Radiological Emergency Response Exercise

Medical scenario

Exercise Manual

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Contents

1. EXERCISE DESIGN

This section is for the exercise organizers, controllers and evaluators. It describes the scenario and provides guidance on how to adjust the exercise scope and objectives.

1.1. INTRODUCTION

This exercise manual is intended as the basis for the preparation, conduct and evaluation of a radiological emergency response exercise based on a transport accident involving radioactive sources. The sources used are Ir-192 and Cs-137, which are common in many countries for industrial and medical applications. The scenario involves a collision between a train and a truck carrying the sources. Several emergency response personnel and witnesses are potentially contaminated.

The exercise is designed to involve many emergency groups, including first responders, radiological assessors, medical first responders and ambulance staff, hospital staff and national organizations with a role in responding to such events. Yet, the scenario remains flexible and adaptable so that it can be used to conduct small, medium or large-scale exercise.

Although the exercise manual is very detailed, it is important to realize that it must still be adapted to the local context. Hence, users of this manual should consider it a basis upon which their own customized exercise manual can - and must - be developed.

1.1.1. Background

Accidents involving commonly used radioactive sources (radiological accidents) are significantly more frequent than nuclear reactor emergencies (nuclear accidents) and can occur almost anywhere in the world. Although radiological accidents typically affect fewer people, they can still potentially lead to severe consequences, including radiation injuries and even death. Such consequences can be significantly reduced with proper, coordinated emergency planning and response. Yet, many countries lack the coordinated preparedness needed to adequately respond to radiological emergencies.

Part of a complete preparedness program is the regular conduct of emergency response drills and exercises aimed at maintaining the skills of emergency workers and testing the coordination of various response organizations. One of the most important challenges in a radiological accident situation is to effectively coordinate the response of first responders, medical first responders, radiation specialists, hospital personnel and other qualified national and international resources. Once coordination emergency plans have been developed, emergency response exercises are a good way to verify the effectiveness of such plans.

This manual describes a radiological emergency response exercise in the context of a multi-disciplinary training program that may prove useful for maintenance of the skill levels pertinent to emergency preparedness.

1.1.2. Purpose of exercises

Regulatory controls, standardized procedures, and radiation safety audits reduce the likelihood of accidents occurring in the course of known radiological practices. In the case of unforeseen or illicit activities, emergency response services provide interventions that mitigate the health and environmental impact of exposures resulting from such activities. Despite such arrangements, accidents involving radioactive sources happen and, in some

cases, can lead to serious radiological exposures with medical consequences. In the unlikely event of an accident, adequate emergency response is the most effective line of defense.

The main purpose of emergency exercises is to challenge a significant portion of the overall emergency organization. An exercise that challenges a single team is usually referred to as a drill.

The objectives of an exercise can be:

- to validate plans and procedures and to test performance (*performance evaluation)*;
- to provide an opportunity for training in a realistic situation (*training*); or
- to explore and test new concepts and ideas for emergency arrangements (*trials*).

It is very important to note that, in the context of the present exercise, and in accordance with IAEA guidelines, a good exercise is not necessarily one where everything goes well, but rather one where many good lessons are learned. Therefore, the present manual encourages a realistic set up and conduct of a radiological emergency response exercise to reveal strengths and weaknesses of response arrangements, and it discourages the conduct of "choreographed demonstrations" that aim at showing how good the response organization really is.

1.1.3. Nature of this exercise

The exercise arrangements detailed in this manual focus on testing the cooperation between all emergency responders during the early phase of the response including, more specifically, between medical and radiological specialists. The arrangements also include a significant medical component, which covers medical response to a radiological accident both on-scene and at a medical receiving facility (hospital).

The basic exercise described in this manual consists of a one-day field exercise that focuses on the field response and early actions at the medical receiving facility, followed by a second-day table-top exercise aimed at testing longer-term decisions and actions to the medical and public health complications arising from the accident.

For the purpose of the medical component of the field exercise, some aspects of the initial response by non-medical personnel may have to be staged, precluding a realistic, free-play, exercise of these response resources. For example, in order to achieve certain dose levels for the simulated victims, the initial actions of the first responders may have to be staged to prevent early removal from the radiation field.

By adding or selecting appropriate exercise objectives and determining the amount of free play allowed in the exercise, it is possible to develop drills, table-tops, and partial or full exercises based on this scenario. Section 2.7 describes how the scenario can be adapted to change the focus of the exercise.

To test the full response capabilities, it is sometimes necessary to postulate an unlikely set of circumstances. The scenario described in this manual may appear very unlikely to some. Experience has shown, however, that most real accident situations involve a combination of events that may initially appear unlikely.

1.1.4. Definitions

Some new terms, used throughout this manual, must be properly understood by all who take part in the exercise. They are defined below.

Player	A person or organization that fulfills emergency functions during the exercise as if it were a real situation, whose participation is normally evaluated, and who does not normally know the scenario.
Controller	A person responsible for providing simulated exercise data and injects to the players, for directing the exercise as required and for stopping the exercise if necessary.
Evaluator	A person responsible for recording the player actions and evaluating the overall response against the exercise objectives after the exercise has ended.
Exercise team	Group of persons consisting of controllers and evaluators.
Observers	Persons invited to witness the exercise but who have no role as either controllers or evaluators, and no authority to interfere with the players actions.
Participant	Generic term used to designate players, evaluators, controllers and observers.
Exercise inject	Information that is provided to the players by a controller to simulate an event or action that has not really occurred but that is part of the exercise scenario. Example: "A concerned member of the public just called to find out if they could travel through the affected area."
Exercise data	Information that is provided to the players by a controller after the right actions to get that information have been completed. For example, when instruments are turned on and survey actions are performed, the controller provides simulated ambient radiation readings.

1.2. EXERCISE SPECIFICATIONS

1.2.1. Exercise objectives

The objectives of this scenario are to demonstrate the ability of the emergency response organization to fulfill the following performance objectives:

1.2.1.1. On-scene control

- Emergency response services arrive promptly at the scene.
- On-scene command and control is promptly established.
- The medical response at the scene is well coordinated with other response organizations, particularly radiological response, in terms of cooperation, command and control and communication links.
- The radiological response at the scene is well coordinated with other response organizations, particularly medical response, in terms of cooperation, command and control and communication links.
- The capability to direct and control emergency operations is demonstrated and maintained.
- The transfer of responsibility at the site, if it occurs, is carried out seamlessly and effectively.
- Immediate conventional hazards are promptly mitigated.
- Notification of public health and governmental authorities is demonstrated.

1.2.1.2. Medical response

- The medical responders at the accident scene (critical first aid) promptly address the immediate medical consequences of an acute event involving trauma, internal and external contamination and acute radiation syndrome.
- Life-saving medical first aid is given priority over decontamination.
- Triage of those involved at the scene of an accident (workers, responders, and public) is performed appropriately based on medical needs, contamination and potential overexposure.
- Critical patients are promptly transferred to the appropriate hospitals while minimizing, to the extent possible, the spread of contamination.
- Patient transport is performed safely using appropriate equipment.
- Patient care during transport is adequate.
- Effective initial and subsequent medical management of symptomatic, asymptomatic, externally contaminated, and internally contaminated patients is provided.
- Medical authorities correctly assess the current and potential public health issues related to the accident and notify authorities.

1.2.1.3. Radiological response

- Qualified radiological specialists promptly notify medical authorities of the presence of high radiation fields or the projection of high radiation exposures.
- A safe perimeter is promptly established and confirmed safe by scene survey and measurements of contamination.
- Capability of continuous monitoring, dose evaluation, and radiation protection of emergency workers, medical personnel, patients, and the public is demonstrated.
- Measures to prevent the spread of contamination are taken.
- Procedures for the monitoring and decontamination of emergency workers, equipment, and vehicles are adequate
- Hazardous sources are recovered or made safe in a timely manner.

1.2.1.4. Media relations

- The media at the scene is properly managed including rumor control.
- Media liaison is coordinated between the various response organizations.
- Factual media statements are formulated and issued to the public.
- Medical information is promptly provided to the relatives and the media; and is coordinated with other response organizations.

1.2.1.5. Public health

- The principal short-term risks to the population are identified and characterized.
- Decisions are taken and actions are outlined to allay fear and panic.
- An action plan that conforms to governmental guidelines is developed to control potential exposure from food production, sales, and consumption.
- A basic epidemiological assessment is developed and a study is designed.

1.2.1.6. International assistance

- The need for additional specialized assistance or medical referral is identified and assessed.
- If required, international assistance is requested.
- Appropriate coordination is established with international experts.

1.2.1.7. Post-exercise critique

- The capability of the emergency responding organization to conduct a post-exercise self-assessment and responders' exit interviews is demonstrated.

1.2.2. Exercise scope

The default exercise scope for which this scenario has been developed is described in Table 1. Please note that the scope is flexible and that various exercise types can be organized based on this scenario (see subsection 2.7).

TABLE 1. EXERCISE SCOPE

Aspect	Proposed definition
Level of participation	Initial response by local personnel with escalation to regional and national resources. International experts may be requested based on existing national capabilities.
Exercise duration	Two days with exercise debriefing on third day.
Exercise type	First day designed as field exercise including response at the scene, pre-hospital care and hospital emergency care up to stabilization and decontamination. The second day is designed as a tabletop exercise for the period of 1 to 30 days after the accident.
Hours	This exercise is planned for normal working hours. However, it could also be conducted outside normal working hours.
Participating organizations (see Table 3)	First responder personnel (police, fire, emergency medical services); local government officials; media; public health officials; commercial establishments (e.g., owner/shipper/transporter of source).

1.2.3. Exercise constraints

The exercise constraints are based on a combined radiological-medical exercise that tests emergency response procedures to assess, transport to an appropriate medical facility, treat, and decontaminate injured contaminated persons. The extent of play of the exercise does not include the participation of relocation centers or other offsite locations. The specific constraints for this scenario are:

- Number of casualties: at least 4 and at most 50 casualties.
- Medical consequences include:
  - Internal contamination;
  - External contamination;
  - Local overexposure;
  - Whole body overexposure.;
  - Deterministic and non-deterministic exposure levels;
  - Life-threatening and non-life-threatening injuries combined with radiological consequences.
- Cooperation between medical and radiological specialists must be tested.

The constraints can be adjusted to vary the exercise focus.

1.3. EXERCISE STRUCTURE AND SCHEDULE

The basic schedule is shown in Table 2. If international assistance and coaching is required, two days of preparation in advance of the start of the exercise should be scheduled.

TABLE 2. EXERCISE SCHEDULE

Phase	Day 2		Day 1		Day 1		Day 2		Day 3	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Preparation										
Controller and evaluator training										
Field exercise										
Table-top exercise										
Evaluation and out-briefing										

1.3.1. Preparation

Preparation includes the following actions:

- Finalize all logistics arrangements for the setup of the accident scene.
- Contact all participating organizations to confirm their availability on the days of the exercise (this supposes that initial coordination was completed well ahead of the exercise dates).
- Distribute the Players Guide to the players' organizations, who should in term brief the players.
- Make the final media coordination arrangements, if required.
- The exercise team members coming from outside the country arrive.
- Verify that the simulated patients are available on the day of the exercise and that the moulage[1] team will be available early before the start of the exercise.

Depending on the scale of the exercise and the experience of the exercise organizers, this phase may take more than two days. An assessment of the tasks to be completed in time for the exercise should be carried out several weeks before the exercise itself.

1.3.2. Controller and Evaluator Training

Exercise controllers and evaluators should be trained one or two days before the exercise. Training will consist of the following:

- Define the objectives of the exercise.
- Explain the scenario, including events to be played in real time and those that should not be played for safety reasons (explosions or fires).
- Describe the role of controllers and evaluators (see section 3).

[1] Moulage: simulation of physical injuries through the use of make-up.

- Describe the concept of *performance evaluation* and go through the evaluation objectives and criteria.
- Describe the emergency response system in the host country and recognition of cultural or system differences. This is mainly for the benefit of the international controllers and/or evaluators. For example, uniformed service personnel of a given country may function as medical responders without having medical training or ambulance services may include physicians.
- Assign specific responsibilities to the controllers and evaluators.
- Describe exactly how the exercise will be conducted (for example, the exercise may be one in which emergency responders do not know before arrival at the scene that a radiation hazard is present).
- Go through the scenario line by line using the master events list to ensure that each controller understands his/her role, actions required, and optimal responses should players request data.
- Explain the moulage needs
- Tour the accident scene and the facilities that will be used for the exercise.

The number of controllers necessary to control the unfolding of the exercise could increase or decrease based upon the choice of the variables discussed above. In an exercise involving a complex case mix and large number of patients (for example, 47) the proportion of controllers to patients could be as high as 1:1.

1.3.3. Field exercise (Phases 1 and 2)

The field exercise is divided into two phases:

1. on-scene response (Phase 1), and
2. the hospital response (Phase 2).

These phases will be conducted in real time at a simulated accident scene and will involve simulated casualties and patients. Phases 1 and 2 will cover the following aspects of the response:

- Discovery.
- Activation.
- Pre-hospital response at the scene.
- Triage.
- Initial transfer to hospital(s).
- Basic life support in transit.
- Immediate care.
- Decontamination and contamination control.
- Surveys.

Depending on the players' actual response, Phases 1 and 2 may overlap. The Phase 1 and Phase 2 organization and the complexity of the patient profiles will require participation by numerous

on-scene controllers and hospital controllers. In order to limit the size of the exercise organization, it is strongly suggested that a single hospital be used even if the standard procedures were to call for several hospitals to handle the disposition of patients. In such a case, evaluators would be informed to take into consideration the artificial change in standard procedure in their evaluation.

1.3.4. Exercise table-top (Phase 3)

This is further referred to as Phase 3 of the exercise.

Only selected representatives from the medical and other responding organizations will participate in this part of the exercise. At this point, the exercise becomes primarily focused on the longer-term medical assessment and response. It will cover the period of 1-30 days after discovery.

Phase 3 will address the following issues:

- Situation reports (lead agency, medical, radiological, public health)
- Triage.
- Identification of all potential patients.
- Definitive care in hospital.
- Media advisories (if required).
- Public health issues.
- Surveys.
- Interface with other organizations (rationale of decision-making and system limitations).
- Communication with the media.

The players will gather around a conference table. Exercise inputs will be provided in compressed-time and players will be asked to respond by stating clearly their assessment of the information and their intended course of actions.

1.3.5. Evaluation (Phase 4)

Phase 4 will consist of the following actions:

- Debriefing.
- Responders' exit interview.
- Final written report.

This phase is for the evaluators to evaluate the exercise, document medical assessment and care, and assess it in light of international guidelines. During this time, the players may hold their own self-assessment meeting, debrief each other, and conduct their own responder exit interviews

The evaluation should focus on performance. It should highlight the strengths and weaknesses of the response organization. It should not be focused on a pass-or-fail decision. It should provide constructive lessons and a meaningful learning experience for the players in the context of a series of training programs that they have attended previously.

To achieve this, evaluators will have to be selected amongst professionals who are familiar with the players' roles and practices and who have received similar professional training.

Once the evaluation is completed, the evaluators must communicate the results of the evaluation to the players. The evaluation should be submitted in writing as a draft report. Final editing and publishing should be completed within two weeks.

After the official evaluation reports have been presented, it is useful to reconvene players to discuss improvements required to address issues raised in the evaluation report. At this time, video clips of interesting aspects of the exercise could be shown, if available. These will help players understand issues raised and identify possible corrective actions.

1.4. PARTICIPANTS

The participating organizations are listed in TABLE 3. This list can be revised and adjusted depending on the specific scope and objectives selected by the organizers. In order to avoid confusion between players vs. controllers, evaluators and observers, the latter should be identified by special labeling, nametags, or clothing designed for the exercise.

TABLE 3. PARTICIPANTS

Participant	**Field exercise**	**Table top**
Ambulance	✔	
Hospital personnel	✔	
Radiological response team	✔	
Police and/or fire-rescue team	✔	
Media spokespersons	✔	✔
Medical specialists	✔	✔
Public health specialists	✔	✔
National authorities for radiological emergency response including designated IAEA national coordinator		✔
Owner of the source	✔	
Shipper/transporter of the source	✔	
Observers (government representatives, trainers, educator, etc.)	✔	✔

2. SCENARIO

This section is for the controllers and evaluators. It should be distributed to them at the latest on the day of controller/evaluator training, which should occur no later that one or two days before the exercise.

DO NOT GIVE THIS INFORMATION TO THE PLAYERS.

2.1. NARRATIVE

The accident takes place in a suburban area at the intersection between a railroad track and a main road next to a stream. The accident scene layout is shown in FIG. of Annex Situational data.

A truck with a driver and co-driver is carrying radioactive sources from a construction site. It is traveling with a radioactive placard and a manifest of sources being carried. It contains the following sources:

- Twelve Cs-137 gauges that were recovered from an industrial site being demolished. Each source contains approximately 4 GBq (100 mCi) of Cs-137.
- Two industrial gamma radiography instruments, each containing approximately 10 TBq Co-60 (300 Ci).

In their haste to leave the site, the drivers collected the radiography equipment with the tube still connected. One of the sources was not properly retracted and is still in the tube. The other is secure in its container. The driver and co-driver are exposed to the unshielded Co-60 source during transport.

The Cs-137 gauges are old and in very bad shape (FIG. 1).

FIG. 1. Cs-137 sources.

An example of the radiography instrument is shown in FIG. 2.

FIG. 2. Radiography equipment.

A train collides with the truck. The truck is dragged over 100 m and the cargo area is completely destroyed by the collision. One Co-60 source is ripped out of the tube. The one that was secure in the container stays in the container. The Cs-137 gauges are crushed and the Cs powder is dispersed. This results in contamination over approximately 20 m × 10 m down the track. Some of that contamination extends to the stream.

The truck driver and co-driver are seriously injured, stuck partway in the cab with sources around them. The truck driver struck his head on the control panel, broke his leg, and is unconscious. The co-driver has multiple lacerations and is confused. They receive a significant whole-body exposure. They also inhale small amounts of Cs-137 that has been partly dispersed in the air as a result of the accident. The train engineer, fearing a possible fire or explosion due to fuel spilled at the scene, went to help the driver and co-driver. He works to free them, which takes approximately 30 minutes, and receives a significant whole body dose.

There is a restaurant/bar at approximately 50 m northwest of the accident scene and a small shopping plaza at approximately 100 m southeast (directions may be adjusted to fit the local geography). At the time of the accident, 20 persons were in the restaurant/bar and 60 were in the plaza. One of them calls emergency response services, providing no more information than the simple fact that a train crash has occurred. Within approximately 10 minutes, 38 witnesses are within the contaminated perimeter at the scene of the accident, trying to help. Within the contaminated perimeter, not including the two drivers, the following injured people are found:

- The train engineer sustained lacerations and a chest injury during the crash, received significant exposure, and is contaminated.
- The assistant train engineer has been able to pull out of the locomotive and is sitting next to the train in the contaminated area with burns on his hands and forearms from scraping the engine block during the crash.
- Three witnesses went straight to the truck remains to try to manually extricate the driver and co-driver from the cab. They received significant exposure and are contaminated. Two of them are injured in the process, with burns and lacerations.

- Thirty-five[2] other witnesses roam around the accident scene, confused about what they should be doing to help. They all get contaminated. Most are not seriously injured. A few of the uninjured are women who had been shopping with children. At the time of the crash they left their children for safekeeping with family/friends at the plaza and approached the scene.
- Two of the 35 witnesses pick up one of the Cs gauges and hold it for a few minutes before they roll it into the river.

Twenty[3] more bystanders observe the scene from a distance, well outside the hazard area. Some of them were taking care of their own and others' children. No child ventured into the contaminated perimeter but some of the children, looking for their mothers, have neared it.

Approximately 30 minutes after the accident six policemen arrive and five minutes later five firemen arrive in two fire trucks, followed by two ambulances staffed by physicians (as is the practice in the Eastern European/New Independent States region). Because of the imprecision of the witness' initial call to emergency services the first responding personnel deployed to the scene have only rudimentary knowledge and awareness[4] of hazardous materials.

2.2. START STATE

The exercise begins with the arrival of emergency services personnel[5] who have been activated by a telephone call to the 24-hour call centre. The personnel include 17 persons, nominally six police officers, five firemen, and a total of six ambulance physicians, nurses and drivers[6]. When the emergency personnel arrive at the scene, the truck driver and co-driver have been pulled out of the cab by witnesses and are lying at some distance away from the Co-60 sources and Cs-137 gauges and on the edge of the contaminated area. All of the witnesses are standing at the edge of the contaminated area and are quite agitated. The emergency personnel descend from their vehicles and enter the accident area. One fireman fractures an arm. The overall situation is as described in TABLE 4.

TABLE 4. START STATE CONSEQUENCE SUMMARY

Persons	Consequences
Driver (D-1)	External contamination Internal contamination Dose received = 2-3 Sv

[2] This number of witnesses can be adjusted to fit the desired exercise scope.
[3] This number can also be adjusted to fir the desired exercise scope.
[4] This is a staged portion of the exercise designed to focus on the medical first response. For a realistic field exercise, the arrival of immediate responders does NOT need to be staged.
[5] The exercise start state presumes the following disaster response model:
- Fire Department: a municipal government service comprised of trained uniformed personnel with responsibility for fire fighting, extrication of victims, and damage control;
- Police Department: a municipal government service comprised of trained uniformed personnel with responsibility for traffic control, security, and collection of forensic evidence;
- Emergency Medical Services: a local or municipal government service comprised of trained medical first responders with responsibility for evaluation, triage, and transport of patients according to best practice guidelines of the community served;
- Incident Command: a pre-determined control strategy for disaster mitigation employed by uniformed personnel of all responding agencies (fire, police, EMS)

[6] This number of emergency response personnel corresponds to the number of radiation "victims" for which the scenario provides medical data. This number can be adjusted depending on the exercise scope and objectives.

	Bilateral femur fracture, head injury Unconscious
Co-driver (D-2)	External contamination Internal contamination Dose received = 2-3 Sv Multiple bruises and lacerations Confused
Train engineer (C-1)	External contamination Small internal contamination Dose received = 1-2 Sv Says he is OK but has chest injury
Assistant train engineer (C-2)	External contamination Small internal contamination Dose received = 1-2 1Sv Burns on hands and forearms
Witnesses at the scene (38)	
W-1 to W-3 helping the victims	External contamination Doses received = 1-2 Sv W-1: Burnt hands W-2: Laceration legs and arms, very small internal contamination W-3: No injury
W-4 to W-38	External contamination Doses received < 1 Sv W-4: Laceration on hand, very small internal contamination W-5 and W-6: Local radiation burns W-7, W-8, W-9: No injury W-10 to W-17 are females and have no injury W-18 to W-38 are males and are uninjured or have minor soft-tissue injuries
First responders, excluding medical personnel (5 firemen, 6 police)	
R-1 to R-5	External contamination Doses received < 1 Sv R-2: Arm fracture
R-6 to R-11	No contamination Doses received insignificant
Others	
20 by-standers including children	No external contamination Doses received insignificant

2.3. SETUP OF THE ACCIDENT SCENE

The accident scene should be set up as realistically as possible to suit the scenario. However, it may not be possible to be completely realistic. The following guidance may assist in creating a believable and motivating simulated accident scene.

- The accident can be simulated with a small and a larger truck on an apparent collision course.
- Source scattering can be simulated with a large number of boxes, each box representing one of the Cs-137 gauges. Mark each box with a radioactive label (II).

