

2011.3.11 Record Collection

CHAPTER **3**

Round-Table
Discussion



Itaru Nishimoto



Shoji Kodate



Hiroshi Inoue



Takashi Ito



Susumu Omokawa



Hiroshi Shimizu



Masahiro Tsuboi



Yoshihiro Osaka



Tsuneo Sakamoto



Akihiko Nakano

Main Theme of Round-Table Discussion

How Well Prepared Are We for a Future Mega-Earthquake?

■ Date: May 9 (Wed.), 2012 15:00-17:30

■ Venue: Reception room, 3rd floor, the JRC Tohoku Block Blood Center

Participants:

Itaru Nishimoto (Chief Executive Officer, Blood Service Headquarters)

Shoji Kodate (Director General, Aomori Blood Center)

Hiroshi Inoue (Director General, Iwate Blood Center / Managing Editor of this book)

Takashi Ito (Director General, Miyagi Blood Center / Current Director of Tohoku Block Blood Center)

Susumu Omokawa (Director General, Akita Blood Center)

Hiroshi Shimizu (Director General, Yamagata Blood Center)

Masahiro Tsuboi (Director General, Fukushima Blood Center)

Yoshihiro Osaka (Senior Director, Blood Donation Marketing Department, Hyogo Blood Center)

Observers:

Tsuneo Sakamoto (Director, Risk Management and Litigation, Blood Service Headquarters)

Akihiko Nakano (Deputy Director, Management and Planning Division, in Charge of Public Relations, Blood Service Headquarters)

■ Chair : **Hiroshi Inoue**

Inoue, Management Editor (ME): It is time for a round-table discussion with the general directors of the JRC six blood centers in the Tohoku region where the Great East Japan Earthquake hit the hardest.

I have been assigned by the Chief Executive Officer to facilitate the discussion since I have been involved in editing this book.

Thank you for sparing your precious time to join us. A special thank you in particular to Chief Executive Officer Nishimoto for accommodating our request, and Director Sakamoto and Deputy Director Nakano for accompanying him. Their participation is highly appreciated. Moreover, Senior Director Osaka from the Hyogo Blood Center is also here to share with us information on the Great Hanshin-Awaji Earthquake, which was another mega-quake with its epicenter located immediately below an urban area in Japan. The discussion involving those at the Blood Service Headquarters on the lessons learned from the experiences in the quake-hit areas will be very meaningful if it can lead to the establishment of future crisis management. All contributions from all of you at this round-table discussion would be much appreciated.

Before we begin, I would like to invite Chief Executive Officer Nishimoto to make an opening statement, reviewing the performance of the past year since the Great East Japan Earthquake hit. He has led our response to and recovery from the disaster. Please go ahead, Chief Executive Officer Nishimoto.

Opening Statement by Chief Executive Officer Nishimoto

I am Mr. Nishimoto, Blood Service Chief Executive Officer. Thank you so much for sparing your precious time for this opportunity.

Thinking back on those days, I came to this region several days after the earthquake hit and stayed one night in a nap room at the Miyagi Blood Center. I remember it as if it was yesterday, I really feel that time has gone by faster than the actual period of one year and two months.

There is a proverb which says, “Turn a misfortune into a blessing.” This applies well to this situation from two points of view. First, the terrible misfortune can provide us with lessons on how to prepare for future ones. The completion of this book can create one very positive outcome from such a misfortune.

Second, the disaster relief efforts spawned a wide-area management system which started this past April. The establishment of block blood centers, like the one in Miyagi for the Tohoku region, has raised some concerns about the possible decline of the existing prefectural blood centers. We are in the initial stages of uniting the blood centers within each block so they will operate more smoothly, and we estimate operations will be ready within one year. In this context, this opportunity of a round-table discussion in the wake of the disaster could become the first activity to combine the efforts within the block region since the disaster. Thus, we would like to leave something useful, as a legacy to following generations from this disaster. I conclude my speech by asking you actively to join in the discussion.



Inoue (ME): We received the messages from Chief Executive Officer Nishimoto that we should learn lessons from the Great Earthquake in order to provide feedback to the following generations, and form connections between the Blood Service Headquarters and activate the local blood centers.

I would now like to invite the next speaker, a current Director General Ito to reflect on the performance over the past year. As the Director General of the Miyagi Blood Center, at the time of the Great East Japan Earthquake, he has tried to return the Miyagi Blood Center to normalcy. This blood center was hit the hardest among the six blood centers in this region, and has continued to adjust to the need for blood in the Tohoku region for the past year.

Speech by Director General Ito

Good afternoon. Thank you for joining us from distant places. In particular, it is our pleasure to welcome the participants from the Blood Service Headquarters, Chief Executive Officer Nishimoto and his companions, Director Sakamoto and Deputy Director Nakano.

When the Miyagi Blood Center was built in 2008, various considerations, including natural disaster preparedness, were taken into account. It was intended that the structure and function of the blood center would be to prepare for a natural disaster including a mega-quake. The center would have to give a high priority to blood testing for the six prefectures in the Tohoku region. Construction of a laboratory for producing blood products in three prefectures in the southern Tohoku region was therefore completed prior to the earthquake on March 11th, 2011. Even at the design stage, water supply and city gas were considered to be the most vulnerable life lines in the case of a disaster. Indeed, it was realized that heating gas is not good for air conditioning in the case of a disaster, because it took a long time for the supply to resume after a mega-quake. In addition, the shortage of water made the recovery of the central blood center difficult. The continuous operations of blood services were therefore greatly disturbed following

the disaster.

The recovery of the blood examination and production functions of the blood centers took us nearly 40 days, including equipment repairs and validations. In line with this timetable, all efforts were taken to regain stable distribution through video-link conferences with the Blood Service Headquarters and the Distribution Stabilization Sub-committee.

Fortunately, there were no casualties among the staff in the six Tohoku prefectures as a result of the tragedy, and there were no major accidents with blood donors either.

These are fortunate outcomes from the tragedy, but we should not presume that it will be the same in the future. So it will be the greatest pleasure for us to use our experience as far as possible to figure out necessary countermeasures against crises in this roundtable discussion. This will also be useful for other blood centers in our country.

I highly appreciate Managing Editor Inoue's major contribution in generating the idea of, and then taking the initiative in, documenting the experiences from this disaster. We will continue to cooperate with him through the further process of editing the publication.



Inoue (ME): Over the past one year and two months, the operation of blood services in Tohoku has recovered well thanks to this exquisite partnership between the Blood Service Headquarters and General Director Ito, as well as the efforts made by all the blood centers and their staff across Japan. I would like to take this opportunity to again express our appreciation for all of them.

Round-table talk

How Well Prepared Are We for a Future Mega-Earthquake?

Inoue (ME): The aim of publishing this book is to use the experience of this disaster to build a better disaster-resilient system for the JRC blood services operation. The Japanese Red Cross Society has been entrusted by the Japanese government, in order to prepare for a possible series of mega-earthquakes expected to hit this country in the future.

