STATEWIDE PLANNING FOR RADIOLOGICAL EMERGENCIES IN CONNECTICUT

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Objectives

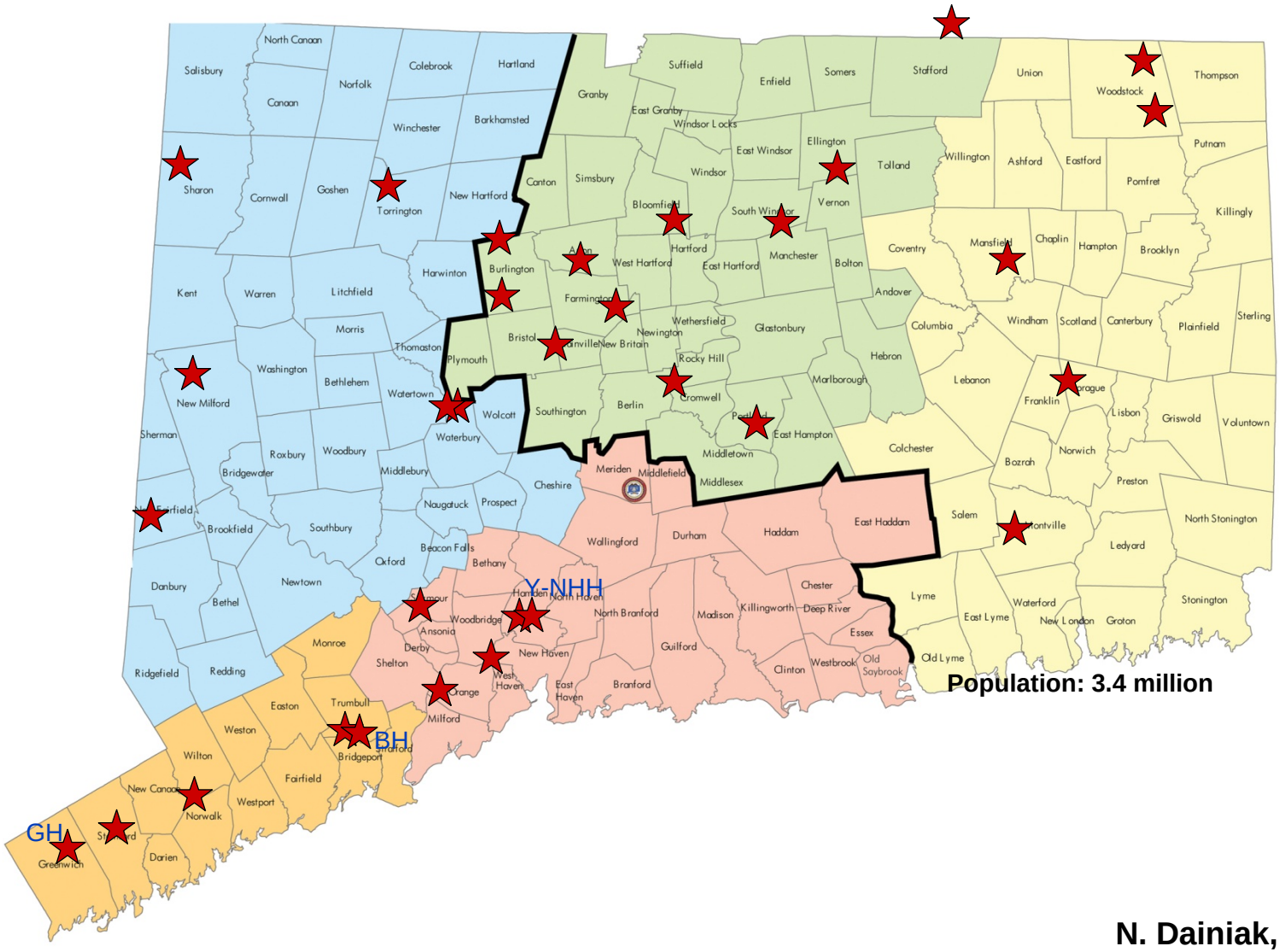
1. Review process for development of Connecticut Radiation Response Plan.