- Source damage can be conveyed by spreading debris, Styrofoam, etc. over the simulated contaminated area. One of the boxes should be placed away from the scene. If there is a stream next to the scene, the box should be placed in the stream or close to it to suggest that contamination may have leaked into the stream.
- The patients should be placed as shown in Annex Situational data.
- The injured patients must be "moulaged" at least one hour prior to the exercise start. Moulage requirements are contained in Table 22 of Annex B-3: Medical data.

One of the challenges in this exercise will be the transition from Phase 1 to Phase 2. This is because it is necessary to track the patients that will go to the hospital based on their actions at the accident scene. To simplify the exercise control, all potential patients must be labeled. The chief controller must ensure that the following is carried out before the exercise starts:

- Choose which three witnesses will be sent to hospital.
- Label the casualties and the injured witnesses in accordance with Table 22.

If the exercise focuses on medical response, select five responders who will simulate injured personnel and label them R-1 to R-5.

If the exercise focuses on on-scene coordination, do not simulate any injured or overexposed responders for Phase 2 and do not label responders.

2.4. KEY EVENTS AND CRITICAL TIMELINE

The critical timeline for this scenario is shown in Table 5. Events listed should happen as close as possible to the time shown and in the order shown for the exercise objectives to be met.

The critical timeline contains very few events. This is because this exercise should allow free-play. During the field exercise the players should be allowed to carry out their actions with little or no interference from the controllers (other than for safety-related issues).

TABLE 5. CRITICAL TIMELINE

Event	Timing (minutes)	Remark
Accident occurs.	0	
Witnesses respond to the scene.	< 15	This timing is important to stage the proper simulated doses.
Driver and co-driver are pulled out of the truck by witnesses and brought to the edge of the contamination.	30	This is important to stage the dose to the driver and co-driver for the medical scenario. If the focus is on the on-scene response, this event is not critical.
Response services arrive at the scene, are told that the truck contained radioactive material and are given a manifest of the inventory carried.	>30	

The first responders are informed that one of the spheres was seen rolling into the stream.	60	
Immediate medical response has been completed	End of day 1	

2.5. MASTER EVENTS LIST (PHASES 1 AND 2)

The master-events list (MEL) contains all of the exercise "injects", i.e. the messages that will be transmitted by the controllers to the players. The complete injects are contained in ANNEX A: EXERCISE INJECTS. Injects are numbered by phase and in tens so that new injects can be inserted at a later date without changing the numbering of existing injects.

TABLE 6. MASTER EVENTS LIST—FIELD AND HOSPITAL PHASES 1 AND 2 (DAY 0 OF EXERCISE)

Inject #	Time (h:min)	Inject (Controller must force the following actions or simulate the play)
Phase 1: Field Exercise *(Time from start state of exercise)*		
1-10	-0:30	Call to the emergency response 24/7 service to inform the dispatchers of the accident. There is leaking fuel. The information provided by the witness is basic information about a train and truck crash with no details about hazardous materials.
	0:00	Arrival of emergency services personnel. NOT AN INJECT.
1-20	When patient is examined by player	Provide data on the initial condition of patients.
1-30	0:30	W-5 informs the first responders that there is a radioactive placard. If 30 minutes later first responders have not requested of driver 2 the location of the manifest and found the manifest, then controllers provide the manifest to players.
1-40	0:45	When questioned, witnesses describe the accident.
1-50	0:45	If by this time first responders have not called their headquarters for radiation specialist support, then force the request to headquarters. Note if basic instructions for on-scene management are given by headquarters. If not, instruct the on-scene commander to establish a contamination perimeter, evaluate patients and transport patients in accordance with existing protocols.
1-60	1:00	W-7 informs one of the emergency responders that he saw a round object rolling into the stream.
1-70	1:00	Two members of the media arrive at the scene with cameras. Questions and issues are suggested in the inject.
1-80	1:15	20 more observers arrive at the scene, some of them in cars, blocking the road. Another car tries to drive through.
1-90	1:30	Fearing the dangers of radiation, W-1, W-2, W-3 and W-4 try to leave. If they succeed, the controller will bring them back to the on-scene commander.
1-100	2:00	Patient 12, witness 3, male, 28 years complains of nausea
1-110	2:30	Patient 12, witness 3, male, 28 years starts vomiting
1-120	3:00	End of Phase 1 when all the people at the scene have been controlled, injured patients

Inject #	Time (h:min)	Inject (Controller must force the following actions or simulate the play)
		have been evacuated, the source has been placed in a safe condition, the scene is stable and recovery work can begin. The exercise may go into recovery work if the number of controllers allows Phase 1 and Phase 2 to overlap. If so, one evaluator should stay at the scene to evaluate the source recovery work.
Phase 2: Hospital Immediate Care *(Timing is from the arrival of the first patient at the hospital. Time is approximate unless otherwise specified beginning with the arrival of patients at the hospital. Note that some injects may run in parallel with the Phase 1 injects, for example, if on-scene response proceeds as patients are being treated in emergency rooms. Time has been compressed to allow for Phase 2 to be completed in approximately ½ day)*		
	0:00	**Chief controller, determine Phase 2 time 0 as the time of arrival of first patient at the hospital and inform all Phase 2 controllers. Ensure all the patients are labelled.**
2-10	0:00	Initial medical condition As patients arrive at the hospital, their condition is given in Table 22. Medical data for phases 1 and 2. In addition, W-3 is nauseous.
2-20	0:30	Family members of patients start calling the hospital for news about the victims.
2-30	0:45	Mother of W-23 calls hospital to ask what to do about her son's shoes. They were taken away at the scene and he has no replacement shoes.
2-40	1:00	W-3 starts vomiting.
2-50	1:00	Media arrives and requests information of the condition of patients, the accident, the radiological regulatory system in the country, the requirements for transporting radioactive material, etc. The purpose of this inject is to force the hospital staff to start thinking about coordinated media efforts.
2:60	1:15	Three media representatives phone the hospital to find out about the patients.
2-70	1:30	Radio news flash announces that there has been an accident with widespread contamination, that 100 people were affected and that six people are in critical condition and may die from radiation sickness.
2-80	1:45	It is reported that some hospital staff are quite concerned about radiation and are trying to leave work early to minimize their risk. Some of the other hospital patients are also concerned and demand to be transferred.
2-90	2:00	Concerned citizens living downstream and quite a distance from the accident call the emergency response service and the hospital reception to find out if they should be worried about their health and what measures they could take to protect themselves.
2-100	2:00-2:30	Ten media representatives phone the hospital to find out about the patients.
2-110	2.30	R-2 If an X ray is not taken by hour 2:30, force an X ray.
2-120	2:30	C-1 If by hour 2:30 a chest X ray has not been done, force chest X ray.
2-130	2:30-2:45	Ten more media phone the hospital to find out about the patients.

Inject #	Time (h:min)	Inject (Controller must force the following actions or simulate the play)
2:140	3:00	The mayor calls the medical officer of health (or equivalent) to ask if there is a concern about public health and what he should tell people.
2-150	3:00	C-2 Nausea and vomiting, continuing
2-160	3:10	D-1 Patient dies.
2-170	3:30	W-2 Psychological decompensation. Nausea and vomiting.
2-180	3:40	W-1 Nausea continues
2-190	3:50	C-1 Patient has nausea.
2-200	4:00	C-2 Nausea and vomiting, continuing
2-210	4:00	D-2 Patient has nausea and is vomiting.
2-220	5:00 or when requested	Provide personal dosimetry data for assessment of exposures.
2-230	5:00	This Phase is terminated when the final patient has received emergency care, been decontaminated and been referred for further hospital care or discharged, or 8 hours after the start of Phase 1, whichever comes first.

2.6. MASTER EVENTS LIST AND FACILITATING NOTES (PHASE 3)

Table 7 outlines the tabletop exercise on the second day (Phase 3). Real time is from the start of the tabletop. The public health injects, medical injects, and supporting data are contained in Annex A and are to be provided to players only if requested or when stated so in the master-events list.

The role of the Phase-3 facilitator is a bit different from that of a field-exercise controller. Detailed instructions for the facilitator are given in section 3.2.4.

The format of the Phase-3 master events list (MEL) is printed in landscape mode to allow more room for discussion items. The Phase-3 MEL is to be used by the facilitator to guide the discussion.

TABLE 7: MASTER-EVENTS LIST FOR PHASE 3 (TABLETOP, DAYS 1-30 AFTER ACCIDENT)

Inject #	Inject real time (day 2)	Simulated time	Inject/controller instructions	Points for discussion

3-10
3-20
3-30
	08:00
	
	Discussion 08:00-09:00
		Start of day 2	Provide radiological, medical and public health situation reports (inject 3-10).
			
			Provide "start" medical data (inject 3-20).
			
			Media requests for information on patients' conditions, public health, incident and estimate of the dose received by the patients (inject 3-30).
				❑ What is your assessment of the situation?
				❑ What are the priorities?
				❑ Make a list of required actions in order of priority.
				❑ For each patient:
				  ❑ What is your assessment of the patient's condition? Prognostic?
				  ❑ What immediate medical actions are required?
				  ❑ What longer-term actions are required?
				❑ What else could happen next?
				  ❑ From a medical perspective.
				  ❑ From a public health perspective.
				❑ What actions would you take to prepare for what could happen next?
				❑ What should you tell the media?

3-40	09:00 Discussion 09:00-09:30	Day 2 10:00	The mayor/prefect responsible for the area wants to know what the public health issues are, especially given the rumour that a source was lost in the stream for some time before being recovered.	❑ Make a list of the major public health issues, in order of priority. ❑ Should there be drinking water and fish restrictions (assume that the public gets drinking water from downstream and that there are some deep wells located in proximity to the stream)? ❑ Are there appropriate guidelines for policy? ❑ What actions can you take to control drinking water contamination? ❑ Is it possible to identify people at risk? ❑ Is there a mechanism to identify, track, and notify those at-risk? ❑ Should there be a medical screening? ❑ How can you be sure that all the radioactive material has been recovered, and how do you reassure the population of that?

Inject #	Inject real time (day 2)	Simulated time	Inject/controller instructions	Points for discussion
3-50	09:30 Discussion 09:30-10:00	Day 3 09:00	Eight people show up at emergency saying that they were involved in the accident and may be suffering from radiation illness. After a quick survey, none of these people is found to be contaminated. After further medical analysis, none is found to have been exposed to more than 1 Gy.	❑ What actions should you take and what are the priorities? ❑ More people may be showing up. How do you quickly screen them? ❑ Are there actions that you could take to prevent the flooding of medical emergency rooms with people who are scared of possible contamination? ❑ How many people may realistically have been exposed? ❑ What about family members of witnesses who went home without being checked for contamination? ❑ Should the public be notified and should people be asked to report somewhere for screening if they think they may have been exposed? ❑ Is there a need for a concerted public health communications plan? ❑ Coordination with other hospitals. Patients may be reporting elsewhere too. ❑ How do you explain the risk to the public? ❑ Where could this I-125 be coming from?
3-60	09:45	Day 3 12:15	The radio reports that a private citizen brought a sample of water from the stream to a university for analysis and dangerously high contamination levels of Cs-137 and Iodine-125 were found. The media report further claims that an advisory to boil water should be issued by the authorities.	

3-70	10:00
	
	Discussion 10:00-11:00
		Day 7
		09:00
			Provide days 1-7 medical data.
			
			Provide bioassay data as and when requested.
				❑ For each patient:
				  ❑ What is your assessment of the patient's condition? Prognostic?
				  ❑ What immediate medical actions are required?
				  ❑ What longer-term actions are required?
				❑ What about methylene blue for cesium?
				❑ Risks/benefits?
				❑ Are these locally available?
				❑ Discuss the benefit of wearing dosimeters for the responders.

3-80	10:30	Day 7 12:30	More questions from the media who want to know how many people were actually affected, how many may die, and why such an incident was allowed to happen.	

Inject #	Inject real time (day 2)	Simulated time	Inject/controller instructions	Points for discussion
3-90	11:00 Discussion 11:00-11:30	Day 8 15:00	Offer of assistance from neighbouring country and from the IAEA.	❑ Do you have established procedures for requesting assistance? What are they? ❑ Who would be the coordinating agency? ❑ Draft a message that you would send to the IAEA.
3-100	11:30 Discussion 11:30-12:00	Day 9 10:00	Provide post-decontamination radiation levels at the site as measured by the radiological specialists, indicating that the site of the accident is still contaminated, clean up was not completed, and people may have been exposed to radiation even after the accident.	❑ What would be acceptable levels of residual contamination? ❑ Are there agreed upon limits in your country? ❑ What about the waste? ❑ What measures need to be in place to follow up the decontamination workers?
	12:00-13:00	**Lunch**		
3-110	13:00 Discussion 13:00-13:45	Days 8-21	Provide days 8-21 medical data for patients. Provide bioassay data if and when requested.	❑ Same assessment as before.
3-120	13:45 Discussion 13:45-14:30	Day 8 12:15	News report that the consequences of the accident are still rising, with additional people reporting sick to the hospital from what is believed to be radiation sickness.	❑ Should a public health advisory group develop plans for epidemiologic follow-up. Consider case/exposure registry? ❑ Who is the case? How to decide exposure threshold for follow-up? Discuss study design. Coordinate with Health Physics personnel, police, and others.
3-130	14:00	Day 8 14:00	Patient comes to hospital eight days after accident having been encouraged to do so by friends and family. One of the examining nurses surveys the patient with a survey monitor that records at least 10 times background on this patient.	
3-140	14:10	Day 11 09:00	Ten people claiming to have been present at the accident report to emergency of another hospital. They have no obvious symptoms but are feeling week and nauseous.	
3-150	14:30 Discussion 14:30-15:30	Days 22-30	Provide days 22-30 medical data for patients.	❑ Same assessment as before.
3-160	**15:30**		**ENDEX**	
	15:30-16:00	**Break**		
	16:00-17:00		Debriefing	

2.7. EXERCISE OPTIONS

One of the intended features of this scenario will be its adaptability. The "users" of this manual should be able to extract parts of the scenario to conduct drills, table-tops or field exercises at the local, regional or national levels testing the pre-hospital, in-transit, or in-hospital aspects of patient care. The following sections describe how the scenario and exercise can be adapted for various goals.

2.7.1. Exercise with focus on on-scene response

To test the real-time response of the emergency response services in an accident involving radiation, the start-state could be modified as follows:

- Leave the driver and co-driver in the truck.
- The train engineer and assistant engineer attempt to rescue the drivers without success but they stay at the scene, trying, until the first responders arrive and give them instructions.
- No change for the witnesses, except that the number of witnesses may vary according to the desired exercise scope.
- Let the first responders free-play without intervention from the exercise controllers.
- No responders will be dispatched to the hospital.

The exercise organizers can also vary the complexity of the scene by adding conventional hazardous materials to the simulated radioactive material.

In the case of an exercise focusing on on-scene response, the medical component of the exercise would be more focused on the coordination with other emergency responders. The radiological consequences would not be fixed since they would depend on the time taken to pull the victims from the hazard area. Therefore, simulated doses and personnel contamination would have to be dynamically adjusted by the exercise controllers based on the emergency responders' actions.

2.7.2. Exercise with focus on short-term medical response

If the goal is to test the hospital immediate care only, then start the simulation with the patients in the ambulance. In this case, patients 1 to 12 will all be simulated.

Assume the patients are contaminated and vary the complexity of the medical profiles. For example, the train conductor could suffer a pneumothorax, leading to a discussion of appropriate timing of life-saving vs. decontamination procedures. Terminate the exercise when the last patient has been decontaminated and has left the hospital emergency area.

2.7.3. Exercise with focus on longer-term medical response

To test the longer-term medical response, hold the tabletop portion of the exercise only.

2.7.4. Number of patients

The number of patients can be adapted to match the desired exercise scope. For example, assuming that, as a minimum, the driver is injured and overexposed, then all the other persons contained in this scenario are optional. They may still be there but may not necessarily be contaminated. The exercise organizer can choose which of the persons included in this scenario should be part of a specific exercise.

As mentioned, as the number of patients and complexity of case mix increase, the exercise organization becomes more complex and labor-intensive.

3. GUIDE FOR CONTROLLERS AND EVALUATORS

This section is for the controllers and evaluators. It should be distributed to them well before the exercise and should form the basis of controller and evaluator training that needs to take place in the days preceding the exercise.

3.1. GENERAL INFORMATION

This exercise comprises two main components: a one-day full-field exercise and a one-day tabletop exercise. During the field exercise:

The chief controller will be in charge of all aspects of the exercise conduct. He/she will be assisted by several area controllers, who will be responsible for designated parts of the exercise.

The chief evaluator will be responsible for the management and conduct of the evaluation team. He/she will coordinate with the chief controllers, who remains in charge of all aspects of the exercise conduct.

Observers, if present, must not interfere with the exercise. One controller must be designated for each group of observer. He/she will instruct the observers on the need to refrain from interfering with the exercise and will ensure that this is adhered to during the exercise.

3.1.1. Exercise control and evaluation organization

The exercise control and evaluation organization for Phases 1, 2 and 3 are listed in Table 8, Table 9 and Table 10, respectively. As much as possible, the controllers and evaluators should be different persons, unless there is a restriction on space, for example in the ambulance. In this case, the controller may also act as the evaluator.

For Phase 2, the control organization can be quite complex due to the need to provide real-time medical data to the examining physicians and other medical staff for all the patients involved in the exercise. These patients include the witnesses brought to the hospital, even if they show no abnormal symptoms. For this Phase, the optimal controller team will be determined as follows:

- Estimate the number of patients that may be brought to the hospital.
- Estimate the number of teams of physicians and/or nursing staff and/or paramedics who may work independently at the hospital.
- Choose between the two following exercise control strategies:

    1) Patient control: there will be at least one controller for each group of four patients. Controllers will provide medical data to the medical staff when requested and when appropriate medical actions are taken. Controllers will also coach the simulated patients to fulfill their role.

    OR

    2) Medical control: there will be one controller for each team of physicians, nurses and/or paramedics. Each controller will follow the medical team and provide the medical data for the patients being examined.

Depending on the number of simulated patients and medical teams at the hospital, one option or the other will require fewer controllers. Before making a decision on the Phase-2 control strategy, however, the practicality of each should be considered (e.g. there may be physical reasons why one option may not work at all).

TABLE 8. EXERCISE ORGANIZATION (PHASE 1)

Position	Name	Location	Responsibilities
Controllers			
Chief		On-scene	Overall conduct of the exercise.
Site		On-scene	Setup the simulated accident scene, including equipment and people. Ensure that overall safety is maintained at the scene during the exercise. Cleanup the scene after the exercise.
Radiation 1		On-scene	Provide ambient and contamination data to radiation survey personnel responding at the scene.
Radiation 2		Contamination control point	Provide personnel and vehicle contamination data (as appropriate) to the radiation surveyors in charge of controlling people, equipment and vehicles at the control point.
Radiation 3		As required	Assist Radiation controllers #1 and #2 as required.
First response		On-scene	Follow the first response team and provide injects as required.
Medical 1		Ambulance 1	Ensure that the moulage of simulated victims is ready prior to the exercise. Explain to the truck drivers and the train engineers what their role is during the exercise. Brief the casualties on the nature of their injuries. Follow ambulance #1 and provide medical and radiological data on casualties, as required.
Medical 2		Ambulance 2	Follow ambulance #2 and provide medical and radiological data on casualties, as required.
Other medical			Depending on the medical resources that are expected to be dispatched to the accident scene, there may be a need for additional medical controllers. There should be one medical controller per medical or paramedical team.
Media		On-scene	Organize and simulate the media at the scene.
Crowd	May be the same as the site controller	On-scene	Organize the simulated crowd and brief the people on their role and exercise behaviour. Ensure crowd injects are provided when required.

Position	Name	Location	Responsibilities
Evaluators			
Chief		On-scene	Manage the evaluation team. Evaluate the on-scene commander and on-scene team coordination.
Radiation 1		On-scene	Evaluate the main survey team.
Radiation 2		Contamination control point	Evaluate the contamination control point.
First response		On-scene	Evaluate the non-medical response teams.
Medical 1		Ambulance 1	Evaluate the first medical response team that arrives at the scene.
Medical 2		Ambulance 2	Evaluate the second medical response team that arrives at the scene.

TABLE 9. EXERCISE ORGANIZATION (PHASE 2: HOSPITAL)

Position	Name	Location	Responsibilities
Controllers			
Chief		Hospital	In charge of Phase 2 of the exercise. May be the same as the chief controller for Phase 1 if the two Phases do not overlap.
Medical		With the patients or with the medical team (see discussion above)	Provide the medical data for each patient, as required. Note. The patients need to be clearly identified so that they can be transferred between controllers in a seamless fashion. Patients include witnesses who have been brought to the hospital, even if they show no symptoms.
Survey - access point		Access to the emergency room, where contamination surveys are being done	Provide contamination data to survey personnel monitoring patients at their arrival to the treatment area. See subsection 7.2.1.7. for contamination data.
Survey – emergency room		Emergency room	Provide contamination data to personnel monitoring patients undergoing treatment in the emergency room. See page subsection 7.2.1.7. for contamination data.
Survey – exit point		Exit from the emergency room	Provide contamination data to survey personnel monitoring patients at their exit from the treatment area. If the access and exit are close, the survey controllers for access and exit points may be the same. See subsection 7.2.1.7. for contamination data.
Simulation cell		Hospital administration team or suitable	Provide injects on events external to the hospital.

Position	Name	Location	Responsibilities
		office with phone or fax	
Evaluators			
Chief		Hospital	In charge of Phase 2 evaluation of the exercise. May be the same as the chief evaluator for Phase 1 if the two Phases do not overlap.
Triage (1 or 2)		Emergency room reception	Evaluate the medical triage
Emergency room (1 or 2)		Emergency room	Evaluate the medical trauma treatment of patients in a potentially contaminated environment.
Radiation protection		Roaming	Evaluate the radiation protection aspects of the work performed by all the medical personnel.

TABLE 10. EXERCISE ORGANIZATION (PHASE 3: TABLETOP)

Position	Name	Location	Responsibilities
Facilitator		Conference room where the tabletop is held	Establish and communicate the rules for the tabletop. Establish and clearly communicate the goals of each discussion period. Provide injects and data. Guide the discussion.
Assistant facilitator		Idem	Assist the facilitator with the data, injects and general organization of the tabletop.
Evaluator		Idem	Evaluate the responses by the tabletop participants.

3.1.2. Schedule

The schedule in Table 11 needs to be completed by the exercise organizers well in advance of the exercise.

TABLE 11. CONTROLLER AND EVALUATOR SCHEDULE

Action	Date/Time	Location
Exercise team training		
Pre-exercise meeting of controllers and evaluators for final coordination and time check (day of the exercise)		
Field exercise (Phase 1)		
Hospital exercise (Phase 2)		
Tabletop (Phase 3)		
Players debrief (immediately following the exercise).		

Note that this debrief is held BY the players FOR the players. Controllers and evaluators do not normally comment during this debriefing session.		
Evaluators meeting		
Final debrief		
Final evaluation report		

3.1.3. Locations

This section must be completed prior to the exercise. It will contain all the locations that will be used during the exercise. It should also state who is responsible for ensuring that the venues are available and open on the day they are needed, and who is responsible for ensuring that all the required equipment and logistics will be available at the appropriate locations when required. Table 12 provides guidance on the locations required and must be completed by the exercise organizers prior to the exercise.