The objective of this discussion, with the participation of Blood Service Chief Executive Officer, is the exchange of information about the future risk management of our blood services. It is important to look at the aftermath caused by this mega-earthquake and huge-tsunami, and identify the problems what we have learned, and then look at how to resolve the problems, so that we can improve the crisis management for the further development of our blood services.

Let me facilitate the discussion under the following 10 topics, followed by a summary.

The topics of the round-table discussion

1. Preparedness for a future mega-earthquake
2. Establishment of an emergency power source system
3. Providing a reliable emergency communication system
4. Ensuring reliable lifelines
5. Architectural preparedness
6. Wide-area management system
7. Communications with medical institutions and blood donors
8. Ensuring staff safety during a nuclear accident
9. Identification of prioritized distribution destinations
10. Daily training in disaster-relief activities
11. Summary

1. Preparedness for a Future Mega-Earthquake

Inoue (ME): Let me start with the first topic. It seems that the experience of this mega-earthquake and huge tsunami has substantially changed the awareness of and preparedness for earthquakes. At the onset, adjectives such as “unprecedented”, “the greatest” and “unanticipated” were used to describe the mega-earthquake. It has come to be recognized, however, that similar earthquakes have repeatedly hit Japan in its long history.

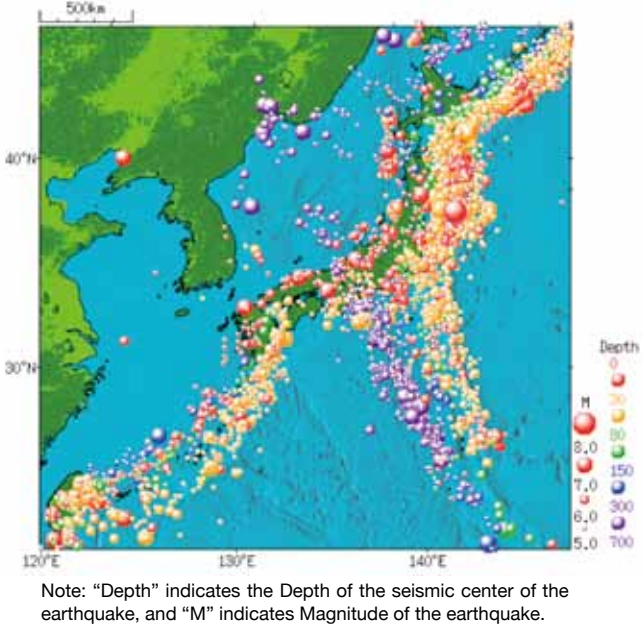
The Blood Services are a national program while the JRCS is the entity entrusted by the government to operate the program. Unlike private companies in general, it is imperative at the time of a disaster that we should maintain “a stable distribution.” Should a mega-earthquake hit a populated area, there would be a high risk of blood undersupply, which was not the case in the March 2011 Earthquake, thereby threatening lives that could otherwise have been saved. If such devastation occurred in many areas, we might be told that we no longer deserve to handle the blood services.

The Guidelines for Blood Services Crisis Management (the Fifth revised edition) newly revised on April 13, 2012, based on the experiences of the Great East Japan Earthquake highlights the importance of “(being) able to share a common sense of crisis among the Blood Service Headquarters and regional blood centers” and to “avoid an escalation of the crisis, minimize the damage, continue to operate while ensuring the safety in works, including staff and donors, as well as return to the normal situation swiftly.” These suggest the basic principle that we have to continue to prepare, both in strength and mind, in order to overcome a mega-earthquake.

To begin with, I would like Blood Service Chief Executive Officer Nishimoto to show us how the Blood Service Headquarters of the JRCS will define the targeted scale of an earthquake and the targeted resilience against it.

Notes by the Secretariat

(1) Earthquake distribution around Japan (1960-2011)
Located in one of the most active seismic and volcanic zones in the world, Japan is frequently affected by earthquakes and volcanic disasters. JMA (Japan Meteorological Agency) operationally monitors seismic and volcanic activity throughout the country and issues relevant warnings and information to mitigate damage caused by disasters related to earthquakes, tsunamis and volcanic eruptions. (Inserted from the web site with the permission of JMA)



(2) Table of earthquakes in Japan
Earthquakes with a magnitude of 7.0 or more are listed. Within this range, bold letters indicate earthquakes with a magnitude of more than 8.0 or those with a significant impact. The pink letters indicate the earthquakes which hit the Tohoku region. The height of tsunami wave is expressed as “HUGE”, if the height was five meters or more, “HIGH” if it was one meter or more, and “LOW” if it was less than one meter.

DATE	MAGNITUDE	SEISMIC INTENSITY	TSUNAMI	NAME OF EARTHQUAKES (PREFECTURE)
1901/08/09	7.2			OFF THE EAST COAST (AOMORI)
1902/01/30	7.0			SANPATI-KAMIKITA (AOMORI)
1909/03/13	7.5			OFF THE BOUSOU PENINSULA (CHIBA)
1911/06/15	8.0			KIKAIJIMA (KAGOSHIMA)
1915/03/15	7.0			OFF THE COAST OF TOKATI (HOKKAIDO)
1915/11/01	7.5		LOW	OFF THE COAST OF MIYAGI (MIYAGI)
1918/09/08	8.0			OFF THR ETOROFU ISLANDS
1923/09/01	7.9			GREAT KANTO EARTHQUAKE (TOKYO)
1927/03/07	7.3			NORTH TANGO (KYOTO)
1928/05/27	7.0			OFF THE COAST OF IWATE (IWATE)
1931/03/09	7.2			OFF THE COAST OF SANRIKU (IWATE)
1931/11/02	7.1			HIUGANADA (MIYAZAKI)
1933/03/03	8.1		HUGE	SHOWA SANRIKU (IWATE)
1933/06/19	7.1			OFF THE COASTOF MIYAGI (MIYAGI)
1935/10/18	7.1			OFF THE COAST OF SANRIKU (IWATE)
1936/11/03	7.4		LOW	OFF THE COAST OF MIYGI (MIYAGI)
1937/07/27	7.1			OFF THE COAST (MIYAGI)
1938/05/23	7.0			OFF THE COAST OF IBARAKI (IBARAKI)
1938/11/05	7.5	5	LOW	OFF THE COAST OF FUKUSHIMA (FUKUSHIMA)
1941/11/19	7.2		HIGH	HIUGANADA (MIYAZAKI)
1943/06/13	7.1			OFF THE EAST COAST OF AOMORI (AOMORI)

Nishimoto, Chief Executive Officer (CEO):
I think the introduction made by Dr. Inoue has covered almost all the issues to be addressed by the Blood Service Headquarters. As the proverb states, “a natural disaster strikes when people lose their memory of the previous one”. We do not know when and how intense the next earthquake will be. It may be as large as the Great East Japan Earthquake or even more devastating. Therefore, as for the targeted scale of the earthquake, I have no choice but to answer “however big it will be.” As for the targeted resilience: we will be committed to achieving preparedness of “complete resilience” by simulating it with all human wisdom and scientific expertise. I am afraid that my answer was rather abstract...