2. Describe building of clinical biodosimetry laboratory surge capacity in Connecticut.

3. Understand potential value of Web EOC (web-enabled collaborative crisis IS) in exercises.

4. Review emerging partnership among academics, the Connecticut DEP and private sector for training.

YNHHS



Population: 3.4 million

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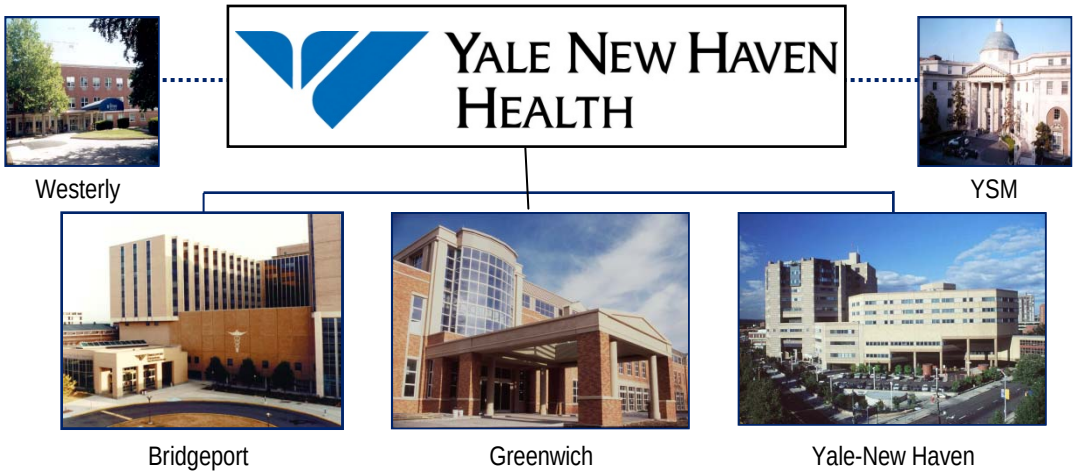
Yale New Haven Health System



- Largest, most integrated healthcare system in Connecticut
- 12,000 employees and 3,500 physicians
- 78,000 patient discharges and 1,300,000 outpatient visits
- 3 acute care hospitals, a children's hospital and a psychiatric hospital
  - **A Level 1 Burn Center and a Level 1 Trauma Center**
- $1.5 billion in revenues and $1.9 billion in assets
- Primary teaching hospital of the Yale University School of Medicine (YSM)
- **Designated** by the State of Connecticut Department of Public Health in 2002 as a **Center of Excellence for Bioterrorism Preparedness and Response** to develop statewide emergency preparedness programs and services for healthcare delivery organizations

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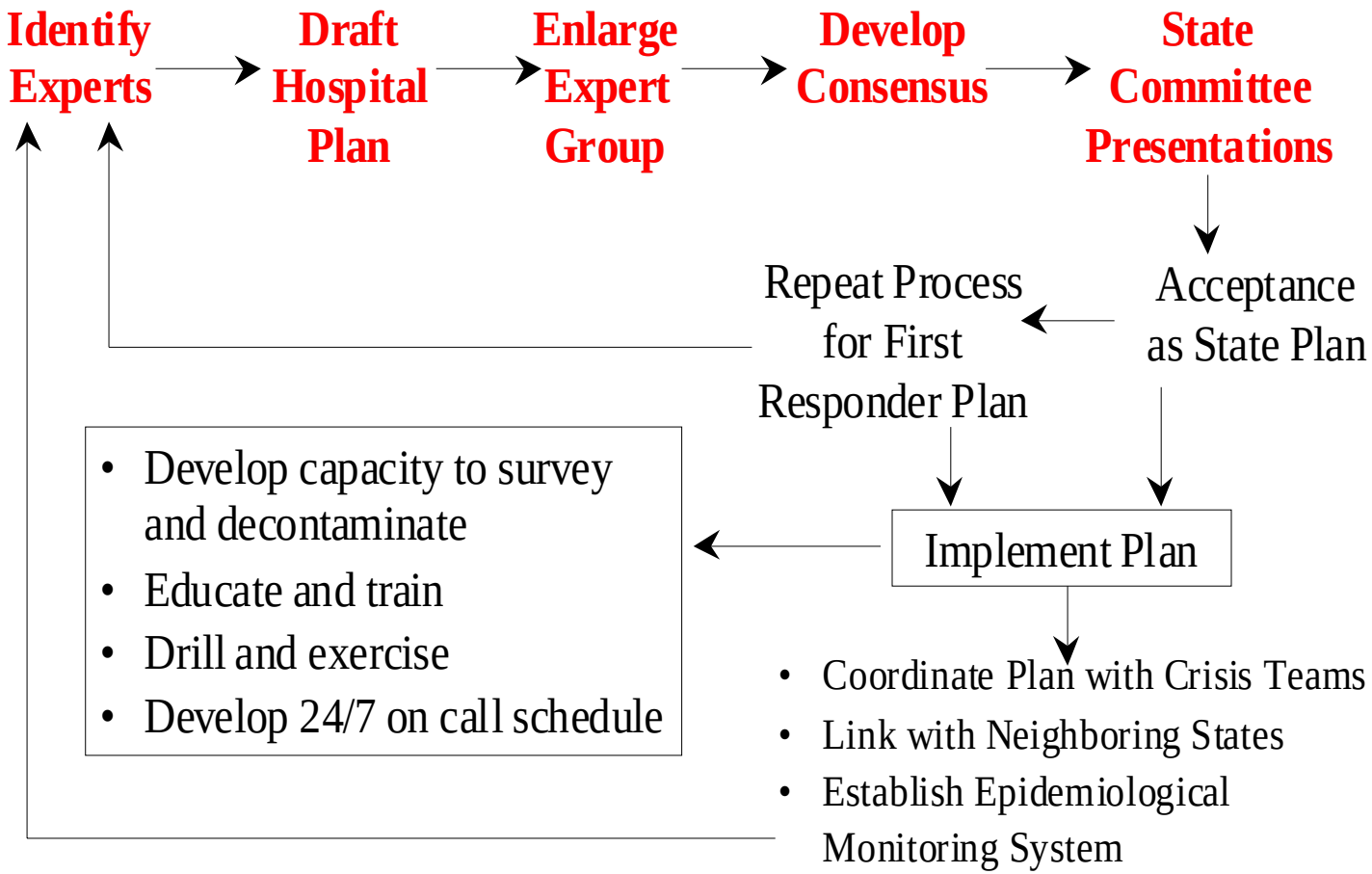
Development of Radiation Preparedness Program