TABLE 12. EXERCISE LOCATIONS

Exercise portion	Date	Location	Equipment required	Responsible
Exercise team training			Projector Paper and pens Exercise manuals	
Phase 1 (field exercise)		Site	Setup material	
Phase 2 (hospital exercise)		Emergency room and hospital facilities (note that regular patients may have to be relocated)	Standard medical equipment as available	
		Simulation cell	Telephone Fax	
Phase 3 (tabletop)			Projector Blackboards or easels Writing supplies	

3.1.4. Logistics

Exercise organizers must ensure that the logistics arrangement contained in Table 13.

TABLE 13. LOGISTICS ARRANGEMENTS

Item	Remarks
Hotel reservations or other accommodations	
Meeting locations and times	See subsection 3.1.3.
Writing supplies for controllers and evaluators	
Writing supplies for tabletop	
Electronic equipment	Projector, electronic easels, etc.
Transportation for exercise team and observers	To the field accident site From the site to the hospital
Communications for the controllers and evaluators	Ensure radio channels are different than those used by the players
Safety equipment	Hard hats Hard boots Dosimeters Fire fighting equipment if working with hazardous material
Identifying badges	Badges for controllers and evaluators. Patient identification badges.
Copies of the scenario, guides for controllers and evaluators, and guides for players.	
Moulage team	Moulage to be completed at least one hour before the start of the field exercise.
Others (specify)	

3.1.5. Communications

Communications between players will take place through standard communication channels, in accordance with the plans and procedures, unless otherwise directed by the controllers. Due to the risk of those communications being inadvertently intercepted by members of the public or the media, and to avoid the perception that a real emergency is taking place, all communications between players must start with **"FOR EXERCISE"**. Controllers must ensure that this is respected during the exercise. Players often forget!

No communication with outside non-participating organizations is permitted during the exercise. However, communications with non-playing organizations must be directed to the simulation cell or to the local controller.

Controllers and evaluators will use separate communication channels to the extent possible.

3.1.6. Safety

Safety is paramount. All players, evaluators and controllers are responsible to ensure that actions taken do not pose real safety concerns. Players shall not deviate from normal safety procedures under any circumstances. If a play event causes safety concerns to the players, they must notify the appropriate controller. The exercise may then be allowed to proceed by simulating response actions, may be interrupted temporarily by the controller or may be stopped.

In case of a real emergency, players must immediately notify the appropriate controller, who will inform the chief controller. The chief controller will then decide how to proceed and may decide to suspend or stop the exercise.

3.2. GUIDE FOR CONTROLLERS

3.2.1. Roles and responsibilities

The role of a controller is to direct the exercise through providing information to the players as to the state of the scripted emergency. Controllers provide exercise injects and data, and monitor safety.

They must ensure that they are thoroughly familiar with the overall exercise scenario and evaluation objectives, and their particular roles and responsibilities. Prior to or during the exercise, controllers should not hesitate to discuss matters of concern with the chief controller to obtain guidance or clarification.

The Lead Controller has ultimate authority over all other Controllers, Evaluators, and any guests or observers.

Controllers' responsibilities will likely occupy them fulltime during the exercise. For this reason, as much as possible, controllers should not also be evaluators. Exceptions to this rule include the following situations:

- Space is limited and two exercise staff may not be present at the same time (e.g. ambulance).
- The controller has few injects and is primarily present to ensure the scenario remains on track.

3.2.2. Controller instructions

- Make sure that you are wearing an identification badge, hat or other.
- Ensure you have the proper communications equipment, if required.
- Go to your designated location at least 15 minutes prior to the exercise start at that location.
- Once on location, immediately inform the chief controller that you are ready.
- Identify yourself as controllers to the organization being evaluated at the start of the exercise.
- The exercise starts on time unless otherwise instructed by the chief controller.
- Begin each message with "FOR EXERCISE ..."

- Ensure verbal communications are well understood by the players.
- Begin and end printed messages with “FOR EXERCISE”;
- Closely follow the instructions in the Master Event List and ensure that all injects are being delivered.
- Provide data if requested or deserved by the players. Data is deserved if the player takes appropriate actions that, in a real situation, would lead to the data.
- If the scenario gets off track, immediately report the problem to the chief controller. If immediate corrective actions are required to keep the scenario on track, take such actions and inform the chief controller after. Otherwise, wait for the chief controller instructions. Note that “getting off track” means that the rest of the exercise may be compromised as a result, e.g. responders find a source that is supposed to be lost for the purpose of the exercise.
- Do not accelerate the exercise by providing information ahead of schedule, unless directed by the chief controller. Do not create injects unless they are necessary to return the exercise on track. Inform the chief controller of key new injects provided.
- Immediately halt an activity that is unsafe and report the action to the chief controller. Note that only the chief controller can terminate the exercise.
- Monitor the players and make minor adjustments only when necessary to keep the exercise on track or to maintain a safe environment.
- At the end of the exercise, return the exercise site to a safe state.

3.2.3. Simulation cell

One simulation cell will play the role of non-participating organizations. The exact role will vary depending on which organizations decide to play. The simulation cell should provide simulated organization injects by telephone or fax when required. An exercise telephone list must be provided to the players at the time of the exercise. The exercise telephone list will list the simulated organizations and their simulated telephone numbers, which are for telephones located in the simulation cell.

3.2.4. Phase 3 facilitator instructions

The Phase 3 facilitator is more than a controller. His/her role is also to guide the discussion and make sure that the results obtained are constructive. This requires great flexibility, agility and diplomacy. The facilitator should never argue or present his/her own opinion.

- Introduce yourself as the facilitator.
- Introduce the objectives of the tabletop. Write them on a board in view to all if possible. Otherwise, distribute the objective in printed form.

  Tabletop objectives

  - Discuss long-term medical and public health issues following a radiological accident.
  - Assess the ability of the participants to determine appropriate actions in the days following a radiological accident.

- Explore issues associated with the longer-term response to a radiological accident.
- Encourage cooperation between the various specialists.
- Build a basis for on-going coordination between the various specialists.
- Encourage the formulation of constructive solutions to the complex longer-term challenges of radiological accidents.

- Explain how the tabletop will work:

  Tabletop conduct

  - The tabletop is a discussion exercise designed to encourage evaluation of simulated situations and decision-making.
  - Time is compressed and spans the period between the day following the accident up to 30 days later.
  - During the day, situations and injects related to the radiological accidents will be provided. In some cases, specific issues to discuss will accompany the injects.
  - The facilitator will give a time limit for discussion. At the end of this time, the players must present:
    1. Their assessment of the situation.
    2. Their decision on required actions, in order of priority.
    3. Their assessment of what should be done next.
  - The players must designate a leader and a recorder.
  - If the players decide to break into working teams to tackle specific issues, they can. In this case, each team will designate a team leader and a recorder.
  - If there are questions regarding missing information, the players must ask the facilitator, who may provide the information is it is available and if it is realistic to obtain it based on the actions taken by the players.

- Ask if there are any questions.
- Start the tabletop with the first inject.

Note that, to start the tabletop on time, the pre-tabletop briefing should start approximately 30 minutes in advance.

3.3. GUIDE FOR EVALUATORS

3.3.1. Roles and responsibilities

During the exercise, the role of evaluators is to record facts, and only facts. The evaluation will take place after the exercise, in accordance with the performance objectives contained in section 3.4.

The role of evaluators is to observe the exercise and make notes of their observations for later analysis and evaluation. They do not interact with the players, except for urgent safety concerns, and should route questions through a controller where possible. The evaluators must be able to

recognize deficiencies and make recommendations. However, this does not mean that evaluators should constantly be on the lookout for small errors. Only those deficiencies that affect the overall effectiveness need to be investigated thoroughly. Keep note of all deficiencies and quote examples to reinforce comments.

Evaluators must have excellent knowledge and experience of the functions that need to be evaluated.

3.3.2. Evaluators instructions

Prior to the exercise

- Review the scenario timeline and exercise evaluation objectives applicable to your area.
- Review the applicable evaluation criteria.

During the exercise

- Arrive at the assigned location at least 15 minutes prior to the beginning of the exercise.
- Ensure you are wearing the Evaluator identification badge, hat or other.
- Position yourself to maximize your effectiveness in evaluating, and DO NOT interfere with exercise play.
- Record facts, not impressions. Identify specific occurrences with time, date, location and organization involved. Record occurrence of repetitive actions.
- Record the time of major scenario events and actions.
- Ensure that each item is relevant to the role of the person/organization being evaluated.
- Note strengths as well as weaknesses.
- Ask questions only for clarification, and only if absolutely necessary. Do not become involved in discussions with players or other evaluators or controllers. Do not joke with the players.
- Listen to all communications.
- Check actions against the plans, procedures, directives, etc.
- Observe but do not correct. Let the players solve the problem.
- Observe the way the controllers provide the injects and the data and note any problems associated with these actions (e.g. data not clear or too late, etc.).

After the exercise

- Collect all printed notes, faxes, etc. generated by the players.
- Attend the players' debrief session, but do not offer comments until your evaluation meeting with the other evaluators has taken place.
- Review and consolidate your notes prior to the evaluation meeting. Use the exercise evaluation objectives as a guide to ensure that your notes cover all relevant aspects of the evaluation.
- Attend the evaluation session at the time and location specified by the chief evaluator.

3.3.3. Evaluation meeting

The evaluation meeting will be chaired by the chief evaluator. All evaluators will attend. The following procedure should be followed:

- Establish the exercise timeline based on the evaluators' notes.
- Review each exercise evaluation objective. Note that some objectives apply more to the field exercise or to the table top.
- For each objective, review the facts as collected by the evaluators. Ask yourself the question: how do these facts really relate to the objective being evaluated?
- Grade the performance against each objective and record the facts from the evaluators' notes to clearly support the grading.

Exercise objective grades

- **Excellent**: this means that the performance of players exceeded expected standards of good practice and is amongst the best that you have seen.
- **Good**: this means that the performance met expected standards.
- **Below standard**: this means that the performance requires improvements in this area in order to meet the expected standards.
- Remember that the evaluation must be based on facts, not perception. Allow that some of the facts may be wrong and, if they are critical, may need to be verified with the players.
- At the end, determine the key strengths and weaknesses of the exercise.
- Document the evaluation in writing.

The table of exercise objectives and criteria will be used as the template for the evaluation report.

Phases 1, 2 and 3 of the exercise should be evaluated separately. If required, the chief evaluator will separate the evaluators into groups for each Phase. Note that not all objectives apply to all Phases. The evaluators will indicate exercise objectives that do not apply by writing "*not evaluated*" against the relevant objective in the evaluation report (see section 3.4 for report template).

3.3.4. Evaluation debriefing

The findings of the evaluation meeting must be presented to the key players as soon as possible after the exercise. This presentation should be prefaced with the following statement:

> *"The evaluation contained in this report is based on facts as they were observed by the evaluators. However, we realize that evaluators are human and that some facts may have been missed or misinterpreted. Therefore, please consider this evaluation report as a guide for the improvement of your emergency response capability, and NOT as a criticism of your abilities as emergency responders."*

3.3.5. Exercise report

The written evaluation report should be provided in draft form immediately following the evaluation meeting. A final evaluation report should, as much as possible, be produced and delivered to the senior emergency response representatives no later than two weeks following the exercise.

3.4. EVALUATION OBJECTIVES AND CRITERIA

TABLE 14. EVALUATION OBJECTIVES AND CRITERIA

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
1	**Objective: On-scene control is established, maintained, coordinated and effective.**		**Grade:**
1.1	Emergency response services arrive promptly at the scene.	Time of first call: Time of arrival at the scene:	
1.2	On-scene command and control is promptly established.	Person in charge: Is it clear to all who is in charge? Are situation reports provided by the on-scene commander? Are actions by all response teams well coordinated?	
1.3	The medical response at the scene is well coordinated with other response organizations, particularly radiological response, in terms of cooperation, command and control and communication links.	Do teams talk to each other? Do medical teams report to the on-scene commander?	
1.4	The radiological response at the scene is well coordinated with other response organizations, particularly medical response, in terms of cooperation, command and control and communication links.	Do teams talk to each other? Do radiation survey teams report to the on-scene commander?	
1.5	The capability to direct and control emergency operations is demonstrated and maintained.		

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
1.6	The transfer of responsibility at the site, if it occurs, is carried out seamlessly and effectively.	Is there a transfer of responsibilities during the response? How is this transfer effected? Is there a briefing between the old and the new on-scene commander? What information does the briefing contain? Is it confusing?	
1.7	Immediate conventional hazards are promptly mitigated.	What conventional hazards are present? Are they recognized? Are special precautions taken?	
1.8	Notification of public health and governmental authorities is demonstrated.	Time of first notification: Content of notification message: Frequency of situation reports:	
2	**Objective: Pre-hospital (Phase 1), hospital (Phase 2) and longer-term (Phase 3) medical response is effective and minimizes the combined effects of trauma and potential radiation exposures.** **Pre-hospital (Phase 1)** **Hospital (Phase 2)** **Longer-term (Phase 3)**		**Grade:** **Grade:** **Grade:**
2.1	The medical responders at the accident scene (critical first aid) promptly address the immediate medical consequences of an acute event involving trauma, internal and external contamination and acute radiation syndrome.	What are the priorities of the first medical responders at the scene?	

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
2.2	Life-saving medical first aid is given priority over decontamination.	Is the presence of a possible radiation hazard delaying critical first aid? Time of arrival of medical responders at the scene: Time at which medical actions are initiated: Is information on the victims collected by the medical responders?	
2.3	Triage of those involved at the scene of an accident (workers, responders, and public) is performed appropriately based on medical needs, contamination and potential overexposure.	Is there a medical triage point established? - for the public? - for the responders? Does the triage address medical needs first? Does it address possible contamination and/or overexposure? Are people directed appropriately? Do people bypass the triage?	
2.4	Critical patients are promptly transferred to the appropriate hospitals while minimizing, to the extent possible, the spread of contamination.	Time of first ambulance transport: Times of subsequent ambulance transports: Other means of transport used to bring patients to the hospital? Are precautions taken to minimize the spread of contamination? Is the hospital emergency radiation area setup? Is patient transferred to the hospital through a controlled access point that minimizes the spread of contamination?	
2.5	Patient transport is performed safely using appropriate equipment.		
2.6	Patient care during transport is adequate.	Are vital signs monitored?	

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
2.7	Effective initial and subsequent medical management of symptomatic, asymptomatic, externally contaminated, and internally contaminated patients is provided.	Are medical documents prepared adequate? Are patients assessed for medical conditions before being assessed for radiological exposure? Does an assessment of patients for radiological exposure take place with assistance of radiation protection official.	
2.8	Medical authorities correctly assess the current and potential public health issues related to the accident and notify authorities.	Are public health issues considered?	
3	**Objective: Radiological response prevents the spread of contamination and effectively minimizes the exposure of victims, witnesses and emergency response personnel.**		**Grade:**
3.1	Qualified radiological specialists promptly notify medical authorities of the presence of high radiation fields or the projection of high radiation exposures.	Do the medical personnel know what areas to avoid and what radiation protection precautions need to be adopted? Are they kept informed of the hazards by the radiation survey personnel?	
3.2	A safe perimeter is promptly established and confirmed safe by scene survey and measurements of contamination.	Time perimeter established: Distance: Is a survey of the perimeter conducted? Is the perimeter adjusted during the response?	
3.3	Capability of continuous monitoring, dose evaluation, and radiation protection of emergency workers, medical personnel, patients, and the public is demonstrated.	Do workers wear dosimeters? Is there a dose management system established? Are dose estimates done for workers and the public?	
3.4	Measures to prevent the spread of contamination are taken.	Is there an access control point? Is there a contamination survey of the site? Is the survey repeated periodically?	

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
3.5	Procedures for the monitoring and decontamination of emergency workers, equipment, and vehicles are adequate	Are personnel and vehicles monitored before they leave the controlled area? Is there change of clothing? Are there contaminated waste disposal arrangements?	
3.6	Hazardous sources are recovered or made safe in a timely manner.	Type of hazardous material: Time recovered:	
4	**Objective: Media relations provide prompt and accurate information to the media and adequately addresses public concerns in order to minimize the psychosocial impacts of the radiological accident.**		**Grade:**
4.1	The media at the scene is properly managed including rumor control.	How are media received? By whom? Are they treated politely? Are they provided with accurate and complete information? How many spokespersons are there?	
4.2	Media liaison is coordinated between the various response organizations.	What are the coordination arrangements? Are different messages being provided by different organizations?	
4.3	Factual media statements are formulated and issued to the public.	Is information of the media considered as a priority? Is the working relationship fostered with the media cooperative or confrontational? How often are media provided with official statements?	
4.4	Medical information is promptly provided to the relatives and the media; and is coordinated with other response organizations.	Are steps taken to identify the relatives? Are they informed by authorized medical staff? How?	
5	**Objective: Public health issues are recognized and addressed in order to minimize the collective impact of the accident on the overall population.**		**Grade:**

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
5.1	The principal short-term risks to the population are identified and characterized.	Are the main short-term *risks* to the population identified and characterized? Do public health representatives establish coordination with radiological specialists? Are all exposure pathways taken into account? Is the impact on regional ecology assessed? Is the impact on traffic patterns discussed? Are national radiological intervention levels considered?	
5.2	Decisions are taken and actions are outlined to allay fear and panic.	Do public health officials develop a communication plan and a public notification plan? If so, is that plan coordinated with the media officials? Are primary targets defined? What means of communication are considered?	
5.3	An action plan that conforms to governmental guidelines is developed to control potential exposure from food production, sales, and consumption.	Is an action plan developed to control potential exposure sources including food production, sales, and consumption? Are public health officials aware of relevant policy and standards? Is there a plan for return to normal daily activities? What are the decisions regarding drinking water restrictions?	
5.4	A basic epidemiological assessment is developed and a study is designed.		
6	**Objective: If necessary, international assistance is sought and coordinated with appropriate national organizations.**		**Grade:**
6.1	The need for additional specialized assistance or medical referral is identified and assessed.	Is this aspect considered? If so, is the type of medical assistance needed clearly identified?	

Inject #	Objectives (noted as #) and criteria (noted as #.#)	Observations *Record your justification comments in this column*	Grade *Record your grade for each objective in this column*
6.2	If required, international assistance is requested.	Who requests? Is this in accordance with the national plan? Which organizations are contacted (simulated)?	
6.3	Appropriate coordination is established with international experts.	What is the interface with international resources? Is a plan designed to ensure that the international assistance is well coordinated? Are customs issues addressed?	
7	**Objective: Post-exercise critique is constructive.**		**Grade:**
7.1	The capability of the emergency responding organization to conduct a post-exercise self-assessment and responders' exit interviews is demonstrated.		

4. GUIDE FOR PLAYERS

This guide is to be distributed to players prior to the day of the exercise.

4.1. INTRODUCTION

Although accidents involving radioactive sources are rare, their consequences can be serious if the response is not prompt, well planned and well coordinated. Part of a complete preparedness program is the regular conduct of emergency response drills and exercises aimed at maintaining the skills of emergency workers and testing the coordination of various response organizations. Emergency response exercises are a good way to test, evaluate and maintain our response capabilities.

On [*insert dates*], an emergency response exercise for a simulated accident involving radioactivity will be held. The exercise will include the following components [*delete as required*]*:*

- response at the scene of an accident;
- transport of casualties (potentially contaminated) to the hospital;
- hospital immediate treatment; and
- a tabletop on longer-term medical treatment, public health management and issues.

Some of you will be participating in only some of the exercise activities. Others will participate in all. This manual provides the information you need to know to participate in the exercise.

4.2. EXERCISE SCOPE AND OBJECTIVES

This exercise has been designed to test the ability of the emergency response organizations to carry out the following performance objectives in a, organized and coordinated manner:

Performance objectives	Specific areas on which the exercise will focus (evaluation criteria)
On-scene control	• Response time • Command and control • Coordination between services • Safety and mitigation • Notification of public health and governmental authorities
Medical response	• Immediate medical assessment • Life-saving medical first aid • Triage • Transfer to hospitals • Contamination control • Hospital medical management of symptomatic, asymptomatic, externally contaminated, and internally contaminated patients • Public health issues • Longer-term medical assessment and management (tabletop)

Radiological response	• Coordination with medical and hospital staff • Safety management at the scene • Contamination monitoring and dose control • Contamination control • Source recovery
Media relations	• Media management at the scene • Rumour control • Coordination with other response organizations • Provision of information to the media
Public health	• Risk identification and assessment • Public health actions decisions
International assistance	• Needs assessment • Request procedure • Coordination of planned international resources
Post-exercise critique	• Post-exercise briefings by players

4.3. PARTICIPATING ORGANIZATIONS

The following organizations will participate as players in this exercise [*to be completed by exercise organizers before distribution to players*]:

Exercise portion	Organizations	Scope of participation *(indicate is participation is full or partial; if partial, indicate extent of play)*
Phase 1 (field exercise)		
Phase 2 (hospital)		
Phase 3 (tabletop)		

4.4. EXERCISE SCHEDULE AND LOCATION

Exercise portion	Date	Location
Phase 1 (field exercise)	*Insert date*	Unannounced
Phase 2 (hospital)	*Insert date*	*Insert name of participating hospital. Only one hospital will participate in each exercise.*
Phase 3 (tabletop)	*Insert date*	*Insert location*

4.5. EXERCISE RULES

All players must demonstrate a professional attitude throughout the exercise. This is particularly important for personnel involved in the field exercise, who may come into contact or be observed by members of the public.

As for any exercise, some data will be simulated. It is the role of the controllers to provide the simulated data. However, players must "deserve" this information, i.e. the simulated data will only be provided to the players if appropriate actions are taken to obtain the data (e.g. contamination data will not be provided if the instrument is turned off).

Apply the following guidance during the exercise:

1. Perform the actions as if the situation were real.
2. If an action cannot be performed for safety or exercise-related reasons, clearly explain to the controller the action that you would take.
3. If you need data that is not available because of the simulation (e.g. gamma radiation reading), perform the actions that would normally be required and ask the controller to provide the data.
4. Only contact directly the organizations that are participating in the exercise.
5. If you need to contact an organization that is not participating, contact the simulation cell or the controller.

4.6. EXERCISE COMMUNICATIONS

Communications between players will take place through standard communication channels, in accordance with the plans and procedures, unless otherwise directed by the controllers. Due to the risk of those communications being inadvertently intercepted by members of the public or the media, and to avoid the perception that a real emergency is taking place, all communications between players must start with **"FOR EXERCISE"**.

No communication with outside non-participating organizations is permitted during the exercise. However, communications with non-playing organizations must be directed to the simulation cell using the following exercise telephone/communications list:

Non-playing organization	Exercise telephone number or contact information (e.g. radio channel)
To be completed by exercise organizers	

4.7. INTERACTIONS WITH CONTROLLERS AND EVALUATORS

Controllers and evaluators are members of the exercise conduct team. A controller is responsible for:

- supplying input to the players on simulated events (injects) during the exercise;
- providing simulated data to the players when appropriate actions are taken to obtain the data;
- answering players' questions related to the exercise when some rules or injects are not clear; and
- ensuring that all actions taken are safe.

The controller is the only person who can stop the exercise.

