



Forty-Sixth Annual Meeting Program



Communication of Radiation Benefits and Risks in Decision Making



March 8–9, 2010



Hyatt Regency Bethesda
One Bethesda Metro Center
7400 Wisconsin Avenue
Bethesda, MD 20814



Introduction

Communication of Radiation Benefits and Risks in Decision Making

Forty-Sixth Annual Meeting of the National Council on Radiation Protection and Measurements

Effective communication about the benefits and risks of radiation has become an increasingly important aspect of making and implementing decisions on radiation health protection in government, medicine, industry, research laboratories, and academia. The primary goal of the 2010 NCRP Annual Meeting will be to examine key issues, current controversies, and new tools and findings related to radiation risk communication.

Topics to be featured at the meeting include:

- concepts and examples of effective risk communication today and in historical perspective;
- role of new tools and media as efficient vehicles for radiation risk communication;

- communication issues and challenges posed by potential acts of nuclear and radiological terrorism and radiation emergencies;
- communicating benefits and risks of medical applications of radiation for the diagnosis and treatment of disease; and
- mechanisms and examples of effective communications in decision making related to protection of human health and the environment.

Central to the theme of the meeting will be the engagement of all relevant stakeholders in the process of reaching decisions involving radiation protection, which is essential for achieving sustainability of the decisions.

Communication of Radiation Benefits and Risks in Decision Making

Monday, March 8, 2010

Opening Session

8:15 am **Welcome**
Thomas S. Tenforde
President
National Council on Radiation
Protection and Measurements

Seventh Annual Warren K. Sinclair Keynote Address

8:30 am **Effective Risk Communication Before, During and After a Radiological Emergency: Challenges, Guidelines, Strategies and Tools**
Vincent T. Covello
Center for Risk Communication

Basic Concepts and Examples of Effective Risk Communication

Paul A. Locke, *Session Chair*

9:30 am **Crafting Interactivity: Transforming Assumptions About Communication in Science and Policy**
Mark A. Aakhus
Rutgers University

9:50 am **Break**

10:15 am **Transparency, Openness and Accountability in Risk Assessment: Lessons from the National Academies Science and Decisions Report**
Thomas E. McKone
University of California, Berkeley

10:40 am **Panel on Getting the Message Out**
Paul A. Locke, *Moderator*

Panelists:

Lessons Learned from Communicating with Stakeholders Who Have Many and Varied Perspectives
Todd Martin

Communication 2.0: Increasing Information Reach and Impact Through New Media and Public Engagement
Jay M. Bernhardt
Centers for Disease Control and Prevention

Importance of Science in Accurate News Reporting: A Journalist's Perspective
Terry Moran
ABC News

12:00 pm **Questions and Answers**

12:30 pm **Lunch** [box lunches will be available for \$15 (limited supply)]

Social Networking: How It Can be Used to Improve Public Health Communication
Janice Nall
Centers for Disease Control and Prevention

Communication, Terrorism and Homeland Security

Steven M. Becker, *Session Co-Chair*
Charles W. Miller, *Session Co-Chair*

2:00 pm **Panel on New Research, Recent Experience, and Emerging Challenges**
Steven M. Becker, *Moderator*

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Panelists:

London Polonium Incident: Lessons for Risk Communication

G. James Rubin
Kings College London

American Attitudes About Terrorism and Other Threats: What Can Be Learned from Rapid Emergency Polls of the Public

Gillian K. SteelFisher
Harvard School of Public Health

Risk Communication with Vulnerable Populations: Best Practices

Deborah C. Glik
University of California Los Angeles School of Public Health

Risk Communication and Radiological/Nuclear Terrorism: A Strategic View

Steven M. Becker
University of Alabama at Birmingham School of Public Health

3:05 pm **Questions and Answers**

3:20 pm **Break**

3:40 pm **Panel on New Approaches, Projects and Initiatives**

Charles W. Miller, *Moderator*

Panelists:

Federal Interagency Communication Strategies for Addressing Radiation Emergencies and Other Public Health Crises

Charles W. Miller
M. Carol McCulrey
Centers for Disease Control and Prevention

Federal Planning for Nuclear and Radiological Terrorism Community Preparedness

Tammy P. Taylor
Office of Science and Technology Policy

State Perspectives on Effective Communication in Acts of Terrorism

Adela Salame-Alfie
Conference of Radiation Control Program Directors

Informing and Engaging the Public in Preparedness Efforts: The Israeli Experience

Bruria Adini
Israeli Ministry of Health

4:35 pm **Questions and Answers**

4:45 pm **Break**

Thirty-Fourth Lauriston S. Taylor Lecture on Radiation Protection and Measurements

5:00 pm **Introduction of the Lecturer**

F. Owen Hoffman
Senes Oak Ridge, Inc.

Radiation Protection and Public Policy in an Uncertain World

Charles E. Land
National Cancer Institute

6:00 pm **Reception in Honor of the Lecturer**

Communication of Radiation Benefits and Risks in Decision Making

Tuesday, March 9

8:15 am **NCRP Annual Business Meeting**

9:15 am **Break**

Communicating Benefits and Risks of Medical Radiation

Julie K. Timins, *Session Chair*

9:35 am **Changes in Medical Communication: Historical Perspective**

Julie K. Timins
Diagnostic Radiology

9:50 am **Toward a Holistic Approach in the Presentation of Benefits and Risks of Medical Radiations**

Louis K. Wagner
University of Texas Houston Medical School

10:05 am **Communicating the Benefits and Risks of Radiation Therapy: Maintaining Context, Perspective and Reassurance**

Lawrence B. Marks
University of North Carolina at Chapel Hill

10:20 am **Just the Facts: Mammography Saves Lives with Little if Any Radiation Risk to the Mature Breast**

Daniel B. Kopans
Harvard Medical School

10:35 am **Legal Aspects of Patient Communication**

Leonard Berlin
Rush North Shore Medical Center

10:50 am **Questions and Answers**

11:05 am **Break**

Communication on Children's Imaging and on Computed Tomography

Fred A. Mettler, Jr., *Session Chair*

11:20 am **Introduction: Computed Tomography Radiation and Population Dose**

Fred A. Mettler, Jr.
University of New Mexico

11:25 am **Image Gently® Campaign: The Use of Social Marketing to Promote Radiation Protection for Children**

Marilyn J. Goske
Cincinnati Children's Hospital Medical Center

11:35 am **Image Gently® International: Communication Conundrums**

Kimberly E. Applegate
Emory University School of Medicine

11:45 am **Communicating About Computed Tomography: Challenges and Uncertainties**

Rebecca Smith-Bindman
University of California, San Francisco National Cancer Institute

12:00 pm **Radiation Safety in the Era of Helical Computed Tomography: Methods to Decrease Patient Exposure in the Community Hospital Setting**

Steven Birnbaum
Associated Radiologists

12:15 pm **Questions and Answers**

12:30 pm **Lunch**

Program Summary

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Jill A. Lipoti, *Session Chair*

- 1:40 pm **Beyond Dose Assessment: Using Risk with Full Disclosure of Uncertainty in Public and Scientific Communication**
F. Owen Hoffman
David C. Kocher
Senes Oak Ridge, Inc.
- 2:00 pm **Using the International Radiation Protection Association Guiding Principles: Putting Theory into Practice for Sustainable Implementation**
C. Rick Jones
- 2:20 pm **Community Environmental Monitoring Program: A Case Study of Public Education and Involvement in Radiological Monitoring**
William T. Hartwell
David S. Shafer
Desert Research Institute
- 2:40 pm **Psychosocial and Health Impacts of Uranium Mining and Milling on Navajo Lands**
Susan E. Dawson
Utah State University
- 3:00 pm **Break**
- 3:20 pm **Stakeholder Engagement Process in the ETHOS Project in Belarus**
Thierry Schneider
Nuclear Evaluation Protection Centre

- 3:40 pm **Panel Discussion**
Don M. Curry
Susan E. Dawson
William T. Hartwell
F. Owen Hoffman
C. Rick Jones
Thierry Schneider

- 4:20 pm **Future Directions of ICRP Committee 4: Application of ICRP Recommendations—From Stakeholder Involvement to Self-Help Protective Actions**
Jacques Lochard
Nuclear Evaluation Protection Centre

- 4:40 pm **Communicating Radiation Benefits and Risks: Some Lessons Learned**
Paul A. Locke
Johns Hopkins Bloomberg School of Public Health

- 4:50 pm **Closing Remarks**
Thomas S. Tenforde
President, NCRP

- 5:00 pm **Adjourn**

Communication of Radiation Benefits and Risks in Decision Making

Monday, March 8, 2010

Opening Session

8:15 am

Welcome

Thomas S. Tenforde

President, National Council on Radiation Protection and Measurements

8:30 am

Seventh Annual Warren K. Sinclair Keynote Address

Effective Risk Communication Before, During and After a Radiological Emergency: Challenges, Guidelines, Strategies and Tools

Vincent T. Covello

Center for Risk Communication

The purpose of this presentation is to describe the elements of effective risk communication before, during and after a radiological emergency.

Effective risk communication is central to informed decision making about radiological risks. It establishes public confidence in the ability of individuals and organizations to deal with a radiological emergency.