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Phases of Development of Radiation Response Plan

Time Frame	Committee	Membership
August 2002 - Present	YNHHS Clinical Advisory Committee	Co-chairs: N. Dainiak and R. Femia
September 2002 - March 2003	Radiation Subcommittee	Facilitator: D. Delli Carpini Members: N. Dainiak, M. Bohan, C. Morgan, D. Wyshko, E. Wilds, M. Werdmann
April 2004	Approved by YNHHS OEP Executive Committee	
April 2003 - Present	Connecticut Radiation Response Planning Group	Chair: N. Dainiak Members: D. Delli Carpini, M. Bohan, A. Barlow, C. Beck D. Cheng, N. Daly, P. Flagg D. Ferrari, P. Glazer, P. Mas, K. McCormick, R. Nath G. Piontek, K. Rice, K. Roberts, A. Salner, J. Shaw, E. Wilds, S. Rockwell

Institutions: Bridgeport Hospital, Greenwich Hospital, Hartford Hospital, State of Connecticut Department of Environmental Protection, State of Connecticut Office Emergency Preparedness. University of Connecticut Health Center, Yale-New Haven Hospital, Yale University School of Medicine.

Organizations: American Society for Therapeutic Radiology and Oncology, Capital Region Metropolitan Medical Response

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Development of a Statewide Hospital Plan for Radiologic Emergencies

Nicholas Dainiak, M.D., Domenico Delli Carpini, Ph.D, Michael Bohan, B.S., Michael Werdmann, M.D., Edward Wilds, Ph.D., Agnus Barlow, M.S., Charles Beck, B.S., M.S., M.A., David Cheng, M.D., Nancy Daly, M.S., M.P.H., Peter Glazer, M.D., Peter Mas, M.S., Ravinder Nath, Ph.D, Gregory Piontek, B.S., M.S., Kenneth Price, M.P.H./C.H.P., Joseph Albanese, Ph.D., Kenneth Roberts, M.D., Andrew L. Salner, M.D. and Sara Rockwell, Ph.D

Although general guidelines have been developed for triage of victims in the field and for hospitals to plan for a radiologic event, specific information for clinicians and administrators is not available for guidance in efficient management of radiation victims during their early encounter in the hospital. A consensus document was developed by staff members of four Connecticut hospitals, two institutions of higher learning, and the State of Connecticut Department of Environmental Protection and Office of Emergency Preparedness, with assistance of the American Society for Therapeutic Radiology and Oncology. The objective was to write a practical manual for clinicians (including radiation oncologists, emergency room physicians, and nursing staff), hospital administrators, radiation safety officers, and other individuals knowledgeable in radiation monitoring that would be useful for evaluation and management of radiation injury. The rationale for and process by which the radiation response plan was developed and implemented in the State of Connecticut are reviewed. Hospital admission pathways are described, based on classification of victims as exposed, contaminated, and/or physically injured. This manual will be of value to those involved in planning the health care response to a radiologic event.

