MANAGEMENT OF EMERGENCIES

Group 4_Case Scenario D_The Chernobyl Radionuclear Event

Former Ukrainian Soviet Socialist Republic, 1986

TASK I, II, III, IV

(Individual Work)

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On April 26, 1986, a major reactor accident occurred at the Chernobyl Nuclear Power Plant. It was a radionuclear accident and emergency with Caesium-137. With lack of transparency in the beginning, few documents could be presented to track the event thoroughly from the beginning. With inadequacy of capacity prepared, limited professional responses were taken to contain and mitigate the disaster in the initial phase. However, reviewing the disastrous event and reflecting upon the suffering experience, we shall appreciate the advent of International Health Regulations (2005) (IHR(2005)). Here below come up the issues that are important in the management of an emergency like the Chernobyl radionuclear event, namely human health risk assessment, event and environmental monitoring and response measures evaluation, communication, and public health governance and responsibilities.

I. Human health risk assessment

Few, if any, records documented the initial risk assessment of human health for the Chernobyl radionuclear event though it was unusual and unexpected and did have serious impact on public health with significant risks of international spread and international travel or trade restrictions. As an event with high potential for spread, with a high case fatality rate, with severe consequences on trade or travel, occurring in clusters related to a common source, related to the international release, from today's viewpoint, it shall constitute a public health emergency of international concern (PHEIC).

For a radionuclear event, as for chemicals, exposure can refer to the intake, e.g., inhalation, ingestion, dermal exposure, of the toxic chemical. Intakes by inhalation, ingestion, and absorption are also potentially important exposure pathways for radionuclides, although radionuclide intake is typically expressed in units of activity, i.e., Bq or Ci rather than mass. Radionuclides that enter through these internal exposure pathways may become systemically incorporated and emit alpha, beta, or gamma radiation within tissues or organs. Unlike chemical assessments, an exposure assessment for radioactive contaminants can include an explicit estimation of the radiation dose equivalent.

Unlike chemicals, radionuclides can have deleterious effects on humans without being taken into or brought in contact with the body. External radiation exposures can result from either exposure to radionuclides at the site area or to radionuclides that have been transported from the site to other locations in the environment. This is because high energy beta particles and protons from radionuclides in contaminated air, water, or soil can travel long distances with only minimum attenuation in these media before depositing their energy in human tissues.

The quantification of the amount of energy deposited in living tissue due to internal and external exposures to radiation is termed radiation dosimetry. The amount of energy deposited in living tissue is of concern because the potential adverse effects of radiation are proportional to energy deposition. The energy deposited in tissues is proportional to the decay rate of a

radionuclide, and not its mass. Specifically, the three steps of an exposure assessment for chemicals also apply to radionuclides: (1) characterization of the exposure setting; (2) identification of the exposure pathways; and (3) quantification of exposure, esp. determining exposure point concentration, estimating intake and dose equivalent and evaluating uncertainty.

For human health risk concerned, besides the general injuries and mortalities that could result from a disaster, for a radionuclear event, risk assessment includes those for acute and delayed radiation sickness, mutagenesis, carcinogenesis, and teratogenesis. All the ”liquidators” from the army, power plant staff, local police and fire services and the residents of “contaminated” areas shall be the priorities.

Beyond the scope of human health risk per se, as a result of the chain reaction of the circumstances, environmental consequence risk shall be assessed. For an event like the Chernobyl radionuclear accident, the radioactive fallout caused radioactive material to deposit itself over a large area of ground. Winds quickly blew the toxic cloud from Eastern Europe into Sweden and Norway. Systems of water, soil, air flow, and food chain shall be assessed. For the ecosystems that might be covered, a variety of biological creatures might be threatened. The landscape might be changed and the space might be altered.

A disaster often imposes a major health impact with a broad spectrum of psychological consequences. The stress of evacuation, relocation, and displacement with disruption to social networks and no possibility to return prevails. A social stigma with a designation of the affected population as “victims” rather than “survivors” might lead to feelings of helplessness and lack of control over their future, or otherwise, the affected population might be shunned by local residents because the evacuees were provided with new houses and pensions. The affected population might be discriminated against by prospective employers. Uncertainty about the present and the future dominates their life. Mistrust of official information and the false attribution of most health problems to radiation exposure will be the scenario. Psychological disorders such as anxiety, depression, confusion, and other disorders may further lead to mental health stress. Besides loss of economic stability, a lack of physical and emotional well-being and long-term threats to health in current and possibly future generations might be commonplace.

Last and not least, the possible economic, political and social consequences come around a major issue in the human health risk assessment. The economical, social and political declining of the affected area might happen as a result of the shortage in labor force, the strict rules introduced, and the decline of production and exportation.

II. Event and environmental monitoring and response measures evaluation

In reality, besides the atmosphere created by bureaucracy and hierarchy of a system like the Soviet, there were many problems in the Soviet nuclear power industry. Evidences showed that there was not a proper exchange of information and co-ordination between the team in charge of the test and the personnel in charge of the operation and safety of the nuclear reactor. Breakdown of communication was implied in the process of the event. Few documents provided the evidence that any competent authority or authorities received some notifications, recognized the emergency, issued alert, and responded accordingly in the very beginning. Likewise, paucity of document supported that there were rational and well-organized monitoring and response measures on event and environment from the beginning in the Chernobyl radionuclear emergency.