Inoue (ME): Thank you for your response. Next, I would like to invite Director Sakamoto to brief us on the enhanced concepts and rules in the revised Crisis Management Guidelines (the Fifth revised edition) from his viewpoint.

Sakamoto, Director (D): The Guidelines were revised this past April by building on the previous edition. Specifically, the part regarding the ensuring lifelines appears to be significantly enhanced. Another point is to confirm whether a higher priority for power, gas and other supply will be given to the blood centers at the time of a disaster. It is also very important to conduct disaster training on a regular basis.

Inoue (ME): The Blood Service Headquarters has rarely provided field survey of the Crisis Management Guidelines to each blood center. Some crisis management problems during the Great East Japan Earthquake could have been avoided if regular inspections and guidance had been provided, similar to the ordinary guidance on pharmaceutical affairs.

Sakamoto (D): The ordinary guidance on pharmaceutical affairs was originally intended to cope with the Product Liability Act, mainly by enforcing the laws related to pharmaceutical issues. Infrastructure

DATE	MAGNITUDE	SEISMIC INTENSITY	TSUNAMI	NAME OF EARTHQUAKES (PREFECTURE)
1943/09/10	7.2			TOTTORI (TOTTORI)
1944/12/07	7.9		HUGE	TONANKAI (SHIZUOKA, AICHI, MIE, WAKAYAMA)
1945/02/10	7.1			OFF THE EAST COAST OF AOMORI (AOMORI)
1946/12/21	8.0		HIGH	NANKAI (WAKAYAMA, TOKUSHIMA, KOCHI)
1948/04/18	7.0			OFF THE SAUTH COAST (WAKAYAMA)
1948/06/28	7.1	7		FUKUI (FUKUI)
1952/03/04	8.2		HIGH	OFF THE EAST COAST OF TOKACHI
1953/11/26	7.4			OFF THE COAST OF BOSO (CHIBA)
1958/11/07	8.1			OFF THE ETOROFU ISLAND
1960/03/21	7.2			OFF THE SANRIKU (IWATE)
1961/08/19	7.0			KITAMINO (AICHI)
1963/10/13	8.1		HIGH	OFF THE ETOROFU ISLAND
1964/06/16	7.5			NIIGATA (NIIGATA)
1966/04/01	7.5			HIUGANADA (OITA, MIYAZAKI)
1968/05/16	7.9	5		OFF THE COAST OF TOKACHI (HOKKAIDO)
1968/06/12	7.2			OFF THE COAST OF SANRIKU (IWATE)
1969/08/12	7.8			OFF THE SHIKOTAN ILAND
1971/08/02	7.0	5		OFF THE COAST OF TOKATHI (HOKKAIDO)
1972/12/04	7.2	6		EAST OF THE HACHIJOY ISLAND (TOKYO)
1973/06/17	7.4	5		OFF THE NEMURO (HOKKAIDO)
1975/06/10	7.0		HUGE	OFF THE EAST HOKKAIDO (HOKKAIDO)
1978/01/14	7.0			SEA NEAR THE SHORE OF OSHIMA
1978/06/12	7.4	5	LOW	OFF THE COAST (MIYAGI)
1981/01/19	7.0	4		OFF THE COAST OF SANRIKU (IWATE)
1982/03/21	7.1	6		OFF THE COAST OF URAKAWA (HOKKAIDO)
1982/07/23	7.0			OFF THE COAST OF IBARAKI (IBARAKI)
1983/05/26	7.7	5	HIGH	JAPAN SEA CHUBU NIIGATA (NIIGATA, AKITA)
1983/06/21	7.1	4		OFF THE WEST COAST OF AOMORI (AOMORI)
1984/01/01	7.0	4		SOUTH EAST OF MIE (MIE)

DATE	MAGNITUDE	SEISMIC INTENSITY	TSUNAMI	NAME OF EARTHQUAKES (PREFECTURE)
1984/08/07	7.1	4		HIUGANADA (OITA, MIYAZAKI)
1989/11/02	7.1	4	HIGH	OFF THE COAST OF SANRIKU (IWATE)
1993/01/15	7.5	6		OFF THE COAST OF KUSHIRO (HOKKAIDO)
1993/07/12	7.8	5	HUGE	OFF THE SOUTH WEST COAST (HOKKAIDO)
1994/10/04	8.2	6		OFF THE EAST COAST (HOKKAIDO)
1994/10/09	7.3	4		OFF THE EAST COAST (HOKKAIDO)
1994/12/28	7.6	6		FAR OFF THE COAST OF SANRIKU (AOMORI)
1995/01/07	7.2	5		OFF THE COAST OF IWATE (AOMORI)
1995/01/17	7.3	7		GREAT HANSHIN-AWAI (HYOGO)
1995/12/04	7.7		LOW	OFF THE SOUTH EAST COAST OF ETORFU ISLAND
2000/01/28	7.0	4		OFF THE SOUTH EAST COAST OF NEMURO (HOKKAIDO)
2000/10/06	7.3	7		WEST OF TOTTORI (TOTTORI)
2003/05/26	7.1	6 LOWER		SOUTH SANRIKU (IWATE, MIYAGI)
2003/09/26	8.0	6 LOWER	HIGH	OFF THE COAST OF TOKACHI (HOKKAIDO)
2004/09/05	7.4	5 LOWER		OFF THE EAST WEST COAST OF KII (MIE, WAKAYAMA)
2004/11/29	7.1	5 UPPER		OFF THE COAST OF KUSHIRO (HOKKAIDO)
2005/08/16	7.2	6 LOWER		OFF THE COAST OF MIYAGI (MIYAGI)
2005/11/15	7.2	3	LOW	OFF THE COAST OF SANRIKU (IWATE)
2008/05/08	7.0	5 LOWER		OFF THE COAST OF MITO (IBARAKI)
2008/06/14	7.2	5 UPPER		INNER IWATE·MIYAGI (IWATE, MIYAGI)
2008/09/11	7.1	5 LOWER		OFF THE COAST OF TOKACHI (HOKKAIDO)
2010/11/30	7.1	3		OFF THE WEST COAST OF TITI ISLAND (TOKYO)
2011/03/09	7.3	5 LOWER		OFF THE COAST OF SANRIKU (MIYAGI)
2011/03/11	9.0	7	HUGE	GREAT EAST TOHOKU (IWATE, MIYAGI, FUKUSHIMA)
2011/04/07	7.2	6 UPPER		OFF THE COAST OF MIYAGI (MIYAGI)
2011/04/11	7.0	6 LOWER		COAST OF FUKUSIMA (FUKUSHIMA)
2011/07/10	7.3	4	LOW	OFF THE COAST OF SANRIKU (IWATE, MIYAGI, FUKUSHIMA)
2012/12/07	7.3	5 LOWER		OFF THE COAST OF SANRIKU (AOMORI, IWATE, MIYAGI, IBARAKI)