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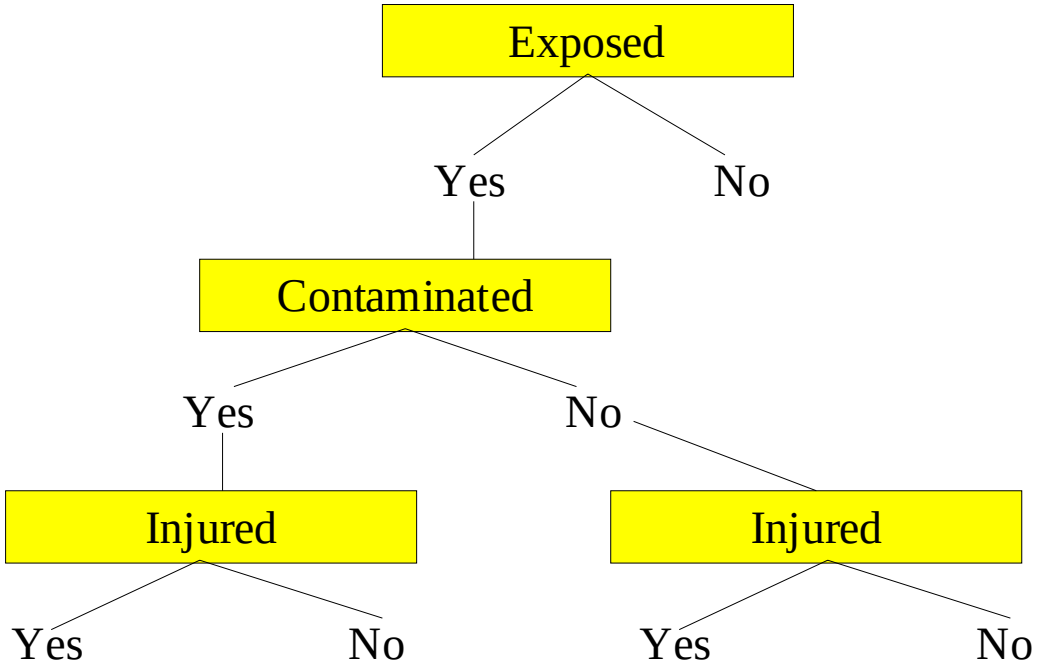
Assumptions

- A radiological event may involve one or more municipalities in Connecticut.
- A radiological event may occur without advanced warning.
- Victims of a radiological event may exhibit no or few non-specific symptoms.
- A significant psychological impact may occur in the setting of a very low dose exposure.
- Management of a radiological event requires that healthcare workers act in a calm and organized fashion.

Response in the Emergency Department (ED)

- Classification of victims based on contamination, external exposure and/or physical injury
- Decontamination, if necessary
- Clinical assessment and initial laboratory monitoring
- Triage of patients to the operating room for surgery, hospitalization for therapy or discharge for ambulatory monitoring

Classification of Victims



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Triage Measures

1. No exposure.
    - Psychosocial needs
2. Exposure, no contamination.
    - Process normally
    - Treat physical injuries
3. Contamination and minor injury.
    - Decontamination
    - Admit for observation, dose assessment
4. Contamination and serious injury.
    - Tr eat life-threatening injury first
    - Decontamination

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Data Collection

1. **Document date/time and examiner**

2. **History:**
   - **Location of incident**
   - **Time of exposure**
   - **Duration of exposure**
   - **Activity at time of exposure**
   - **Occupation**
   - **Other**

3. **Physical Exam:**
   - **Vital signs (fever, hypotension, orthostasis)**
   - **Skin (edema, erythema, blistering, desquamation)**
   - **Cardiovascular (heart sounds, neck vein distention, rales)**
   - **Gastrointestinal (abdominal swelling or pain)**
   - **Hematological (ecchymoses, petechiae)**
   - **Neurological (papilledema, reflexes, motor, sensory, cognitive function)**

4. **Document technical data from personal dosimeters and other radiation monitoring devices.**

Record all information on a flow chart or medical card that becomes part of the medical record. Data may be entered into a radiation casualty management software program (the Biological Assessment Tool*) and/or used to assign a "response category".

