2022

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

Exercise Date: August 17, 2022

EXERCISE OVERVIEW

Exercise Name	2022 RITN Tabletop Exercise (TTX)
Exercise Date	August 17, 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	Children's Mercy Hospital Kansas (Overland Park, KS) Cleveland Clinic (Cleveland, OH) Duke University Health System (Durham, NC) Franciscan St. Francis Health (Carmel, IN) Intermountain Primary Children's Hospital (Salt Lake City, UT) Karmanos Cancer Institute (Detroit, MI) Massachusetts General Hospital Cancer Center (Boston, MA) Memorial Sloan Kettering Cancer Center (New York, NY)

	North Shore University/Northwell Health Cancer Institute (Lake Success, NY) Northwestern Memorial Hospital (Chicago, IL) Scripps MD Anderson Cancer Center (San Diego, CA) Spectrum Health (Grand Rapids, MI) Thomas Jefferson University Hospital (Philadelphia, PA) University of California at Davis (Davis, CA) University Hospitals Seidman Cancer Center (Cleveland, OH) University of Kentucky Medical Center (Louisville, KY) University of Virginia Health (Charlottesville, VA) Wake Forest Baptist Health (Winston-Salem, NC)
Point of Contact	RITN Control Cell RITN@NMDP.ORG (612) 884-8276

EXERCISE SUMMARY

On August 17, 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? **55% yes**
2. Is the local/state PCC included in RITN planning efforts? **45% yes**

Laboratory and Outpatient Surge

Facilities indicated that incident command would be established and then augmented with subject matter experts (e.g., laboratory, hematology, oncology, blood bank, radiation safety) given the radiological scenario. Communications with local, state, and federal partners regarding the surge response would follow established procedures and be coordinated through incident command. Activating command would enable coordination amongst multiple RITN hospitals and the PCC within a geographic area.

Laboratory staff receive radiation training, often it is comprised of general radiation safety and does not include details specific to a RITN response (i.e., precautions for samples and patients). It would be important to have the radiation safety officer (RSO), medical toxicology and/or clinical staff working closely with the laboratory staff in this circumstance so they feel confident doing their job. The laboratory personnel must have and understand safety measures in place and use of appropriate PPE. Participating facilities also discussed decontamination, sample storage, and disposal of potentially contaminated waste.

RITN hospital physicians with subject matter expertise would offer telephonic consultation to the extent there was bandwidth to support it. At least one facility, would leverage their 211 system to receive incoming calls and have shared the RITN referral guidelines. This system could be better integrated with the PCC so that the same message is being communicated, but the 211 system has more bandwidth for telephonic consultation. Another facility would staff the telemedicine and phone consultation with hematologists and fellowship programs to help with assessment and triage of patients.

Plans developed by the Region 1 (Massachusetts) Regional Disaster Health Response System (RDHRS) include a provider to provider telephonic consultation in an emergency; for this scenario, radiation safety nurses could be identified throughout the system and be connected to