The evaluators are responsible for recording key facts during the exercise and evaluating the response against the exercise objective after the exercise. The evaluators will not *evaluate* the actions *during* the exercise, but only after, when all the observations from all the evaluators have been collected and assessed.

4.8. SIMULATION CELLS

Simulation cells will simulate the following organizations:

[*to be completed by exercise organizers*]

4.9. SAFETY

Safety is paramount. All players, evaluators and controllers are responsible to ensure that actions taken do not pose real safety concerns. Players shall not deviate from normal safety procedures under any circumstances. If a play event causes safety concerns to the players, they must notify the appropriate controller. The exercise may then be allowed to proceed by simulating response actions, may be interrupted temporarily by the controller or may be stopped.

In case of a real emergency, players must immediately notify the appropriate controller. The chief controller will then decide how to proceed with the overall conduct of the exercise.

4.10. MEDIA ARRANGEMENTS AND GUIDELINES

Some media may be simulated at the scene. The simulated media persons will be clearly identified by a badge or other clothing article. If you are approached by simulated media, respond as you normally would during a real emergency, ensuring that you preface any comment by "FOR EXERCISE".

If you are approached by real media (i.e. media not clearly identified as simulated media by a badge or other clothing article), explain to the media person that you are involved in an emergency response exercise and refer the person to the controller.

4.11.FEEDBACK REQUIRED FROM PLAYERS

At the end of the exercise, each group of players will conduct an informal debriefing to self-evaluate. The leader of each group will moderate this meeting and ensure that notes are kept for future reference and action.

The exercise staff may attend this briefing. However, they will not record your comments nor will they provide comments on the exercise. That is because their evaluation starts only once all the notes from all the evaluators have been gathered and analyzed.

5. DEALING WITH THE REAL MEDIA DURING THE EXERCISE

5.1. LIAISON WITH THE PUBLIC AND MEDIA

Any exercise may attract media interest. This may present several challenges, including the following:

- the real media can interfere with the conduct of the exercise;
- the real media may interfere with the simulated media;
- the presence of simulated and real media can confuse the players;
- the results of the exercise can be misinterpreted by the real media and cause an unnecessary crisis after the exercise, especially if the exercise revealed areas for improvement in the plans and procedures.

Hence, it is important to develop an effective organization and strategy to interact with the real media. This strategy should be implemented several weeks prior to the exercise.

5.2. STRATEGY

The media should be informed of the exercise prior to its conduct. This can be done through a media release. The information provided should clear explain the purpose of the exercise. It should also explain that the exercise is designed to challenge the response teams in order to reveal the areas where improvements can still be done.

A separate media team should be designated to deal with the real media during the exercise. The personnel in this group should not be players in the exercise.

Simulated media should wear clear identification badges or article of clothing showing that they are part of the exercise staff.

5.3. MEDIA ARRANGEMENTS

The arrangements should include the following:

- Spokesperson. A spokesperson must be appointed. This person must be an articulate representative, who is thoroughly familiar with the facility and with the particular exercise. This person should also have current media training.
- Media announcement. The purpose of the media announcement is twofold: to get timely and accurate information to the public; and to keep the media informed. The announcement should include a brief description of the exercise including approximate date, time and purpose. A phone number for public inquiries should also be included. The person(s) responsible for answering the phone must be properly briefed.
- Media photo opportunity. Arrangements with should be made for the media to take photos or videos of the exercise. Media liaison officers should be designated to assist. Clear guidelines must be provided to the media about not interfering with the players or the exercise site.

Some persons may be directly affected by the exercise, including:

- people living near the exercise site who may be witnessing the events;
- hospital patients at the hospital where Phase 2 will take place;
- visiting emergency patients at the same hospital.

These persons should be informed of the exercise prior to its commencement or as soon as possible after the start of the exercise. By doing so, the potential for conjecture, unfounded rumour or possible panic will be reduced or avoided.

Local authorities and emergency call services (911 or its equivalent) should also be informed that an exercise is taking place in case they receive inquiries from the public.

6. ANNEX A: EXERCISE INJECTS

Note that all injects have been preformatted with a “real time” and a “simulated time”. Exercise organizers may need to adapt these timings if the exercise takes place at different times.

Exercise injects contain either a MESSAGE or INSTRUCTIONS to the controller, or both. The message must be given to the controller as stated in the “injection method”. Make sure that the message is clear and well understood. If possible, give the player the sheet of paper with the message on it.

PHASE 1

Inject #	**1-10**	Inject time	**07:30**
Injected by	**On-site controller**		
Injection method	**Phone call**		

MESSAGE

From: Witness

To: Emergency response 24/7 call service or other designated player

Simulated time: 07:30

A witness called the emergency response 24/7 service to inform the emergency dispatchers of an accident. He gave information about a train and truck crash, possible leaking fuel, and gave no other information.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**1-20**	Inject time	**When patients are examined by medical responders**
Injected by	**Medical controllers**		
Injection method	**Verbal**		

MESSAGE

D-1, truck driver 1, male, 45 years Injuries severe enough for death to be imminent. There is a serious head injury. Patient is unconscious. Further exam reveals bilateral femur fracture.
D-2, truck driver 2, male, 32 years Multiple lacerations and bruises on arms and legs severe enough to indicate surgery or possible OR intervention. Hematomas on the chest and head. Devitalized tissue and exposed bone. Possible tendon injury. Confusion.
C-1, conductor 1, male, 60 years Lacerations of arm and legs (small). Bruise on chest. Wounds are such that they can be managed without surgery, under local anesthesia and with pain management.
C-2, conductor 2, male, 40 years Burns on palms of hands and forearms. Extremely painful. Surface of combined burns is 6%.
R-1, male, aged 55 years Complete physical exam is normal.
R-2, male, aged 56 years Arm injury. Patient is complaining of extreme pain in forearm (left), which is deformed.
R-3, male, aged 43 years Complete physical exam is normal.
R-4, male, aged 62 years Complete physical exam is normal.
R-5, male, aged 58 years Complete physical exam is normal.
W-1, male, 30 years Injuries on hands. There are extremely painful burns in palms of both hands. Patient is nauseated.
W-2, male, 30 years Lacerations on legs and arms (small). Vital signs are all normal.
W-3, male, 28 years No injuries. Vital signs are all normal.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**1-30**	Inject time	**08:30**
Injected by	**Medical controllers**		
Injection method	**Verbal**		

MESSAGE

From: W-5

To: On-scene response personnel

Simulated time: 08:30

There is a radioactive placard on the truck.

INSTRUCTIONS

If a national transport manifest form is available, use it instead of the following simulated form.

Wait 30 minutes.

If 30 minutes pass and players have not requested the manifest (see next page), then provide the manifest to the responder in charge.

FIG. 3. Inject 1-30 (Attachment).

Inject 1-30 (Attachment)

Transport of dangerous goods

Transport manifest

Class 7

RADIOACTIVE MATERIAL

Consignor: Doitall industries

Consignee: Storitall storage and waste management

Carrier: Takitall transport

Cargo:

Cesium gauges

article	Gauges
material	Cesium (Cs-137)
activity	4 GBq
number of items	12
package type	A
classification	I
transport index	none
packaged by	Al Reno
permit #	none
special instructions	none

Radiography equipment

article	Industrial radiography cameras
material	Cobalt (Co-60)
activity	10 TBq
number of items	2
package type	B
classification	II Yellow
transport index	3
packaged by	Dimitri Vladstok
permit #	CC3679001
special instructions	In case of damage, isolate, call consignee and and wait for help. Do not touch the packages. Do not smoke near the packages.

In case of emergency, contact Doitall Industries.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**1-40**	Inject time	**When questioned**
Injected by	**Witnesses (under crowd controller supervision)**		
Injection method	**Verbal**		

MESSAGE

From: Witness

To: Responders (when questioned)

Simulated time: When requested

We were in the plaza (or the coffee house) next to the scene and we heard a big noise. When we came out, we saw people crawling out of the train and the truck. The truck drivers seem to be quite hurt. Some of us went to help. There were debris scattered all over the place. Some of them rolled into the stream. This is awful, just absolutely awful.

INSTRUCTIONS

Get the witnesses to act naturally, with panic in their voice in some cases. Get them to tell the story in their own words, provided that they stay close to the script above. Allow questioning.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**1-50**	Inject time	**08:45**
Injected by	**Site controller**		
Injection method	**Verbal**		

INSTRUCTIONS

If by now the responders have not yet called the radiation specialists, instruct them to do so. Also, if they have not established a safety perimeter around the accident scene, instruct them to do so.

The reason for doing this is that an uncontrolled spread of contamination will be difficult to simulate and may significantly affect the rest of the exercise.

Inject #	**1-60**	Inject time	**09:00**
Injected by	**Witness 7 (under supervision of crowd controller)**		
Injection method	**Verbal**		

MESSAGE

From: Witness 7

To: Emergency responder

Simulated time: 09:00

I don't know if this is important, but just in case it is, I should tell you that there was a large round object that was thrown out of the truck and rolled into the stream. I would not mention it, but I think that it had some kind of a radioactive symbol on it. I also saw some kids trying to fish it out of the water. Do you think that is important?

Inject #	**1-70**	Inject time	**09:00**
Injected by	**Media verbal**		
Injection method	**Visual and verbal**		

INSTRUCTIONS

Instruct the simulated media to arrive at the scene. Ensure they are wearing their simulator identification. Let the media simulators act as if they were real media. Ensure that they do not "oversimulate". Possible actions and questions:

- Go around the scene and take pictures.
- Cross the security perimeter.
- Ask responders in the field questions about the intervention.
- How many injured? How many dead?
- What happened?
- Who is in charge?
- Is the material involved dangerous?
- Was alcohol involved?
- What hospital are the victims being brought to?
- How many people affected?
- How many contaminated?
- Do you know how to deal with this kind of accidents?
- Name of victims
- Interview witnesses

Inject #	**1-80**	Inject time	**09:15**
Injected by	**Site controller**		
Injection method	**Visual or verbal**		

INSTRUCTIONS

If cars and extra witnesses are available, make them arrive at the scene now. Arrange the cars so as to block the ambulances at the scene of the accident.

If no cars or witnesses are available, provide the verbal inject below.

MESSAGE

From: Witness

To: On-scene commander

Simulated time: 09:15

10 cars just arrived and are blocking the road. 20 additional witness arrived and are approaching the scene.

Inject #	**1-90**	Inject time	**09:30**
Injected by	**Crowd controller**		
Injection method	**Visual**		

INSTRUCTIONS

Ask witnesses 1, 2, 3 and 4 to try to leave and tell them they are leaving because they are scared of radiation. If they succeed, they must report to you and you bring them back to the on-scene commander.

Inject #	**1-100**	Inject time	**10:00**
Injected by	**W-12 (under supervision of medical controller)**		
Injection method	**Verbal**		

MESSAGE

From: W-12
To: Responders present
Simulated time: 10:00

I feel nauseous.

Inject #	**1-110**	Inject time	**10:30**
Injected by	**W-12 (under supervision of medical controller)**		
Injection method	**Verbal**		

INSTRUCTIONS

Ask W-12 to simulate vomiting.

Inject #	**1-120**	Inject time	**11:00**
Injected by	**Chief controller**		
Injection method	**Verbal**		

INSTRUCTIONS

Terminate Phase 1 when all the people at the scene have been controlled, injured patients have been evacuated, the source has been placed in a safe condition, the scene is stable and recovery work can begin.

PHASE 2

NOTE

Inject time = time from arrival of first patient at hospital

Inject #	**2-10**	Inject time	**T0 + 0:00**
Injected by	**Medical controllers**		
Injection method	**Verbal**		

INSTRUCTIONS

As patients are examined by medical staff at the hospital, provide the medical data contained in TABLE 22. MEDICAL DATA FOR PHASES 1 AND 2.

In addition, W-3 reports that he is nauseous.

Inject #	**2-20**	Inject time	**T0 + 0:30**
Injected by	**Simulation cell**		
Injection method	**Phone**		

MESSAGE

From: Family members
To: Administration
Simulated time: Starting at 11:30

I am looking for my [son, daughter, husband, wife], W-3. I would like to know what his/her condition is. Is this radioactive stuff dangerous? What should we do? Will he/she be radioactive when he/she comes back home?

INSTRUCTIONS

Before this inject can take place, you will need a list of the names of the patients who were admitted at the hospital.

Repeat the calls for various patients. Vary the message slightly from call to call.

Inject #	**2-30**	Inject time	**T0+0:45**
Injected by	**Simulation cell**		
Injection method	**Phone**		

MESSAGE

From: Mother of W-23

To: Hospital administration

Simulated time: 13:00

Hello, this is Marjoree Vitcom. My son was involved in an accident this morning. He said there was something radioactive. Well, that's not the problem. The problem is that they decontaminated him or something like that, and they took his shoes away. I don't have any other pair of shoes for him. Can I have them back? Can't you just clean them and give them back to me? That is a real problem, he can't go around walking bare feet to school!

Inject #	**2-40**	Inject time	**T0 + 1:00**
Injected by	**W-3 (under supervision of medical controller assigned)**		
Injection method	**Visual**		

INSTRUCTIONS

Ask W-3 to start simulated vomiting.

Inject #	**2-50**	Inject time	**T0 + 1:00**
Injected by	**Simulation cell**		
Injection method	**Verbal**		

INSTRUCTIONS

Send on person from the simulation cell to the emergency room where the patients are being treated. Simulate the real media and ask questions regarding:

- number of patients
- number of dead patients
- severity of injuries
- radioactivity: risks to them, their families and the public
- what is being done with the radioactivity on the people and at the site
- does the hospital have experience dealing with this type of situation?
- does this happen often?
- has it happened before?

Inject #	**2-60**	Inject time	**T0 + 1:15**
Injected by	**Simulation cell**		
Injection method	**Phone**		

INSTRUCTIONS

Call the hospital administration and simulate the real media by asking questions such as the following:

- number of patients
- number of dead patients
- severity of injuries
- radioactivity: risks to them, their families and the public
- what is being done with the radioactivity on the people and at the site
- does the hospital have experience dealing with this type of situation?
- does this happen often?
- has it happened before?

Inject #	**2-70**	Inject time	**T0 + 1:30**
Injected by	**Chief controller**		
Injection method	**Written – give the inject form**		

MESSAGE

Simulated time: 12:20

News flash from N.E.W.S. Radio.

N.E.W.S. radio has just learned that there was a major collision involving a train and a truck that was carrying radioactive material. The accident blasted the radioactive material into the air and contaminated the grounds around the accident scene. Witnesses say that the debris were spread over a radius of about 200 m and that a thick cloud of smoke, possibly carrying dangerous radioactive substances, was seen drifting from the scene. It appears that over 100 people were hurt, including 10 who are in serious conditions at the central hospital.

Authorities have indicated that, so far, there is no serious risk to the public. However, Dr. Victor Green, of CAT (the coalition against technology), has indicated that this kind of accident was unavoidable and is the direct result of the inability of the government to properly regulate the nuclear industry. He added that, hypothetically, this accident could result is dozen of additional cancer deaths over the next 50 years.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-80**	Inject time	**T0 + 1:45**
Injected by	**Simulation cell**		
Injection method	**Phone**		

MESSAGE

From: Hospital reception

To: Administration

Simulated time: 14:00

Hi, this is reception. Sorry to bother you, but I thought I should tell you that a lot of the staff are leaving early because of radioactivity on the hospital. I wanted to know if that is OK. I also wanted to know if I should be thinking about leaving too.

I should also tell you that some of the patients are apparently starting to talk and that some of them are quite worried.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-90**	Inject time	**T0 + 2:00**
Injected by	**Simulation cell**		
Injection method	**Phone**		

MESSAGE

From: Medical officer of health office OR police

To: Administration

Simulated time: 14:30

This is the office if the medical officer of health. We are receiving a lot of calls from people who live close to the radioactive accident this morning. Unfortunately, we are unable to reach the medical officer of health. Tell me:

- *Is there a risk for people living near the accident scene?*
- *What about people who live downstream from the little river?*
- *Can people drink the water?*
- *What do I tell people who are worried?*

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-100**	Inject time	**T0 + 2:00-2:30**
Injected by	**Simulation cell**		
Injection method	**Phone**		

INSTRUCTIONS

Call the hospital administration and simulate the media asking:

- What happened?
- How many victims?
- Any deaths?
- Names of victims
- Age of victims
- Contamination of hospital

Make 10 successive calls. Vary questions and attitude from one call to another.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-110**	Inject time	**T0 + 2:30**
Injected by	**Medical controller for patient 6**		
Injection method	**Verbal**		

INSTRUCTIONS

If an X ray for R-2 has not yet been ordered, politely remind the doctor in charge that an X ray may be advisable. If the doctor refuses, do not insist.

Inject #	**2-120**	Inject time	**T0 + 2:30**
Injected by	**Medical controller for patient 3**		
Injection method	**Verbal**		

INSTRUCTIONS

If a chest X ray for C-1 has not yet been ordered, politely remind the doctor in charge that a chest X ray may be advisable. If the doctor refuses, do not insist.

Inject #	**2-130**	Inject time	**T0 + 2:30-2:45**
Injected by	**Simulation cell**		
Injection method	**Phone**		

INSTRUCTIONS

Call the hospital administration and simulate the media asking:

- How may dead?
- Names
- Name of doctor in charge
- Who is the spokesperson?
- Will you hold a press conference?
- Have other patients been affected by the radioactivity?

Make 5 to 10 successive calls. Vary questions and attitude from one call to another.

Inject #	**2-140**	Inject time	**T0 + 3:00**
Injected by	**Simulation cell**		
Injection method	**Phone**		

MESSAGE

From: Mayor

To: Administration

Simulated time: 15:00

This is the Mayor. I am starting to get a lot of questions about this accident this morning. I need an assessment of the potential public health impacts. Can you get one of your top doctors working on this and liaise with me.

INSTRUCTIONS

Depending on the response, one of the doctors may call back and you may have to simulate the mayor on an on-going basis. If so, emphasize the public health concerns about the emergency.

Inject #	**2-150**	Inject time	**T0 + 3:00**
Injected by	**C-2 (under supervision of designated medical controller)**		
Injection method	**Visual**		

INSTRUCTIONS

C-2 start simulated vomiting.

Inject #	**2-160**	Inject time	**T0 + 3:10**
Injected by	**D-1 controller**		
Injection method	**Verbal**		

INSTRUCTIONS

Inform the doctor in charge of D-1 that the patient has died. Instruct D-1 to look dead.

Inject #	**2-170**	Inject time	**T0 + 3:30**
Injected by	**Medical controller for W-2**		
Injection method	**Verbal**		

INSTRUCTIONS

Instruct W-2 to simulate vomiting.

Inform the doctor in charge of patient 11 that he is suffering from psychological decompensation.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-180**	Inject time	**T0 + 3:40**
Injected by	**W-1 (under supervision of designated medical controller)**		
Injection method	**Verbal**		

MESSAGE

From: W-1
To: Doctor in charge
Simulated time: 19:00

I feel very nauseous.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-190**	Inject time	**T0 + 3:50**
Injected by	**C-1 (under supervision of designated medical controller)**		
Injection method	**Verbal**		

MESSAGE

From: C-1
To: Doctor in charge
Simulated time: 19:30

I also feel very nauseous.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-200**	Inject time	**T0 + 4:00**
Injected by	**C-2 (under supervision of designated medical controller)**		
Injection method	**Verbal**		

MESSAGE

From: C-2
To: Doctor in charge
Simulated time: 19:30

I also feel very nauseous.

INSTRUCTIONS

Simulate vomiting.

FOR EXERCISE **FOR EXERCISE** **FOR EXERCISE**

Inject #	**2-210**	Inject time	**T0 + 4:00**
Injected by	**D-2 (under supervision of designated medical controller)**		
Injection method	**Verbal**		

MESSAGE

From: D-2
To: Doctor in charge
Simulated time: 19:30

I also feel very nauseous.

INSTRUCTIONS

Simulate vomiting.

Inject #	**2-220**	Inject time	**T0 + 5:00**
Injected by	**Chief controller**		
Injection method	**Written message**		

INSTRUCTIONS

Provide the following dosimetry data. These doses have been evaluated by radiation specialists based on the field measurements and the time at the accident scene.

Patient	**Estimated dose**
D-1	5 Gy
D-2	5 Gy
C-1	1 Gy
C-2	1 Gy
W-1	2 Gy
W-2	2 Gy
W-3	1 Gy

Notes:

- Only those patients for whom the estimated dose is > 1 Gy are shown
- Dose is estimated on the basis of time spent near the source and distance from the source.

Inject #	**2-230**	Inject time	**T0 + 5:00**
Injected by	**Chief controller**		
Injection method	**Verbal**		

INSTRUCTIONS

This Phase (Phase 2) is terminated when the final patient has been processed through emergency care, decontaminated and referred for further hospital care or discharged, or 8 hours after the start of phase 1, whichever comes first.

Inform all players and all controllers that the exercise is over.

Remind the players that they should conduct a debriefing.

Remind the controllers to ensure that the scene of the exercise is returned to normal.

Remind the evaluators of:

- the need to collect all logs, faxes, etc.
- the need to attend the players debrief
- the time and place for the evaluation session

PHASE 3

Inject #	**3-10**	Inject time	**07:45**
Injected by	**Facilitator**		
Injection method	**Verbal and written**		

INSTRUCTIONS

Provide the situation reports (starting next page) with supporting data:

- Incident situation report
- Radiological situation report
- Medical situation report
- Public health situation report

Incident situation report

At 08:00 h yesterday, a collision occurred at [*insert location*] between a cargo train and a vehicle carrying radioactive material. Some of the radioactive material containers were destroyed and the scene was contaminated. The driver was severely injured and later died in hospital. The co-driver and the two train engineers were injured but are in stable condition at the hospital. Several witnesses were affected by the accident and had to be taken to the hospital. Several were found to be contaminated.

By 10:00, all persons present at the scene had been triaged and released or sent to the hospital.

At 13:00, a sphere deemed to be radioactive was recovered from the stream. The sphere was placed in quarantine with the other objects. No further investigation of that sphere were carried out.

By 17:00, the major debris had been removed and placed in quarantine pending contamination survey and cleanup.

As of 08:00 this morning, a security cordon of 100 m radius around the scene in maintained for investigation and decontamination purposes. All emergency staff working at the scene are under the control of an on-scene commander, assisted by a radiation specialist.

Radiological situation report

Reference: survey map [provide a copy of Fig.6*FIG. 6. Dose rates at the scene before* ***source removal***, Fig.7*FIG. 7. Dose rates at the scene before source removal (colour coded)* and Fig.9 *FIG. 9. Actual* ***surface contamination***].

The truck involved in the collision was carrying 12 gauges with Cs-137 and 2 gamma radiography cameras containing Co-60. It appears that some of the cesium sources were damaged by the collision and that one of the cobalt sources was somehow ejected from its enclosure. As a result, there were high radiation fields over approximately 500 m^2. Once the cobalt source was recovered, contamination survey indicated that there was cesium contamination over approximately 30 m^2 immediately around the area where the truck was found.

When air samples were taken, there was no significant contamination in the air. However, it is possible that, immediately after the collision, there was indeed airborne contamination. This may have resulted in some internal contamination of people in the immediate vicinity of the accident. This would have to be assessed through internal contamination analysis (whole body counting or bioassays).

We are in the process of determining who may have received high doses. It would appear, at first glance, that some people did receive more than 1 Sv. That is certainly the case for the truck drivers and the train conductors. However, based on witness reports, it is quite likely that some of the bystanders also received significant exposures. We will provide you with more information as it becomes available.