***Available at the Armed Forces Radiobiology Research Institute website<www.afrri.usuhs.mil>**

Dainiak N, Biodos EPR-2006

CLINICAL FLOW CHART

Patient ID:		Date/time of exposure:				Examiner:		
Date and time of examination								
N	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity
Nausea								
Vomiting								
Anorexia								
Fatigue syndrome								
Fever								
Headache								
Hypotension								
Neurological deficits								
Cognitive deficits								
Maximum								
Grading N								
H	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity
Lymphocyte changes								
Granulocyte changes								
Thrombocyte changes								
Infection								
Blood loss								
Maximum								
Grading H								
C	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity
Erythema								
Sensation/itching								
Swelling/oedema								
Blistering								
Desquamation								
Ulcer/necrosis								
Hair loss								
Onycholysis								
Maximum								
Grading C								
G	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity	Degree of severity
Frequency (stool)								
Consistency (stool)								
Mucosal loss/d (stool)								
Bleeding/d (stool)								
Abdominal cramps/pain								
Maximum								
Grading G								
Grading Code	N H C G	N H C G	N H C G	N H C G	N H C G	N H C G	N H C G	N H C G
Radiation Category								
Days after exposure								

Modified from TM Fliedner, I Friesecke, K Beyrer (eds) Brit Inst Radiol, Oxford, 2001.

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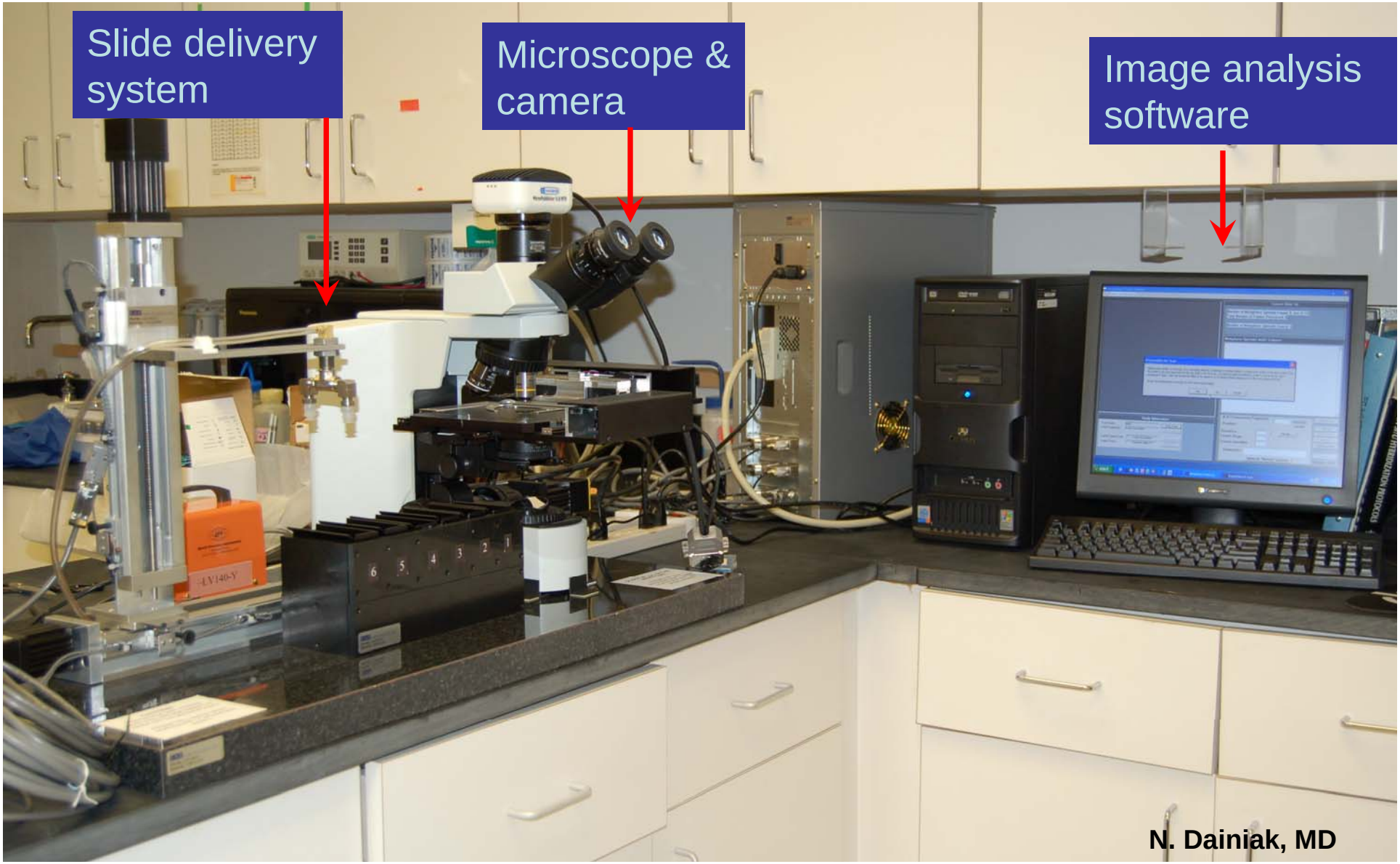
Building Connecticut's clinical biodosimetry laboratory surge capacity to mitigate the health consequences of radiological and nuclear disasters: A collaborative approach between the state biodosimetry laboratory and Connecticut's medical infrastructure