Numerous studies have highlighted the importance of risk communication in enabling individuals and organizations to make informed choices. Effective risk communication provides people with timely, accurate, clear, objective, consistent and complete risk information. It is the starting point for creating an informed public that is:

- involved, interested, reasonable, thoughtful, solution-oriented, cooperative and collaborative;
- appropriately concerned about the risk; and

- more likely to engage in appropriate behaviors.

Effective risk communication is based on four models that describe how people process risk information and make risk decisions:

- risk perception model;
- mental noise model;
- negative dominance model; and
- trust determination model.

Each of these models and corresponding templates will be briefly described in this presentation.

Together, these models provide the intellectual and theoretical foundation for understanding the major challenges to effective risk communication before, during and after a radiological emergency. These challenges will be briefly described.

This presentation will conclude with a discussion of guidelines, strategies, and practical tools for communicating effectively about radiological risks.



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Basic Concepts and Examples of Effective Risk Communication

Paul A. Locke, *Session Chair*

9:30 am

Crafting Interactivity: Transforming Assumptions About Communication in Science and Policy

Mark A. Aakhus
Rutgers University

Science and policy communication is often understood as the transmission of information by scientific experts. Yet, contemporary demands for transparency and new approaches to governance call for something more as policy professionals and scientific experts find themselves in situations where they are responsible for involving and integrating the many, often conflicting, perspectives and goals of stakeholders. The information transmission orientation satisfies only some of the communicative demands of these situations that require support for managing disagreement and fostering coordination and collaboration. The aim of this presentation is to introduce

principles that can be used to craft interactivity between experts and nonexperts. Scalable communication designs will be presented from research on communication in policy processes and from work in the Global Sensemaking and Pragmatic Web communities that are applicable to technologically-supported deliberation. This presentation will suggest how expertise in scalable communication design can be developed so that policy professionals can embrace the demands of involvement without abandoning the need for competence in science and policy communication.

9:50 am

Break

10:15 am

Transparency, Openness and Accountability in Risk Assessment: Lessons from the National Academies *Science and Decisions* Report

Thomas E. McKone
University of California, Berkeley

The process of risk assessment has been used to help understand and address a wide variety of hazards and has been instrumental to the U.S. Environmental Protection Agency, the U.S. Nuclear Regulatory Commission, other federal and state agencies, industry, the academic community, and others in evaluating public health, safety, and environmental concerns. In December 2008, on the 25th anniversary of the its ground-breaking 1983 *Red Book*, the National Research Council issued its latest advice on risk

assessment titled *Science and Decisions, Advancing Risk Assessment*. This report takes on the difficult task of defining new directions for risk assessment and risk management. This presentation will provide an overview of this report with a focus on how it fosters transparency, openness and accountability in risk assessment.

The presentation will begin with an overview of the history, practice, and current state of risk assessment. Consideration will then be given to the challenges facing risk assessment over the next decade as a

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tool for policy and public discourse. As noted in *Science and Decisions*, “virtually every aspect of life involves risk. How we deal with risk depends largely on how well we understand it.” In order to better confront current and future challenges, *Science and Decisions* extends the approach of the *Red Book*, finding that risk assessment should be viewed as a method for evaluating the relative merits of various options for managing risk rather than as an end in itself. This requires considering a broader range of factors in risk assessment, including both chemical and non-chemical stressors, vulnerability of the exposed population, and the overall impact of actions on communities. The concluding chapters of *Science and Decisions* provide a plan for improving the utility of risk assessments expanding the role of risk assessment in decision making.

Among the lessons of *Science and Decisions* we discover that the key steps needed to foster transparency, openness and accountability in risk assessment include:

- define the problem—risk assessment works best when it confronts a well defined problem;
- make clear who is at risk—within human populations, there are significant variations in exposures to harmful agents and in vulnerability to these agents;
- identify the decision makers and ensure that their questions are addressed;
- evaluate whether a risk assessment will offer any new insight for a problem—will it be solutions-based or an effort at procrastination; and
- know how to put the result in context.

10:40 am

Panel on Getting the Message Out

Paul A. Locke, *Moderator*

Panelists:

Lessons Learned from Communicating with Stakeholders Who Have Many and Varied Perspectives

Todd Martin

Stakeholder involvement is rarely seen as an integral element of project decision making—whether the project is the siting, design and construction of a facility or the setting of a regulatory standard. Yet organized stakeholder opposition threatens countless projects. Acknowledging the role and influence of stakeholders and effectively involving stakeholders in project decision making is critical to success.

This presentation will describe the basic principles and approaches to stakeholder

involvement as well as proven methodologies for incorporating stakeholder involvement into the fabric of decision making. This presentation will include: identifying stakeholders, developing involvement processes, and using language understandable to stakeholders.

Overall, this presentation is aimed at giving decision makers the tools to effectively incorporate the critical elements of stakeholder involvement in project decision making.

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Communication 2.0: Increasing Information Reach and Impact Through New Media and Public Engagement

Jay M. Bernhardt

Centers for Disease Control and Prevention

American consumers today have access to more health and risk information than ever before. The proliferation and ubiquity of electronic communication channels have made it easy for most people to seek and find information on almost any health related topic, and the information they uncover often spans diverse and divergent perspectives. As a result, people have an increasingly difficult time judging the accuracy and credibility of information coming from “experts” and are turning instead to peers and “friends” through online social networks to inform their health-related decision making. The Centers for Disease Control and Prevention (CDC) has been studying consumer information-seeking behavior for many

years and has developed new media health communication strategies to increase the reach and impact of its health information. CDC now engages its audiences using user-centered, web-based communication combined with social media channels, such as Facebook,[®] Twitter,[®] YouTube,[®] in order to provide health and risk information to consumers where, when and how they want and need it to inform healthy and safe decisions. This presentation will explain and explore CDC’s “2.0” communication strategy and will examine the reach and impact of health information provided to the public during the current 2009 H1N1 influenza pandemic.

Importance of Science in Accurate News Reporting: A Journalist’s Perspective

Terry Moran

ABC News

Science is constantly in the news. From political debates over energy policies and bioethical issues, to advances in health sciences that are of keen interest to an aging population, to pure research into the cosmos or the subatomic world, to the continuing questioning of the theory of evolution—science occupies a central place in today’s print, broadcast, cable and online media.

How well do the media cover scientific inquiries and advances? What are the challenges in communicating sometimes abstruse scientific concepts to a general news audience? How can the media help to improve the scientific literacy of our audiences, and empower citizens to participate more fully in public-policy decision making that deals with science?

As a journalist in print and television news for almost 25 y, I have covered many stories where science played an important role—DNA forensic evidence and analysis in courtrooms; product-liability lawsuits; global climate change; embryonic stem-cell research; the influenza pandemic; energy policy; and, inevitably, the evolution “debate.” There are four big challenges mainstream journalism faces in covering these and other scientific topics:

- *Understanding the concepts.* Journalists are generalists, and most of us do not have deep scientific backgrounds. So the first order of business is grasping what it is we are covering.
- *Communicating the uncertainties.* The news is a headline-oriented business. We want bottom lines, clear

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conclusions, unambiguous “take-aways” for our audiences. But science is more often than not incremental in its advances, provisional in its conclusions, and open to revision. This conflict between the needs of news and the nature of science often produces misinformation.

- *Exposing the cranks.* Many voices clamor to get into every news story. Reporters are deluged with press releases, emails, and phone calls from advocates and activists on most big news stories. Some of these voices are extremist or frankly uninformed. So good reporters become good gatekeepers; as they develop an understanding of a story, and speak to the most widely respected authorities on it, they also weed out from the public debate distractive or destructive players. In science reporting, with so many pseudo-scientific claims and

movements in our society, the gate-keeping function of good journalism is much more challenging.

- *Delegitimizing the “denialists.”* We live in an age where, it seems, people can deny anything, find “reasons” for it, and get on television to proclaim it. From conspiracy theories about the origin of HIV-AIDS, to the anti-vaccine hysteria, to the willful misreading of the fossil record when it comes to the theory of evolution—the “denialists” are everywhere. Good journalism is about telling the truth, and it should do that to stem the tide of “denialism.”

Each of these challenges for journalists in covering science-related stories requires diligence and ethical professionalism to meet. But good stories require something else, too: They require you—good scientists who can inform, guide and participate in these important news stories.

12:00 pm

Questions and Answers

12:30 pm

Lunch [box lunches will be available for \$15 (limited supply)]

Social Networking: How It Can be Used to Improve Public Health Communication

Janice Nall

Centers for Disease Control and Prevention

In today's communication landscape, we can creatively use more tools than ever to provide public health information when and where it is most needed and to engage citizens in personal behavioral changes. For example, social media can play an important role in achieving an effective crisis communications response to public health emergencies. These technologies can help us to:

- increase the dissemination and potential impact of rapid public communications in incidents involving life-

threatening illnesses, acts of terrorism, or other potentially-major threats to public health;

- use emerging channels of communication to reach diverse audiences with tailored and personalized health messages;
- facilitate interactive communication and community engagement; and
- empower people to make healthier and safer decisions in protecting public health.

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Some of the key learning objectives of this presentation include:

- specific challenges and opportunities governmental entities face in using social media;
- strategies for integrating social media into crisis communications efforts;
- methods for encouraging rapid spread of messages to potentially affected members of the public; and
- ideas on how to tap into the “wisdom of the crowds” to improve public health communications.

