2022

RITN Tabletop Exercise (TTX) After-Action Report/Improvement Plan Laboratory Surge

Exercise Date: July 19, 2022

EXERCISE OVERVIEW

Exercise Name	2022 RITN Tabletop Exercise (TTX)
Exercise Date	July 19, 2022
Scope	This exercise is a distance-based tabletop exercise planned for 1 ½ hours. Exercise play is limited to RITN facilities and their response partners' collective challenges and considerations for improved and effective response.
Mission Area(s)	Response
Capabilities	Healthcare and Medical Response Coordination Medical Surge
Objective	**Objective 1:** RITN hospital staff can assess the ability of their laboratories to handle a surge in demand for complete blood counts with differential, comprehensive metabolic panels, and coagulation parameters. **Objective 2:** RITN hospital staff can identify staff, equipment, and other resource needs to include supply chain disruptions. **Objective 3:** RITN hospital staff can identify medical toxicology resources available and discuss coordination between the hospital and local poison center. **Objective 4:** Assess the ability of the blood bank to meet the increase in demand for blood products.
Hazard	Radiological
Scenario	Medical surge from a distant radiological incident
Sponsor	Radiation Injury Treatment Network® (RITN) National Marrow Donor Program (NMDP) Office of Naval Research (ONR)
Participating Organizations	City of Hope Comprehensive Cancer Center (Duarte, CA) Colorado Blood Cancer Institute (Denver, CO) Dartmouth-Hitchcock Medical Center (Lebanon, NH) University of Chicago Medical Center (Chicago, IL) University of Miami Health System – Sylvester Cancer Center (Miami, FL) University of Oklahoma Medical Center (Oklahoma City, OK) University of Pittsburgh Medical Center (Pittsburgh, PA) University of Rochester Medical Center – Wilmot Cancer Institute (Rochester, NY)

	University of Texas MD Anderson Cancer Center (Houston, TX)
Point of Contact	RITN Control Cell RITN@NMDP.ORG (612) 884-8276

EXERCISE SUMMARY

On July 19, 2022, RITN centers and the RITN Control Cell participated in an online tabletop exercise to describe coordination of the laboratory and outpatient surge response as well as information sharing, data systems, and supply chain disruptions following a distant radiological event. A facilitated series of exercise tasks were provided to participants for their consideration, response, and group discussion organized by the exercise scenario summary below.

Scenario Summary: The following illustrate the scenario events considered for participant discussion:

Exercise Scenario

- A 10-kiloton Improvised Nuclear Device (IND) was detonated in an urban area approximately 250 miles away from your facility. No threat of fallout and no utility interruptions.
- It is expected that a large number of people with mild to moderate trauma and those seeking evaluation for radiation exposure will self-evacuate to seek medical attention.
- Poison Control Centers (PCCs) throughout the country begin receiving large volumes of calls from people that were in the fallout zone.
- It is necessary to set up a receiving area for the outpatients and perform daily blood counts (i.e., CBCs collected and analyzed once per 24 hours).

Scenario Update

- Approximately 1,800 radiation victims have arrived in the local area, mostly self-evacuating. More expected over the next week. They require initial evaluation and blood tests; daily testing will need to occur for at least 2 weeks for many of them.
- In addition to the outpatients, approximately 500 samples are arriving daily to your laboratory for analysis from overwhelmed shelter locations closer to the blast site resulting in a total daily sample load that is nearly double the routine daily average.
- Due to the unprecedented detonation of an IND, transport of goods has been significantly slowed as inspections are increased at airports and along roadways within the U.S.
- There is a significant demand for blood products both in the immediate area and throughout the region where acute radiation injury patients are being housed. Trauma patients are also impacting total blood supplies. Volunteer donations have increased.

