RISK & CRISIS COMMUNICATIONS STRATEGIES AND PRACTICE (RAD/NUC EMERGENCIES)

Learn from the PAST | Prepare for the Future

MARK BASNIGHT
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Welcome!
We are glad you are here!
Course/Venue Logistics
In case of an emergency
Schedule
Breaks
Restrooms
Mobile devices on silent
Workshop Agenda

Unit I.  What’s Radiation and How Do We Talk About It?

Unit II. Inherent Challenges Rad/Nuc in the Public Consciousness

Unit III. Identifying & Addressing Target Audiences
Workshop Agenda

Unit IV. Developing Key Messages
Unit V. Legal Matters for Social Media
Unit VI. Managing Information
Unit VII. Communication Strategies
But First...

WHO ARE YOU?

TAKE THE QUIZ

NAME?

POSITION/TITLE?

ORGANIZATION/AGENCY?

TAKE AWAY?
So, What’s Radiation and How Do We Talk About It?

Steve Sugarman, MS, CHP
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Summit Exercises and Training
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Steve Sugarman, MS, CHP

- Vice President and Corporate HP – Summit Exercises and Training
- Certified Health Physicist (American Board of Health Physics)
- 30+ years of health physics experience
  - 12 years in industrial setting
  - 19 years in emergency response support setting
- MS – University of Tennessee – Safety Education and Service
- Primary Interest: Integration of health physics into emergency response
What’s Coming Up?

• A little bit about what people know
• A little bit about radiation basics
• What can radiation do?
• Why’s all this radiation stuff important?
• How might you talk about it?

Some things you may not know. Some things you might already know, but you may find a new way to talk about it. Feel free to interject where you feel necessary...ask questions...make this useful for you. Communication is key!
Who’s Your Audience, and When Are You Talking to Them

- The public
- Workers
- Responders
  - Fire
  - EMS
  - Police
  - Medical
- Public health
- Officials/decision makers
- The media
The Basics

It's the basics. You can't be Picasso unless you know how to draw a real face; then you can turn it upside down.

- Diane English
What Do Most People Know about Radiation?

Hint: It’ll fit in here.
Radiation

According to the Health Physics Journal (HPJ-60) radiation is the emission and propagation of energy through space or through a medium in the form of waves.
What is Non-ionizing Radiation?

- Some forms of energy meet the definition of radiation but really aren’t radioactive sources
- Examples include radio waves, light, UV radiation and microwaves
Simply Put: What is Ionization?

- Ionization is the creation of a charged particle.
- Ionization results in the formation of an ion.
- Ionizing radiation has enough energy to strip electrons from atoms which can create changes within the cell.
- Radioactive materials emit ionizing radiation primarily in the form of alpha particles, beta particles, x-rays, gamma rays, or neutrons.

Never trust an atom…they make up everything.
What are Radioactive Materials?

• Materials that emit ionizing radiation
• Chemically identical to their non-radioactive counterparts
  • The difference is that as the normal metabolic processes occur, radiation is being emitted and irradiating those tissues.
• Behave in the body the same as their non-radioactive counterparts (for example, radioactive iodine behaves the same as stable iodine)

Henri Becquerel
(Discovered spontaneous radioactivity in 1896)

Public “Education” about Radiation
Risk Perception

Real risk does not equate to perceived risk. Neither of which equates to acceptable risk.
Radioactive Sources are Everywhere
Identification of Radioactive Sources and Devices

- Published by the International Atomic Energy Agency (IAEA)
- Summarizes the uses and theories of operation of many commonly encountered radiological devices

IAEA Publications: Nuclear Security Series No. 5: Identification of Radioactive Sources and Devices; ISBN 92-0-111406-0; ISSN 1816-9317

Available at:
DU penetrator of a 30 mm anti-tank round: approximately 280 grams DU (about 113 μCi or 4.2 MBq)

Ir-192 HDR Brachytherapy Source: 5-10 Ci (185-370 GBq)

Ir-192 Industrial Radiography Source: 100+ Ci (3.7+ TBq)
Irradiation

• In the case of an irradiated patient, there is no radioactive material transferred.