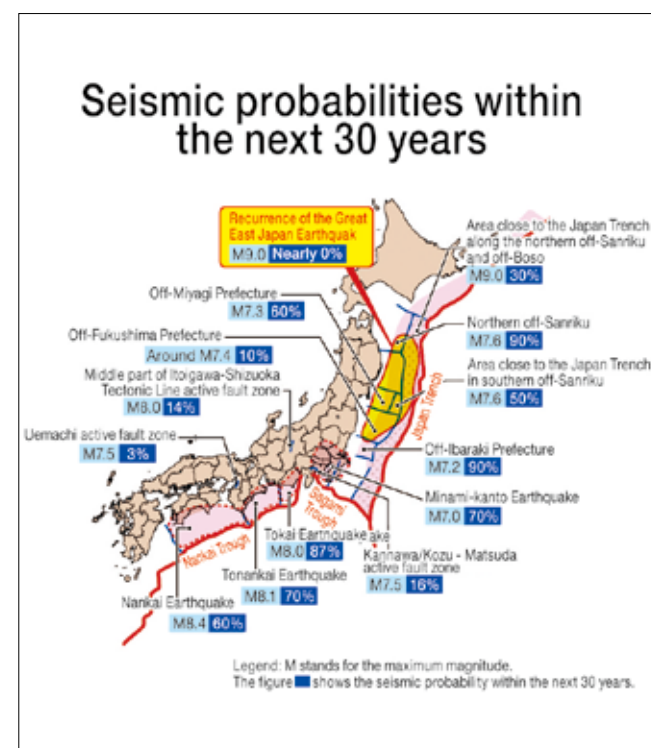
(base facilities for industries and social life) and crisis management are to be handled by those in charge of managerial and operational oversight, but that may not have been effective enough to work well this time. I would like to improve the checking system for crisis management from this point forward.

Ito, Director General (DG): The fifth revised edition of the crisis management guidelines was published on April 13 of this year after being considered at five sessions of the “Operations Safety Management Committee.” I was a member of that committee. In the new guidelines, “prioritized use of helicopters” was not explicitly laid out since the contract had not been concluded yet as of

this March. However, I have heard that a contract for the prioritized use of helicopters by the JRCS has since been signed with a company with more than 40 helicopters. The Blood Service Headquarters has addressed that issue very well. It is imperative to regularly check how this will be operated, in case it does not work well at the time of an earthquake, as suggested by Dr. Sakamoto.

Inoue (ME): Helicopters may not be able to play a role when the atmospheric conditions are poor, for example in the event of wide-spread fires. So daily training is important preparation for a mega-quake, especially for people in a densely populated urban areas.

(3) Seismic probabilities within the next 30 years



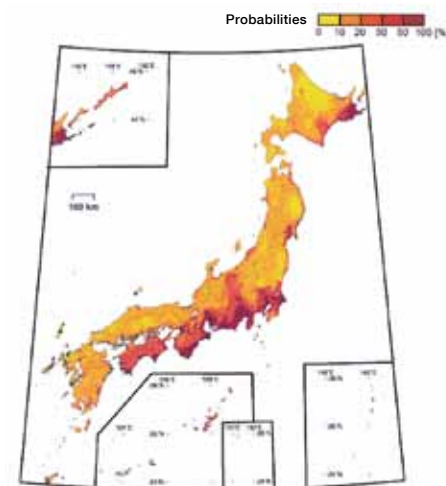
In December 2011, the Headquarters for Earthquake Research Promotion, which is attached to the government (the Ministry of Education, Culture, Sports, Science and Technology) forecast that, “within the next 30 years, there is a 30% probability of a magnitude 8 to 9 trembler” in an area close to the Japan Trench along the coasts of the Sanriku and Boso regions. Although accumulated seismic energy was released in the area between the central and southern Sanriku coast by 3.11 and its aftermath, it is considered to remain in the northern Sanriku and Ibaraki Prefectural regions. As the 3.11 Earthquake occurred when its seismic probability was estimated at 20%, there is little doubt that a mega-earthquake will likely occur, given the 30% probability. Higher seismic probabilities have been forecast for the re-occurrence of the Minami-Kanto, Tokai, Tonankai and Nankai Earthquakes. Therefore, it is imperative to prepare across all of Japan for mega-quakes.

(4) At the time of a disaster we should resume daily operations as soon as possible and sustain blood services.

Concerning “the blood services’ attitude towards crisis”, the previous version of the Risk Management Guidelines published in 2008 describes “natural disasters and ... unanticipated events that can happen at any time. ... at the time of a disaster we should respond to it appropriately and promptly in order to resume daily operations as soon as possible...” and further: “even if a crisis occurs (due to different causes), blood services must be sustained.” and “it is necessary to share the same sense of “crisis” between the Blood Service Headquarters and regional blood centers.”

Probabilistic Seismic Hazard map.

A Probabilistic Seismic Hazard map shows the distribution of earthquake risk; seismic probability varies according to the movement at each fault line, compared to a long-term evaluation of each fault, as well as the “Seismic Hazard Map for Specified Seismic Source Fault” for each earthquake. The location, probability and magnitude of each potential earthquake is taken into account by measuring the intensity of the shaking at various locations near each fault line in an integrated manner, then summing up the probability distribution of tremors above a certain intensity at each location point.



2. Establishment of an Emergency Power Source System

(1) Sustaining functions of the blood centers with an emergency power generator

Inoue (ME): Let us discuss securing a power supply, which is placed at the top of lifelines in the new guidelines.

Without power supply, a wide range of electrical equipment will not work. This includes Unified System (the blood service information system), communication devices, IT devices, freezers and refrigerators, testing and manufacturing equipment for blood products, conveyors, automated blood collection machines, monitoring devices, a lifting pump connected to the water storage tank, fire-alarm systems, sprinkler and security alarm systems.

Therefore, the first and foremost issue for providing a power supply is having an emergency power generator. At present, an emergency power generator has been installed at every blood center across Japan. At the time of this mega-quake, there were some problems and malfunctioning issues with the emergency power generators of the blood centers in the Tohoku region. Early recovery of those generator systems avoided severe accidents. If the quake had hit at a different time, it may have delayed the discovery of these generator malfunctions, and created severe complications. The details should be presented here to facilitate further improvements at blood centers across the country.

In the North the emergency power generator of the Akita Blood Center did not work, so that the blackout hit just after the earthquake. This was attributed to the breakdown of the relay (under voltage relay) as described in the Chapter 1 in this book. Please explain this in more detail.

