Downloadable

• www.acr.org

http://www.bt.cdc.gov/radiation/clinicians.asp

• www.bt.cdc.gov/radiation/clinicians.asp

• www.acr.org

• www.acr.org
• Report No. 111: Developing Radiation Emergency Plans for Academic, Medical or Industrial Facilities

• Report No. 138: Management of Terrorist Events Involving Radioactive Material

• Int J Radiat Oncol Biol Phys. 2006 May 1;65(1):16-24
• Connecticut hospitals, State Dept. Env. Prot. and Office of Emergency Preparedness, with assistance of ASTRO

CDC Tool Kits
www.bt.cdc.gov/radiation/

• For Emergency Services Clinicians
• For Public Health Professionals

Detection and Instrumentation

Radiation Instruments in Hospitals

• Portal monitors
• Area Monitors

Dosimeters, Survey Meters

• Personal Dosimeters
  – Needed for ED staff
• Portable radiation survey equipment for monitoring contamination
  – GM Pancake probe
  – Doctors should NOT have to carry this around!!
Radiation Instruments in Hospitals

- To screen patients for internal contamination
  - Thyroid Scanners
    - Feasible and practical
  - Gamma Cameras
    - Not for large numbers

An Evaluation of Hospital Radiation Detectors for Use in Screening Potentially Contaminated Individuals

www.bt.cdc.gov/radiation

What Can Hospital Medical Physicists Do?

- Make yourself known as an asset
- Understand your hospital emergency response plan and organization
- Contribute to training programs
- Contribute to emergency planning
- Participate in exercises
- Anticipate and be able to provide needed technical assistance
- Be prepared to assist in developing communication material

Medical Reserve Corps

- Volunteer opportunity for health and medical physicists to contribute to their local communities

www.medicalreservecorps.gov

You Are Needed!!

- Volunteer opportunity for health and medical physicists to contribute to their local communities

Finding Your Local MRC

- Opportunity to serve your community during times of need
- Free educational and training opportunities
- Gain experience from exercise participation
- Personal recognition
- Be among the first group who receives vaccinations or antibiotics during a bioterrorism event or disease outbreak (This includes your immediate family as well)

www.medicalreservecorps.gov

Personal Benefits
For Our Profession

- Introducing local public health and emergency response communities to radiation safety
  - Educate, increase "radiation literacy"
  - A greater appreciation for our profession
- We can gain valuable real-world experience working/collaborating with our public health partners.

Conclusions

- The medical and public health community will be heavily involved in any nuclear/radiological incident.
- Medical health physicists can play key role.
- Medical health physicists should engage before the incident occurs to be most effective when it occurs.

THANK YOU!

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