ANALYSIS OF CAPABILITIES

Exercise Discussion Module 1: Preparing for a Surge

Participants were tasked with responding to a series of questions at their individual facility then reporting out to the group on capabilities and actions. During the first module, two poll questions were asked of the group:

1. Does a laboratory surge plan exist for radiological incidents? **33% yes**
2. Is the local/state PCC included in RITN planning efforts? **42% yes**

Laboratory and Outpatient Surge

Facilities indicated that incident command would be established and then augmented with subject matter experts such as hematology, oncology, and laboratory. Communications with local, state, and federal partners regarding the surge response would follow established procedures (e.g., portal for local/county healthcare coalition).

Laboratory staff receive radiation training, but it is comprised of general radiation safety and does not include details specific to a RITN response (i.e., surge in laboratory samples/tests, exposure and sample handling). Another item mentioned by the exercise participants regarding laboratory personnel safety was the mental health stress and fatigue for a long duration response, similar to COVID-19. It would be important to designate the ICS Safety Officer to monitor staff health and implement any necessary protocols or modifications.

RITN hospital physicians with subject matter expertise would offer telephonic consultation as possible given the situation and associated staffing demands. Some would be willing to use the PCC to manage incoming calls. For example, the University of Pittsburgh Medical Center is co-located with the PCC who is trained on the radiological issues and management of a RITN event.

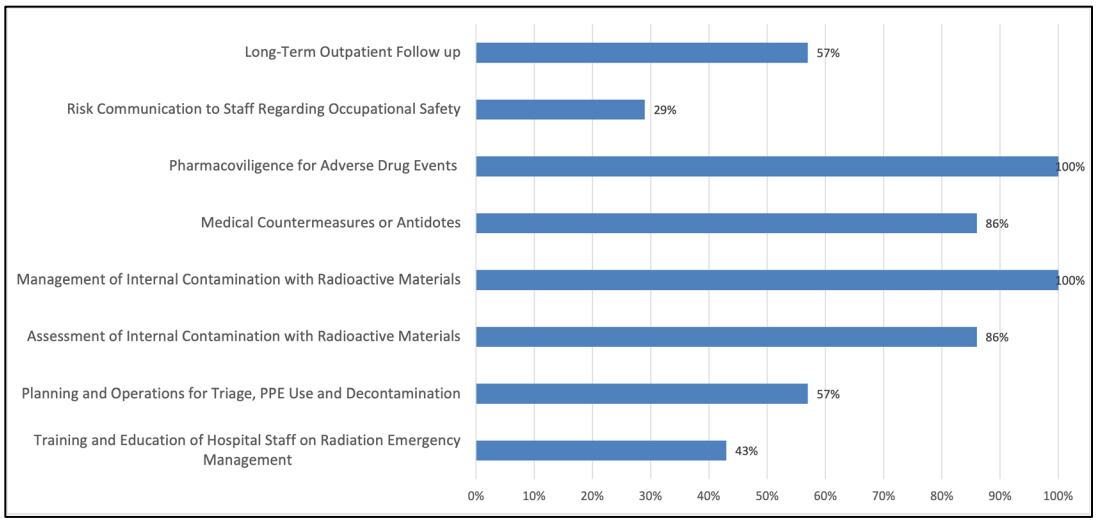
Medical Toxicologist and Poison Control Center Coordination

Hospitals were asked about the role of a medical toxicologist as it relates to RITN response plans. For example, to support activities such as training and education, triage plans and operations, the use of PPE, decontamination, assessment and management of internal contamination, long term follow up of outpatients, adverse drug events, and risk communication.

Just over one-third (37.5%) of responding RITN hospitals have a medical toxicologist on staff that could support the response with assistance from the radiation safety officer, trained EMTs or other expertise within affiliated university programs/residencies. However, 75% of hospitals

indicated that the medical toxicologist is not integrated into the RITN planning efforts. The functional response role that hospitals felt their medical toxicologist could take in a RITN response are outlined in Figure 1 below; most frequently mentioned was pharmacovigilance for adverse drug events and management of internal contamination while the least likely role for a medical toxicologist was to provide risk communication to RITN center staff.

Figure 1.



All hospitals indicated that they would rely on the PCC to handle incoming calls and consultations during a surge; however, the majority (75%) of participating hospitals have not shared the RITN referral guidelines with the PCC and half (50%) of respondents said that the PCC is integrated into planning efforts.. While relationships with the PCCs were demonstrated, the formalized process for sharing RITN guidelines and directing patients to the appropriate level of care during a disaster requires more attention.