Omokawa (DG): At the time of the blackout, the ordinary power system should have automatically switched over to the emergency power generator and critical circuit. The emergency power generator was supposed to start working, but this did not happen. Consequently, we manually shifted the power system and were able to supply power.

Ito (DG): Did you generate power or not?

Omokawa (DG): As a result, we generated power, not by itself but by manually turning it on.

Inoue (ME): Would it be difficult to undergo regular inspections?

Omokawa (DG): This aspect needs to be improved. It is important to undergo regular inspections and preparedness training.

Inoue (ME): We were not immune to such problems,

either. At the Iwate Blood Center, because the fuel tank of the emergency power generator was shared with the heating system, the amount of fuel contained decreased to an extent that only allowed it to work for less than three days. At the time of the disaster, fuel was not supplied by our supplier, but by another supplier facilitated by the Prefectural Emergency Response Headquarters through our request to the JRC Iwate Chapter. I heard the Hachinohe Blood Office in Aomori Prefecture also faced a lack of fuel for a similar reason.

By the way, I heard that the Akita Blood Center had additional problems because it used a water-cooled power generator...

Omokawa (DG): I did not know that it was a water-cooled system at the time of the disaster.

Ito (DG): The same type of generator was used at the time of the Great Hanshin-Awaji Earthquake in 1995, which stopped working soon after switching on.

Inoue (ME): At the time of the Great Hanshin-Awaji Earthquake, the Hyogo Blood Center used a water-cooled in-house power generator. According to a record of disaster experiences, the generator stopped working a few hours after the quake because the water supply ran out when the storage tank was empty.

Osaka, Senior Director (SD): It stopped within four and a half hours..

Inoue (ME): In the first edition of crisis management guidelines published in October 2003, there was a statement that said, “careful attention should be paid to the assurance of cooling water in case of a water-cooled emergency power generation system.” When a blackout is caused by a mega-earthquake, it is often the case that the pumping of water to a storage tank also ceases to work, leading to the discontinuation of in-house power generator. Does the water-cooled system have any advantages such as higher efficiency and horse power?

Osaka (SD): We finally chose the water-cooled power generator in order to cool the stored blood in the newly built facility.

Nishimoto (CEO): Do you mean you are still using water-cooled power generator for the newly built facility of the blood center?

Osaka (SD): Yes.

Nishimoto (CEO): Is that so? That means the lesson that was learned was not communicated forward very well, doesn’t it?

Ito (DG): When building the new facility of the Miyagi Blood Center, we did not pay much attention to the type of emergency power generator, either water-cooled or air-cooled. However, we recognize that the water-cooled, system has drawbacks, and a radiator (air-cooled) system should have been chosen.

Inoue (ME): To put it differently, since the air-cooled system can work, as demonstrated in the Miyagi Blood Center this time, it would be better to state definitely in the Guidelines that only air-cooled power generators should be installed in the blood centers.

Ito (DG): I think so, too.

Osaka (SD): The disaster experience was not fully reflected upon when building the current facility of the Hyogo Blood Center. When the facility is rebuilt again, this problem will be addressed, taking these considerations into account.

Nishimoto (CEO): The record of disaster experiences in the Hyogo Blood Center was published one year after the Great Hanshin-Awaji Earthquake. I wonder if the document was properly used to assist in the recognition of such a problem, or check the systems. The record was probably not used much, including by me. Lessons learned from a disaster should be widely communicated and shared with blood centers across Japan. Otherwise, history may repeat itself.

Inoue (ME): In the Chapter 1 “Response of Six Blood Centers to the disaster” in this book it was stated that in the Miyagi Blood Center smoke vents in the ceiling, which should open only in case of fire, were malfunctioning due to the quake, so that electricity was preferentially switched for the ventilation, which led to the refrigerator and freezer not receiving electricity from the emergency power supply. Then red cells were removed from the refrigerator and placed in a carrying box for preservation with ice until the reason for the lack of electricity was clarified. This would be another problem to be solved.

Omokawa (DG): As for the Akita Blood Center, I greatly regret that I did not know whether the in-house power generator was water-cooled or air-cooled, how the system functioned or what type of fuel was required. Although the staff was supposed to know the equipment, it is important to prepare for such a disaster by inspecting the facility and conducting training exercises so as to know how to respond to the various problems that occur in a disaster.

Inoue (ME): At the Akita Blood Center, the fuel tank of the emergency power generator is also shared with the heating system. This should also be checked by the Risk Management Department of the Blood Service Headquarters, and it is necessary to urge blood centers all over Japan to pay attention to that issue, and the question of separation of the fuel sources.

Shimizu (DG): At the Yamagata Blood Center, there was a problem with power distribution. The emergency

power system was connected to a refrigerator at the distribution unit on the first floor, but was not connected to the office and the server on the second floor. The staff hastily connected the second floor to the first with an electrical extension cord. Thus, even the general affairs division of the Yamagata Blood Center was not fully aware where the emergency power generator was connected and where it was not. That is what I regret at this time.

Omokawa (DG): The Akita Blood Center had a similar problem. Since the Unified System (the blood service information system) was not connected to the emergency generator, an electric extension cord was added in a similar manner to get the system to work.

(2) Issue of ensuring multiple off-site power circuits at blood centers

Osaka (SD): The new facility of the Hyogo Blood Center has a dual-line high voltage power receiving system as a commercial power supply. Even if one line fails to work, the other one allows distribution of power, and if either of them fails, the emergency power generator will start to work.

Inoue (ME): The new Hyogo Blood Center has a dual-line power supply from Kansai Electric Power Company, in which power is remains supplied, even if one line goes down.

Ito (DG): We have also considered the application of such a system. “Dual line” means that the system is connected to two different power sub-stations, while “double line” refers to a two-line wiring drawn from the same transformer.

Inoue (ME): Does the Miyagi Blood Center have a dual-line power receiving system?

Ito (DG): No, it doesn’t. The application of such a system was technically possible. However, it would have cost too much to bury the wires in the ground both from the Takamori and the Teraoka sub-stations. Therefore we gave up on a dual-line power receiving system, and instead we enhanced the emergency power generator system. For your reference, the Tokyo

Inoue (ME): “The Unified System” at the Iwate Blood Center was connected to the emergency power generator. The sustenance of the Unified System is given the second priority for power feeding in the new Guidelines. Another problem concerns back-up batteries attached to the apheresis equipment, hand-sealers, auto-manometer, and ECG as well as to the fire and security alarm systems. It was recently found that some counter-measures are required to address loss of power to these devices immediately following or within one hour after the blackout, as they may not be backed up by an emergency power generator, especially such in blood donation rooms across Japan.

Metropolitan Blood Center has a dual-line power receiving system. When an overhead wire was cut by a falling crane vehicle near the Edo River, one line went down, but the other one worked. I am sure that a dual-line power receiving system would be effective in case of such an accident.

Tsuboi (DG): I think that Tokyo Electric Power Company should have applied a dual-line power receiving system to its nuclear stations.