• An irradiated person is NOT radioactive and cannot transfer radioactive material to another person or object.
**What is Radiation Dose?**

- Dose refers to the amount of energy deposited per unit mass of absorber.
- The conventional (USA) dose unit is the rad.
- The SI unit is the gray (Gy)
- 1 Gy = 100 rad
So, What Does This Really Mean?

Biological Effects are Determined by:

- Total dose (How much?)
- Dose rate (How fast?)
- Volume of tissue or anatomical body part irradiated (Where?)
- Type of radiation (How “efficient” is it?)
- Pre-existing conditions (Were you already sick/hurt?)
- Individual susceptibility factors (We all respond to things differently.)

*If we were talking about getting punched instead of radiation, would it make a real difference?*
How “Risky” Is a Certain Radiation? They’re Not All the Same

$W_R$ relates the amount of biological damage, and resulting risk, caused by any type of radiation to that caused by the same absorbed dose of x or gamma rays.

<table>
<thead>
<tr>
<th>Radiation Type and Energy Range</th>
<th>$W_R$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photons, electrons, and muons - all energies</td>
<td>1</td>
</tr>
<tr>
<td>Neutrons - energy &lt; 10 keV</td>
<td>5</td>
</tr>
<tr>
<td>Neutrons - energy 10 keV to 100 keV</td>
<td>10</td>
</tr>
<tr>
<td>Neutrons - energy &gt; 100 keV to 2 MeV</td>
<td>20</td>
</tr>
<tr>
<td>Neutrons - energy &gt; 2 MeV to 20 MeV</td>
<td>10</td>
</tr>
<tr>
<td>Neutrons - energy &gt; 20 MeV</td>
<td>5</td>
</tr>
<tr>
<td>Protons - other than recoil protons, energy &gt; 2 MeV</td>
<td>5</td>
</tr>
<tr>
<td>Alpha particles, fission fragments, heavy nuclei</td>
<td>20</td>
</tr>
</tbody>
</table>

Full table, including footnotes can be found in 10CFR835, Subpart C
Reduction of External Dose

• Minimize the time spent near the radiation source
• Maximize the distance away from the source \( (1/R^2) \)
• Make use of available shielding
• Minimize the quantity of radioactive materials handled
Distances Related to Specified Doses in 1 Hour

100 TBq (~2700 Ci) $^{137}\text{Cs}$

- 20 mSv (2 rem): 21.5 meters
- 50 mSv (5 rem): 13.6 meters
- 100 mSv (10 rem): 9.6 meters
- 250 mSv (25 rem): 6.1 meters
- 1 Sv (100 rem): 3.0 meters
- 50 Sv (5000 rem): 1.0 meters
- 10 Sv (1000 rem): 0.4 meters

Assumes point source (distances 3x the largest dimension)
Distances are rounded to nearest .1 meters
Gamma doses assume 1 Sievert (Sv) = 1 Gray (Gy)
1 Sv = 100 rem, 1 Gy = 100 rads
What is Contamination?

- Contamination is simply the deposition of radioactive material onto or into someone/something.
- Many people don’t understand the difference between irradiation and contamination:
  - Exposure does not necessarily imply contamination.
  - It may be up to you to explain the intricacies.
This Is Contamination

Now, how would you deal with it?
What Can Ionizing Radiation Cause?
(and it’s nothing immediate)

The definition of 'safe' is not strictly an engineering term; it's a societal term.
- Henry Petroski
Effective Dose Per Individual in the US Population:
~6.25 mSv or ~625 mrem (NCRP-160)

- Medical: 3 mSv (~48%)
- Ubiquitous Background: 3.11 mSv (~50%)
- Occupational/Industrial: 0.008 mSv (~0.1%)
- Consumer Products: 0.13 mSv (~2%)