Therefore, the baselines of the health status and environmental situation could not be defined at the start and followed up thereafter. Information about the severity and significance of the contamination was often sparse and uneven; public opinion was uncertain and even many doctors were not sure how to interpret information that did become available. As a result, there was a loss of confidence in the information and in the countermeasures recommended. International assistance became possible in 1989 when the Government of the USSR finally sought some alternatives in tackling the problem.

Moreover, the response measures, rather than proactive and based upon a contingency plan, appeared reactive and of limited professionalism, and probably resulted in even more catastrophes and long-term negative consequences. On the spot of the accident, many firemen added to their considerable doses by staying on call on site. On fighting graphite fires, flying helicopters while dumping materials over the reactor caused additional destruction of the standing structures, spread the contamination, and probably led to a further release of radionuclides a week later.

As regard to the proved increase in thyroid cancer following the Chernobyl accident, it is related to the high levels of radioactive iodine releasing from the Chernobyl reactor in the early days after the accident and contaminating the pastures eaten by cows which then concentrated it in their milk. Since radioactive iodine is short lived, if people had stopped giving locally supplied contaminated milk to children for a few months following the accident, it is likely that most of the increase in radiation-induced thyroid cancer would not have resulted. The Emergency Orders and the “Mark and Release” management system adopted by the UK Food Standards Agency in 1986 definitely served as a clear contrast.

The World Health Organization (WHO) sent a team of experts in June 1989, as did the League of Red Cross and Red Crescent Societies in early 1990. The Government of the USSR, in October 1989, formally requested the International Atomic Energy Agency (IAEA) to coordinate an international expert assessment of the concept and the measures that the USSR evolved and took after the event. As a result, an international project was launched in the spring of 1990 with an independent "International Advisory Committee" of 19 members set up under the chairmanship of Dr. Itsuzo Shigematsu from Japan. The other scientists on the Committee came from ten countries and five international organizations with the expertise encompassing, among other disciplines, medicine, radiopathology, radiation protection, nutrition, radioepidemiology and psychology. Laboratories in several countries, including Austria, France, and the USA, helped to analyze and evaluate collected material. The goals of the project were to examine assessments of the radiological and health situation in areas of the USSR affected by the Chernobyl accident, and to evaluate measures to protect the population. Actually, the professional evaluation and laboratory testing stated above not only shared the heavy loads on the already devastated system, but also played the role of so called third-party professionalism and justice.

From fragmented data, populations with different degrees of exposure were estimated. Mortalities and morbidities, being tried to differentiate between radiation exposure and not, were reported. Aside from a definite increase in thyroid cancer, mostly in children but also in adolescents, leukemia and pre-menopausal breast cancer were implicated in certain populations. Impacts on other physical conditions, psychological dimension, environmental dimension, and economic-political-social dimension have been on the way of independent decipherment. For example, recent reports said there were some indications that the concrete sarcophagus at Chernobyl was breaking down. Long-term monitoring is required.

Better news is the international guidance and/or guideline values being adopted with future possible advance in radiation knowledge, e.g., the linear-no-threshold model, the experience of medical radiology, and the follow-up of previous high radiation-exposure situations, being recognized. The WHO's International Programme on the Health Effects of the Chernobyl Accident (IPHECA) was established to support national programs and a series of international projects to monitor health consequences. International collaboration like EU/UNDP continues implementing on Chernobyl with medical monitoring and recovery projects undertaken to combat the negative effects of the Chernobyl Disaster. European Space Agency has been assisting the Ukrainian team to monitor Chernobyl’s radioactive floods. UNDP, in collaboration with countries in Central Asia, further initiated projects addressing radioactive dust, contaminated groundwater, and toxic landslides and floods to rehabilitate the toxic waste sites and minimize the regional environmental threats.

In light of capacity building, the Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) was established in 1987 with emphasis on early notification and assistance. A WHO Collaborating Center or a REMPAN Liaison Institution plays a competent role as the terms of reference at national, regional, and international levels in response to

radionuclear emergencies. Under the Early Notification Convention, the IAEA is the designated international organization that is officially notified by the accident or affected country and provided with relevant information about the accident. WHO, as well as other co-operating international organizations, are notified and provided with further relevant information through the IAEA. WHO helps establish a link between the country making the request and REMPAN assisting center(s) and Regional Offices, keeping all REMPAN centers informed about the details of the accident and progress in its management.

For an event management, reactions shall be appropriate and based on well-founded risk assessment and international best practice as established up to date. The international community shall be provided with timely and accurate information about the event. Effective international assistance, when requested, can be rapidly provided to contain threats at the source and to reduce human suffering, economic and social losses. All in all, the event management process shall be adhered to the principles of consistency, timeliness, technical excellence, transparency, and accountability. However, the Chernobyl radionuclear event did comply with none of the above.