Ito (DG): I suppose that it would be more difficult for nuclear power plants.

Inoue (ME): As for the Fukushima nuclear power plant, I believe that its dual-line power receiving system did not work after the tsunami hit.

Ito (DG): The application of such a system is very expensive, taking running costs etc. into account. The basic power charge would double.

Inoue (ME): I wonder if it may not work for a large range of disasters, like a “3.11”, because they involve a number of sub-stations. I believe the Blood Service Headquarters should have specific guidelines as to when and where the dual-line power receiving system would be applicable.

(3) Issue of higher priority given to the recovery of off-site power supply to the blood centers

Inoue (ME): The third issue on ensuring power is how to further promote, “the routine checks with the external utilities about the prioritized recovery of the lifeline to the blood centers,” as required, from previous Guidelines.

Sakamoto (D): As Dr. Ito mentioned, it is important for the blood centers to establish an agreement in advance with the electric company, to give us a higher priority to receive the necessary power to maintain the lifelines in the event of a disaster.

Osaka (SD): At the time of the Great Hanshin-Awaji Earthquake there was no opportunity at all to consider prioritized power distribution to medical institutions.

Ito (DG): It would be difficult for medical institutions to receive the prioritized power distribution. Such a prioritized distribution at the time of a disaster may have limitations in its realization, and convincing others during a disaster would be very hard to achieve.

Inoue (ME): Electric power companies have their own mobile electric-power generators, and they might be able to dispatch them to our centers, if our power generators fail. It is important for us to have confidence in the national program of blood services and the JRCS, the entity entrusted by the government, to distribute blood products all over the country. I would like to ask the Blood Service Headquarters to give us more concrete suggestions for how we can handle the issues of “prioritized power distribution to the blood centers”.

(4) Issue of ensuring an emergency power source system for donation rooms

Inoue (ME): The fourth issue of securing power is to ensure an emergency power source, or emergency power generator, for donation rooms. One of the lessons learned from the most recent earthquake is that there were almost no donation rooms where such a system was available. The statement that such a system should be established is not described in either the new or the old Guidelines. The loss of electric power in a donation room causes a number of problems. First, the blood bag sealers no longer work, which happened at the Yamagata Blood Center, which leads to the discarding of collected blood. Also, the Unified System stops functioning, and the rooms become dark. If a donor becomes sick at this time, an electro-cardiogram can also not be obtained, the labels on ampules cannot be read to administer drugs, and blood vessels are not visible. Other monitors and machines also require electricity. No alarms will be sent to the security company in the event that a stranger enters the room (the battery of the security system lasts only 30 minutes.) With all of these examples and more, I

believe that an emergency power generator, in principle, has to be installed by the building owner. It seems that there is no reference in the new Guidelines that requires the installation of emergency power generators in donation rooms. Dr. Ito, can you explain this, as a member of the committee related to the Guidelines?

Ito (DG): Basically, it is a problem of how to install it in a blood donation room that is not in a building we own.

Inoue (ME): That’s why I believe an addendum should have been added in the new Guidelines, such as, “the installation of an emergency power generator should be a requirement, at least in the future, when signing the contract, or the owner of the building has to be asked to install one, because its necessity has repeatedly been recognized.”

In Aomori Prefecture, there is a blood donation room where the owner of the building installed an emergency power generator after the disaster. Was this

made possible due to a special request or some other reason?

Kodate (DG): In the Hirosaki Blood Office, the donation room and distribution facility is in a rented building where an emergency generator was not connected to the room. With the owner’s permission, a wire was connected from the generator to the room, thus ensuring that the blood storage will be maintained, even in the event of a blackout.

Ito (DG): The owner of the building is likely to install a generator if he/she does not want the blood donation room to move to another building. It is essential.

Inoue (ME): You cannot tell a donor who gets sick and needs to have an electro-cardiogram to leave the room during a blackout, can you? The new Guidelines instruct us “to take out the donor with VVR (vasovagal

reaction) on a stretcher,” but what happens in the case of a donor whose condition worsens on the way downstairs on a stretcher, when the donation room is located on the 21st floor? Does this comply with “the protection of donors” principle as required by law?

Ito (DG): No, it doesn’t.

Inoue (ME): In principle, emergency power generators are indispensable for blood donation rooms. The risk management guideline of the blood service headquarters has been requested to address it. For our part, we will also urge the owners of the buildings to install them. It will be urgent to set a target for the Blood Service Headquarters to address the issue of ensuring the emergency power generators for donation rooms.

(5) Issue of checking with external organizations on the prioritized recovery of commercial power distribution

Inoue (ME): Fifth, we will discuss the issue of checking with external organizations on the prioritized recovery of commercial power.

Power failure recovery was relatively quicker this time within a day in our district. I suppose that it also took only one day to recover power after failure at the time of the Great Hanshin-Awaji Earthquake in 1995.

Osaka (SD): The power failure lasted around 18 hours.

Inoue (ME): It takes less than one day in many cases. In such a case, is it meaningful to dare to negotiate for earlier recovery? For our part, we may voluntarily refrain from such a negotiation, believing categorically that it would not be very useful turning the switch on and off in a sort of distribution switchgear room covering a wide area.

Sakamoto (D): As for the storage of blood products, it is laid out that an emergency power source, including

fuel, for three days shall be secured in advance. If the in-house power generator would stop within three days, however, it is important during normal times to ask for a prioritized recovery in an emergency to ensure stable storage of the blood products, as well as their storage for distribution.

Omokawa (DG): At the time of the biggest aftershock on April 7, 2011, I felt that although medical institutions were given a higher priority for the recovery of commercial power distribution, we were not. In Akita City, commercial power distribution was being recovered from areas where medical institutions were located, while the blood center still had a blackout. As Director Sakamoto mentioned, we did not know about such negotiation. Of course, we wanted earlier recovery as an institution that has the responsibility to keep on donating blood, but we did not know how to negotiate it, or whom to approach at all. Who, for example, should we contact first, Tohoku Electric Power Company, the utilities? I thought it imperative

to consider, in consultation with the Blood Service Headquarters, how to address the case if it would take us long to recover the commercial power distribution, if it is significant? I wonder, however, if a higher priority is given to the blood center...

Inoue (ME): Securing blood supply is part of supporting surgery and medical care, though. A strenuous attempt to convince them in terms of the need for medical care could be more successful than we expect. I do not know about the national strategy, but the recovery from a national emergency is probably behind the public administration, defense, and medical care in terms of priority. From the perspective of the state, public medical institutions, core hospitals and blood centers may be treated at the same level. I think it unnecessary to voluntarily refrain from asking before begging to negotiate.

On March 24 (Thur.), 2011, I visited the Miyagi Blood Center by means of an emergency vehicle

travelling down the Tohoku Express Highway, where general traffic was still prohibited to pass. The goal of my visit was to make an adjustment about the schedule for resuming blood collections, as well as to comfort the staff of the Miyagi Blood Center. I was able to see the devastated second and third floors of the building of the Miyagi Blood Center. At that time, I was also worried about the timeline for restoring utility lifelines.