Communication, Terrorism and Homeland Security

Steven M. Becker, *Session Co-Chair*
Charles W. Miller, *Session Co-Chair*

2:00 pm

Panel on New Research, Recent Experience, and Emerging Challenges Steven M. Becker, *Moderator*

Panelists:

London Polonium Incident: Lessons for Risk Communication

G. James Rubin
Kings College London

Alexander Litvinenko, a Russian dissident and former KGB officer, died on November 23, 2006 after having been apparently poisoned in a central London hotel. The mysterious circumstances of his death sparked enormous press interest focusing on potential links with international espionage. The discovery that he had been poisoned with radioactive ^{210}Po added a new dimension to the case, as traces of radioactivity were subsequently discovered in numerous locations across the city. Given the possible risk to members of the public who might have been exposed to ^{210}Po in the run-up to and immediate aftermath of his poisoning, the U.K. Health Protection Agency (HPA) mounted a major public health initiative to identify those people who had been at an affected area and to offer them a test, while also attempting to reassure the majority of the population of London that any risk to their health was negligible.

Using two linked studies, we tested the effectiveness of the HPA's communications with both groups of people: the

general public and those who had been at an affected location. To assess the perceptions of the general public, HPA ran a cross-sectional telephone survey, randomly sampling 1,000 members of the London public. This survey collected data over a 3 d period immediately after HPA revised their risk assessment and began calling for more potentially-affected members of the public to make themselves known. Despite the spread of radioactive material across the city, public concern about the incident was muted—only 11.7 % of our sample felt that their own health might be at risk. Aside from demographic variables, the key factors associated with heightened perceptions of risk were believing:

- incident was related to terrorism rather than to espionage;
- targeted at the wider public, rather than at one person; and
- people who had not been in a contaminated area could be affected.

To assess the perceptions of members of the public who had been in a

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contaminated area, HPA conducted qualitative interviews with 86 participants who were randomly selected from a register compiled by HPA. While most participants responses were highly complimentary about the way HPA communicated with them, several specific opportunities for improvement were identified. In particular, participants were skeptical about what they felt were attempts to reassure, rather than inform, them.

The ^{210}Po incident demonstrated that the public do not always perceive radiation to be a “dread risk”. . . the “spy story” aspects of this incident seemed to diminish any perceived risk to health. As a result of lessons learned from the incident, future research is now being planned to assess public perceptions and their correlates in the next major chemical, biological, radiological or nuclear incident to occur in the United Kingdom.

American Attitudes About Terrorism and Other Threats: What Can Be Learned from Rapid Emergency Polls of the Public

Gillian K. SteelFisher
Harvard School of Public Health

Understanding the views and concerns of the public is a critical factor for those who plan effective public responses to possible radiological/nuclear terrorist attacks, as well as for those who would need to communicate with the public at the time of such a crisis. Rapid emergency public-opinion polling provides a key tool in garnering such information. Polling carried out during the 2001 anthrax attacks and, more recently, during the H1N1 pandemic, may provide useful insights about the public's response to crises in general, and suggest applications to radiological terrorism attacks specifically.

This presentation reviews key findings of a series of polls that were conducted over the course of the anthrax attacks and the H1N1 pandemic. Each poll is based on a randomly-selected, national sample of more than 1,000 people. These polls cover the public's initial response to an

emergency, changes in attitudes over time, behaviors including the adoption of practices to reduce exposure to anthrax or slow the spread of the H1N1 and vaccination uptake. They also highlight public views of local, state and federal government responses to these events. Together, the results provide a view of differential reactions to the threat across the population and over time and the role that perceived threat plays in willingness to adopt behaviors. Results also highlight the public's differential trust in information sources and suggest issues that are important—from their perspective—for public officials and others to address in crisis communications.

The presentation will also cover the use of rapid polling of the public in emergency situations and explain the strengths and limitations of this tool specifically in the context of radiological attacks.

Risk Communication with Vulnerable Populations: Best Practices

Deborah C. Glik
University of California Los Angeles School of Public Health

Being able to understand and meet the information needs of vulnerable populations is an essential component of risk

communication for homeland defense. This presentation will draw on recent research and practical experience in such

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areas as hazards education, health communication, and disaster preparedness and response to discuss what is known about crafting and disseminating messages for vulnerable populations.

Particular attention will be devoted to lessons learned from:

- LA PREP, a recently conducted disaster preparedness effectiveness study among low income Latinos in Los Angeles;
- Pre-Event Message Development Project, a national formative research study;
- Great California Shakeout, a state-wide preparedness exercise conducted in 2008 and 2009;
- Multijurisdictional Preparedness Exercise conducted in California in 2005; and

- Building effective public health community- and faith-based organization partnerships for disaster readiness.

Among the communication strategies to be considered are active listening and formative research, ongoing message development and pretesting, attention to language and literacy issues, use of ethnic or small media to communicate with hard-to-reach populations and interpersonal methods for message dissemination. Taking marketing and educational techniques and tailoring them to the needs and cultural perspectives of distinct social groups greatly enhances the possibility of successful communication for homeland defense. Highlighted will be case examples that have used participatory approaches, coalitions, formative research and pretesting, narrow casting, partnerships with community- and faith-based organizations, and ethnic, popular or new media formats.

Risk Communication and Radiological/Nuclear Terrorism: A Strategic View

Steven M. Becker

University of Alabama at Birmingham School of Public Health

As the United States and other nations have moved to address the threat of terrorism involving radioactive materials, improving radiological/nuclear risk communication, public information, and emergency messaging has come to be seen as a high-priority focus. The process of improving radiological/nuclear terrorism risk communication can be conceptualized as occurring in four overlapping phases. The first phase involved the recognition that communication and information issues are pivotal in the unfolding of a radiological/nuclear terrorism event and in determining its outcome. The publication of NCRP Report No. 138, *Management of Terrorist Events Involving Radioactive Material*, which emphasized communication's profound effect on public reaction and government response, was an

important milestone in this first phase. In the second phase, recognition of the centrality of communication and information issues stimulated and inspired a variety of new research initiatives aimed at providing an empirical basis for improved radiological/nuclear risk communication. The Pre-Event Message Development Project, which examined people's perceptions, information needs, and views of informational materials, is one example of such efforts; others include focus group and interview research on the information needs of vulnerable populations, focus group research on emergency-responder concerns and information needs, studies of current radiological/nuclear informational materials, and surveys of public perceptions. In the third stage of efforts to improve radiological/nuclear risk

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communication, local, state and federal agencies, professional societies, and others have worked to utilize insights generated by empirical research in order to develop better and more responsive informational materials, emergency messages, templates, web content, web portals, and training tools. This third phase has also seen efforts to use research findings to identify the information needs and preferences of new key audiences in the responder community. Like the second phase, the third phase is continuing to unfold today and will likely continue into the future. The fourth phase in improving risk communication for radiological/nuclear terrorism—what might be

considered a mature phase—is only now just beginning. In this phase, there is a developing recognition that for radiological/nuclear risk communication to be fully effective, it must go beyond making better messages aimed at particular audiences. In particular, this emerging phase seeks to anchor radiological/nuclear information, emergency messaging, and risk communication in a broader approach: one that more actively and directly engages, activates and partners with the public. In this presentation, each of the four stages is discussed, and future challenges in improving radiological/nuclear risk communication are examined.

3:05 pm

Questions and Answers

3:20 pm

Break

3:40 pm

Panel on New Approaches, Projects and Initiatives

Charles W. Miller, *Moderator*

Panelists:

Federal Interagency Communication Strategies for Addressing Radiation Emergencies and Other Public Health Crises

Charles W. Miller

M. Carol McCurley

Centers for Disease Control and Prevention

The threat of terrorism involving radioactive materials has grown significantly in recent years. A large-scale incident involving radiation would pose numerous preparedness and response challenges. It is increasingly clear that communication will be one of the most challenging, yet critical, elements of response. Providing clear, actionable, and credible information and messages will be key to reducing deaths, injuries and illnesses, and psychological impacts of the event.

Federal agencies have a variety of roles and responsibilities related to communicating with the public before, during and

after a radiological emergency. To better understand the various efforts currently under way, the Radiation Studies Branch of the Centers for Disease Control and Prevention convened a roundtable of representatives from federal agencies with responsibility for communicating with the public about radiation emergencies. The objectives of this meeting were to:

- provide a forum where participants could discuss with one another their respective roles and responsibilities in communicating to the public in the event of a radiation emergency,

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- identify existing radiological/nuclear emergency messages and materials for the general public,
- learn what communication planning activities are underway or planned across the various agencies, and
- discuss how the lines of communication can be broadened across agencies.

Roundtable participants shared valuable information about efforts underway to develop information and messages for a variety of audiences, and agreed that continued interagency coordination and dialogue about communication before, during and after an event are needed. The group suggested several strategies for future collaborative efforts, and indicated a desire to continue working together to develop and assess messages for radiological emergency preparedness and response. The group also recommended that more work be done to determine whether messages need to be packaged or tailored for specific special populations, and suggested that more research be conducted to answer questions about specific audience/cultural needs around communicating radiation risks. Extensive discussion centered on the advantages and disadvantages of having “pre-event” education efforts (*i.e.*, specific information campaigns to build a knowledge base about radiological emergency preparedness prior to such an event occurring). Some participants believed that it would

be better to focus on all-hazards pre-event education to build a “culture of preparedness” first. Other recommended strategies included exploring ways to counter public fatalism relative to radiation emergencies, and identifying priority outreach strategies—whether *via* direct-to-public communication or communication *via* partners and interlocutors.