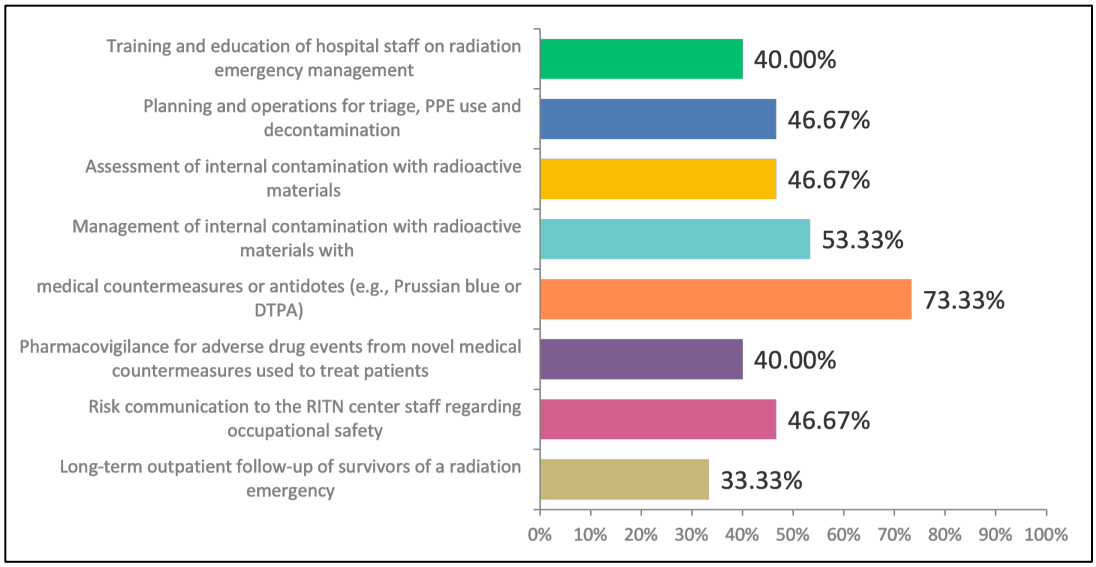
clinicians at other hospitals who have patients with acute radiation syndrome (ARS). If this was activated statewide, it could allow for patients to undergo assessment without needing to be transferred to a RITN hospital.

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.

Over 70% of participating hospitals (n=13) stated that they have at least one medical toxicologist available that could support a RITN response. It was recognized that often the medical toxicologists are more proficient in chemistry which is significantly different expertise that radiation, thereby the Radiation Safety Officer (RSO) would be the primary expert. REAC/TS was also mentioned as an expert that could be utilized in a radiological emergency, however in a nationwide event these assets would be extremely overwhelmed so it is still important to identify and coordinate with local/state experts. Only 31% of participating 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 medical countermeasures and least likely role being long-term outpatient follow up.

Figure 1.



Over 70% of hospitals responding to the exercise survey had not formally integrated the PCC into their RITN plans nor had the majority (56%) considered whether or not to use the PCC to handle incoming calls and consultations. Additionally, only 22% of participating hospitals had shared the RITN referral guidelines with the state/local PCC. At least one hospital utilizes the PCC as an education and outreach partner. 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 and reagents, hospitals indicated having stockpiles available within the hospital or at affiliated facilities and/or central location. Blood collection supplies (tubes, needles, syringes, plastics) would be of biggest concern. Hospitals recognized the competition for resources, routine supply chain disruptions being further exacerbated, and challenges getting materials to some locations (i.e., limited access that may require law enforcement assistance to get to the hospital). It was noted that resource requests may need to be escalated to the state or federal level though still a national shortage may be anticipated.

Hospitals would leverage knowledge and plans from the COVID-19 pandemic for sample testing surge and associated staffing requirements. For example, hospital campus' or networks have the ability to move around both staff and/or samples to maximize the ability to process samples.

Laboratory staffing would be of concern; however facilities can activate additional laboratory teams/departments/affiliated facilities or academic partners in anticipation of the sample surge. It was also noted that relationships are in place with regional laboratories that could help with the testing surge.

Strengths

The following strengths were demonstrated:

Strength 1: Over half (55%) of participating hospitals have a laboratory surge plan in place that includes a radiation incident.

Strength 2: 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, state or federal level following established protocols.

Strength 3: Hospitals have experience with supply chain issues following the COVID-19 pandemic and have strengthened relationships with local partners for resource sharing as well as to surge sample collection and testing.

Strength 4: Over 70% of hospitals have at least one medical toxicologist on staff; however less than half have of those have integrated that expertise into the RITN plans.

Areas for Improvement

The following areas require improvement:

Area for Improvement 1: 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 2: More formally integrate medical toxicologists (or similar expertise) into the RITN planning efforts, for example to support risk communication, decontamination, and administration of medical countermeasures.