Laboratory Staff, Supplies, and Equipment

For surge supplies, hospitals indicated having stockpiles available within the hospital or at affiliated facilities and/or coalition networks. Vendor contracts would be leveraged but supply chain (products and transportation) is an expected issue and likely would require escalating resource requests to the state and federal levels. Blood collection supplies (vacutainers, plastics) would be of biggest concern.

Laboratory staffing would likely be problematic; however hospitals would adjust work schedules, call in surge staff, and leverage affiliated sites within the health system.

Strengths

The following strengths were demonstrated:

Strength 1: Hospitals are familiar with emergency response plans to request staff and supply resources from affiliated organizations or to escalate the request to the healthcare coalition or state level following established protocols.

Strength 2: Hospitals have experience with supply chain issues following the COVID-19 pandemic and have strengthened relationships with local partners for resource sharing; with vendors for procurement.

Areas for Improvement

The following areas require improvement:

Area for Improvement 1: Only 33% of participating hospitals have a formalized laboratory surge plan; it is recommended to leverage the COVID-19 experience and plans/best practices from other hospitals to ensure a laboratory surge plan is in place to include radiological response. An additional resource that may assist with laboratory surge planning: https://www.aphl.org/aboutAPHL/publications/Documents/PHPR_SurgeCapacityLRNB_JAN2015.pdf

Area for Improvement 2: RITN hospitals should strengthen/expand their relationship with PCCs, in particular as it relates to support for a radiation incident and sharing the RITN referral guidelines to help with phone consultations.

Area for Improvement 3: More formally integrate medical toxicologists into the RITN planning efforts, for example to support training, decontamination, and pharmacovigilance.

Area for Improvement 4: Conduct an evaluation of supplies needed based on the scenario presented in this exercise to ensure a complete list of needs is outlined and the time it would take to receive specialty items (e.g., laboratory supplies).

Area for Improvement 5: Consider augmenting laboratory radiation safety training with details specific to a RITN response, such as the estimated number of specimens, test types, and timelines.

Area for Improvement 6: Ensure that response plans for staff health and well-being during incident response include considerations for prolonged stress and mental health such as assigning staff to monitor/check in on the employees (including laboratory personnel.

Exercise Discussion Module 2: Laboratory Testing, Result Reporting and Assessment of Blood Products

This module focused on the patient arrival and need for laboratory testing, data tracking, and blood products. As above, participating hospitals were given a set of questions to respond to.

Blood Collection and Data Tracking of Results

RITN hospitals indicated having plans in place to support outpatient blood draws and would rely upon models used during the COVID-19 pandemic such as using satellite centers offsite from the main hospital and augment phlebotomists and lab technicians with nurses, medical students, and other ancillary staff. Shuttles and/or couriers are in place to transport samples from offsite locations, though it may take more time than routine operations due to the volume of samples.

Epic electronic health records and Cerner or Beeker laboratory management systems are used by participating hospitals to track patients and report sample results, which have a proven track record from the COVID-19 pandemic for managing surge testing (i.e., barcodes would be used). To report patient results to the individual and outpatient shelter, patients would be registered into "MyChart"-type systems which while time consuming it would be worth it to electronically communicate results. None of the hospitals responding to this question indicated concerns with tests result tracking and reporting; the only issue highlighted would be the limited information available on patients.

Increased Testing Demand Capabilities and Challenges

Hospitals were also asked to consider the laboratory capacity to performed increased testing throughput. The main challenges would be staffing and supplies (e.g., tubes). Anticipated staffing gaps would be those who collect the blood sample, those who perform the tests and those performing data entry required for patient registration and sample tracking.

Supplies would be more of a challenge than staff or space, most laboratories have stockpiles of supplies but realize the supply chain fragility. Participating RITN hospitals indicated relying on the help of affiliated or neighboring hospitals, using contracted laboratory sites, and appealing to the national stockpile as well as NMDP/RITN.