The group also raised some overarching questions that should be discussed in future cross-agency collaborations, including:

- Should radiation pre-event education be a priority in light of limited resources? Would this be effective or would pre-event education about radiation only scare the public or be ignored entirely?
- What types of pre-event education are possible? The “it depends” factor associated with a radiation emergency makes it difficult to have messages created pre-event.
- How can we communicate radiation-related terms and concepts into terms that lay people can more easily understand?

Although a formal interagency workgroup has not been established, the participants of the communications roundtable have continued to interact and share progress and opportunities for moving this important effort forward.

Federal Planning for Nuclear and Radiological Terrorism Community Preparedness

Tammy P. Taylor
Office of Science and Technology Policy

In January of 2009 the Executive Office of the President (EOP) released interagency-developed *Planning Guidance for Response to a Nuclear Detonation – First Edition*, to provide emergency planners with nuclear detonation-specific response

recommendations to maximize the preservation of life in the event of an urban nuclear detonation. This guidance addresses the unique effects and impacts of a nuclear detonation such as scale of destruction, shelter and evacuation

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strategies, unparalleled medical demands, management of nuclear casualties, and radiation dose management concepts. The guidance is aimed at response activities in an environment with a severely compromised infrastructure for the first few days (*i.e.*, 24 to 72 h) when it is likely that many federal resources will still be enroute to the incident. The target audiences for the guidance are response planners and their leadership including elected officials and incident commanders.

The *Planning Guidance – First Edition* does not expressly address the topic of public communications due to the fact that the U.S. Department of Homeland Security (DHS) was actively conducting a program to develop communication plans for response to nuclear detonations. It does, however, emphasize the importance of public communications and how critical pre-event public communications are to the success of response to a nuclear detonation. In March of 2009, the Homeland Security Institute (HSI) delivered DHS Office of Health Affairs its final report entitled, *Nuclear Incident Communication Planning*. HSI's interagency-informed, proposed communication strategy was developed for nuclear detonation incidents with three distinct components of communication guidance:

- pre-event education;
- national leadership guidance; and
- responder communication guidance.

The results of this work and continuing planning efforts out of the EOP will result in the inclusion of guidance devoted to the topic of public communications in the *Planning Guidance for Response to a Nuclear Detonation – Second Edition* intended for release in summer 2010.

In the *Planning Guidance – Second Edition*, numerous efforts in the federal interagency on the topic of public information and/or communications for radiological and/or nuclear terrorism incident planning will be addressed. Recommendations emerging from efforts led by DHS and the Centers for Disease Control and Prevention will be included.

Key recommendations that will be addressed in the *Planning Guidance – Second Edition* include:

- specific information and actionable guidance for appropriate preparedness and protective actions relative to the public;
- physiological and psychological aspects of human behavior in public communications;
- public awareness training; and
- emergency responders and national leadership tactics for communicating protective actions to the public in the face of ambiguity and lack of scientific consensus.

In an effort to make substantial progress towards these recommendations, work within the interagency planning group has been initiated. The interagency work will be described in general themes as follows:

- literature review to develop recommendations regarding message expansion to schools, businesses, special-needs populations, and unaffected populations;
- gaps associated with public communications; and
- communications strategies and tactics to evaluate benefits and deficiencies.



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State Perspectives on Effective Communication in Acts of Terrorism

Adela Salame-Alfie

Conference of Radiation Control Program Directors

Effective communication during any emergency is based on the premise that the communities to which the message is directed are familiar with the directives given at the time of the emergency, and trust the entity providing the message. When communities have an understanding of the messages, and their rationale, they may be more likely to follow the directives given during the emergency. This may be particularly important in the area of radiological emergency response following an act of terrorism, where messages may appear to be contrary to recommended actions for other types of emergencies.

As we plan to respond to a radiological emergency, it is very important to have a library of “canned” pre- and post-event messages that can be used when time is of the essence. These messages need to be clear, consistent, and should be pre-tested well in advance (through focus groups or other means) to ensure that they are easily understood and to follow, and that new concepts are explained in layman’s terms. They should also include anticipated follow-up questions and actions that the public can take to reduce or minimize their exposure to radiation.

Advanced development of pre- and post-event messages will allow us to test the content of the message during nonemergency conditions. Having a well designed and consistent pre-event messaging campaign, that is aimed at educating the public on the basic concepts of radiation protection and the available protective

action recommendations, will help reduce the inherent fear of radiation, and will help the communities tasked with the development of a local radiological emergency response plan implement their plan.

To ensure familiarity and encourage compliance by members of the public, a good pre-event education campaign should take advantage of the availability of multimedia outlets and could start at schools and other public settings. Familiarity with the basic terms used in radiological emergency response such as the options for protective action recommendations will help ensure protection of the public, especially during critical times. The post-message templates should be readily available to government officials tasked with implementing the radiological emergency response plan, so they can be delivered soon after the event has taken place, even before details of the incident are available. These template messages should be written such that they can be easily modified or adapted depending on the event, and can be customized for the specific community (*i.e.*, location of appropriate shelters, evacuation routes, etc.) The use of such templates can help promote consistency and address many of the public’s key questions up front.

The continued involvement of members of the Conference of Radiation Control Program Directors in partnership with the federal agencies tasked with the development and delivery strategy of these messages is key to ensuring consistency and applicability across the country.

Communication of Radiation Benefits and Risks in Decision Making

Informing and Engaging the Public in Preparedness Efforts: The Israeli Experience

Bruria Adini

Israeli Ministry of Health

Informing and engaging the public in preparedness and response efforts and enhancing resilience of the population is an integral component of crisis management in Israel. Social fortitude impacts on decision making during emergencies and is integrated in the response plans.

Pursuant to the lessons learned from the many multi-casualty events that occurred during the years 2000 to 2006 and the two major conflicts that Israel was confronted with in 2006 and 2009, it was apparent that the population needs reinforcement of the community and personal levels of resilience. Following several studies, resilience centers were created in numerous communities that focus on treatment, consultation, development and counseling of the population in times of crisis. These community treatment centers are involved in activities of preparedness, prevention, intervention and development of civilian resilience in crises.

Training and educating the public prior to the onset of an emergency is considered in Israel as a crucial component of emergency preparedness. During 2009, a national exercise was conducted involving the total population of the country. As part of the drill, the public was requested to follow the directives of the government and the Home Front Command, and to enter shelters upon the sound of sirens.

School intervention programs are conducted annually, aimed at facilitating and preparing children to cope with trauma situations. These interventions are based on the assumption that intervention programs can be implemented by mediators that are trained for this task and are supervised by health professionals. Teachers were found

to be the most effective mediators with children.

During emergencies, national spokespersons are appointed in order to actively inform the public regarding the conflict and its implications. These officials convey information to the public several times a day, utilizing both the electronic and written media. Public information centers are operated by the Home Front Command, the Ministry of Health, and local municipalities. These centers are manned by senior personnel that can offer an immediate response to queries of the public. Moreover, the frequent questions that are raised are centrally accumulated and referred daily to the spokespersons, who then present the answers through the media in order to inform the general public.

In order to strengthen the resilience of the population, it is important to clearly define policies during the health crises and convey them as openly and transparently as possible. Nevertheless, it is also important to be aware of the limitations and needed boundaries for sharing information, not due to information security or intelligence constraints, but rather taking into account the resilience of the society. At times sharing with the public all known information regarding potential risks might cause more harm than benefit. Such was the case in the 2006 conflict regarding non-conventional risks.

Surveys of status of the population are conducted during conflicts continuously, in order to monitor the impact of the conflict on the public and the results are considered as part of the process of decision making. The findings of these surveys were taken into account during the last

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two conflicts, when decisions had to be made whether or not to completely evacuate a psychiatric hospital that was exposed to missile attacks and whether to transfer patients from their regular wards in an acute-care hospital to sheltered facilities.

In conclusion, risk communication is a strong tool for supplying information and

should be utilized wisely and continuously. An informed population and relationships that are built on trust and reliability promote resilience. It is the role of leaders to anticipate the populations' needs before they emerge, and to act upon them so as to prevent their occurrence or mitigate their consequences.

4:35 pm

Questions and Answers

4:45 pm

Break

Thirty-Fourth Lauriston S. Taylor Lecture on Radiation Protection and Measurements

5:00 pm

Introduction of the Lecturer

F. Owen Hoffman
Senes Oak Ridge, Inc.

Radiation Protection and Public Policy in an Uncertain World

Charles E. Land
National Cancer Institute

Ionizing radiation is a known, well-documented, and reasonably well-quantified human cancer risk factor. This fact is based on a remarkably consistent body of dose-response information from epidemiological studies of exposed populations, supported by experimental studies using animal and cellular models, and is largely ascribable to the relative ease, compared to other carcinogens, of estimating radiation dose to organs and local tissues. Statistical models for radiation-related cancer risk are increasingly used to inform radiation protection and the adjudication of compensation claims for cancers diagnosed following occupational and environmental exposures to ionizing radiation. The 2007 BEIR VII report, *Health Risks from Exposure to Low Levels of Ionizing*

Radiation, presented usable site-specific estimates in terms of excess relative and excess absolute risk with probabilistic uncertainty limits, for cancers of 11 organ sites modeled as parametric functions of radiation dose, gender, exposure age, and age at observation, for application to U.S. populations. The 2006 UNSCEAR report, *Effects of Ionizing Radiation*, reviewed the evidence for 24 organ sites and presented dose-response models for 13 as applied to different world populations, and the 2003 NIH report, *NCI-CDC Working Group to Revise the 1985 NIH Radioepidemiological Tables*, which was specifically directed at claims adjudication, presented estimates for 26 cancer types and subtypes affecting 22 organs.