Note: 1 mrem = .01 mSv, 1 mSv = 100 mrem
# Local Injury Thresholds

<table>
<thead>
<tr>
<th>Dose</th>
<th>Effect</th>
<th>Timing* (time post exposure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 rads, 3 Gy</td>
<td>Epilation</td>
<td>14-21 days</td>
</tr>
<tr>
<td>600 rads, 6 Gy</td>
<td>Erythema</td>
<td>Early, then 14-21 days later</td>
</tr>
<tr>
<td>1000-1500 rads, 10-15 Gy</td>
<td>Dry Desquamation</td>
<td>2-3 Weeks</td>
</tr>
<tr>
<td>1500-2500 rads, 15-25 Gy</td>
<td>Wet Desquamation</td>
<td>2-3 Weeks</td>
</tr>
<tr>
<td>&gt; 2500 (&gt; 25 Gy)</td>
<td>Deep Ulceration/Necrosis</td>
<td>Dependent upon dose</td>
</tr>
</tbody>
</table>

Information taken from The Medical Aspects of Radiation Incidents, 4th Edition (REAC/TS)
## ARS Thresholds

<table>
<thead>
<tr>
<th>Dose</th>
<th>Syndrome</th>
<th>Signs/Symptoms*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100 rads, 0-1 Gy</td>
<td>NA</td>
<td>Generally asymptomatic, potential slight drop in lymphocytes later (near 1 Gy)</td>
</tr>
<tr>
<td>&gt; 100 rads, &gt; 1 Gy</td>
<td>Hematopoietic</td>
<td>Anorexia, nausea, vomiting, initial granulocytosis and lymphocytopenia</td>
</tr>
<tr>
<td>&gt; 6-800 rads, &gt; 6-8 Gy</td>
<td>Gastrointestinal</td>
<td>Early severe nausea, vomiting, watery diarrhea, pancytopenia</td>
</tr>
<tr>
<td>&gt; 2000 rads, &gt; 20 Gy</td>
<td>Cardiovascular/ CNS</td>
<td>Nausea/vomiting within first hour, prostration, ataxia, confusion</td>
</tr>
</tbody>
</table>

*Information taken from The Medical Aspects of Radiation Incidents, 4th Edition (REAC/TS)
Lymphocyte Counts with Values Predicted by Andrew’s Model

From Andrews GA, Auxier, Jr., Lushbaugh, CC.

*The importance of dosimetry to the medical management of persons accidentally exposed to high levels of radiation.*

Time to Vomiting as It Relates to Dose

Work by Dr. Ron Goans
Future Risk

- US Cancer Society: It is expected that in the US, cancer is the cause of death in 23.1% of the population (2.31 million cancer deaths per 10,000,000 people).

- According to NCRP Report No. 115, the lifetime excess risk of fatal cancer is 4% per Sv (0.04% per rem) for a worker population and 5% per Sv (0.05% per rem) for the general population.

- If this same population received an excess total dose of 0.1 Sv (10 rem) over their life span, there would be an excess risk of 50,000 cancer deaths. Therefore, the total revised burden of fatal cancers in a population of ten million individuals from a 0.1 Sv (10 rem) exposure is increased from 2.31 million to 2.36 million.

(10,000,000 people) x (0.0005 deaths per person per rem) x (10 rem) = 50,000 excess cancer deaths

Information taken from The Medical Aspects of Radiation Incidents, 4th Edition REAC/TS)
How to Get There
...and Why...

The secret of getting ahead is getting started.
- Mark Twain
Importance of Integration: Get to Know Each Other

An understanding of the basic health physics concepts is important because it helps build the foundation for appropriate radiation emergency response and associated communications.

Okay, so if we say it this way here’s what’s going to happen...I think!!!
The Four Biggest Questions
(Or One Question Asked 4 Different Ways?)