Sample processing capacity varied by laboratory, ranging to the ability to surge minimally to being able to reach 1000-1700 tests per day in house. One hospital would leverage sister facilities in order to bring their total testing surge capability to 5,000-10,000 per day. None of the responding RITN hospitals would use manual flow cytometry and it is anticipated that a minority of patients would require this, only those that were triaged as potential transplant patients.

Responses were mixed as to how sample testing would occur; in at least one facility the default was to a "first in, first out" approach while others leaned into a prioritization strategy using clinical information (exposure, laboratory values, patient condition) to determine which samples should be tested first. A test code could be created to indicate certain samples need to be handled as priority within the lab.

Blood Products

RITN hospitals participating in this exercise would leverage their onsite donor centers, appeal to additional donors, and reach to external partners such as hospitals, local suppliers (e.g.,, Vitalin), and the American Red Cross. It was recognized that nationwide resources could be significantly impacted in a major/widespread catastrophe. The gaps related to blood donation would be phlebotomists, runners, and collection tubes, as well as sufficient refrigerated storage if there was a surge in donated blood products.

Blood irradiation is standard and has been performed in house at the RITN hospitals for the past several years. Also, it is estimated that 75% of blood products are already irradiated upon receipt.

One of the participating hospitals was located near the Canadian border and indicated that it may be possible to reach out to the Red Cross in Canada to support blood donations operations.

HLA Typing

HLA typing determinations are performed by the medical team using established criteria. Participating hospitals agreed that they would work through families (e.g., parents, siblings) for HLA typing and there would be a role for NMDP to assist with this process.

One participating facility said there was space in the -70°C freezer but further discussion was required to determine priority of what is stored. Another facility said that buccal swabs would be extracted and held by a private company. Others had storage for blood or buccal swabs onsite indefinitely in their HLA laboratory.

Strengths

The following strengths were demonstrated:

Strength 1: Hospitals would leverage models developed during the COVID-19 pandemic to respond to the surge in outpatient blood collection such as using medical students and ancillary staff for sample collection and registration, barcoding methods for rapid registration, as well as dedicated couriers for sample transport.

Strength 2: Hospitals have protocols in place to expedite priority samples for testing (to include a test code indicating priority); these would just need to be modified for the criteria related to radiation injury patient condition.

Strength 3: Hospitals have redundant blood suppliers in place and processes to establish a blood drive on site, but it must be recognized that collecting and processing blood (or having it shipped from another location) can take days so it is best to implement these activities early.

Strength 4: Established criteria and processes are in place to perform HLA typing.

Areas for Improvement

The following areas require improvement:

Area for Improvement 1: Staffing to support an increase in outpatient blood collection and sample tracking is expected to be a challenge. Using this scenario, continue to evaluate how to augment staffing for this purpose.

Area for Improvement 2: While partnerships with independent laboratories (e.g., LabCorp) exist, it may be valuable to discuss specific attributes of a radiation emergency and outpatient testing response with these partner labs.

Area for Improvement 3: Some hospitals did not report archiving patient blood samples for possible future HLA typing. If space permits, it may be valuable to do so for a certain period of time (e.g., 3 months, 6 months) either on site or at a private contracted facility. Discussions on which samples to prioritize for storage are also recommended.

Area for Improvement 4: Some hospitals do not have much capacity to expand testing particularly for a long duration response; these organizations should partner with other hospitals or contract with commercial laboratories to ensure plans are in place to surge.

APPENDIX A: IMPROVEMENT PLAN

This improvement plan template has been developed specifically for the RITN centers participating in the 2022 RITN Tabletop Exercise conducted on July 19, 2022. RITN centers can utilize this table to organize the opportunities for improvement to augment and develop their own corrective actions. The improvement plan is intended to strengthen the response of RITN hospital core capabilities identified in this report.