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In an earlier presentation at the 2008 NCRP Annual Meeting (Health Phys. **97**; 2009), I argued that it is useful to view radiation protection as a political process that involves consent by stakeholders, a diverse group that includes people who might be expected to be risk-averse and concerned with plausible upper limits on risk, cost-averse, and concerned with lower limits on risk, or combining both points of view, and that quantification of uncertainties in risk is at least as important for this process as point estimates. The quantitative uncertainty analysis (QUA) approach to risk estimation has been explored in a number of NCRP reports, including Commentary No. 14, *A Guide for Uncertainty Analysis in Dose and Risk Assessments Related to Environmental Contamination* (1996); Report No. 126, *Uncertainties in Fatal Cancer Risk Estimates Used in Radiation Protection* (1997); and Report No. 153, *Information Needed to Make Radiation Protection Recommendations for Space Missions Beyond Low-Earth Orbit* (2006); as well as

in the 2003 NIH report, the 2007 BEIR VII report, and the 2006 UNSCEAR report.

Finally, it is possible that the QUA approach to radiation-related risk, although presently used in the United States to inform compensation adjudication for radiation-related cancer, and logically addressable in terms of negotiation among stakeholders, may not be the most important aspect of reaching agreement among stakeholders with different views. It is interesting in this respect to compare the occupational illness compensation scheme negotiated between British Nuclear Fuels and the relevant trade unions in the United Kingdom, and which now covers most major employers in the U.K. nuclear industry, with that legislated in the United States (the Energy Employees Occupational Illness Compensation Program Act of 2000) to compensate radiation-related cancer cases among former employees of the U.S. Department of Energy and its contractors.

6:00 pm

Reception in Honor of the Lecturer

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Tuesday, March 9

8:15 am **NCRP Annual Business Meeting**

9:15 am **Break**

Communicating Benefits and Risks of Medical Radiation

Julie K. Timins, *Session Chair*

9:35 am **Changes in Medical Communication: Historical Perspective**

Julie K. Timins
Diagnostic Radiology

Developing the Knowledge Base

Upon the discovery of x rays in 1895, there was an immediate effort to determine the potential benefits of this mysterious modality. Medical applications, such as the diagnosis of fractures, were rapidly developed. Three years later x rays were in use in military field hospitals. Within months of Roentgen's initial report, x-ray dermatitis was recognized, followed shortly by descriptions of radiation damage to hands and fingers of operators. Recognition of potential carcinogenesis came later. Marie Sklodowska-Curie, Nobel Laureate and pioneer in the science of radioactivity, died of aplastic anemia as a result of her radiation exposure. Her daughter, Irene Joliot-Curie, Nobelist and researcher on artificially created radioactivity, died of radiation-induced leukemia.

Radiation therapy with radioactive sources such as radium began in the early 1900s. Some of the tissue effects of radiation became quickly apparent. Other late effects, such as acceleration of coronary artery disease and development of secondary cancers, were not acknowledged until relatively recently. The need to balance benefits and risks in the utilization

of medical radiation has long been recognized.

Radiology as a Medical Specialty

Initially, radiology was incorporated into the practice of many nonspecialized physicians. As radiology developed into a separate specialty, the radiologist often practiced both diagnostic and therapeutic radiology and functioned as a consultant to the referring physician. Diagnostic radiology and radiation oncology have since diverged. Radiation oncologists have long functioned as primary care physicians during the treatment period. In diagnostic radiology, there has been a growing movement to expand the physician-patient relationship, promoting direct communication of results to the patient.

Paternalism versus Patient Autonomy in Medical Decision Making

The early 1900s was the era of paternalism in medicine. The doctor advised the patient what procedures and treatments were recommended, and the patient followed his advice. This attitude has given way to a model of open communication and patient decision making. Nontraditional sources of information are widely available, particularly internet sources of

Communication of Radiation Benefits and Risks in Decision Making

varying validity. Patients often demand specific diagnostic examinations and treatments.

Recent Approaches to Education on Radiation Benefits and Risks

Information on the benefits and risks of medical radiation has traditionally been targeted to physicians and medical physicists. However, recently there has been an emphasis on educating the public. An explosion of information is targeted directly to the patient consumer, particularly online. Examples of topics of interest

include the radiation risks of computed tomography and the benefits and risks of radiation therapy in treatment of cancer. Websites of particular value to professionals and consumers alike include: the Food and Drug Administration, the Centers for Disease Control and Prevention, the American Association of Physicists in Medicine, the Health Physics Society, the jointly sponsored American College of Radiology/Radiological Society of North America website *RadiologyInfo*, and the National Cancer Institute, to name a few.

9:50 am

Toward a Holistic Approach in the Presentation of Benefits and Risks of Medical Radiations

Louis K. Wagner

University of Texas Houston Medical School

Benefit and risk of medical radiological examinations are like poles of a magnet. Neither exists without the other. Unlike poles of a simple bar magnet, benefits of a procedure are often disproportionate to the risks. The art of communication is to relate these opposing aspects with clarity and a fair perspective.

Effective communication requires that the communicator consider the following:

- Is the audience an individual, a small group, or a large group?
- Who is the audience; what does the audience already know or think they know about the topic?
- What is the fair perspective that should be communicated? and
- If someone told me what I am about to say would I believe it, understand it, and feel that it was fairly presented with respect and courtesy?

Radiological medicine is bifurcated into two branches of professionals. The first is the medical profession that must deliver healthcare within the boundaries imposed by a patient's symptoms, the physician's experiences and skills, available

technologies, time constraints, and costs. The other branch is scientists who study risk and debate the strengths and weaknesses of epidemiological and laboratory data as well as our understanding of the long- and short-term effects associated with exposure to radiations. A natural bias exists in communications from these two branches. Literature has shown that physicians tend toward a perspective emphasizing benefits of a radiological study while underestimating risks imposed by the procedure. A physician's training in radiation risk is often confined to little or no didactic instruction about a topic that evolved from many man-centuries of research. Basic scientists who study risk are not trained in the medical benefits of procedures and do not see patients. Each group naturally perceives benefits-versus-risks in a manner biased by their background. This bias will be an integral part of communication unless a self-imposed effort is made by each party to reduce it.

An example of a built-in bias is the acronym: ALARA—meaning that radiation exposures be maintained as low as reasonably achievable. The acronym is apt

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for radiation protection of workers where exposures to radiation are incidental, not intentional. But in medical practice, radiation exposure to a patient is intentional with the primary goal of providing benefit. ALARA focuses on risk. Medical care requires that the benefit/risk of a procedure, as a quotient, be as high as reasonably achievable. In the milieu of medical management, benefits of radiation applied to patients must be given fair emphasis relative to all risks imposed by those

applications (including risks such as uses of contrast agents). Medicine should separate itself from radiation protection mantras and build its own benefit/risk perspective of communication.

This presentation will address methods aimed at advancing communications of benefit/risk in a holistic manner that hopefully will bring clarity and a fair understanding to our audience of patients.

10:05 am

Communicating the Benefits and Risks of Radiation Therapy: Maintaining Context, Perspective and Reassurance

Lawrence B. Marks

University of North Carolina at Chapel Hill

Radiation therapy is commonly used to treat a variety of malignant and benign conditions. For many conditions, radiation therapy provides improvements in local control, survival, and relief of troubling symptoms. Nevertheless, radiation is a recognized carcinogen and damaging agent. The field of radiation oncology has a many-decade tradition of acknowledging and studying the normal tissue reactions to radiation. Our focus in this area has led often to inappropriately-elevated perceived risks.

The vast majority of patients receiving radiation therapy have a favorable therapeutic ratio: that is, the benefits of the radiation exceed the risks. For example, radiation therapy for breast cancer improves the absolute 10 to 15 y overall survival by approximately 6 to 9 %. This reflects an approximate 7 to 10 % increase in breast-cancer-specific overall survival, plus an approximate 1 % excess in cardiac morbidity/mortality. Nevertheless, some women choose not to receive radiation due to the potential cardiac risks.

It is critical to communicate risks to patients in the context of the potential medical benefits. In most of the situations, the alternative treatments (e.g., extensive

surgery in lieu of limited surgery plus radiation) have far greater risks. The absolute magnitude of the risk should be clearly defined such that the patient and their family can put these risks in perspective. Further, the potential toxicities of radiation do not manifest until many years, or even decades, following radiation exposure. Thus, for many patients with serious diseases, the risks at such lengthy time horizons are not particularly relevant.