The figures provided to you show the radiation levels before the source was removed and the contamination map after source removal.

Cleanup efforts have started but are complicated by the need to preserve scene integrity for investigation purposes and the large number of debris. It is estimated that cleanup will be completed within the next two days only.

Medical situation report

At 09:00, the hospital started admitting patients from an accident involving radioactive material. Due to the presence of radioactivity, the emergency room patients were relocated and the emergency radiation area was setup.

By 12:00, 12 patients had been admitted. One was in critical condition, three in serious condition and the rest were stable. All had been contaminated to some degree.

The truck driver died of traumatic head injuries and compound fractures at 1230. Four of the remaining 11 patients were discharged as outpatients.

At 15:00, we started receiving other patients who claimed that they had been contaminated at the accident scene. By the end of the day, 34 patients had been received and examined. Some had minor contamination. Some had minor cuts and bruises. Lymphocyte counts were taken in all cases. All 34 were discharged.

Outline of Public Health Situation Report

Note. This public health situation report must be adapted to the local conditions. Exercise organizers are to fill in the blanks.

Public health background (to be completed)

Population, age distribution, socio-economic status	
Health status	
Sources of public water supply	
Sources of food supply and food habits	
Public health infrastructure	
Underlying industrial infrastructure	

As of 20:00 yesterday, there has been little public health concern. Approximately 20 calls were received by the office of the medical officer of health, primarily from people who wanted to know if it was safe to drive by the accident site or to let their children play in the parks outside.

However, we are expecting that this situation will change as a result of the high profile given to this accident by the morning newspaper and of the concern generated about radiation hazards.

Inject #	**3-20**	Inject time	**08:00**
Injected by	**Facilitator**		
Injection method	**Written form**		

INSTRUCTIONS

Provide the medical data for day 1 (see next page).

Insert **TABLE** with only the first data row (Start and D1) for each patient.

Inject #	**3-30**	Inject time	**08:15**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Municipal public affairs officer

To: Entire group

Simulated time: Day 2, 09:00

We have received 50 calls from local and national journalists, including one call from CNN, on yesterday's accident. We noted the main questions asked:

- *name of the company owning the source*
- *name of the carrier*
- *description of the accident*
- *number of casualties*
- *number of deaths*
- *names of people involved*
- *name of hospitals involved*
- *sources involved*
- *extend of contamination*
- *radioactive hazard*
- *clean up completed or not*
- *have you found all the radioactive material*
- *will more people die*

I think they want to interview the companies, the hospital and the victims. Should we do something to coordinate our stories?

Inject #	**3-40**	Inject time	**09:00**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Mayor/Prefect

To: Public health organization

Simulated time: Day 2, 10:00

The mayor/prefect is worried about the impact of the accident on public health. He is primarily concerned about the victims and the witnesses at the scene, but he is also expressing great worries about the potential impact on the population living in proximity to the accident scene. He feels that we should be adopting a totally open approach and divulge to the public all that we know about the consequences of the accident. In particular, he is concerned about a rumour that a radioactive sphere rolled into the stream and may have contaminated the water. He would like an immediate briefing on:

- *public health issues*
- *extent of hazard*
- *who is at risk*
- *is there a water contamination problem*
- *embargo or other measures to adopt*
- *what can be done or said to reassure the public*

Inject #	**3-50**	Inject time	**09:30**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Hospital

To: Emergency management committee

Simulated time: Day 3, 09:00

We just received eight new people who claim to have been involved in the accident. They claim to be contaminated. Some suffered from fatigue and nausea. One had vomited.

We had a bit of a problem processing them because we did not have a radiation surveyor at our disposal and the medical staff were afraid to treat them for fear that they were contaminated. It took two hours to get a qualified surveyor. During that time, we put the eight patients in isolated rooms. They weren't pleased, but they waited patiently.

After a full survey, none of them had any contamination. Nevertheless, we took blood samples.

INSTRUCTIONS

After 15-30 minute discussion, inform the players that the lymphocyte counts indicated no doses in excess of 1 Sv.

Inject #	**3-60**	Inject time	**09:45**
Injected by	**Facilitator**		
Injection method	**Written**		

MESSAGE

From: W.N.E.W.S. News

To:

Simulated time: Day 3, 12:15

From a radio news program:

More news indicating a cover up by the authorities on the radioactive accident two days ago. A source from the local university has informed W.N.E.W.S. that a water sample provided by a private citizen and analyzed in the university's radioactive laboratory has shown high levels of contamination. The university source reported that level of 200 mBq of Cs per liter and 50 Bq of I-125 per liter. This information contradicts previous statements by the authorities stating that there was no contamination of the local water supplies.

Ralf Green, of the coalition for a greener environment, has been following the situation closely. According to Mr. Green, the authorities should accept their responsibility, live up to their duties and immediately issue a boil water advisory.

More on this on our 6 o'clock news.

Inject #	**3-70**	Inject time	**10:00**
Injected by	**Facilitator**		
Injection method	**Written**		

INSTRUCTIONS

Provide the medical data for days 2-7 (see next page).

Insert **TABLE** with only
the first and second data rows (Start, D1, D2 to D8) for each patient.

Inject #	**3-80**	Inject time	**10:30**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Media officer

To: Emergency management group

Simulated time: Day 7, 12:30

Several calls from the media were received following the noon hour news. This time, the media appears to be focusing on the "why" issues:

- *Why was this accident allowed to happen?*
- *Why did the regulator not do its job in preventing such an accident?*
- *Why did people have to die? Was our emergency response inadequate?*
- *Are transport regulations inadequate?*
- *Does the government bear the ultimate responsibility for this accident?*

I suggest that we address the issue of responsibility and admit out guilt while explaining that we will do everything to ensure that this does not happen again. What do you think?

Inject #	**3-90**	Inject time	**11:00**
Injected by	**Facilitator**		
Injection method	**Written**		

MESSAGE

From: IAEA

To: National contact point

Simulated time: Day 8, 15:00

The IAEA has become aware of the situation regarding the medical consequences of the accident last week and would like to kindly offer its assistance in the form of an Expert mission to help the national authorities deal with the medical condition of the victims and identify any additional and unanticipated complication from the emergency.

In anticipation for this mission, we kindly request that you provide the following information:

- *name of national coordinator*
- *location and contact information*
- *exact nature of the assistance requested*
- *coordinating instructions*
- *border clearance instructions and entry visas*
- *dates suitable for the mission*

Inject #	**3-100**	Inject time	**11:30**
Injected by	**Facilitator**		
Injection method	**Written**		

MESSAGE

From: Survey team

To: Emergency management group

Simulated time: Day 9, 10:00

We have just completed a final survey of the accident scene. All debris has been removed. The top layer of soil has been removed or turned. However, after careful analysis and laboratory work, it appears that:

1) The contamination levels are close to background

but

2) The contamination has spread.

Preliminary analysis of soil samples near the stream show low levels of Cs contamination.

Water samples are clean.

See the contamination map (Fig. 4).

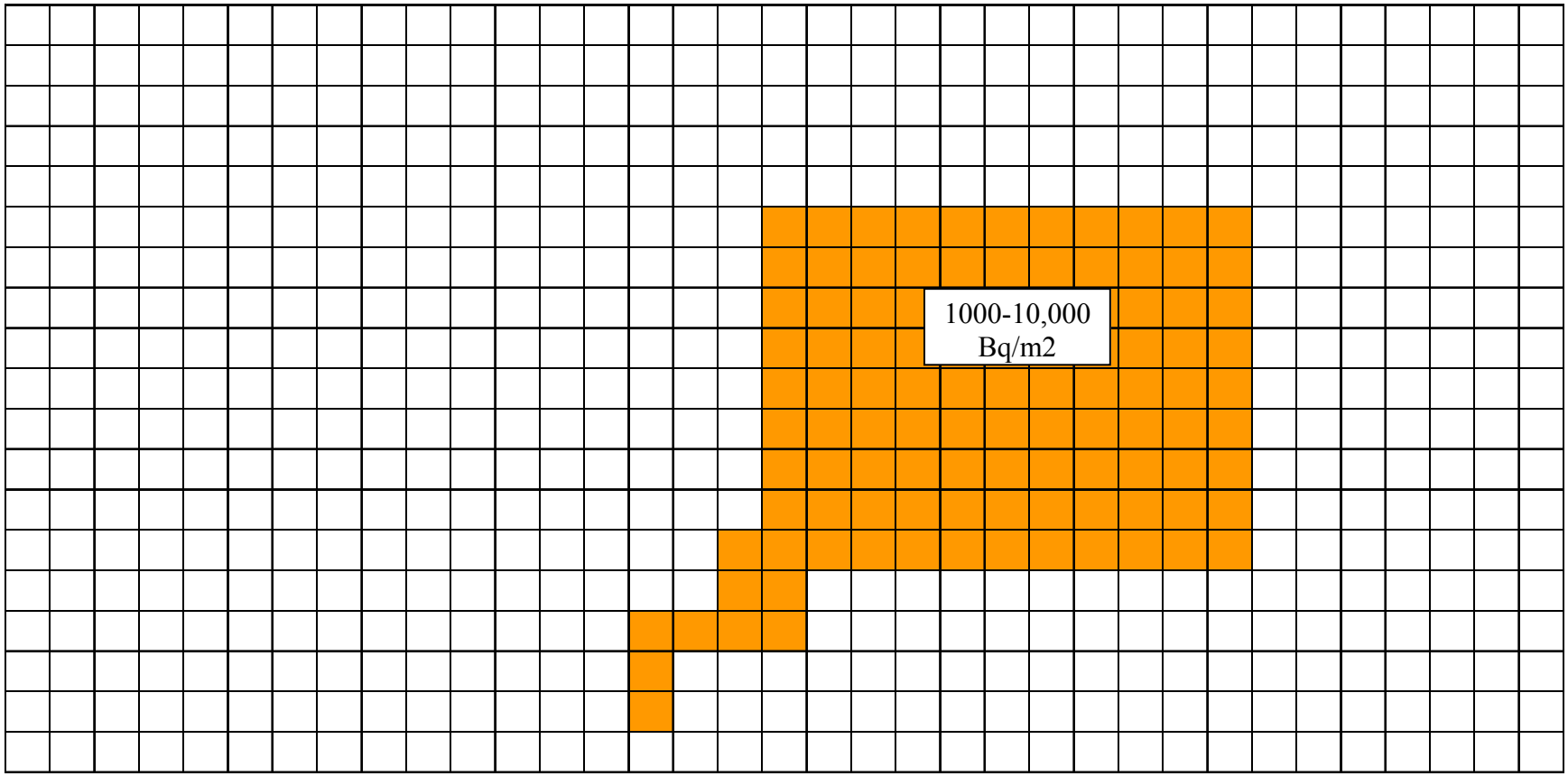

FIG. 4. Post-cleanup survey results[7].

[7] each square represents 1 m^2

Inject #	**3-110**	Inject time	**13:00**
Injected by	**Facilitator**		
Injection method	**Written**		

INSTRUCTIONS

Provide the medical data for days 8-21 (see next page).

Insert **TABLE** with
the first, second and third data rows (Start, D1, D2 to D7, D8-D21) for each patient.

Inject #	**3-120**	Inject time	**13:45**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Media officer
To: Emergency management group
Simulated time: Day 8, 12:15

We have just heard the following announcement on the radio news at noon:

It appears that the consequences of last week's radiation accident are still mounting. W.N.E.W.S. news has learned that at least four people are in critical condition following the exposure to dangerously high levels of radioactive cesium and cobalt. Although doctors have so far refused to provide details on the patients' conditions, they have confirmed that one person died and that it is not certain if the death is due to radiation. Witnesses report that some people who were at the scene of the accident are starting to see burns appear one week after the fact. Unable to explain such burns, they are blaming radiation as the cause. Dr. Jonathan Livingston, epidemiologist, told radio news that it would take years before the full ramifications of the accident on the health of the citizens is understood. He also said that, in the meantime, people who feel they may have been affected should report any ailment to their family doctor.

Inject #	**3-130**	Inject time	**14:00**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Hospital

To: Emergency management group

Simulated time: Day 8, 14:00

We just had a patient comes to hospital after being encouraged to do so by friends and family. It turns out that, on the day of the accident, the patient was in the bar. He went to the accident site, stayed for about 10 minutes and returned to the bar after. He had no injury at that time. He still wears the shoes that he wore on the day of the crash. The patient was surveyed. He was very contaminated. He was decontaminated and given a complete physical exam. All was normal. He was then discharged.

Inject #	**3-140**	Inject time	**14:10**
Injected by	**Facilitator**		
Injection method	**Verbal**		

MESSAGE

From: Hospital B

To: Emergency management group

Simulated time: Day 11, 09:00

Hospital B just received 10 patients who claim to have been at the accident last week with the radioactive sources. They appear normal, but show signs of fatigue. Two of them are very nauseous. We have neither equipment nor expertise here to deal with this situation. Please advise.

None of the patient have seen a doctor yet. This is their first visit to the hospital. We have no way of verifying if they were indeed present at the scene of the accident.

Inject #	**3-150**	Inject time	**14:30**
Injected by	**Facilitator**		
Injection method	**Written**		

INSTRUCTIONS

Provide the medical data for days 22-30. Give the players **TABLE** IN FULL.

Inject #	**3-160**	Inject time	**15:30**
Injected by	**Facilitator**		
Injection method	**Verbal**		

INSTRUCTIONS

Inform the players that this is the end of the exercise. Ask them to take a 30-minute break and reconvene at 16:00.

During the break, consult with the evaluator, if present, and provide an evaluation of the tabletop exercise against the exercise evaluation objectives.

At the evaluation, remind the players that this is a learning experience and that the evaluation is intended to provide a basis for identifying priorities for improvement, not a criticism of their capabilities.

7. ANNEX B: EXERCISE DATA

7.1. SITUATIONAL DATA

7.1.1.1. Weather

The weather for the exercise is the real weather.

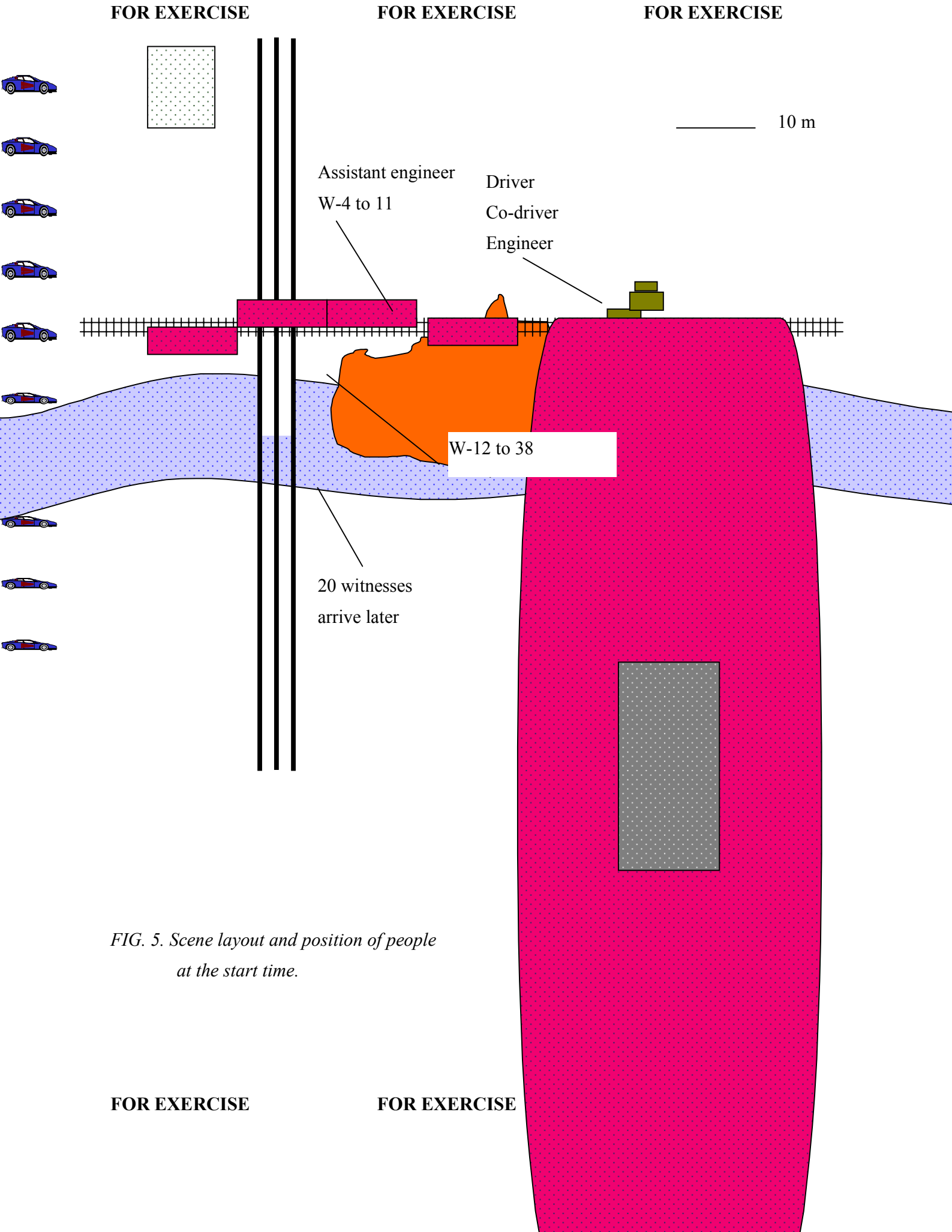

FIG. 5. Scene layout and position of people at the start time.

7.1.1.2. Simulated roles of witnesses, drivers and engineers at the scene

This section will describe the behaviour that each of the simulated witnesses must adopt during the exercise. It will also describe the behaviour of the injured driver and co-driver and of the train engineer and assistant-engineer.

Person	**Designation**	**General behaviour at the accident site**
Driver 1	D-1	Unconscious.
Driver 2	D-2	Extreme pain. Confused. Worried about his partner. Mumbles about "packages" and "dangerous".
Conductor 1	C-1	"Take-charge" attitude. Is bleeding but acts tough. Tries to help responders. Gets in the way.
Conductor 2	C-2	Stands on the side in extreme pain to the hands. Tries to help but the hand burns are too painful. He tries frantically to explain to the responders what happened. Slight panic.
Witness 1	W-1	Paces back and forth around the truck. He was helping but burned his hands and is in pain. Is getting weaker with time and starts complaining of nausea to the responders. Provides encouragement to the responders from the side-line and gets in the way.
Witness 2	W-2	Very busy trying to help the victims. Nervous. Tries to direct the responders.
Witness 3	W-3	Stands next to the victims, dazed and confused. State of shock.
Witness 4	W-4	Angry at the responders for taking so long to get there. Claims to know one of the victims. Yells orders at the responders to take care of his friend.
Witnesses 5-10	W-5 to W-10	Standing very close to the accident scene. Trying to help but apprehensive. They keep trying to get close to the victims even after the security cordon has been established.
Other witnesses		Stand outside the cordon. Try to observe from various angles. Move around to see how the responders will handle the movement of people around the scene.

7.2. RADIOLOGICAL DATA

7.2.1.1. Sources data

Characteristic	Value
Cs-137 gauges	
Number of gauges on the truck	12
Activity in each gauge at the time of the accident	4 GBq
Dose rate on contact (shielding intact)	20 μSv/h
Dose rate on contact (internal shielding degraded)	15 mSv/h
Form	Powder
Co-60 gamma radiography equipment	
Number on the truck	2
Activity in each	10 TBq
Dose rate at 1 m from an unshielded source	2.5 Sv/h
Form	Solid, sealed source

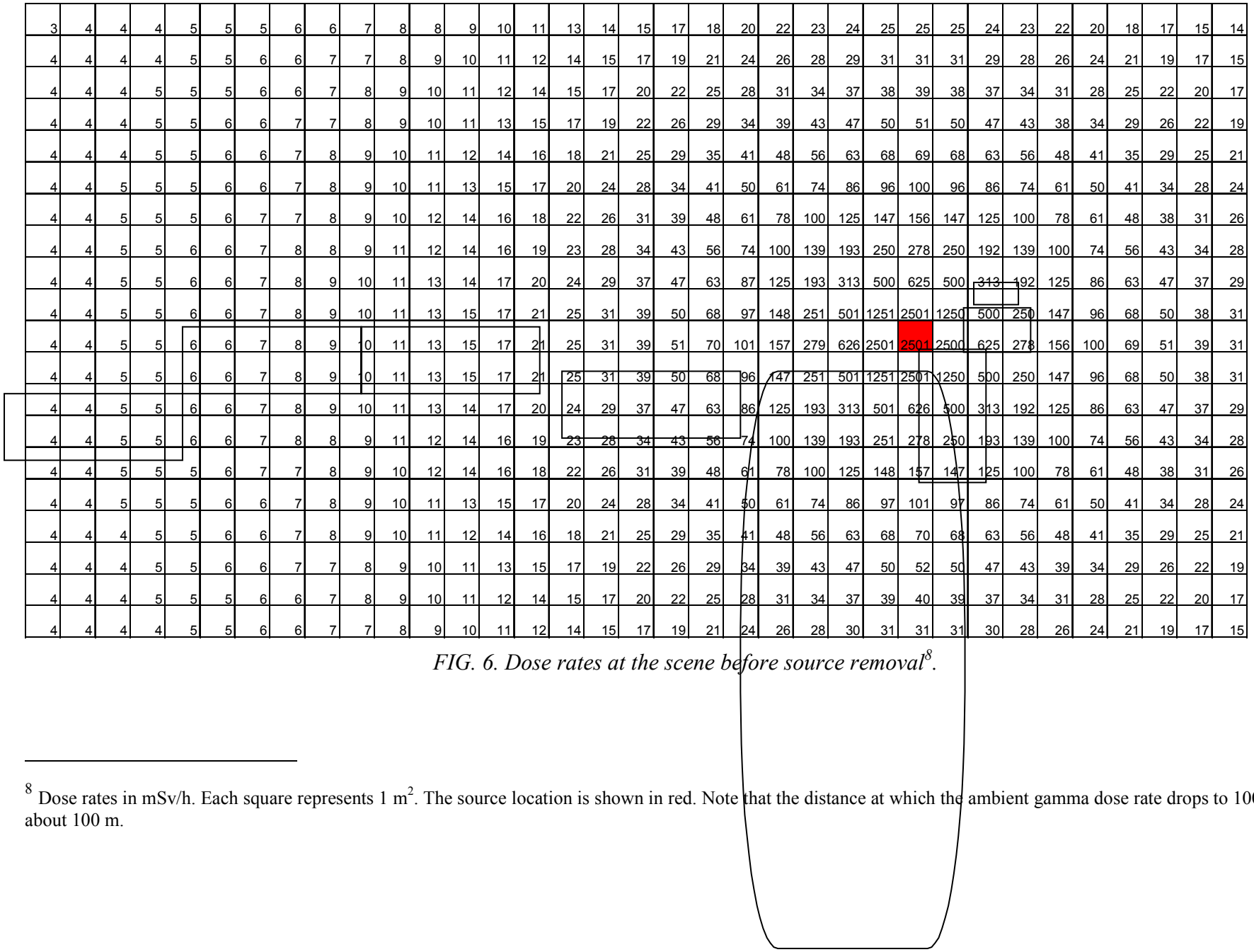

FIG. 6. Dose rates at the scene before source removal[8].