Area for Improvement 3: It may be valuable to further discuss protocols for handling potentially radioactive samples and patients to include PPE use, decontamination, sample storage, and waste disposal. Laboratory staff should be trained on any updated protocols.

Area for Improvement 4: 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 5: While REAC/TS are recognized as the radiological experts, it must be acknowledged that they will be overwhelmed in a national emergency and it is important to identify and integrate into plans local radiological expertise (e.g., medical toxicologists, PCC, university).

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 have routinely exercised these operations and would utilize anyone trained in blood collection (e.g., phlebotomists, MD, RN, LNP) to perform sample collection, it would occur either at outpatient shelters or a multitude of possible locations on the hospital campus, use pre-established or internal couriers to transport samples.

Patients have to be registered and assigned a physician to create an electronic record which would be used for internal reporting and communicating lab results to patients. Some facilities mentioned the use of bar codes for faster registration and reporting of results. A challenge raised through discussion pertained to the outpatient shelters being operated by the county or state staff, so it was unclear how results would be shared with the patients. One suggestion was having a seat at the hospital command center for the county/state representative (or vice versa – hospital at the county command center) to streamline communications such as patient laboratory results.

Increased Testing Demand Capabilities and Challenges

Hospitals were also asked to consider the laboratory capacity to perform increased testing throughput. The main challenges would be staffing and supplies (e.g., tubes) to both perform the tests but also the data entry required for patient registration and sample tracking. The COVID-19 pandemic streamlined registration processes and at least one hospital has built an internal process for registering RITN patients and tracking them as a separate group; this could be implemented if enough staff were available for the registration process. Phone intakes by hospital operators with training could also facilitate more rapid registration.

Staffing was highlighted as the biggest challenge to increased testing demand as described by the scenario but the supply chain risks were also recognized. Others indicated being able to surge to other labs on campus (though there were concerns about the level of certification and possible need for altered standards of care) or external laboratories. Staff skills would also be evaluated in some locations to redistribute staffing to support laboratory functions.

Sample processing capacity depends on the test ordered but the majority of facilities were able to quantify the number of tests that could be performed per day (CBC, coagulation, chemistry) or

by how much they could surge beyond the routine operations. It was more difficult for facilities to answer the question about transitioning to and throughput for manual flow cytometry processes; it is a slower, more limited process or hospitals need to send the samples out to contracted laboratories. For some participating facilities, this question requires more consideration.

Sample prioritization is directed by the BMT experts, laboratory director, the RSO, and medical ethics. Samples are prioritized for testing based on severity of illness (inpatient, emergency room) and existing protocols (e.g., those developed during the COVID-19 pandemic) would be modified to expedite priority samples for this situation.

Blood Products

Hospitals would notify primary and secondary blood suppliers to obtain blood product resources from other areas. Blood drives and partnerships with universities to obtain blood products were also cited along with the longer lead time to bolster the supply. The anticipated gaps were supply chain issues, testing donors for infectious diseases, and trained staffing (FDA regulated process requires trained staff). RITN hospitals have the ability to irradiate blood onsite, but also can request that it be irradiated by the supplier prior to delivery.

HLA Typing

HLA typing determinations are performed by the medical team using established criteria. There were mixed responses for archiving early samples for future HLA testing – some performed this routinely, others utilized external blood banks or laboratories for sample storage and typing, while several others had not considered storing samples.

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 identifying staff trained in blood draws and/or laboratory testing and redeploying them as well as dedicated couriers for sample transport.

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

Strength 3: Some participating hospitals had implemented test codes or barcode systems that enable more streamlined registration processes in the event of a surge patients including the need for laboratory testing and result reporting.

Areas for Improvement

The following areas require improvement:

Area for Improvement 1: Use this planning scenario to consider methods for how results would be reported to the hospital physician from outpatient settings that are not part of the electronic health record system. This can include IT solutions or manual processes.

Area for Improvement 2: 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 or redeploy staff for this purpose.

Area for Improvement 3: Most hospitals did not have a well-established process for getting laboratory test results back to patients. This requires more evaluation and protocol development.