• Is it a problem...yes or no?
  • If no, stop there!
• Is it a big problem?
  • Act accordingly and start martialing resources
• Is it a medium problem?
  • Just be careful not to make it a big problem
• Is it a small problem?
  • Probably not a problem, but an inconvenience
The Keys to Effective Initial Response

• Your communications plan is going to be VERY IMPORTANT!
• Don’t overcomplicate things that don’t need to be complicated
• Contaminated personnel can be handled with minimal risk to the responders
• A person who has only been irradiated poses no hazard to anyone else
• The decimal points will come later – maybe think in broader terms early on
There Are Many Things to Consider: How Are You Going to Communicate It?

- Impact on medical community
- Population monitoring/tracking
- Shelter-in-place vs relocation (from/to where?)
- Are personnel willing to respond to a radiological event?
- Environmental/food chain impact
- Proper training/education for responders
- Proper training/education for decision makers
Education/Training

- Education and training – there’s a difference
- Education: philosophies and concepts allowing people to make decisions based on situations faced
- Training: makes a person skilled at a particular job
- Decide who gets what
  - Boots on the ground (training?)
  - Decision makers (education?)
  - Medical vs fire vs law enforcement vs PIO
- Both must be done in an understandable manner
  - Try to provide real-life examples
Exercises

• Thought given to goals and desired outcomes
• Who gets invited to participate in what?
• Goal should be to challenge, not defeat participants
• Deficiencies identified vs lessons learned
Identify Areas for Improvement… and Improve

Train and Educate

Practice and Exercise
What’s the Guidance Say?

Science is a first-rate piece of furniture for a man's upper chamber, if he has common sense on the ground floor.

- Oliver Wendell Holmes Sr.
## Response Worker Guidelines
### Protective Action Guides and Planning Guidance for Radiological Incidents
*(EPA - January, 2017)*

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Activity</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 rem (50 mSv)</td>
<td>All occupational exposures</td>
<td>All reasonably achievable actions have been taken to minimize dose.</td>
</tr>
<tr>
<td>10 rem (100 mSv)a</td>
<td>Protecting valuable property necessary for public welfare (e.g., a power plant).</td>
<td>Exceeding 5 rem (50 mSv) unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.</td>
</tr>
<tr>
<td>25 rem (250 mSv)b</td>
<td>Lifesaving or protection of large populations</td>
<td>Exceeding 5 rem (50 mSv) unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.</td>
</tr>
<tr>
<td>&gt;25 rem (250 mSv)</td>
<td>Lifesaving or protection of large populations</td>
<td>All conditions above and only for people fully aware of the risks involved.</td>
</tr>
</tbody>
</table>

*a For potential doses >5 rem (50 mSv), medical monitoring programs should be considered.

*b In the case of a very large incident, such as an IND, incident commanders may need to consider raising the property and lifesaving response worker guidelines to prevent further loss of life and massive spread of destruction.*
Section 6.2 – Emergency Exposure Situations:
“...because actual emergency exposure situations are inherently unpredictable, the exact nature of necessary protection measures cannot be known in advance but must flexibly evolve to meet the circumstances.”

“...an overall protection strategy is necessary, generally including an assessment of the radiological situation and implementation of different protective measures.”
A Major Change in Philosophy?

- Law Enforcement – Stand-off distances
- EMS/Medical – Proper patient handling techniques
- Fire/HAZMAT – Use of protective clothing/respiratory protection depending upon the hazard

Don’t let the radiation distract you from the bullets, fires, biological pathogens, potential explosive devices, collapse hazards, gas leaks, exposed electrical wiring…well, you get the point!
The two words 'information' and 'communication' are often used interchangeably, but they signify quite different things. Information is giving out; communication is getting through.

- Sydney J. Harris
What Did You Just Say?