Patients appreciate if their concerns are acknowledged, rather than dismissed. It is important for the patients to be reassured that the medical team is aware of the risks of radiation, and are taking appropriate steps to minimize these risks (albeit not guarantee their prevention). An effort should be made to educate the patients to understand that the radiation oncology team includes nurses, dosimetrists, therapists, physicists and engineers who ensure that the equipment is functioning properly and that the dose is being delivered as intended.

The patients go through fairly elaborate procedures (immobilization, three dimensional imaging, simulation) to help the radiation oncology team minimize the risks to normal tissues. Explaining the

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goals and details of these procedures (verbally, in writing, and occasionally *via* video) will help ease patient's fears and increase their confidence in their health-care team, and their compliance with these procedures. For example, patients are often immobilized in face-masks during radiation (sort of custom made "hockey-goalie-like masks) to help keep the patient still during therapy. This allows to be made the margin around the tumor smaller, thus reducing the risks. However, these masks are uncomfortable, confining and claustrophobic. Explaining the utility of the masks tends to improve compliance with, and acceptance of, the masks.

It is equally important for the nonradiation oncology members of the health-care team to be educated about radiation risks. Many physicians in nonradiation specialties are unclear about the true benefits/risks of modern radiation therapy. As with communication with patients and families, communication with other members of the health-care team should clearly place all risks in context and perspective. Colleagues also derive comfort from our acknowledging the risks of radiation, and are reassured by knowing that we are doing what we can to minimize these risks.

10:20 am

Just the Facts: Mammography Saves Lives with Little if Any Radiation Risk to the Mature Breast

Daniel B. Kopans

Harvard Medical School

Mammography screening is one of the major medical advances of the past several decades. Prior to 1990, the death rate from breast cancer had been unchanged in 50 y. Mammography screening began on a national scale in the middle of the 1980s and, as would be expected, the death rate from breast cancer began to drop in 1990. Since 1990, the death rate from breast cancer has decreased by 30 %. Studies in the Netherlands and Sweden, using direct measurements in the general population, show that most of the decrease is due to mammography screening beginning at the age of 40 y, with a small component due to improved therapies (therapy is more effective when cancers are small and earlier stage). A major concern, raised in the 1970s, was that the radiation from mammography might cause more cancers than would be cured.

Not only did this prove to be a huge overestimate, but it has become clear that it is radiation delivered in very young women (teenagers and women in their early twenties), before terminal differentiation has taken place, that is the time of risk. Once the breast has differentiated the risk from radiation is markedly reduced. By the time women reach their late thirties and early forties, there is no measurable risk from mammographic doses, and even the extrapolated risk is far below even the smallest benefit from screening. Hundreds of millions of mammograms have been obtained since the 1980s. If mammography were causing cancers, the incidence of breast cancer would be increasing. In fact, it is decreasing. Women need to be provided with this information to be reassured that mammograms save lives and that the radiation risk is minimal if any.

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10:35 am

Legal Aspects of Patient Communication

Leonard Berlin
Rush North Shore Medical Center

A quarter of a century ago radiation physicist Lauriston Taylor characterized the public's perceptions regarding exposure to ionizing radiation and its potential hazards as a "cloud of ignorance or misunderstanding," and observed that there is a common feeling among the uninformed public and news media that radiation is so mysterious that "even the scientists don't know what's happening."

Are the public and news media any better informed today? Do they still wonder whether the scientists of today "really know" what is truly "happening" with regard to the nature of radiation exposure and its potential hazards? The answers to these questions are not clear-cut when one considers the conflicting headlines with which the public is confronted on a regular basis:

"Longstanding controversy exists about the level of carcinogenic risks attributable to low-level ionizing radiation."

"The benefit of catching a serious brain injury may be outweighed by the dangers of exposing children to radiation from a CT scan."

"One in 1100 children who receive CT scans may eventually die from a cancer caused by excess radiation."

"One 45-year-old woman with a history of kidney stones who had 70 CT scans over 22 years raised her lifetime risk of cancer by 10%."

"Even the lowest amount of exposure to radiation has some risk."

"Consensus has not been reached over the risk of low-level radiation exposure."

"Patients with a median age of 70, who were inadvertently exposed to eight times the expected level of radiation due

to a faulty CT scanner, carry a 1-in-600 risk of developing a brain tumor."

"A 2½ year-old boy who underwent 151 CT images of the brain instead of the prescribed 25 images has a lifetime increased risk of fatal cancer of 39%."

Concerns about possible harmful effects of exposure to radiation arising from diagnostic radiologic procedures have existed in both the scientific and lay communities for many decades. There is, however, no question that the degree of concern over the past few years has been escalated to the "anxiety" if not the "fear" level. Potential exposure to radiation is not a new issue, but it is certainly a "hot" issue.

Americans were exposed to more than six times as much ionizing radiation from diagnostic medical procedures in 2006 than they were in the early 1980s.

To what extent this increased exposure increases the risk of genetic mutations and/or development of cancer is not known with any degree of certainty. The available data are subject to varying interpretations, often debatable and controversial.

What should be communicated to the public? One of the fundamental precepts of the physician is to "do no harm." Yes, physicians are healers, but they are also educators and teachers. Thus, the medical and scientific community must encourage rather than discourage public attention and discussion regarding radiologic imaging and associated radiation exposure. In the 1952 Dwight Eisenhower-Adlai Stevenson presidential campaign, candidate Stevenson proclaimed that "We have to talk sense to the American people." He lost the election, but his words ring as true today as they did then: we must talk sense to the American people regarding

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radiation exposure and its potential hazards. The English author (and physician) W. Somerset Maugham wrote, "There's only one thing about which I am certain, and that is that there is very little about which one can be certain." Maugham's observation is clearly applicable to radiation exposure. We must talk to the public sensibly about the uncertainty regarding the hazards of radiation exposure.

Communication with the public should include the medical/legal ramifications

arising from exposure to radiation and the hazards related to such exposure. There has never been a successful medical malpractice lawsuit that alleged development of cancer or genetic defects resulting from diagnostic x-ray examinations. However, there have been and continue to be sporadic lawsuits filed alleging soft tissue injury resulting from overexposure to diagnostic radiologic equipment, and cancer caused by overexposure to radiation oncology equipment.

10:50 am

Questions and Answers

11:05 am

Break

Communication on Children's Imaging and on Computed Tomography

Fred A. Mettler, Jr., *Session Chair*

11:20 am

Introduction: Computed Tomography Radiation and Population Dose

Fred A. Mettler, Jr.
University of New Mexico

11:25 am

Image Gently® Campaign: The Use of Social Marketing to Promote Radiation Protection for Children

Marilyn J. Goske
Cincinnati Children's Hospital Medical Center

Social marketing is a relatively new science that uses public media and commercial marketing techniques to promote "behavior changes that will improve the health of the population." The underlying premise of a social marketing campaign is that marketing principles are used to "influence a target audience to voluntarily ...modify a behavior for the benefit of individuals, groups or society as a whole" (Kotler *et al.*, *Defining Social Marketing*; 2002) Other names for these campaigns include public education or awareness campaigns or media interventions. Similar

to advertising, a variety of media are used to reach the target population which may be the general public, or a specific group such as the medical profession. These campaigns may use the internet (through website, email, podcasts, blogs, web journals, list servers, and Twitter), the more traditional print media (scientific publications, trade press, lay press) or posters, television and radio.

The Image Gently® campaign is an education, awareness and advocacy campaign in radiology that promotes radiation protection for children worldwide. Through

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the creation of the Alliance for Radiation Safety in Pediatric Imaging, the consortium promotes the need for radiation dose reduction as appropriate to optimize medical imaging. It seeks to create simple, straightforward messages and easily accessible educational materials to achieve this end. Through the Alliance (a partnership of over 50 medical organizations and societies, representing over 600,000 health-care professionals) the educational materials can be distributed throughout the world to effect change at the local level. In this presentation, the relatively new science of social marketing is reviewed and the theoretical basis for an effective communication campaign in radiology is discussed.

The positive message created by radiologists, medical physicists, and radiologic technologists working together emphasizes the medical benefits of computed tomography (CT) when the exam is “justified” and no alternative imaging is appropriate. By working with manufacturers of

medical imaging equipment, government agencies, nonprofits agencies, and other organizations, the campaign may serve to “short circuit” the time it takes for accurate medical information to reach the local user who is directly caring for the pediatric patient. There has been particular emphasis on improving medical literacy for parents through the creation of the Image Gently® medical imaging record card, CT scan brochure for parents (translated into nine languages) and an interventional radiology brochure. Examples of these communication strategies will be demonstrated. Measures of impact of the campaign will be reviewed. The methodology of social marketing has demonstrated that simple, straightforward safety messages on radiation protection targeted to medical professionals throughout the radiology community worldwide, utilizing multiple media, can affect awareness, potentially leading to change in practice that improves safety for our patients.

11:35 am

Image Gently® International: Communication Conundrums

Kimberly E. Applegate

Emory University School of Medicine

The internet has made global communication both feasible and a critical part of our work. The Image Gently® Campaign is an international volunteer effort to reduce the radiation exposure of children undergoing medical imaging. There are over 50 medical, radiology and physics organizations that form the Alliance for Radiation Safety in Pediatric Imaging. The alliance was founded by the Society for Pediatric Radiology, the American College of Radiology, the American Society of Radiologic Technologists, and the American Association of Physicists in Medicine in January 2008 to reduce radiation dose used in pediatric computed tomography (CT) exams. Since its inception, it has created educational modules on CT and interventional

radiology, parent education, and slide lectures for technologists, physicists, and medical student audiences.