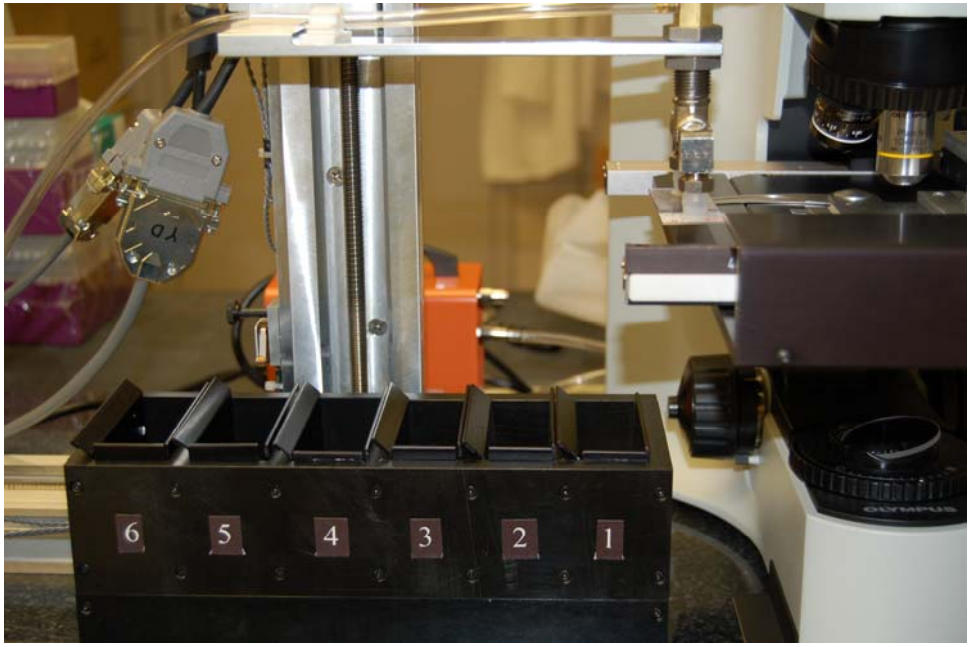
Joseph Alabanese, Kelly Martens, Jeffrey L. Arnold, Katherine Kelley, Virginia Kristie, Elaine Forte, Mark Schneider, Nicholas Dainiak

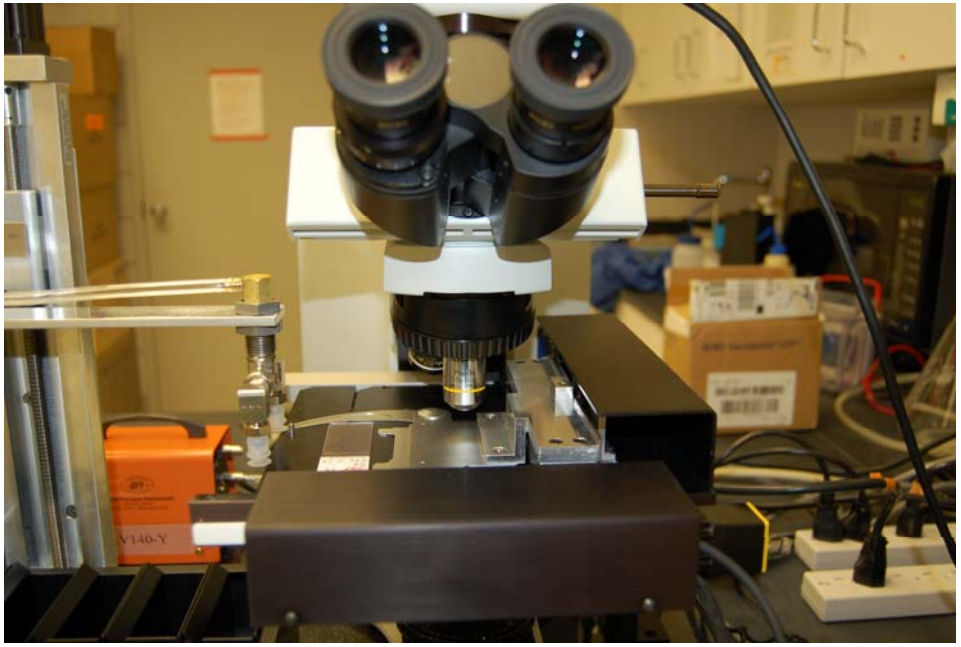
Radiation Measurements 42 (2007) 1138-1142