• Absolute risk: the ratio of the number of people who have a medical event divided by all of the people who could have the event because of their medical condition
• Relative risk: the ratio of the probability of an event occurring in an exposed group to the probability of the event occurring in a comparison, non-exposed group
• Probability of causation and associated error bars
• Energy deposition into soft tissue due to low energy photons
• Biokinetics and radiation dose along the metabolic path
• Seivert vs. gray (or rem vs. rad)...and what the heck’s a becquerel?
Speak in Understandable Terms

• Understandable to the typical person on the street, not a physicist
• Sometimes the smartest person in the room isn’t the right one to deliver the message
• Develop some good analogies
  • Controlling contamination is like controlling talcum powder
  • Light is a type of radiation and protection principles are similar
  • Use of universal precautions is a contamination control technique

The single biggest problem in communication is the illusion that it has taken place.
- George Bernard Shaw
Something to Think About

• Daddy’s quote: “It’s better to speak with people than talk at ‘em.”

• Which is better...
  • 90% correct, but communicate the point?
  • 100% correct, but lose the message?
  • The situation may dictate the level of detail needed

• How did you feel about radiation when you were young? How do your neighbors feel?
  • Is your audience really different?
What Can Happen?

The more you explain it, the more I don’t understand it.
- Mark Twain
WASHINGTON — The federal government will not give anti-radiation pills to millions of people who live 10 to 20 miles from a nuclear plant because there are more effective ways to protect people in case of an accident or terrorist attack, the White House said Monday.

(Name Deleted) holds a pack of potassium iodide tablets in 2002. (Name Deleted) bought anti-radiation pills for his family and employees in case of a radiation emergency. The president's top science adviser concluded Monday that there are more effective ways of protecting Americans during a nuclear crisis.
Anti-radiation Pills Are Urged for Children

Published: Tuesday, April 8, 2003

• Households, schools and child-care centers near nuclear power plants should keep potassium iodide pills on hand to protect children from thyroid cancer in the event of a release of radiation, the American Academy of Pediatrics has recommended.

• Children are especially vulnerable to the effects of radiation, in part because they are closer to the ground, where fallout settles and because their bodies absorb and metabolize substances differently, the pediatrics academy said.
Bill Nye the Science Guy discusses efforts to cool the fuel rods inside the nuclear reactors at the Fukushima plant.

2 min, 55 sec mark of video: The 50 people (plant workers – Fukushima 50) are probably going to suffer, if not immediate radiation sickness and death, certainly some extraordinary health problems in the near future.
Why Iodine Tablets Come Out When Radiation Threatens

You need a little bit of iodine so the thyroid gland in your neck can make hormones to regulate your metabolism. But your body can't tell the difference between the normal iodine found in salt or seafood and the radioactive variety from a wayward nuclear power station.

The supplemental iodine isn't a complete guarantee of protection. A lag in taking the pills after exposure can reduce the supplement's effectiveness, for instance. Also, the iodine pills only offer work against radioactive iodine — not other radioactive elements...
Let’s Wrap This Up

In the end, what counts is what you do.
- Leroy Hood
According to Merriam-Webster, common sense is a sound and prudent judgment based on a simple evaluation of the situation or facts. Granted, the evaluation of a radiological emergency may not be simple, but that doesn’t mean that common sense should be abandoned.

Common sense is the knack of seeing things as they are, and doing things as they ought to be done.

- Josh Billings
Good Help

- NCRP 128 – Radionuclide Exposure of the Embryo/Fetus
- NCRP 161 – Mgt. of Persons Contaminated with Radionuclides
- NCRP 174 – Preconception and Prenatal Exposure
- Rapid Internal and External Dose Estimation
- Radiation Emergency Medical Management
- The Medical Aspects of Radiation Incidents
Emergency Response and Communications

- NCRP 115 – Risk Estimates for Radiation Protection
- NCRP 138 – Mgt. of Terrorist Events Involving Rad Material
  - NCRP Commentary 19 – Key Elements of Preparing Emergency Responders for Nuke/Rad Terrorism
- NCRP 160 – Radiation Exposure to US Population
- NCRP 165 – Responding to a Rad/Nuke Terrorism Incident: A Guide for Decision Makers
- NCRP 166 – Monitoring and Decorp. after a Rad Event
- Communications with the Public in a Nuke or Rad Emergency