There are 11 international organization members with two more pending approval. The international volunteers have translated the simple educational materials into nine languages with several more to be completed. Pediatric radiologist leaders from around the world will discuss radiation protection best practices and training needs at the Society for Pediatric Radiology 2010 spring meeting. Image Gently® is collaborating with the World Health Organization at international child health and the environment conferences as well as on the Global Initiative to Reduce Radiation Exposure, and will

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participate in the International Radiation Protection Association meeting in Helsinki in June. The opportunity to share best practices, concerns, and educational materials globally has led to new insights in radiation protection and global harmonization of risk communication messages.

In pursuing these initiatives, the success of the educational campaign depends on the individuals in each region of the world to not only translate the materials but to tailor the messages to best fit the needs of each nation (developed, less developed), the cultural values of the medical and patient communities, the perceived risk from radiation in each region (Europe versus United States), and the formatting of these materials for the public. For example, developing nations have less access to CT scanning so their educational needs would focus more on plain radiography

and fluoroscopy imaging optimization. The formatting of educational brochures or materials for each region should reflect the appropriate ethnicity, attire and interaction of medical personnel and their families to relate to the local cultural norms. For example, the photos of families and children undergoing CT imaging in the Image Gently® brochure needed to be adapted for the cultural norms of appropriate attire in the Arabic language translation. In another example, justification for CT use varies by geographic region and may be linked to public perception of radiation risk and CT scan use—in Europe there is a higher level of concern about ionizing radiation exposure compared to North America or Japan. Thus, public awareness and cultural values have led to less use of CT and ionizing radiation in Europe.

11:45 am

Communicating About Computed Tomography: Challenges and Uncertainties

Rebecca Smith-Bindman
*University of California, San Francisco
National Cancer Institute*

The use of computed tomography (CT) for diagnostic evaluation has increased dramatically over the past two decades and is associated with substantially higher radiation exposure than conventional radiography. Further, the radiation doses from commonly performed diagnostic CT examinations may be substantially higher and more variable than generally quoted. The variation occurs between patients, facilities and type of study. Thus, depending on where an individual patient receives imaging and the specific technical parameters used, the effective dose received could substantially exceed the median reported doses. Further, estimates of the associated risk from these studies, often and most easily translated into the number of CT scans that will lead to the development of a single cancer, will also vary

widely depending on the specific type of CT examination and the patient's age and sex, and the technical parameters used to complete the study. Thus a single quoted statistic to summarize the risk of CT across all patient groups is simply too crude to provide meaningful information. This presentation will discuss results from several recent studies that have been completed which have quantified the radiation from a large number of CT examinations. Strategies that need to be undertaken to minimize the exposure and to reduce the variation in exposure across patients and facilities through greater standardization and oversight will be discussed. The need to develop metrics that need to be conveyed to patients and physicians alike to help them make informed choices about imaging will also be

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presented. Further, the need for outcome studies to help quantify the benefits of imaging in defined clinical situations will be discussed. This information is crucial to

inform the development of evidence-based guidelines for the appropriate use of imaging.

12:00 pm

Radiation Safety in the Era of Helical Computed Tomography: Methods to Decrease Patient Exposure in the Community Hospital Setting

Steven Birnbaum
Associated Radiologists

Patient exposure to radiation from diagnostic imaging has increased dramatically in the last 15 y, mainly due to helical computed tomography (CT) scanning and certain nuclear medicine procedures. Certain patient populations with repeated radiation exposure can be identified prospectively by CT technologists and radiologists. Retrospectively utilizing data mining techniques, additional patients may be found using well defined, although arbitrary radiation exposure thresholds, and their records may then be flagged in a radiology information system so that further CT imaging is performed only

following radiologist consultation and with strong clinical indication. These programs have been in place for 2 y in two small community hospitals in New Hampshire and have been shown to decrease repeat studies in these patient populations by at least 30 % in the initial stages of this program. Further strategies for decreasing patient exposure are outlined which include clinician and patient education, technical modifications to existing equipment, post-processing software, and regional and state efforts to effect change in the medical community.

12:15 pm

Questions and Answers

12:30 pm

Lunch

Communication of Radiation Benefits and Risks in Decision Making

Jill A. Lipoti, *Session Chair*

1:40 pm

Beyond Dose Assessment: Using Risk with Full Disclosure of Uncertainty in Public and Scientific Communication

F. Owen Hoffman
David C. Kocher
Senes Oak Ridge, Inc.

Evaluations of radiation exposures of workers and the public traditionally have been based on assessments of radiation dose, especially annual dose, without explicitly estimating risk, especially lifetime risk. In doing so, opportunities to

communicate the significance of dose estimates are limited to comparisons with dose criteria in regulations, doses due to natural background or medical x rays, and doses above which a statistically significant increase of disease has been

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observed in epidemiologic studies. However, risk estimates must be made when questions arise concerning the chance that specific diseases might be induced by past or future exposure. Risk estimates depend on the total absorbed dose received by all organs over a lifetime, rather than the highest dose in any year. Risk estimates will vary depending on gender, age, exposure type (acute versus chronic), radiation type, including low- versus high-energy photons and electrons and low- versus high-LET radiations. It is not uncommon to find that two individuals with nearly the same effective dose have substantially different risks as a result of marked differences in the numerous factors known to determine risk that have little or no influence on estimates of effective dose. For example, although population-averaged effective doses are nearly equal from medical and natural sources of radiation, risk assessments indicate that the risk to the average member of the public from exposure to medical diagnostic x rays and computed tomography scans is now nearly twice the risk from exposure to natural background. Risk assessments have identified that indoor radon is a significant contributor to the baseline risk of lung cancer,

particularly among people who have never smoked. Risk assessments have shown the importance of childhood exposures to ^{131}I in atmospheric fallout; those diagnosed with thyroid cancer later in life would frequently meet criteria established for federal compensation of cancer claims filed by military veterans and energy workers. Risk estimation enables comparisons of impacts of exposures to radiation and chemical carcinogens. Comparisons based on risk reveal major differences in the degree of health protection associated with exposure and dose-based regulations for radiation versus risk-based regulations for radiation and chemicals. However, radiation risk estimation with full evaluation of uncertainty has experienced limited application despite the many advantages risk assessment has over dose-based assessments. Why is this so? Certainly there is concern among radiation protection professionals that quantitative risk estimates with uncertainty produce the kind of information that attracts attention from the news media and is used by nuclear critics to alarm the lay public. The future challenge for risk assessors and risk communicators will be to overcome these concerns.

2:00 pm

Using the International Radiation Protection Association Guiding Principles: Putting Theory into Practice for Sustainable Implementation

C. Rick Jones

The International Radiation Protection Association (IRPA) published their *Guiding Principles for Radiation Protection Professionals on Stakeholder Engagement* in February 2009. The publication of this document is the culmination of 4 y of work by the Spanish Society for Radiological Protection, the French Society of Radioprotection, the U.K. Society of Radiological Protection, and the IRPA organization, with full participation by the Italian Society and the Nuclear Energy Agency's Committee on Radiation Protection and Public

Health. The *Guiding Principles* provide field-tested and sound counsel to the radiation protection profession to aid it in the successful engagement with stakeholders in decision-making processes that result in mutually agreeable and sustainable decisions. Stakeholders in the radiation protection decision-making process are now being recognized as a spectrum of individuals and organizations specific to the situation. It is also important to note that stakeholder engagement is not needed or advised in all decision-making

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situations but has been shown to be a tool of first choice in dealing with such topics as intervention and chronic exposure situations, as well as situations that have reached an impasse using traditional approaches to decision making. To enhance the contribution of the radiation protection profession, it is important for

radiation protection professionals and their national professional societies to embrace and implement the IRPA *Guiding Principles* in a sustainable way by making them a cornerstone of their operations and an integral part of day-to-day activities.

2:20 pm

Community Environmental Monitoring Program: A Case Study of Public Education and Involvement in Radiological Monitoring

William T. Hartwell

David S. Shafer

Desert Research Institute

The Community Environmental Monitoring Program (CEMP) was created in 1981 to increase the openness and transparency of radiological monitoring conducted in communities around the Nevada Test Site (NTS), the principal location where the United States tested nuclear devices between 1951 and 1992. Since its inception, CEMP has provided local citizens with a hands-on role in the operation of a radiological monitoring network located in towns and ranches across an approximately 160,000 km² area of Nevada, Utah and California in the southwestern United States. Citizens who live in the towns where stations are located are directly involved in day-to-day operation and data collection, as well as in dissemination of information on radiological surveillance in their communities. Modeled in part after the citizen-run monitoring program instituted around the Three Mile Island Nuclear Power Plant following the 1981 accident there, the program seeks to address public concern about radioactivity from past nuclear testing activities and ongoing NTS activities involving radioactive materials and waste. CEMP is funded through the U.S. Department of Energy's National Nuclear Security Administration Nevada Site Office, and is administered by the Desert Research Institute of the Nevada System of Higher Education.