[8] Dose rates in mSv/h. Each square represents 1 m^2. The source location is shown in red. Note that the distance at which the ambient gamma dose rate drops to 100 μSv/h is at about 100 m.

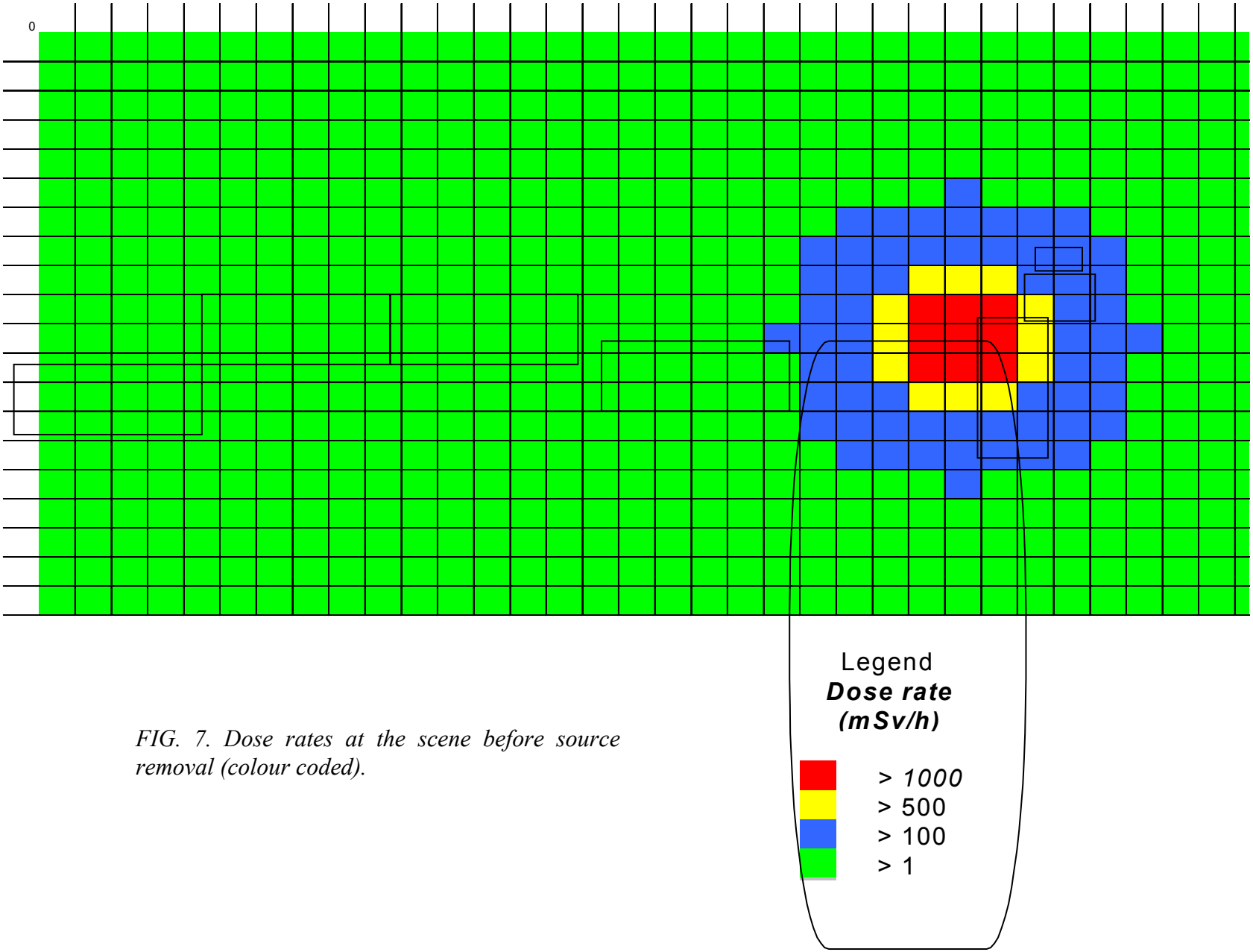

FIG. 7. Dose rates at the scene before source removal (colour coded).

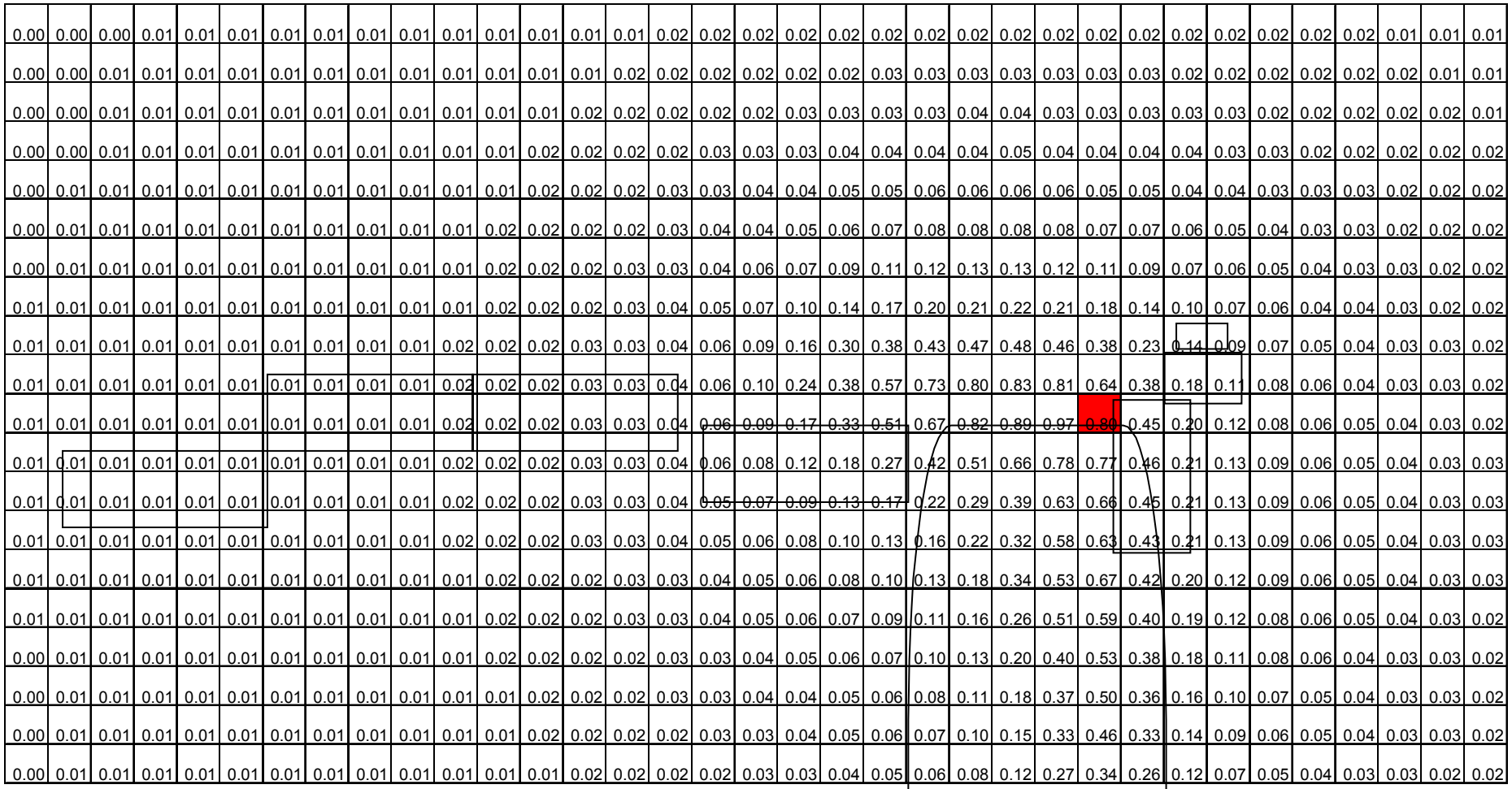

FIG.8. Dose rates at the scene after source removal[9].

[9] Dose rate in mSv/h. The location where the source was is marked in red for reference. Each square represents 1 m^2

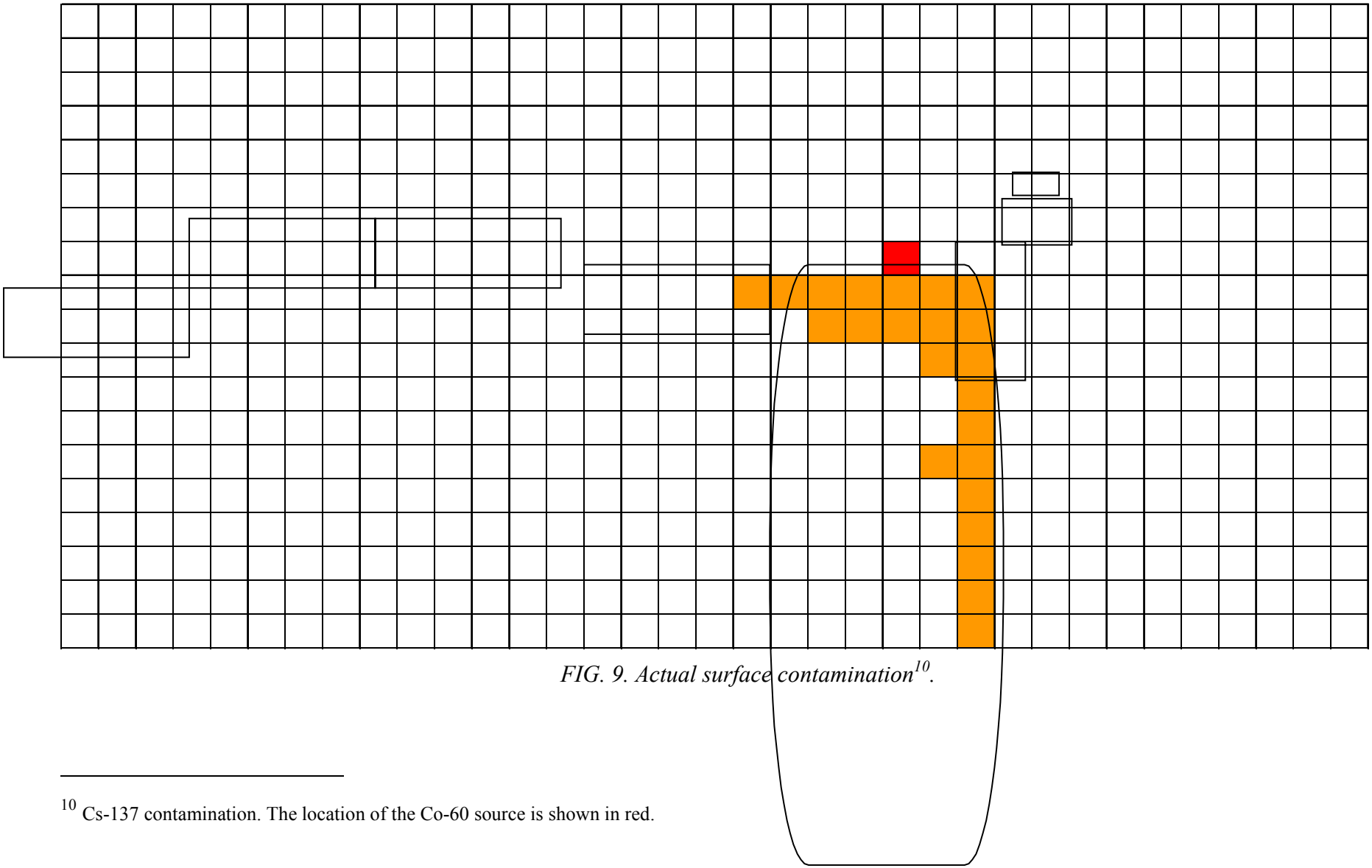

FIG. 9. Actual surface contamination[10].

[10] Cs-137 contamination. The location of the Co-60 source is shown in red.

7.2.1.2. Internal contamination data (total body burden)

TABLE 15: INTERNAL CONTAMINATION DATA (TOTAL BODY BURDEN)

Person	Intake of Cs-137 (Bq)	Dose rate above background from patient (μSv/h)	50 year internal committed effective dose (mSv)[11]
Driver (D-1)	100,000	0.6	1
Co-driver (D-2)	20,000	0.1	0.02
Engineer (C-1)	5000	0.0	0.05
Assistant engineer (C-2)	2000	0.0	0.02
W-1	1000	0.0	0.01
W-2	10,000	0.1	0.1
W-3	5000	0.0	0.05

[11] Based on a conversion factor taken from the U.S. Environmental Protection Agency, *Limiting values of radionuclide intake and air concentration and dose conversion factors for inhalation, submersion, and ingestion*, Federal Guidance Report No. 11, US EPA, Washington, DC (1988). Presented data do not account for external irradiation.

7.2.1.3. Urine analysis results (pCi/d Cs-137)

TABLE 16: URINE ANALYSIS RESULTS (pCi/d Cs-137)

Urine Data	**D-1**	**D-2**	**C-1**	**C-2**	**W-1**	**W-2**	**W-3**
Time (days)	I = 100000 Bq	I = 20000 Bq	I = 5000 Bq	I = 2000 Bq	I = 1000 Bq	I = 10000 Bq	I = 5000 Bq
	I = 2.7E6 pCi	I = 5.4E5 pCi	I = 1.35E5 pCi	I = 5.4E4 pCi	I = 2.7 E4 pCi	I = 2.7 E5 pCi	I = 1.35 E5 pCi
1	4E+04	7E+03	2E+03	7E+02	4E+02	4E+03	2E+03
2	3E+04	7E+03	2E+03	7E+02	3E+02	3E+03	2E+03
3	3E+04	6E+03	1E+03	6E+02	3E+02	3E+03	1E+03
4	2E+04	5E+03	1E+03	5E+02	2E+02	2E+03	1E+03
5	2E+04	4E+03	9E+02	4E+02	2E+02	2E+03	9E+02
6	2E+04	3E+03	8E+02	3E+02	2E+02	2E+03	8E+02
7	1E+04	3E+03	7E+02	3E+02	1E+02	1E+03	7E+02
8	1E+04	2E+03	6E+02	2E+02	1E+02	1E+03	6E+02
9	1E+04	2E+03	5E+02	2E+02	1E+02	1E+03	5E+02
10	9E+03	2E+03	5E+02	2E+02	1E+02	1E+03	5E+02
15	7E+03	2E+03	4E+02	2E+02	8E+01	8E+02	4E+02
20	7E+03	1E+03	3E+02	1E+02	7E+01	7E+02	3E+02
30	6E+03	1E+03	3E+02	1E+02	7E+01	7E+02	3E+02
60	5E+03	1E+03	3E+02	1E+02	6E+01	6E+02	3E+02
90	4E+03	9E+02	2E+02	9E+01	4E+01	4E+02	2E+02
120	4E+03	7E+02	2E+02	7E+01	4E+01	4E+02	2E+02
150	3E+03	6E+02	2E+02	6E+01	3E+01	3E+02	2E+02
180	3E+03	5E+02	1E+02	5E+01	2E+01	2E+02	1E+02
210	2E+03	4E+02	1E+02	4E+01	2E+01	2E+02	1E+02
240	2E+03	3E+02	8E+01	3E+01	2E+01	2E+02	8E+01
270	1E+03	3E+02	7E+01	3E+01	1E+01	1E+02	7E+01
300	1E+03	2E+02	6E+01	2E+01	1E+01	1E+02	6E+01
330	9E+02	2E+02	5E+01	2E+01	9E+00	9E+01	5E+01
360	8E+02	2E+02	4E+01	2E+01	8E+00	8E+01	4E+01

7.2.1.4. Fecal analysis (pCi/d)

TABLE 17: FECAL ANALYSIS (pCi/d)

Fecal Data	**D-1**	**D-2**	**C-1**	**C-2**	**W-1**	**W-2**	**W-3**
Time (days)	I = 100000 Bq	I = 20000 Bq	I = 5000 Bq	I = 2000 Bq	I = 1000 Bq	I = 10000 Bq	I = 5000 Bq
	I = 2.7E6 pCi	I = 5.4E5 pCi	I = 1.35E5 pCi	I = 5.4E4 pCi	I = 2.7 E4 pCi	I = 2.7 E5 pCi	I = 1.35 E5 pCi
1	9E+03	2E+03	4E+02	2E+02	9E+01	9E+02	4E+02
2	9E+03	2E+03	4E+02	2E+02	9E+01	9E+02	4E+02
3	7E+03	1E+03	4E+02	1E+02	7E+01	7E+02	4E+02
4	6E+03	1E+03	3E+02	1E+02	6E+01	6E+02	3E+02
5	5E+03	9E+02	2E+02	9E+01	5E+01	5E+02	2E+02
6	4E+03	8E+02	2E+02	8E+01	4E+01	4E+02	2E+02
7	3E+03	6E+02	2E+02	6E+01	3E+01	3E+02	2E+02
8	3E+03	5E+02	1E+02	5E+01	3E+01	3E+02	1E+02
9	3E+03	5E+02	1E+02	5E+01	3E+01	3E+02	1E+02
10	2E+03	5E+02	1E+02	5E+01	2E+01	2E+02	1E+02
15	2E+03	4E+02	9E+01	4E+01	2E+01	2E+02	9E+01
20	2E+03	3E+02	9E+01	3E+01	2E+01	2E+02	9E+01
30	2E+03	3E+02	8E+01	3E+01	2E+01	2E+02	8E+01
60	1E+03	3E+02	7E+01	3E+01	1E+01	1E+02	7E+01
90	1E+03	2E+02	5E+01	2E+01	1E+01	1E+02	5E+01
120	9E+02	2E+02	4E+01	2E+01	9E+00	9E+01	4E+01
150	8E+02	2E+02	4E+01	2E+01	8E+00	8E+01	4E+01
180	6E+02	1E+02	3E+01	1E+01	6E+00	6E+01	3E+01
210	5E+02	1E+02	3E+01	1E+01	5E+00	5E+01	3E+01
240	4E+02	9E+01	2E+01	9E+00	4E+00	4E+01	2E+01
270	4E+02	7E+01	2E+01	7E+00	4E+00	4E+01	2E+01
300	3E+02	6E+01	1E+01	6E+00	3E+00	3E+01	1E+01
330	2E+02	5E+01	1E+01	5E+00	2E+00	2E+01	1E+01
360	2E+02	4E+01	1E+01	4E+00	2E+00	2E+01	1E+01

7.2.1.5. Content of radionuclides in the body (pCi)

TABLE 18: CONTENT OF RADIONUCLIDES IN THE BODY (pCi)

Total Body	**D-1**	**D-2**	**C-1**	**C-2**	**W-1**	**W-2**	**W-3**
Time (days)	I = 100000 Bq	I = 20000 Bq	I = 5000 Bq	I = 2000 Bq	I = 1000 Bq	I = 10000 Bq	I = 5000 Bq
	I = 2.7E6 pCi	I = 5.4E5 pCi	I = 1.35E5 pCi	I = 5.4E4 pCi	I = 2.7 E4 pCi	I = 2.7 E5 pCi	I = 1.35 E5 pCi
1	1.68E+06	3.35E+05	8.38E+04	3.35E+04	1.68E+04	1.68E+05	8.38E+04
2	1.62E+06	3.24E+05	8.11E+04	3.24E+04	1.62E+04	1.62E+05	8.11E+04
3	1.59E+06	3.19E+05	7.97E+04	3.19E+04	1.59E+04	1.59E+05	7.97E+04
4	1.57E+06	3.14E+05	7.84E+04	3.14E+04	1.57E+04	1.57E+05	7.84E+04
5	1.54E+06	3.08E+05	7.70E+04	3.08E+04	1.54E+04	1.54E+05	7.70E+04
6	1.51E+06	3.03E+05	7.57E+04	3.03E+04	1.51E+04	1.51E+05	7.57E+04
7	1.49E+06	2.97E+05	7.43E+04	2.97E+04	1.49E+04	1.49E+05	7.43E+04
8	1.49E+06	2.97E+05	7.43E+04	2.97E+04	1.49E+04	1.49E+05	7.43E+04
9	1.46E+06	2.92E+05	7.30E+04	2.92E+04	1.46E+04	1.46E+05	7.30E+04
10	1.46E+06	2.92E+05	7.30E+04	2.92E+04	1.46E+04	1.46E+05	7.30E+04
15	1E+06	3E+05	7E+04	3E+04	1E+04	1E+05	7E+04
20	1E+06	3E+05	7E+04	3E+04	1E+04	1E+05	7E+04
30	1E+06	3E+05	6E+04	3E+04	1E+04	1E+05	6E+04
60	1E+06	2E+05	5E+04	2E+04	1E+04	1E+05	5E+04
90	9E+05	2E+05	4E+04	2E+04	9E+03	9E+04	4E+04
120	7E+05	1E+05	4E+04	1E+04	7E+03	7E+04	4E+04
150	6E+05	1E+05	3E+04	1E+04	6E+03	6E+04	3E+04
180	5E+05	1E+05	2E+04	1E+04	5E+03	5E+04	2E+04
210	4E+05	8E+04	2E+04	8E+03	4E+03	4E+04	2E+04
240	3E+05	6E+04	2E+04	6E+03	3E+03	3E+04	2E+04
270	3E+05	5E+04	1E+04	5E+03	3E+03	3E+04	1E+04
300	2E+05	5E+04	1E+04	5E+03	2E+03	2E+04	1E+04
330	2E+05	4E+04	9E+03	4E+03	2E+03	2E+04	9E+03
360	2E+05	3E+04	8E+03	3E+03	2E+03	2E+04	8E+03

7.2.1.6. Content of radionuclides in the lung (pCi)

TABLE 19: CONTENT OF RADIONUCLIDES IN THE LUNG (pCi)

Lung Data	**D-1**	**D-2**	**C-1**	**C-2**	**W-1**	**W-2**	**W-3**
Time (days)	I = 100000 Bq	I = 20000 Bq	I = 5000 Bq	I = 2000 Bq	I = 1000 Bq	I = 10000 Bq	I = 5000 Bq
	I = 2.7E6 pCi	I = 5.4E5 pCi	I = 1.35E5 pCi	I = 5.4E4 pCi	I = 2.7 E4 pCi	I = 2.7 E5 pCi	I = 1.35 E5 pCi
1	2E+05	4E+04	1E+04	4E+03	2E+03	2E+04	1E+04
2	6E+04	1E+04	3E+03	1E+03	6E+02	6E+03	3E+03
3	2E+04	4E+03	1E+03	4E+02	2E+02	2E+03	1E+03
4	6E+03	1E+03	3E+02	1E+02	6E+01	6E+02	3E+02
5	2E+03	3E+02	8E+01	3E+01	2E+01	2E+02	8E+01
6	4E+02	9E+01	2E+01	9E+00	4E+00	4E+01	2E+01
7	1E+02	2E+01	6E+00	2E+00	1E+00	1E+01	6E+00
8	3E+01	6E+00	2E+00	6E-01	3E-01	3E+00	2E+00
9	9E+00	2E+00	4E-01	2E-01	9E-02	9E-01	4E-01
10	2E+00	5E-01	1E-01	5E-02	2E-02	2E-01	1E-01
15	3E-03	6E-04	2E-04	6E-05	3E-05	3E-04	2E-04
20	4E-06	8E-07	2E-07	8E-08	4E-08	4E-07	2E-07
30	8E-09	2E-09	4E-10	2E-10	8E-11	8E-10	4E-10
60	9E-17	2E-17	4E-18	2E-18	9E-19	9E-18	4E-18
90	2E-20	4E-21	1E-21	4E-22	2E-22	2E-21	1E-21
120	7E-22	1E-22	4E-23	1E-23	7E-24	7E-23	4E-23
150	3E-24	5E-25	1E-25	5E-26	3E-26	3E-25	1E-25
180	2E-23	4E-24	1E-24	4E-25	2E-25	2E-24	1E-24
210	2E-25	3E-26	8E-27	3E-27	2E-27	2E-26	8E-27
240	2E-25	4E-26	1E-26	4E-27	2E-27	2E-26	1E-26
270	7E-26	1E-26	4E-27	1E-27	7E-28	7E-27	4E-27
300	4E-26	8E-27	2E-27	8E-28	4E-28	4E-27	2E-27
330	1E-26	2E-27	5E-28	2E-28	1E-28	1E-27	5E-28
360	3E-27	5E-28	1E-28	5E-29	3E-29	3E-28	1E-28

7.2.1.7. Personal contamination data

Note that the following values are provided in Bq/cm^2. Before these values can be used in the field exercise, they must be adapted to the types of instruments used. If there are more than one type, then several such tables must be produced. As a very simple rule, assume that the instrument reading is given by the following equation:

$$\text{Reading} = \frac{1}{2} \times \text{activity} \times \text{efficiency}\,(0.2) \times \text{detector area}\,(\text{cm}^2)$$

Assume that contamination does not change after the third attempt. If contamination is reported on clothes (noted in parentheses), assume that removing the clothes removes the contamination.