I also heard that a lack of gasoline had forced them to use emergency vehicles as commuting cars and 30% of the staff members were spending cold nights in sleeping bags without air conditioning at the blood center, mainly as a result of lack of city gas for air conditioning. Having understood that the recovery of city gas was indispensable to resume blood donation, I called the disaster response unit of Gas Bureau, City of Sendai from my car on my way back home. During that call, I introduced myself and requested, on behalf of the six prefectures in Tohoku region, for the soonest recovery of city gas by stating that the Miyagi Blood

Center in Izumi Ward, Sendai was an integral part of the blood distribution that needed to be secured for Tohoku as a whole, and that the gas stoppage would delay the recovery of functions at the blood center, leading to the risk of being unable to perform surgery in many local hospitals and hence be threatening lives that would otherwise have been saved. When I asked the contact person if there had been any other similar requests, she said, “No such request has been received yet. We have no idea when the gas distribution will be resumed. Please let us consider your request. We understand your circumstances.” Two to three days after the event the distribution of city gas to the Miyagi Blood Center was resumed. It may be just coincidence, but I believe my call made a contribution to the prompt resumption. The call is probably on record as being received shortly after 3:00 p.m. by the contact at the disaster response unit at the Gas Bureau, City of Sendai. It is necessary to dare to do rather than to hesitate from the beginning, isn’t it?

Ito (DG): Yes, it is. I think that there is something like that.

Inoue (ME): Are there cases, for example, in which the blood centers could ask the utility lifelines to provide special vehicles with an emergency power generator if needed?

Ito (DG): You mean a power source car? That could be an option.

Inoue (ME): I believe it is necessary to negotiate arrangements like these with the utilities in advance. Chief Executive Officer Nishimoto, what basic approach is required to make preliminary arrangements with external organizations?

Nishimoto (CEO): It is imperative to convince other parties that our services are an integral part of supporting the medical services that protect people’s lives.

Notes by the Secretariat

(1) Cooling water

It is stated, in the previous Guidelines, concerning the cooling mode of the emergency power generator, at “3.3 Checking the impact of interrupted lifelines,” that “it is necessary to secure cooling water and take measures to refill it, in particular, for water-cooled emergency power generators.”

(2) Three important points

In the new Guidelines, three major points have been added based on the lessons learned from the recent disaster:

- 1) To conduct a regular inspection at least once per year, with the presence of an expert organization, of the emergency power generator in preparation for a blackout of the whole facility.
- 2) To make a list of equipment, outlets, etc. connected to the emergency power generator, with the following order of priority in power distribution: (i) storage facility (refrigerators and freezers); (ii) Information System for Blood Service Data; and (iii) communication-related equipment such as a telephone.
- 3) To check the performance of the emergency power generator so as to ensure that it can work continuously for a minimum of 3 days (72 hours).

(3) Large power force cars

The installation of an emergency power generator for testing and processing should be planned in order to avoid an interruption of testing and processing. In addition it should be provided that, “the capacity of the generator has to be considered separately.”

In “3.3 Deployment of large power source cars,” it is additionally necessary to consider the deployment of power source cars in order to address a possible interruption of power supply due to a breakdown of the emergency power generator.

(4) Helicopters

As for the deployment of helicopters, it is additionally provided in the new Guidelines that “ (8) the operation of helicopters shall follow the “Operational Guidelines for Helicopters in Responding to Disasters and Emergencies in Blood Services” (provisional title) under “10.1 Responses to be made by Blood Service Headquarters.”



3. Providing a Reliable Emergency Communication System

(1) On emergency telephone lines

Inoue (ME): Let us proceed to the issue of ensuring communication tools.

One issue of the mega-earthquake last year was that congested telephone lines interrupted our communications with related facilities with general subscriber phones. I learned later that the congested or crossed lines were due to a wide-area disaster that lead to an automatic regulation by the telephone company so that general users would not be able call. Therefore, it is not surprising that even though we tried hard to communicate by phone, we failed to do so. To avoid such a failure in the future, it has already been recommended in the previous Guidelines to ensure that telephone lines are available for “emergency primary phone lines.” Such a procedure has now been put in place by almost all of the blood centers.

At the Iwate Blood Center, prior to the disaster, procedures for emergency priority phone lines had been completed for six lines: two for the main phones and four for cellular phones. Afterwards, the two lines were replaced by fiber-optic lines, resulting in the removal of the emergency priority phone designation. Another telephone was designated as an emergency priority phone line. These were recently found by checking with Nippon Telegraph and Telephone (NTT). In short, the emergency telephone line in a disaster can only be designated for digital or analogue lines. After the 3.11 Earthquake, only a limited number of our staff or outside members were informed about which phone lines would be available as emergency priority phone lines. As a result, the advantage of the availability of the emergency priority phone line was not utilized enough.

According to the “disaster damage report” of the Miyagi Blood Center in Chapter 1 of this book, “even emergency telephone lines were not effective for communicating with the Blood Service Headquarters.” Can you explain this in more detail, Director General Ito?

Ito (DG): The emergency priority phone lines did not work. They had not worked as an emergency priority phone line at all.

Inoue (ME): Before moving on to the general discussion, let me share some information. According to the recent information provided by the NTT director of general affairs, congested lines in a disaster would automatically regulate calls, and therefore impede general users from calling, but this would not apply to the emergency priority phone lines. If 20 to 30 calls are concentrated on the same receiver, the priority will be given in order of arrival. That’s why availability of an emergency telephone line does not necessarily guarantee access to a telephone line.

From my point of view, what Director Ito of the Miyagi Blood Center mentioned suggests that there

is likelihood possibility to communicate with Blood Service Headquarters by calling repeatedly using the emergency priority phone lines. In reality, this did not work, probably due to the concentration of many calls to Blood Service Headquarters. It would be beneficial if the Miyagi Blood Center could look into the real cause of that malfunction. If the line for the priority telephone was replaced by a fiber-optic line, the likelihood of communicating with the Blood Service Headquarters would be zero. Since the emergency contact point of the Blood Service Headquarters is set to be limited to only a single line, both in the new and previous Guidelines, a rush of calls from outside in a future mega-earthquake may eliminate the possibility of communicating with the Blood Service Headquarters altogether, as happened after the 3.11 earthquake.

After the disaster, staff in charge of transfusion

medicine at a certain central prefectural hospital on the coast confirmed that “communications with the blood center at the time of the disaster were put through an emergency priority telephone in a hospital office, allowing us to transmit the necessary messages (place orders) by calling repeatedly since the fax used for ordering blood products did not work at all.”