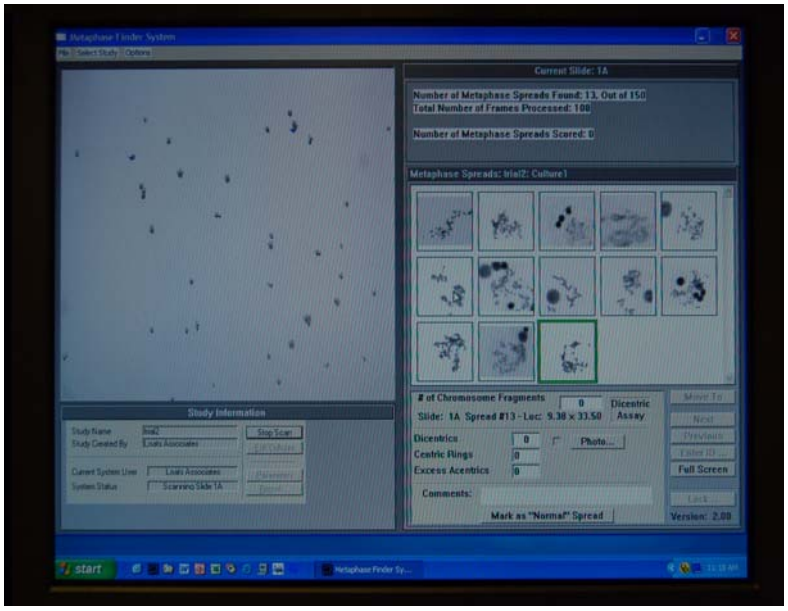
Metaphase Finding System for use in Dicentric Assay



Metaphase Finding System







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Overview of Radiation Dose Determination

1 day	*Collect whole blood samples*
	Isolate lymphocytes
2 – 3 days	*Grow cells for 2 – 3 days*
1 day	*Prepare slides for cytogenetic evaluation*
1 – 2 days	*Score dicentric chromosomes*
5 – 7 days	*Radiation Dose Estimation*

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Surge Capacity

Surge capacity is defined as a health care system's ability to rapidly expand beyond normal services to meet the increased demand for qualified personnel, medical care and public health in the event of large-scale public health emergencies or disasters.

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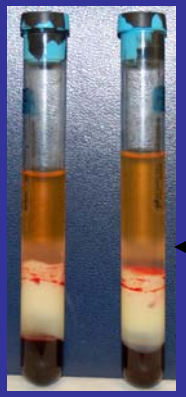
Overview of Lymphocyte Isolation Protocol

Centrifuge

RT, 400xg,
25 min

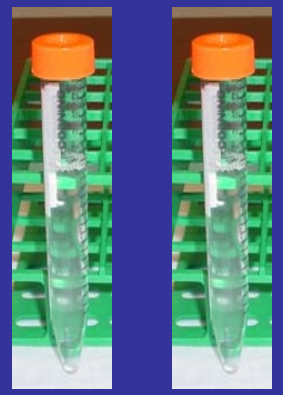
Resolve
Lymphocyte
band



Lymphocytes

* Samples are delivered in CPT vacutainer tubes which are ready for centrifugation.