TABLE 20: PERSONAL CONTAMINATION DATA

Localization	Level of contamination, Bq/cm^2			
	Before decontamination	**After first attempt**	**After second attempt**	**After third attempt**
DRIVER (D-1)				
Head	100	90	60	20
Face	80	40	10	10
Nostrils	100	20	18	16
Ears	50	10	4	4
Front torso (clothes)	300	clean		
Back (clothes)	300	clean		
Left arm (clothes)	150	clean		
Right arm (clothes)	120	clean		
Left hand	100	20	10	10
Right hand	100	25	15	10
Left leg (clothes)	250	clean		
Right leg – femur, open wound	150	100	80	70
Left foot (shoe)	50	clean		
Right foot (shoe)	75	clean		
CO-DRIVER (D-2)				
Head	120	90	60	20
Face	100	40	10	10
Nostrils	50	20	18	16
Ears	25	10	4	4
Front torso (clothes)	300	clean		
Back (clothes)	300	clean		
Left arm (clothes)	150	clean		
Right arm (clothes)	120	clean		

Localization	Level of contamination, Bq/cm^2	Localization	Level of contamination, Bq/cm^2	Localization
Left hand	100	20	10	10
Right hand	100	25	15	10
Left leg (clothes)	250	clean		
Right leg – femur, open wound	150	100	80	70
Left foot (shoe)	50	clean		
Right foot (shoe)	75	clean		
ENGINEER (C-1)				
Head	20	10	5	5
Face	30	10	10	10
Nostrils	60	5	5	5
Ears	10	5	2	2
Front torso (clothes)	20	clean		
Back (clothes)	30	clean		
Left arm (clothes)	25	clean		
Right arm (clothes)	20	clean		
Left hand	200	100	20	20
Right hand	100	75	50	25
Left leg (clothes)	50	clean		
Right leg (clothes)	50	clean		
Left foot (shoe)	100	clean		
Right foot (shoe)	75	clean		
ASSISTANT ENGINEER (C-2)				
Head	20	10	5	5
Face	10	5	5	5
Nostrils	5	5	5	5
Ears				
Front torso (clothes)				
Back (clothes)				
Left arm (clothes)				
Right arm (clothes)				
Left hand				
Right hand				

Localization	Level of contamination, Bq/cm^2	Localization	Level of contamination, Bq/cm^2	Localization
Left leg (clothes)				
Right leg (clothes)	50	clean		
Left foot (shoe)	100	clean		
Right foot (shoe)	75	clean		
ALL RESPONDERS WHO APPROACH THE SCENE				
Head				
Face				
Nostrils				
Ears				
Front torso (clothes)				
Back (clothes)				
Left arm (clothes)	10	clean		
Right arm (clothes)	10	clean		
Left hand	25	clean		
Right hand	50	clean		
Left leg (clothes)				
Right leg (clothes)				
Left foot (shoe)	100	clean		
Right foot (shoe)	100	clean		
W-1, W-2 AND W-3				
Head	20	clean		
Face	10	clean		
Nostrils	5	clean		
Ears				
Front torso (clothes)	100	clean		
Back (clothes)				
Left arm (clothes)	200	clean		
Right arm (clothes)	300	clean		
Left hand	100	clean		
Right hand	200	clean		
Left leg (clothes)	25	clean		
Right leg (clothes)				
Left foot (shoe)	50	20		
Right foot (shoe)	50	20		

Localization	Level of contamination, Bq/cm^2	Localization	Level of contamination, Bq/cm^2	
OTHER WITNESSES WHO GET WITHIN THE SECURITY PERIMETER				
Head				
Face				
Nostrils				
Ears				
Front torso (clothes)				
Back (clothes)				
Left arm (clothes)				
Right arm (clothes)				
Left hand				
Right hand				
Left leg (clothes)				
Right leg (clothes)				
Left foot (shoe)	50	10	clean	
Right foot (shoe)	50	10	clean	

7.2.1.8. Response vehicle contamination data

The following applies to any vehicle entering the contaminated area (approximately 10 × 10 m around the crash site).

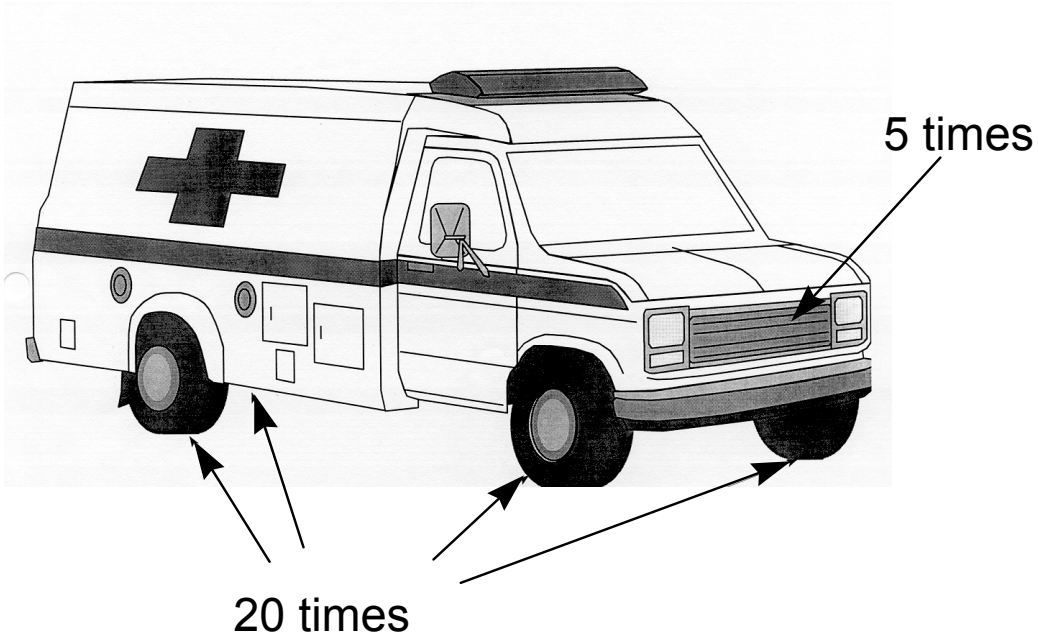

FIG. 10. Respose vehicle contamination data.

7.3. B-3: MEDICAL DATA

Transportation Accident Scenario:

Medical Data, Response Actions, and Medical Injects

The following clinical histories underlie the exercise play for the field day of the transportation accident exercise (the day of the accident, day 0) and the table-top day of the exercise (days 1-30 after the day of the accident). All clinical findings are normal unless otherwise indicated. The clinical histories are based upon the lymphocyte count assumptions (Table 21).

TABLE 21: TWO-DAY LYMPHOCYTE COUNT ASSUMPTIONS[12]

Degree of severity of exposure	12 hours post exposure	24 hours post exposure	48 hours post exposure
Mild	2000	1750	1500
Severe	1800	1500	1200
Very severe	1700	1700	500
Lethal	1700	1000	100

[12] Based on International Atomic Energy Agency - World Health Organization, *Diagnosis and Treatment of Radiation Injuries,* Safety Reports Series No. 2, IAEA, Vienna (1998).

TABLE 22. MEDICAL DATA FOR PHASES 1 AND 2

D-1, truck driver 1, male, 45 years	
Pre-accident history	Primary driver of truck carrying cargo of unsecured sources, extricated by witnesses before arrival of emergency services. He struck his head during the crash.
Radiological data	Whole body dose 2-3 Gy, t = 30 min, d = 0 m. External and internal contamination of skin, clothes, open wounds on head and legs.
Pre-hospital medical data	Blood pressure (Bp) 100/60 mm Hg, pulse 100 beats/min, Respiratory rate (RR) 10 breaths/min.
Pre-hospital response actions	Immobilization, oxygen.
Hospital medical data	Up to hour 5: serious head injury. Unconscious. Further exam shows bilateral fracture of femur. Bp 90/40 mm Hg, pulse 100 beats/min, RR 8 breaths/min, GCS[13] 3/15, lymphocytes (L) 3000 per mm^3. Pupils fixed.
Other diagnostic findings	None. Neither X ray nor CT taken because radiologist does not want to put a contaminated patient on CT scan.
Hospital response actions	Intravenous fluids, intubation.
Bioassay analysis	Blood counts, urine and stool samples, nose swipes.
Set-up	Moulage for head injury and bilateral femur fracture. Simulate unconsciousness.
Significant issues to discuss	Triage. Relative values of aggressive medical management vs. care and comfort.
Future response actions	Decision regarding intervention or not.
Additional resources required	Mortuary affairs.
Injects	1) When examined by player: Player examines patient and makes detailed description of injuries severe enough for death to be imminent. There is a serious head injury. Patient is unconscious. Further exam reveals bilateral femur fracture. 2) +3:10 hrs: Patient dies.
D-2, truck driver 2, male, 32 years	
Pre-accident history	Secondary driver of the truck. He sustains serious injuries and was extricated by witnesses before arrival of emergency services.
Radiological data	Whole body dose 2-3 Gy, t = 15 min, d = 0 m. External and internal contamination of skin, clothes, open wounds. Contamination will be extremely difficult to decontaminate.
Pre-hospital medical data	Bp 140/90 mm Hg, pulse 110 beats/min, RR 16 breaths/min.
Pre-hospital response actions	Immobilization, compression bandages on open wounds, oxygen.
Hospital medical data	Up to hour 8: patient complains of chest pain. Bp 120/70 mm Hg, pulse 100 beats/min, RR 16 breaths/min, GCS 14. L 3100 per mm^3. Hour 11: L 2100 per mm^3.

[13] Glasgow Coma Score (GCS). The GCS is scored between 3 and 15, 3 being the worst, and 15 the best. It is composed of three parameters: Best Eye Response, Best Verbal Response, Best Motor Response.

Other diagnostic findings	On initial exam, X ray: negative findings, ultrasound of abdomen negative
Hospital response actions	Up to hour 4: intravenous fluids, oxygen, diagnostic testing. Externally decontaminated. Hour 8: to OR for wound management, surgical decontamination of wounds. Hr 10: wounds left open. Hr 11: Surgical Intensive Care Unit (SICU). Hr 12: antibiotics and symptomatic care.
Bioassay analysis	Urine analysis: positive for radioactivity.
Set-up	Moulage for multiple lacerations and bruises on legs and arms, hematomas on chest and head, confusion.
Significant issues to discuss	Infection control. Comments: wounds should be left open, otherwise there is risk of infection next day. Detailed medical history can have forensic investigation value. Who/when/how to raise issue of cytogenetic studies.
Future response actions	Long-term hematologic evaluation and follow-up. Urologic/reproductive medicine counseling. Psychiatric counseling.
Additional resources required	Support services.
Injects	1) When examined by player: Player examines patient and describes multiple lacerations and bruises on arms and legs severe enough to indicate surgery or possible OR intervention. Hematomas on the chest and head. Devitalized tissue and exposed bone. Possible tendon injury. Confusion. 2) +4:00 hrs: Patient has nausea and is vomiting.
C-1, conductor 1, male, 60 years	
Pre-accident history	Train conductor, extricated by witnesses before arrival of emergency services.
Radiological data	Whole body dose 1-2 Gy, t = 30 min, d = 5 m. External and internal contamination of skin, clothes, open wounds on legs.
Pre-hospital medical data	Bp 140/70 mm Hg, pulse 110 beats/min, RR 12 breaths/min.
Pre-hospital response actions	Compression bandages of wounds, oxygen.
Hospital medical data	Up to hour 5: patient complaining of chest pain. Bp 160/90 mm Hg, pulse 100 beats/min, RR 26 breaths/min, GCS 15. L 2800 per mm^3. Hr 12: L 2600 per mm^3.
Other diagnostic findings	X ray shows three fractured ribs. Ultrasound of abdomen negative
Hospital response actions	Intravenous fluids, oxygen, NG tube, diagnostic testing, antibiotics, externally decontaminated, wounds debrided in emergency department and continued wound management, pain management, nutrition counseling.
Bioassay analysis	Urine analysis: positive.
Set-up	Moulage for chest injury, lacerations on arms and legs.
Significant issues to discuss	Pain management, infection management.
Future response actions	Hematologic evaluation and follow-up.
Additional resources required	Support services.

Injects	1) When examined by player: Player examines patient and gives detailed description of the injuries. There are lacerations of arm and legs (small). Bruise on chest. Wounds are such that they can be managed without surgery, under local anesthesia and with pain management. 2) If 2:30 h. after arrival to hospital, a chest X ray has not been done, force chest X ray. 3) Patient has nausea 3:50 h. after arrival to hospital.
C-2, conductor 2, male, 40 years	
Pre-accident history	Assistant train conductor who was thrown during the crash and whose arms came into contact with hot metal object.
Radiological data	Whole body dose 1-2 Gy, t = 30 min, d = 5 m. External contamination of skin, clothes, small internal contamination.
Pre-hospital medical data	Bp n/a, pulse 120 beats/min, RR 14 breaths/min.
Pre-hospital response actions	Bandaging of wounds, pain management.
Hospital medical data	Patient complaining of pain in hands and forearms. Scattered 2nd degree burns (6%) on both hands and forearms. Bp 150/80 mm Hg, pulse 96 beats/min, RR 22 breaths/min, GCS 15, L 3100 per mm^3.
Other diagnostic findings	None.
Hospital response actions	Diagnostic testing, burns debrided in emergency department and continued wound management with appropriate burn ointments, pain management, psychiatric support. External decontamination.
Bioassay analysis	Urine analysis: negative.
Set-up	Moulage for burns on arms and legs.
Significant issues to discuss	Long-term scarring, physical therapy and return to work.
Future response actions	Rehabilitative services. Hematologic evaluation and follow-up.
Additional resources required	Support services.
Injects	1) When examined by player: Player examines patient and gives detailed description of the burns on palms of hands and forearms. Extremely painful. Surface of combined burns is 6%. 2) Nausea and vomiting, starting 3 h. after arrival to hospital. 3) +11: Nausea and vomiting, continuing.
R-1, male, aged 55 years	
Pre-accident history	First responder arrives at scene approximately 15 minutes after the collision.
Radiological data	Whole body dose < 1 Gy, t = 25 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	No data collected.
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Up to hour 4, Bp normal, pulse normal, RR normal, GCS normal, L 2800 per mm^3, urine analysis normal. Discharged from hospital.
Other diagnostic findings	None.
Hospital response actions	Complete physical examination, externally decontaminated.
Bioassay analysis	Blood counts, urine and stool samples, nose swipes.

Set-up	Simulate first responder. No moulage required (no injury).
Significant issues to discuss	General concern for all patients: disposal of clothing and supplies/equipment used in prehospital and hospital treatment. Workmen's compensation and issues regarding long-term disability (including legal).
Future response actions	Hematology evaluation and follow-up.
Additional resources required	Support services.
Injects	When examined by player: Complete physical exam is normal.
R-2, male, aged 56 years	
Pre-accident history	First responder arrives at scene approximately 15 minutes after the collision.
Radiological data	Whole body dose < 1 Gy, t = 30 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	None collected.
Pre-hospital response actions	Splinting of left arm, pain management.
Hospital medical data	Patient complaining of extreme pain in his left forearm. Bp 140/80 mm Hg, pulse 90 beats/min, RR 16 breaths/min, GCS 15, L 3200 per mm^3. Hr 12: L 3000 per mm^3.
Other diagnostic findings	X ray shows badly broken arm (closed fracture).
Hospital response actions	Surgical fixation of fracture. Externally decontaminated.
Bioassay analysis	Urine analysis: negative.
Set-up	Moulage for first responder with broken deformed arm.
Significant issues to discuss	Timing of surgical procedure. Workmen's compensation and issues regarding long-term disability (including legal).
Future response actions	Hematology evaluation and follow-up; rehabilitation.
Additional resources required	Support services.
Injects	1) When examined by player: Player examines patient and gives detailed description of the arm injury. Patient is complaining of extreme pain in forearm (left), which is deformed. 2) If an X ray is not taken within 2.5 h. of arrival to hospital, force an X ray.
R-3, male, aged 43 years	
Pre-accident history	First responder arrives at scene approximately 15 minutes after the collision.
Radiological data	Whole body dose < 1 Gy, t = 25 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	No data collected.
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Up to hour 4, Bp normal, pulse normal, RR normal, GCS normal, L 2800 per mm^3, urine analysis normal. Discharged from hospital.
Other diagnostic findings	None.
Hospital response actions	Complete physical examination, externally decontaminated.

Bioassay analysis	Blood counts, urine and stool samples, nose swipes.
Set-up	Simulate first responder. No moulage required (no injury).
Significant issues to discuss	General concern for all patients: disposal of clothing and supplies/equipment used in prehospital and hospital treatment. Workmen's compensation and issues regarding long-term disability (including legal).
Future response actions	Hematology evaluation and follow-up.
Additional resources required	Support services.
Injects	When examined by player: Complete physical exam is normal.
R-4, male, aged 62 years	
Pre-accident history	First responder arrives at scene approximately 15 minutes after the collision.
Radiological data	Whole body dose < 1 Gy, t = 25 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	No data collected.
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Up to hour 4, Bp normal, pulse normal, RR normal, GCS normal, L 2800 per mm^3, urine analysis normal. Discharged from hospital.
Other diagnostic findings	None.
Hospital response actions	Complete physical examination, externally decontaminated.
Bioassay analysis	Blood counts, urine and stool samples, nose swipes.
Set-up	Simulate first responder. No moulage required (no injury).
Significant issues to discuss	General concern for all patients: disposal of clothing and supplies/equipment used in prehospital and hospital treatment. Workmen's compensation and issues regarding long-term disability (including legal).
Future response actions	Hematology evaluation and follow-up.
Additional resources required	Support services.
Injects	When examined by player: Complete physical exam is normal.
R-5, male, aged 58 years	
Pre-accident history	First responder arrives at scene approximately 15 minutes after the collision.
Radiological data	Whole body dose < 1 Gy, t = 25 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	No data collected.
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Up to hour 4, Bp normal, pulse normal, RR normal, GCS normal, L 2800 per mm^3, urine analysis normal. Discharged from hospital.
Other diagnostic findings	None.
Hospital response actions	Complete physical examination, externally decontaminated.
Bioassay analysis	Blood counts, urine and stool samples, nose swipes.
Set-up	Simulate first responder. No moulage required (no injury).

Significant issues to discuss	General concern for all patients: disposal of clothing and supplies/equipment used in prehospital and hospital treatment. Workmen's compensation and issues regarding long-term disability (including legal).
Future response actions	Hematology evaluation and follow-up.
Additional resources required	Support services.
Injects	When examined by player: Complete physical exam is normal.
W-1, male, 30 years	
Pre-accident history	Witness ran from the bar to the train and touched hot metal while helping to extricate victims from the truck wreck.
Radiological data	Whole body dose 1-2 Gy, t = 20 min, d = 0 m. External contamination of hands, clothes.
Pre-hospital medical data	No data collected. (Prehospital services by this time overwhelmed.).
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Patient complaining of pain in hands. Hands are burnt so he cannot eat. Nausea continues for duration. Bp 120/70 mm Hg, pulse 96 beats/min, RR 18 breaths/min, GCS 15, L 3000 per mm^3. Urine analysis: negative. Hr 12: L 2700 per mm^3.
Other diagnostic findings	None.
Hospital response actions	Wound management, pain management, counseling. External decontamination.
Bioassay analysis	Blood counts, urine and stool samples, nose swipes.
Set-up	Moulage for burns on hands.
Significant issues to discuss	Soft tissue injury management. Concern about long-term effects.
Future response actions	Consider expert opinion on soft tissue injury management. Hematologic evaluation and follow-up.
Additional resources required	Referral services for specialized expertise. Support services.
Injects	1) When examined by player: Player examines patient and gives detailed description of the injuries on hands. There are extremely painful burns in palms of both hands. Patient is nauseated. 2) Nausea continues.
W-2, male, 30 years	
Pre-accident history	Witness ran from the bar to the train and fell while helping to extricate victims.
Radiological data	Whole body dose 1-2 Gy, t = 10-15 min, d = 0 m. External contamination of skin, clothes, open wounds on legs. Slight internal contamination.
Pre-hospital medical data	None collected.
Pre-hospital response actions	Bandaging of wounds.
Hospital medical data	Up to hour 3: Lacerations that can be handled under local anesthesia. Bp normal, pulse normal, RR normal, GCS normal, L 3100 per mm^3 Hour 4: Bp 150/90 mm Hg, pulse 110 beats/min, RR 24 breaths/min, L 3100 per mm^3.

Other diagnostic findings	None.
Hospital response actions	Intravenous fluids, diagnostic testing, antibiotics, externally decontaminated in emergency room, minor surgery for wound decontamination and management, pain management, psychiatric support.
Bioassay analysis	Urine analysis: negative.
Set-up	Moulage for small lacerations on legs and arms.
Significant issues to discuss	Contaminated soft tissue injuries.
Future response actions	Hematologic evaluation and follow-up.
Additional resources required	Support services.
Injects	1) When examined by player: Player examines patient and gives detailed description of the lacerations on legs and arms (small). Vital signs are all normal. 2) After 3.5 h. in hospital, psychological decompensation, nausea and vomiting start.
W-3, male, 28 years	
Pre-accident history	Witness ran from the shopping plaza to the train to help the accident victims.
Radiological data	Whole body dose 1-2 Gy, t = 10-15 min, d = 0 m. External contamination of skin, clothes.
Pre-hospital medical data	No data collected.
Pre-hospital response actions	Transport to hospital.
Hospital medical data	Up to hour 4: Bp normal, pulse normal, RR normal, GCS normal, L 2800 per mm^3. Hr 12: Bp normal, pulse normal, RR normal, L 2600 per mm^3.
Other diagnostic findings	None.
Hospital response actions	Intravenous fluids (for nausea).
Bioassay analysis	Urine analysis: negative.
Set-up	No moulage for injury necessary.
Significant issues to discuss	None.
Future response actions	Hematologic evaluation and follow-up.
Additional resources required	Support services.
Injects	1) When examined by player: Player examines patient and notes no injuries. Vital signs are all normal. Patient is nauseous. 2) 1 h. after arrival to hospital, patient starts vomiting.