III. Communication

The Chernobyl radionuclear event happened in a system of information control. The firefighting and emergency workers were even not informed of the risk they encountered. It was not until April 28, two days after the disastrous event and after other countries reported radioactivity in atmosphere, did USSR acknowledge the accident.

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The WHO ever concluded among other things that "scientists who are not well versed in radiation effects have attributed various biological and health effects to radiation exposure. These changes cannot be attributed to radiation exposure, especially when the normal incidence is unknown, and are much more likely to be due to psychological factors and stress. Attributing these effects to radiation not only increases the psychological pressure in the population and provokes additional stress-related health problems, but also undermines confidence in the competence of the radiation specialists". The League of Red Cross and Red Crescent Societies made similar observations.

On Sep. 5, 2005, WHO, IAEA, and UNDP jointly hosted a press release, “Chernobyl: the true scale of the accident”-- 20 Years Later a UN Report Provides Definitive Answers and Ways to Repair Lives. In the press release, transparency with facts was addressed, collaboration with solutions was stressed, and the true scale of the accident’s consequences was presented. And most importantly, the press release was jointly held by independent and professional parties with an open attitude to the accident and hope to move forward reassured. Besides, recommendations called for targeting information to specific audiences through re-alignment and reframing issues. Answers to longstanding questions were provides as a supplement for further reference.

UNDP assumed responsibility for UN-wide coordination of Chernobyl issues in 2004. UNDP established a platform for international cooperation on Chernobyl. UNDP and UN Action Plan for Chernobyl, “A unified message of hope for Chernobyl-affected communities” was one of the key communications. On the message, in line with a shift in strategy from humanitarian assistance to development aid information issues, policy advice, and community development were addressed. On April 24 2009, UN agencies marked Chernobyl anniversary with launch of US $ 2.5-million project aiming to translate the latest scientific information on the consequences of the accident into sound practical advice for residents of the affected territories. A return to normal life as a realistic prospect for people living in the affected territories was the message once again delivered.

Communication is one of the core capacities of emergency management. Proactive

communication of real and potential risk is the basic principle. Public health communication networks and strategies shall be practiced as daily routine. Communication plans and strategies for emergencies shall adapt to specific challenges and be open, clear, and transparent. To identify and be ready for media activities for the first 24-72 hours under extreme time pressure will be anticipated. Timely and accurate information provided at local, national, and international levels shall be in line with the guidelines to build trust, announce early, transparency, understanding the public, assessing the media needs, planning/preparing a communication strategy beforehand. Reflected upon the Chernobyl radionuclear event, people did not witness any communication merits as described above.

IV. Public health governance and responsibilities

Let's go back to the Chernobyl radionuclear event for a while. In reality, besides the atmosphere created by bureaucracy and hierarchy of a system like the Soviet, there were many problems in the Soviet nuclear power industry. The accident actually came from a test taking the advantage of a shutdown of the Unit 4 reactor for routine maintenance on 25 April 1986. Unfortunately, this test, which was considered essentially to concern the non-nuclear part of the power plant, was carried out without a proper exchange of information and co-ordination between the team in charge of the test and the personnel in charge of the operation and safety of the nuclear reactor. According to an assessment report of the Nuclear Energy Agency (NEA), the Chernobyl accident was the product of a lack of "safety culture". There was not one cause of the accident, and the following were several which all contributed to it: 1. design fault in RBMK reactor; 2. violation of procedures; 3. breakdown of communication; 4. lack of a "Safety Culture" in the power plant. In a sense, it illustrates the development of human error—how it is not a decision, but a process, as Stephen Metruck commented.

A public health event like the Chernobyl radionuclear event definitely fulfilled the criteria of a PHEIC. Once happened, it surely goes up to at least the national level, regional and cross-border collaboration and negotiation will be indicated, and international assistance can be of great value in terms of time and capacity constraint on containment and mitigation. Furthermore, it involves the regulating authority together with the collaborating authorities and sectors, from local to national levels, and inevitably concerning regional and international bodies. More than the consideration of assistance when indicated, timely information sharing shall be deemed as a responsibility to the international society.

Reviewing the Chernobyl radionuclear event actually reminded us of the role and importance of national and international legislation, regulations and other relevant instruments of governments/sectors in the context of emergency management. Platforms and networks shall be established as daily routine. Capacity building and contingency plan simulation shall be ready and adaptive as part of the preparedness. Information flow and command flow need to be streamlined. Public health events shall be detected early, reactions shall be appropriate and based on well-founded human health risk assessments. The international community shall be provided timely and accurate information. Effective international assistance, when requested, shall be rapidly provided to control threats to public health at their source. Effective event management process can protect international health security.

In the Chernobyl radionuclear event, among others, international organizations such as WHO, IAEA, WTO, ICAO, IATA, FAO, and ILO, and relevant international networks, such as GOARN, ChemiNet, and REMPAN are all concerned to achieve the objective of protecting and promoting global public health security. Furthermore, a substantial array of intergovernmental organizations and non-governmental organizations whose mandates include global health security concerns are involved.