Transfer cells
To conical tubes
& adjust volume
to 10 mL PBS



Centrifuge

RT, 300xg,
10 min

Suspend
cells in
10 mL
PB-Max
Medium

Transfer
to tissue
culture
flasks

Lymphocytes are
cultured for 2-3 days
at the Biodosimetry
Laboratory

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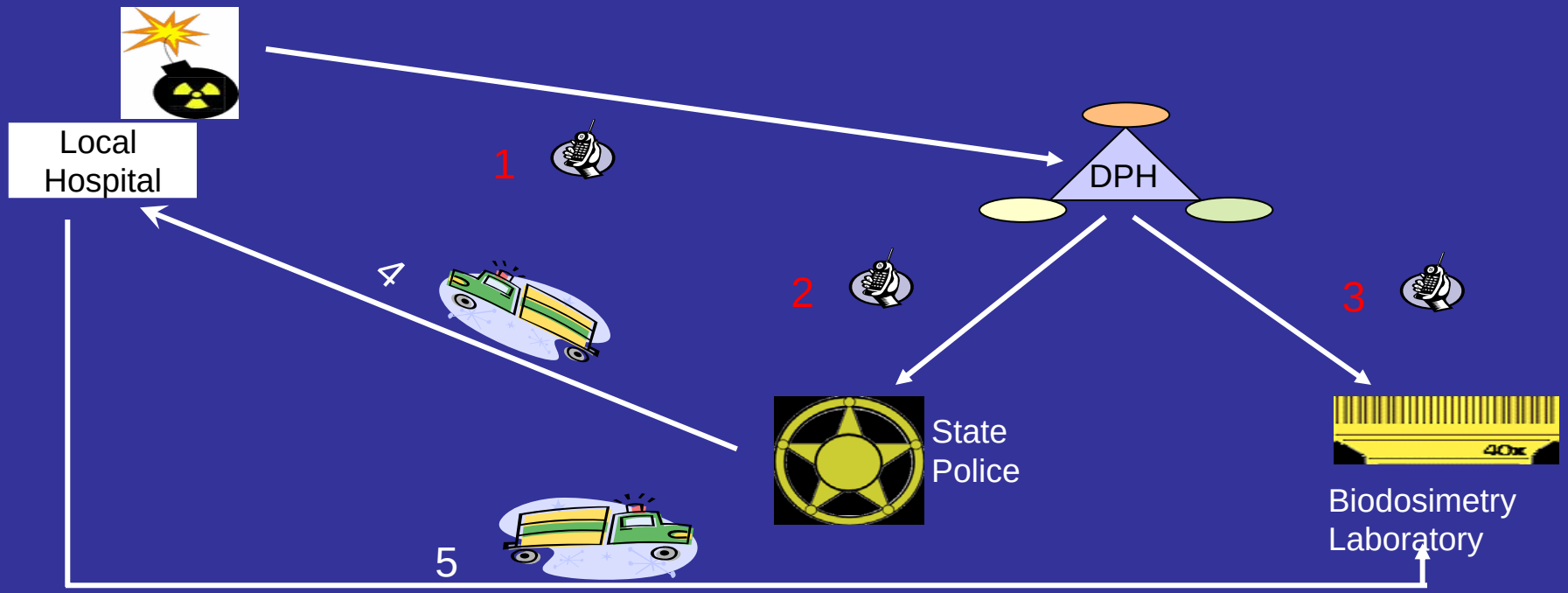
Local Hospital
1
DPH
2
3
4
State Police
Biodosimetry Laboratory
5

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Functional Drill to Test Proficiency of Sample Preparation

Objectives

- Determine quality of samples prepared by laboratorians (cell viability, contamination)
- Determine turn around times
- Assess efficacy of training provide
- Obtain feedback on drill process and lymphocyte isolation protocol

Results

- 18/19 labs and 37/79 trained lab professionals participated in the drill
- All samples were free of contamination and exhibited > 95% cell viability
- Average turn-around time = 199 minutes

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Exercise

An exercise was developed and conducted in cooperation with representatives of the YNHHS Delivery Network Institutions in collaboration with the State DPH. It was designed to build upon corrective actions identified in the 2008 Emergency Operation Center Management Functional Exercise Corrective Action Plan. Its overarching purpose was to expand the utility of WebEOC*.

*Web-enabled collaborative crisis information system designed to provide real-time situational awareness

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Participating Organizations

Players: 86

Observers: 3

Simulators: 7

Evaluators: 5

Controllers: 5

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Findings

1. **The Hospital Incident Command Structure (HICS) was staffed and the Emergency Operation Center was operationalized.**

2. **Response was appropriate and consistent with the State Radiation Response Plan.**

3. **Information for the public was developed and disseminated in a timely manner.**

4. **HICS effectively used WebEOC.**

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Conclusions

1. **Collaboration and consensus building are essential for plan development, and should include academics, radiation oncology, RSOs, ED leadership, state officials (Commissioner of Health) and state agencies such as DEP.**

2. **Surge capacity for biodosimetry may be addressed by training clinical laboratory personnel.**

3. **Partnerships among academics, state personnel and the private sector may aid training in radiation response.**