TABLE 23. MEDICAL DATA FOR PHASE 3, TABLE-TOP EXERCISE

D- 1, male, 45 years	
Start: External and internal contamination of skin, clothes, open wounds on head and legs. There are injuries severe enough for death to be imminent. There is a serious head injury. Patient is unconscious. Bp 100/60 mm Hg, pulse 100 beats/min, RR 10 breaths/min. Further exam reveals bilateral femur fracture. D1: patient 1 dies 3h10min after arrival in hospital.	
Issues for Day 1	Triage. Relative values of aggressive medical management vs. care and comfort. Decision regarding intervention or not
Further Issues	Mortuary affairs
D-2, male, 32 years	
Start: External and internal contamination of skin, clothes, open wounds. Contamination will be extremely difficult to decontaminate. There are multiple lacerations and bruises on arms and legs severe enough to indicate surgery or possible OR intervention. Hematomas on the chest and head. Devitalized tissue and exposed bone. Possible tendon injury. Confusion. Bp 140/90 mm Hg, pulse 110 beats/min, RR 16 breaths/min. D1: Nausea and vomiting. Hospital course continues with following data and treatment: D1: anti-emetics, antibiotics, nothing by mouth (NPO), L 1500 per mm^3.	
D2: to OR for wound closure, continue with antibiotics, L 1200 per mm^3. D3: antibiotics, progressive diet, L 1200 per mm^3. Detailed history of patient is taken to ascertain the mechanism of injury. History reveals that in the quarter hour prior to the accident, as the truck approached the tracks, the primary truck driver had begun breathing as though he was snoring and had difficulty speaking. The patient said that he thought the truck driver's left side of his face looked odd. The patient and the driver were partners and frequently drove the same shift together. He tried to warn the driver of the warning signs at the railroad crossing and remembered asking him if he was ok and if he had remembered to take his medications for high blood pressure that day.	
D9: antibiotics discontinued, wounds well healed. D12: mild neutropenia, neutrophil count (N) 750 per mm^3, mild thrombocytopenia, mild anemia, Hb 9.0 gm%. D18: discharge. D21: outpatient visit. Fever to 39.6°C, neutropenia, N 500 per mm^3, Hb 8.0 gm%, admission to hospital. Hospital actions include broad spectrum antibiotics, blood transfusion, daily N and Hb counts.	
D25: responds clinically. N 800 per mm^3, Hb 11.5 gm %. D30: improving, afebrile, discharge.	
Issues for Day 1	Infection control. In operating room, wounds should be left open otherwise there is risk of infection next day. Detailed medical history can have forensic investigation value. Who/when/how to raise issue of cytogenetic studies.
Issues for Days 2-7	Infection control. In operating room, wounds should be left open otherwise there is risk of infection next day. Detailed medical history can have forensic investigation value. Who/when/how to raise issue of cytogenetic studies.
Issues for Days 8-21	
Issues for Days 22-30	Long-term hematologic evaluation and follow-up. Urologic/reproductive medicine counseling. Psychiatric counseling. Availability of counseling.

C-1, male, 60 years	
Start: External and internal contamination of skin, clothes, open wounds on legs. There are small lacerations of arm and legs. Bruise on chest. Wounds are such that they can be managed without surgery, under local anesthesia and with pain management. Bp 140/70 mm Hg, pulse 110 beats/min, RR 12 breaths/min. D1: chest X ray showing 3 fractured ribs. Patient has nausea. Hospital course continues with the following data and treatments recorded: D1: L 1750 per mm^3, progressive diet, antibiotics.	
D2: L 1500 per mm^3. D3: L 1500 per mm^3, delayed primary closure of wounds under local anesthesia.	
D10: L 1700 per mm^3, discharge, wounds healed, no further antibiotics. D18: outpatient visit, L 1700 per mm^3, weight loss, weak.	
D28: outpatient visit, anxious, phobic, anemia, Hb 9.0 gm%, nutrition and psychiatric counseling.	
Issues for Day 1	Pain and infection management.
Issues for Days 2-7	Pain and infection management.
Issues for Days 8-21	
Issues for Days 22-30	Long-term hematologic evaluation and follow-up. Availability of support services.
C-2, male, 40 years	
Start: External contamination of skin, clothes, small internal contamination. There are extremely painful burns on palms of hands and forearms. Surface of combined burns is 6%. Bp n/a, pulse 120 beats/min, RR 14 breaths/min. D1: patient has nausea and vomiting. D1: wound management with bacteriostatic ointment, L 1800 per mm^3, progressive diet.	
D2: L1700 per mm3, wound management with bacteriostatic ointment. D3: wound areas diagnosed as partial thickness thermal burns, L 1700 per mm^3, wound management with bacteriostatic ointment daily. D5: L1650 per mm3, wound management with bacteriostatic ointment.	
D8: wounds healing, wound management with bacteriostatic ointment. D18: wound management with bacteriostatic ointment, wounds healed, discharge.	
D30: outpatient visit, L2200 per mm^3, physical therapy for burns, concern about infertility, psychiatric support, sperm count?	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Long-term scarring, physical therapy and return to work. Future response actions include rehabilitative services and hematologic evaluation and follow-up. Discuss availability of support services.

R-1, male, aged 55 years	
Start: External contamination of skin, clothes. Complete physical exam is normal. Patient comes for outpatient visits. The following data and treatments are recorded: D1: physical exam, L2700 per mm^3.	
D2: L 2600 per mm^3.	
D8: physical exam, L2500 per mm^3. D21: physical exam, L2500 per mm^3.	
D30: L 2600 per mm^3.	
Issues for Day 1	General concern for all patients: disposal of clothing and supplies/equipment used in pre-hospital and hospital treatment.
Issues for Days 2-7	General concern for all patients: disposal of clothing and supplies/equipment used in pre-hospital and hospital treatment.
Issues for Days 8-21	
Issues for Days 22-30	Workmen's compensation and issues regarding long-term disability (including legal). Hematology evaluation and follow-up and availability of such services.
R-2, male, aged 56 years	
Start: External contamination of skin, clothes. Patient is complaining of extreme pain in left forearm, which is deformed. D1: X ray showing badly broken arm (closed fracture). Hospital course continues with following data and treatments recorded: D1: L 3000 per mm^3, progressive diet.	
D2: L 2900 per mm^3. D3: normal diet. D7: fracture healing well.	
D9: upper gastrointestinal hemorrhage. Hospital actions include work-up (Hb 9 gm %, platelets 100,000), endoscopy, transfusions. D21: L 2200 per mm^3, discharge.	
D30: outpatient visit, Hb 12gm%, L 2200 per mm^3.	
Issues for Day 1	Timing of surgical intervention(s).
Issues for Days 2-7	Timing of surgical intervention(s).
Issues for Days 8-21	
Issues for Days 22-30	Workmen's compensation and issues regarding long-term disability (including legal). Future response actions include rehabilitative services and hematologic evaluation and follow-up. Discuss availability of support services.

R-3, male, aged 43 years	
Start: External contamination of skin, clothes. Complete physical exam is normal. Patient comes to outpatient clinic. D1: physical exam, L 2700 per mm^3.	
D2: L 2600 per mm^3.	
D8: physical exam, L 2500 per mm^3. D21: physical exam, L 2500 per mm^3.	
D30: L 2600 per mm^3.	
Issues for Day 1	Same as for other firemen.
Issues for Days 2-7	Same as for other firemen.
Issues for Days 8-21	
Issues for Days 22-30	Same as for other firemen.
R-4, male, aged 62 years	
Start: External contamination of skin, clothes. Complete physical exam is normal. Patient comes to outpatient clinic. D1: physical exam, L 2700 per mm^3.	
D2: L 2600 per mm^3.	
D8: physical exam, L 2500 per mm^3. D21: physical exam, L 2500 per mm^3.	
D30: L2600 per mm3	
Issues for Day 1	Same as for other firemen.
Issues for Days 2-7	Same as for other firemen.
Issues for Days 8-21	
Issues for Days 22-30	Same as for other firemen.
R-5, male, aged 58 years	
Start: External contamination of skin, clothes. Complete physical exam is normal. Patient comes to outpatient clinic with the following data and treatments recorded: D1: physical exam, L 2700 per mm^3.	
D2: L 2600 per mm^3.	
D8: physical exam, L 2500 per mm^3. D21: physical exam, L 2500 per mm^3.	
D30: L 2600 per mm^3.	
Issues for Day 1	Same as for other firemen.
Issues for Days 2-7	Same as for other firemen.
Issues for Days 8-21	
Issues for Days 22-30	Same as for other firemen.

W-1, male, 30 years	
Start: External contamination of hands, clothes. There are extremely painful burns in palms of both hands. Patient is nauseated. D1: Nausea. D1: L 1750 per mm^3., burn wound management, progressive diet.	
D2: superficial burns, bacteriostatic ointment, L 1500 per mm^3. D3: L 1500 per mm^3.	
D10: wounds healed, psychiatric decompensation. D21: L 1800 per mm^3., discharge.	
D30: outpatient visit, wounds healed, concern about long-term effects. Counseling provided.	
Issues for Day 1	Soft tissue injury management.
Issues for Days 2-7	Soft tissue injury management.
Issues for Days 8-21	
Issues for Days 22-30	Concern about long-term effects of soft tissue injury. Future response actions include referral for expert opinion on soft tissue injury and hematologic evaluation and follow-up. Discuss availability of specialized referrals. Support services.
W-2, male, 30 years	
Start: External contamination of skin, clothes, open wounds on legs. Slight internal contamination. There are small lacerations on legs and arms. Vital signs are all normal. D1: Psychological decompensation, Nausea and vomiting. Hospital course continues with the following data and treatments recorded: D1: L 1700 per mm^3, liquid diet.	
D2: L 1400 per mm^3, normal diet. D5: wounds well healed. D7: L 1400 per mm^3, discharge.	
D10: return to hospital for outpatient clinic visit. Leg wounds are infected, fever 39°C. Patient admitted to hospital. Wound management is provided. D11: culture from wound shows *Staphylococcus aureus*, antibiotics are administered. D18: painful small ulcer on index and thumb. D21: ulcer getting bigger.	
D30: pain management, ulcers managed by plastic surgery, L 1550 per mm^3.	
Issues for Day 1	Contaminated soft tissue injuries.
Issues for Days 2-7	Contaminated soft tissue injuries.
Issues for Days 8-21	
Issues for Days 22-30	Hematologic evaluation and follow-up. Support services.

W-3, male, 28 years	
Start: External contamination of skin, clothes. There are no injuries. Vital signs are all normal. D1: Nausea. D1: L 1800 per mm^3, liquid diet.	
D2: L 1500 per mm^3, normal diet. D3: discharge.	
D10: Patient comes to outpatient clinic. L 1600 per mm^3, doing well.	
D30: L 1400 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Hematologic evaluation and follow-up. Support services.
W-4, male, 30 years	
Start: laceration on hand, external contamination. Hospital response involves wound management and external decontamination in hospital emergency room. Patient discharged and returns for outpatient management.	
D2: L 2000 per mm^3. D6: physical exam, wounds well healed.	
D21: outpatient visit, physical exam, L 2300 per mm^3, wounds well healed.	
D30: outpatient visit, L 2400 per mm^3, doing well.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-5, male, 25 years	
Start: local radiation burns, external contamination. Hospital response includes burn management, external decontamination. Patient discharged with instructions to return for outpatient treatment. D1: outpatient visit, physical exam, L 2600 per mm^3, wound management with bacteriostatic ointment, pain management, antibiotics.	
D2: outpatient visit, L 2400 per mm^3, worsening of skin condition, bacteriostatic ointment, antibiotics. D6: outpatient visit, L 2600 per mm^3, ulceration of involved areas, pain management, plastic surgery consultation, patient history reveals that patient and friend (W6) handled one of the sources at the scene of the accident and threw it into river.	
D21: nausea, vomiting, febrile, admission to hospital, viral syndrome.	
D25: clinically recovered, psychologically upset. D30: continued pain management, psychiatric support, continued involvement with plastic surgery.	
Issues for Day 1	
Issues for Days 2-7	

Issues for Days 8-21	
Issues for Days 22-30	

W-6, male, 28 years

Start: local radiation burns. External contamination. Hospital response includes burn management, external decontamination. Patient discharged with instructions to return for outpatient treatment. The following outpatient course is recorded:

D1: outpatient visit, physical exam, L 2700 per mm^3, wound management with bacteriostatic ointment, pain management, antibiotics.

D2: outpatient visit, L 2600 per mm^3, worsening of skin condition, bacteriostatic ointment, antibiotics.

D6: outpatient visit, L2500 per mm^3, ulceration of involved areas, pain management, plastic surgery consult.

D21: local skin ulcerations continue, nausea, vomiting, febrile, admission to hospital.

D30: clinically recovered, psychologically upset and guilt feelings, continued plastic surgery care.

Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	

W-7, male, 37 years

Start: no injury. External contamination. Hospital response includes complete physical examination, external decontamination, and discharge.

The following outpatient actions and clinical findings are recorded:

D3: outpatient visit, physical exam, L 2600 per mm^3, anxiety, psychological support.

D10: outpatient visit, L 2700 per mm^3.

D25: outpatient visit, L 2300 per mm^3.

D30: outpatient visit, L 2450 per mm^3.

Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	

W-8, male, 22 years

Start: no injury. External contamination. Hospital response includes complete physical examination, external decontamination, and discharge.

The following outpatient actions and clinical findings are recorded:

D3: outpatient visit, physical exam, L 3000 per mm^3, anxiety, psychological support.

D10: outpatient visit, physical exam, L 2700 per mm^3.

D25: outpatient visit, physical exam, L 2600 per mm^3.

D30: outpatient visit, physical exam, L 2750 per mm^3.

Issues for Day 1	

Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-9, male, 20 years	
Start: no injury. External contamination. Hospital response includes complete physical examination, external decontamination, and discharge.	
The following outpatient actions and clinical findings are recorded: D3: outpatient visit, L 1800 per mm^3, phobia about drinking water, psychological support.	
D10: outpatient visit, physical exam, L 2500 per mm^3.	
D25: outpatient visit, physical exam, L 2800 per mm^3. D30: outpatient visit, physical exam, L 2800 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-10, female, aged 25 years, with one child aged 2 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 3000 per mm^3.	
D14: outpatient visit, physical exam, L 3100 per mm^3.	
D30: outpatient visit, physical exam, L 2900 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-11, female, aged 26 years, pregnant (third trimester), with one child aged 2 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2700 per mm^3.	
D14: outpatient visit, physical exam, L 2600 per mm^3.	
D30: outpatient visit, physical exam, L 2700 per mm^3.	
Issues for Day 1	Are there any particular actions necessitated by the pregnancy?
Issues for Days 2-7	
Issues for Days 8-21	

Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-12, female, aged 28 years, with one child aged 3 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2550 per mm^3.	
D14: outpatient visit, physical exam, L 2600 per mm^3	
D30: outpatient visit, physical exam, L 2650 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-13, female, aged 30 years, has just learned that she is pregnant, with one child aged 3 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D4: outpatient visit, physical exam, psychologically unstable, worried about her pregnancy, pregnancy test reveals pregnancy of 11 weeks, hypertensive, admission to hospital. D5: Hospital course involves psychological evaluation, obstetrical consult.	
D10: L 2600 per mm^3, discharge. D17: outpatient evaluation, L 2500 per mm^3.	
D30: outpatient visit, L 2700 per mm^3.	
Issues for Day 1	Discuss provision of specialized (genetic) counseling to inform patient of her options.
Issues for Days 2-7	Discuss provision of specialized (genetic) counseling to inform patient of her options.
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-14, female, aged 31 years, with one child aged 4 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2500 per mm^3.	
D11: brings child in for outpatient evaluation of bloody nose, lymphocyte count of child L2600 per mm^3, platelets 100,000 per mm^3, admission of child to hospital. D12: L 2700 per mm^3 and platelets 115,000 per mm^3 (child), discharge.	

D28: outpatient visit mother and child, physical exam, L 2700 per mm^3 (child).	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-15, female, aged 32 years, with one child aged 4 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2700 per mm^3.	
D14: outpatient visit, L 2000 per mm^3.	
D28: outpatient visit, physical exam, vaginal bleeding, L 2200 per mm^3, platelets 90,000 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-16, female, aged 33 years, with one child aged 6 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2700 per mm^3.	
D14: outpatient visit, L 2500 per mm^3.	
D28: outpatient visit, L 2700 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-17, female, aged 34 years, with one child aged 7 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged.	
D7: outpatient visit, L 2600 per mm^3.	
D14: outpatient visit, L 2700 per mm^3.	
D28: outpatient visit, L 2650 per mm^3. D30: outpatient visit with child with lump on neck, diagnostic work-up?	
Issues for Day 1	

Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Future response actions include close pediatric supervision of child with regard to potential clinical sequelae of radiation exposure.
W-18, male, aged 49 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2500 per mm^3.	
D2: outpatient visit, physical exam, L 2750 per mm^3.	
D21: outpatient visit, chills, fever, "cough", some blood, L3100 per mm^3, pneumonia, admission to hospital.	
D30: discharge	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-19, male, aged 50 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2600 per mm^3.	
D2: outpatient visit, physical exam, L 2300 per mm^3.	
No inject	
D30: outpatient visit, physical exam, L 2400 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-20, male, aged 30 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, physical exam, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2400 per mm^3. D21: outpatient visit, physical exam, L 2400 per mm^3	
D30: outpatient visit, physical exam, L 2350 per mm^3.	
Issues for Day 1	

Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-21, male, aged 28 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2800 per mm^3.	
D2: outpatient visit, physical exam, L 2700 per mm^3.	
D8: outpatient visit, wounds well healed, L 2200 per mm^3, discontinue antibiotics D21: outpatient visit, physical exam, L 2150 per mm^3.	
D30: outpatient visit, physical exam, L 2200 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-22, male, aged 50 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: L 2900 per mm^3.	
D2: L 2200 per mm^3. D3: L 2300 per mm^3.	
D8: outpatient visit, physical exam, L 2400 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3	
D30: outpatient visit, physical exam, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-23, male, aged 18 years	
D1: No injects (delayed entry to medical care)	

D8: Comes to hospital eight days after accident having been encouraged to do so by friends and family. Patient history reveals that on the day of the accident he was in the bar and returned to it after milling about the scene for about 10 minutes prior to arrival of emergency services. He had no injury at that time. He still wears the shoes that he wore on the day of the crash. One of the examining nurses surveys the patient with a survey monitor that records a significant reading for this patient. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. L 2400 per mm^3. Patient discharged. D21: outpatient visit, physical exam, L 2400 per mm^3.	
D30: outpatient visit, physical exam, L 2400 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	Importance of radiological monitoring of all patients arriving at the hospital subsequent to the accident and presenting with history or symptoms relating to the accident. Importance of scene survey that is extensive in scope vs one that is limited. Consider possible contamination of everything surrounding the crash. Importance of timely widespread public notification messages in an attempt to bring forward all persons who were present at the scene rather than waiting for them to come by themselves. Contacting family and others living in home regarding potential radiation exposure (via shoes). Whether press announcement is necessary and what it should state. Should there be a public health message requesting all others with similar accident exposure to present themselves for screening also.
Issues for Days 22-30	
W-24, male, aged 17 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2200 per mm^3.	
D2: outpatient visit, physical exam, L 2300 per mm^3. D6: outpatient visit, painful blisters on index and thumb of right hand. History of touching source. Pain medication, antibiotic ointment	
D8: outpatient visit, physical exam, L 3000 per mm^3. D10: outpatient visit, ulcers on fingers, pain management, antibiotic ointment D21: outpatient visit, physical exam, L 3100 per mm^3.	
D25: plastic surgery consultation D30: outpatient visit, L 2700 per mm^3.	
Issues for Day 1	Importance of taking a full history including identification of an immuno-compromised host. Future response actions: close monitoring by pulmonologist.
Issues for Days 2-7	Importance of taking a full history including identification of an immuno-compromised host. Future response actions: close monitoring by pulmonologist.
Issues for Days 8-21	

Issues for Days 22-30	Should a public health advisory group develop plans for epidemiologic follow-up. Consider case/exposure registry. Who is the case? How to decide exposure threshold for follow-up? Discuss study design. Coordinate with Health Physics personnel, police, and others.
W-25, male, aged 32 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. D1: L 2300 per mm^3, discharge.	
D2: outpatient visit for asthma, physical exam, L2400 per mm^3. Patient history reveals regimen of high dose of prednisone for asthma at present.	
D8: outpatient visit, L 2200 per mm^3. D21: outpatient visit, physical exam, L 2200 per mm^3.	
D30: outpatient visit, L 2200 per mm^3.	
Issues for Day 1	Importance of taking a full history including identification of an immuno-compromised host. Future response actions: close monitoring by pulmonologist.
Issues for Days 2-7	Importance of taking a full history including identification of an immuno-compromised host. Future response actions: close monitoring by pulmonologist.
Issues for Days 8-21	
Issues for Days 22-30	
W-26, male, aged 37 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-27, male, aged 24 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3	
D2: outpatient visit, L 2600 per mm^3.	

D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-28, male, aged 26 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-29, male, aged 39 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-30, male, aged 47 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	

D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-31, male, aged 45 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-32, male, aged 44 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	

W-33, male, aged 61 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2800 per mm^3.	
D2: outpatient visit, L 2900 per mm^3.	
D8: outpatient visit, wounds well healed on physical exam, L 2300 per mm^3, discontinue antibiotics. D21: outpatient visit, physical exam, L 2200 per mm^3.	
D30: outpatient visit.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-34, male, aged 40 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-35, male, aged 30 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	

W-36, male, aged 20 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2800 per mm^3.	
D2: outpatient visit, L 2900 per mm^3.	
D8: outpatient visit, wounds well healed on physical exam, L 2300 per mm^3, discontinue antibiotics. D21: outpatient visit, physical exam, L 2200 per mm^3.	
D30: outpatient visit.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	
W-37, male, aged 29 years	
Start: minor soft tissue injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2800 per mm^3.	
D2: outpatient visit, L 2900 per mm^3.	
D8: outpatient visit, wounds well healed on physical exam, L 2300 per mm^3, discontinue antibiotics. D21: outpatient visit, physical exam, L 2200 per mm^3.	
D30: outpatient visit, sterility?	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	Discussion of importance of referral for counseling regarding infertility.
W-38, male, aged 38 years	
Start: no injury. External contamination. Hospital response actions include complete physical exam, vital signs, lymphocyte count and urinalysis (results all normal), and external decontamination. Patient discharged. D1: outpatient visit, physical exam, L 2700 per mm^3.	
D2: outpatient visit, L 2600 per mm^3.	
D8: outpatient visit, physical exam, L 2500 per mm^3. D21: outpatient visit, physical exam, L 2500 per mm^3.	
D30: outpatient visit, L 2600 per mm^3.	
Issues for Day 1	
Issues for Days 2-7	
Issues for Days 8-21	
Issues for Days 22-30	