CEMP stations provide continuous measurements of gamma radiation and meteorological parameters at 29 stations. Biweekly air particulate samples are also collected for individual gross alpha and beta analyses, and for quarterly composite analyses of gamma-emitting radionuclides. For 23 stations, local citizens (two per station) are employed to monitor station operation and to collect particulate air-filter samples. While involving the public in data collection can contribute to a general level of trust about the process and results, responsibilities of the public participants in CEMP include participating in training to gain a level of knowledge about the monitoring process and results so that they can respond to inquiries from their communities. Transparency also is addressed through having the majority of the instruments at the stations available in near real-time via a public website, despite concerns that have occasionally arisen over sensor and communications network failures. While occasional failures might have been of minor concern from a credibility standpoint prior to the real-time availability of data, the same technologies designed to build trust can sometimes be viewed with suspicion by stakeholders when malfunctions occur. The website has been an important tool in fulfilling program goals of openness and transparency, but it

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also has contributed to changing the makeup of the constituency the CEMP serves. Although nuclear testing at NTS ceased in 1992, continuing public concern about the potential for radionuclides to be transported off NTS has resulted in both a technological and philosophical evolution of the program that has led to its sustainability. The direct involvement of

stakeholders in the monitoring process provides a number of benefits, including increased public confidence in the results, significant cost-savings for the monitoring program, and the opportunity for citizens to serve their communities as knowledgeable laypersons on issues related to NTS and on topics such as radiation and health.

2:40 pm

Psychosocial and Health Impacts of Uranium Mining and Milling on Navajo Lands

Susan E. Dawson
Utah State University

The uranium industry in the American Southwest has had profoundly negative impacts on American Indian communities. Navajo workers experienced significant health problems, including lung cancer and nonmalignant respiratory diseases, and psychosocial problems, such as depression and anxiety. There were four uranium processing mills and approximately 1,200 uranium mines on the Navajo Nation's 26,110 square miles. In this presentation, a chronology will be presented of how uranium mining and milling impacted the lives of Navajo workers and their families. In addition, Navajo communication patterns will also be addressed, including the roles of chapter houses (local governmental units), the media, and local uranium worker support groups. The Navajo initially had no language in which to conceptualize uranium and its hazards. The majority of uranium workers were employed before the creation of the Mine, Safety, and Health Administration and in general did not wear personal protective equipment (e.g., face masks and respirators). They were also not informed generally about the hazards of radiation on the job. The miners worked in largely unventilated mines with high levels of radon, and the millworkers worked in mills that would not meet today's health and safe standards. The workers wore their work

clothes home where they were laundered and many workers brought materials, which were allowed, home from the work site. Many workers and their families lived close to the work sites for extended periods. These work practices have led to fears and concerns among family members given that uranium was brought home from the various facilities. A concerted education effort of culturally sensitive and empowering programs was created about uranium issues. Local community leaders organized chapter house meetings across the reservation to inform workers and their families about the relationship between worker exposures and possible health problems. Information about these meetings was largely disseminated through local radio stations and Navajo newspapers. A reservation-wide effort resulted in activists working with political leaders and attorneys to write radiation compensation legislation which was passed in 1990 as the Radiation Exposure Compensation Act (RECA) and included underground uranium miners, atomic downwinders, and nuclear test-site workers. Later efforts resulted in the inclusion of surface miners, truck haulers, and millworkers in the RECA Amendments of 2000. On the Navajo Nation, the Office of Navajo Uranium Workers was created to assist workers and their families to

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apply for RECA. There were also uranium worker support groups for the miners and the millers on the reservation, which served to provide information, offer emotional support, and advocate for compensation. Present issues concerning the Navajo and other uranium-impacted groups include those who worked in mining and milling post-1971 and are

excluded from RECA and community and environmental health impacts related to uranium mine waste and mill tailings. Past perceptions about uranium impacts have contributed recently to the Navajo rejecting a resumption of uranium mining and milling on Navajo lands, which thus far has been upheld by the courts.

3:00 pm

Break

3:20 pm

Stakeholder Engagement Process in the ETHOS Project in Belarus

Thierry Schneider

Nuclear Evaluation Protection Centre

The long-term contamination of the environment associated with the Chernobyl accident created a complex situation, affecting all the dimensions of the daily life of the inhabitants: health, environment, social life, education, production, distribution of foodstuffs and commodities, etc. The surveys undertaken in the early 1990s highlighted that this complex situation led to a loss of control for the inhabitants of the contaminated territories and that classical approaches of communication were not efficient to provide them with comprehensive and useful information to deal with their situation.

In this context, 10 y after the accident, the ETHOS Project was set up by a European Team in Belarus as a pilot experiment in order to explore the feasibility of involving directly the local populations in their protection. This Project was developed in five villages and gathered teenagers, farmers, young mothers, teachers, and foresters and organized them for addressing different aspects of their lives, such as management of the radiological quality of meat and milk and radiological protection of children.

The process implemented in the ETHOS Project relies on a step-by-step approach to allow villagers to progressively regain control of their day-to-day life:

- The first step was dedicated to listening and learning from the villagers about their concerns, difficulties, wishes, both at the level of their individual life and as citizens living in a contaminated territory.
- The second step aimed at developing a common evaluation of the local radiological situation, performed jointly by the involved villagers, the local professionals, and the ETHOS experts.
- The third step was the identification of possible protection actions to be implemented locally with the existing resources or with a minimum of additional resources.
- The fourth step consisted in establishing (or re-establishing) links between villagers and the local authorities and professionals.

As far as the links were established, it was then possible to develop a real cooperation between all involved stakeholders with the common objective of improving the quality of life in the village, taking into account the constraints and difficulties associated with the local radiological situation.

In order to favor the dissemination of the approach, the following steps of the ETHOS Project were focused on the following characteristics:

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- empowerment of local professionals from the health-care, education, and agriculture systems, as well as those in charge of radiation monitoring to allow them to directly implement the step-by-step approach;
- involvement of the different levels of authorities (local, regional, national) as well as national scientific institutes to accompany this process; and
- development of a practical radiation protection culture among the villagers

including the conditions for its transmission to future generations through the school system.

The ETHOS experience has shown that the direct involvement of the population in the day-to-day management of the radiological situation was feasible and a necessary approach to complete the rehabilitation program implemented by the authorities in contaminated territories.

3:40 pm

Panel Discussion

Don M. Curry
Susan E. Dawson
William T. Hartwell
F. Owen Hoffman
C. Rick Jones
Thierry Schneider

4:20 pm

Future Directions of the International Commission on Radiological Protection Committee 4: Application of ICRP Recommendations—From Stakeholder Involvement to Self-Help Protective Actions

Jacques Lochard
Nuclear Evaluation Protection Centre

For the first time in its 2007 recommendations, the International Commission on Radiological Protection (ICRP) mentions the need to account for the views and concerns of stakeholders when optimizing protection. ICRP considers actual stakeholder involvement in the optimization process introduces the flexibility in the management of radiological risk that is necessary to achieve more effective and sustainable decisions. Stakeholder involvement is now largely recognized as a proven means to achieve incorporation of values into the decision-making process, to resolve conflicts between competing interests, to build shared understanding with both workers and the public, and finally to improve the substantive quality of decisions.

A major evolution in the new recommendations is also the generalization of the

optimization principles to all types of exposure situations including those which were previously related to activities defined as interventions such as, for example, exposure to radon in dwellings, to naturally-occurring radioactive material, and to contaminated sites and territories. All these exposure situations are characterized by the fact that exposures of concerned individuals are largely result from their personal behavior.

Building on the experience with the management of long-term contaminated territories by the Chernobyl accident in the Commonwealth of Independent States and in Europe, ICRP introduced in its Publication 111 the concept of self-help protective actions, which in this particular context aims at the characterization by the inhabitants themselves of their own radiological situation by monitoring the



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radiological quality of their direct environment, their external and internal exposure, the exposure of the people for whom they are responsible (e.g., children, elderly), and in adapting their way of life accordingly to reduce their exposure. Experience in the contaminated territories has also shown that the dissemination of a “practical radiation protection culture” among all segments of the population, particularly

through the education system, is key for the success of protection strategies in the long term.

ICRP is currently exploring how the concepts of “self help protective actions” and “practical radiation protection culture” may find a broader application for other exposure situations.

4:40 pm

Communicating Radiation Benefits and Risks: Some Lessons Learned

Paul A. Locke

Johns Hopkins Bloomberg School of Public Health

4:50 pm

Closing Remarks

Thomas S. Tenforde

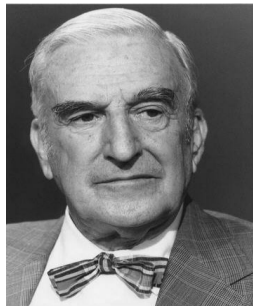
President, National Council on Radiation Protection and Measurements

5:00 pm

Adjourn

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To support radiation protection by providing independent scientific analysis, information and recommendations that represent the consensus of leading scientists.



Lauriston S. Taylor
1929–1977



Warren K. Sinclair
1977–1991



Charles B. Meinhold
1991–2002



Thomas S. Tenforde
2002–

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Monday, March 8, 2010

7:00 am – 5:00 pm

Tuesday, March 9, 2010

7:00 am – 1:00 pm

(no registration fee)

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MANAGEMENT OF
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