Core Capability	Issue/Area for Improvement	Corrective Action	Capability Element[1]	Primary Responsible Organization	Organization POC	Start Date	Completion Date
Core Capability 1: [Capability Name]	1. [Area for Improvement]	[Corrective Action 1]					
		[Corrective Action 2]					
		[Corrective Action 3]					
	2. [Area for Improvement]	[Corrective Action 1]					
		[Corrective Action 2]					

[1] Capability Elements are: Planning, Organization, Equipment, Training, or Exercise.

APPENDIX B: EXERCISE PARTICIPANTS

Participating Organizations	
City of Hope Comprehensive Cancer Center	Amy Pimentel
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Participating Organizations	
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University of Wisconsin Health	Erin McGuire
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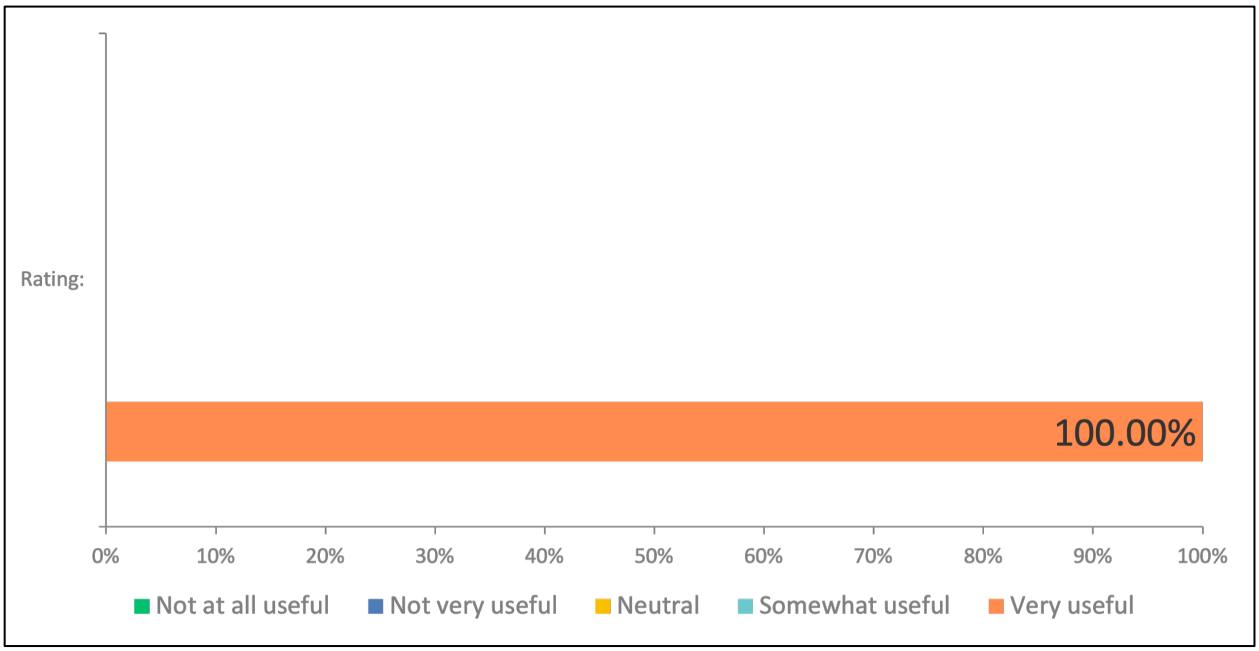
APPENDIX C: PARTICIPANT FEEDBACK

RITN Centers were asked to provide feedback via an online questionnaire following the exercise. The comments below are not in any particular order and are provided unedited to avoid intent changes.

Note: The average rating provided by the participating RITN centers regarding the usefulness of this exercise was 5.0 (out of 5.0). Number of responses = 7.



APPENDIX D: ACRONYMS

Acronym	Term
AAR	After Action Report
ARC	American Red Cross
CBC	Complete Blood Count
HLA	Human Leukocyte Antigens
ICS	Incident Command System
IND	Improvised Nuclear Device
NMDP	National Marrow Donor Program
NDMS	National Disaster Medical System
ONR	Office of Naval Research
PCC	Poison Control Center
RITN	Radiation Injury Treatment Network
TTX	Tabletop Exercise