Area for Improvement 4: Phlebotomists and other staff that would support surge laboratory blood draws and/or blood product collection require additional training on their role in RITN response.

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 August 17, 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	
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Thomas Jefferson University Hospital	Margaret Dilks
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University of Kentucky	Olwen Burton
University of Kentucky	Jeff Bush
University of Kentucky	Alex Fenwick
University of Kentucky	Jay Overman
University of Kentucky	Cory Pelarski
University of Kentucky	Heather Spears
University of Kentucky	Brittany Ware
University of Kentucky	Dennis Williams
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University of Virginia Health	Mike Welling
University of Virginia Health	Shane Anderson
University of Virginia Health	Nat Sellers
University of Virginia Health	Christopher McLaughlin
University of Virginia Health	Tom Brady
University of Virginia Health	Minor Monge
Wake Forest Baptist Health	Rebecca Damron Jennings
Wake Forest Baptist Health	Ken Bishop
Wake Forest Baptist Health	David Holder
Wake Forest Baptist Health	Beth Fisher
Wake Forest Baptist Health	Roy Sellers
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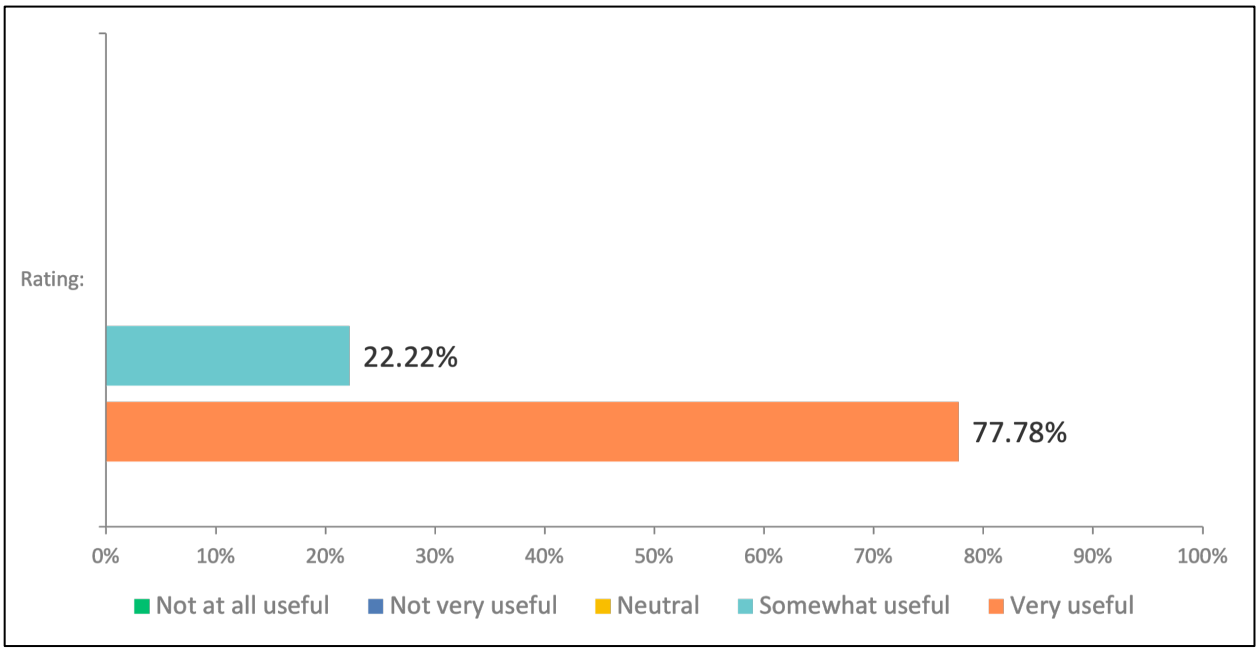
APPENDIX C: PARTICIPANT FEEDBACK

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 = 18.



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