Regarding staff of the Supply Division of our blood center, they answered the same question saying that since the fax for accepting the orders of blood products was not used at all, they only accepted telephone orders by filling out the order forms themselves. Consequently, the problem stemmed from the fact that the emergency priority phone lines for the fax equipment had not been secured by either the hospital or the blood center. As a result, the most important initial step in securing blood services could not be taken in a wide-area disaster.

(2) On satellite phones

Inoue (ME): Another communication tool is a satellite phone. This type of phone was treated as “preferable to be installed” in the previous Guidelines, but that was replaced by the description that it “shall be installed” in the new Guidelines. The satellite phone, which is available either from NTT or KDDI Corporation (au), is recommended by the NTT staff mentioned above, as the best tool although it costs three times as much as a normal phone. It will be especially effective when the telephone lines are cut after an earthquake with its epicenter immediately below a metropolitan area. To connect satellite phones between NTT and KDDI, the signal from an NTT phone is transmitted first via satellite to an NTT relay station on the ground, and on the other side via KDDI’s “international satellite” to an KDDI satellite phone. In the case of a call from a satellite phone to an ordinary phone, the signal is transmitted first via a satellite to a relay station nearby, from which it is transmitted to the ordinary phone through a terrestrial line. As this is an ordinary line it makes it hard to connect two of these phones.

Ito (DG): Are there any blood centers that have satellite phones?

Further, as a result of this, neither side of the transaction was left with any evidence of the transaction, such as an order confirmation or receipt. After that realization dawned on me, I couldn’t help but feel a chill of fear. If there was a communication problem due to the changes in the JRS order acceptance and distribution system, who on earth would take the responsibility for the loss of many lives that would otherwise have been saved? This issue would have been compounded if the mega-earthquake had hit a metropolitan area. We must consider this a serious warning, and make preparations for an earthquake with its epicenter located immediately below a metropolitan area.

An order placed over the internet could be an alternative way of ordering blood products, if available after the disaster.

Inoue (ME): Our blood center has one. It was provided by the Iwate Prefectural Office through the JRC Iwate Chapter. The Office provided the 15 Prefectural Hospitals with satellite phones, and the blood ordering system was maintained in our prefecture through the same route. However, there is a constraint on the availability of suitable offices/sites in the hospitals from which to make a satellite phone call, since the satellite phone has to be directed to the satellite from a window facing south.

Ito (DG): Ultimately, everyone would have to have a satellite phone in order for communications to work.

Inoue (ME): Yes, ideally, for both sides of the communication line. Satellite phones could be more effective for communicating with the Blood Service Headquarters, especially in case of interrupted land lines after an earthquake with its epicenter immediately below a metropolitan area.

Nishimoto (CEO): I wonder if there are satellite phones at Blood Service Headquarters, or the JRC Headquarters.



Kodate (DG): The JRC Headquarters should have a satellite phone, but we have yet to purchase any for the Blood Service Headquarters Office.

Osaka (SD): The JRC Hyogo Chapter has already equipped its emergency vehicles (dispatch cars) with satellite phones. I heard that these phones were used when they were deployed to respond to an earthquake in Niigata Prefecture in 2004.

(3) On Disaster Emergency Message Dial

Inoue (ME): Let me address one more issue. Concerning popular means for communicating one’s safety to others in a disaster there is a special measure called the “Disaster Emergency Message Dial (171),” which operates by telephone or cellular phone. The number one-seven-one for “i-na-i can also be read as ‘nobody around’ in Japanese. In a wide-area disaster, when lines have become congested, you can use a land-line or a cellular phone to dial 171 and follow the guided instructions in order to leave your message to the one you want to talk to. You can also check if you have a message from that individual by dialing 171 and following the guided instructions, and then you can take that opportunity to leave your own message. Your privacy will be protected with a PIN number shared with the other party. Since the system is considered to be effective, especially when one’s whereabouts are unknown, it has been incorporated into the new Emergency Guidelines of our blood center. I think that the Disaster Emergency Message Dial will be very useful in addition to emergency priority phone lines and satellite phones, which have already been referred to in the previous Blood Service Headquarters’ Guidelines.

Nishimoto (CEO): Is the Disaster Emergency Message Dial accessible from cellular phones?

Inoue (ME): When the lines are congested due to a wide-area disaster, you can call to and from any land-line or cellular phone.

Nishimoto (CEO): I always carry the paper with that number, dated February 22, 2006, with me in case my home is hit by a disaster since I am often away on business trips. At the time that it was given to me, I was told to use coins to call from a public phone, which I still believe to be true. I have just looked at that paper

and now realize that it is also accessible from a cellular phone, but you cannot always use it for that purpose, can you?

Ito (DG): No, usually not. You can only use it for your own practice. You will be able to use it if NTT or KDDI sets it in place at the time of a wide-area disaster.

Nishimoto (CEO): Exactly. That’s why I was told to always have ten-yen coins with me and use only public phones. Fortunately, I have never used them for that purpose, but I always have them with me.

Inoue (ME): Initially, the Disaster Emergency Message Dial assumed that users would have land-line phones. Since young people rarely have land-lines today, the system seems to have adjusted itself to communication between land-line and cellular phones, as well as between two cellular phones.

Omokawa (DG): On March 11, 2011, I was in Kagoshima with Chief Executive Officer Nishimoto and received a message from my family in Akita on my cellular phone, and I was able to listen to the voice of my family through the Disaster Emergency Message Dial, saying, “It has also shaken Akita, but we are all right.” I think it is very practical. I do not know how to send a message, but my family knows how to do it.

Nishimoto (CEO): Six years ago, I was told just to remember to dial the number “171” by remembering a play on words “wasurete inai (171, not forgotten yet).” These words are really written down on my paper. At the time of an emergency, I should stay calm and say to myself “*wasurete • i • na • i (171).*”

Ito (DG): I see.



(4) On black and public phones

Tsuboi (DG): Our staff went to a convenience store to use a green public phone installed there.

Tsuboi (DG): I see. So, we had better put public phones inside hospitals, even though all the public phones have been removed because they are rarely used.

Ito (DG): Why does a public phone get through more often?

Inoue (ME): I heard that public phones are connected to an analogue line and are designated as an emergency telephone line, similar to a black telephone line.

Kodate (DG): I also have a comment. Our blood center has an analogue phone.

Tsuboi (DG): It’s a black phone, isn’t it?

Notes by the Secretariat

(1) **Emergency telephone lines**

To ensure the availability of emergency telephone lines, which has been highlighted from the previous Guidelines, it is stated in “2.1.3 Emergency telephone lines,” that “to effectively utilize emergency telephone lines and others provided by NTT and other telecommunications carriers, their availability shall be ensured and a system for their effective use shall be established, and shall include informing every person where they are located. The emergency telephone lines shall be a black phone that does not require an outlet or has to go through a switchboard so that it can be available during a blackout.”

It has also been pointed out since the previous Guidelines that, as to “emergency telephone lines,” that “in and around an earthquake or disaster stricken area, communications over telephones will no longer work due to the extreme congestion of the lines. In past disasters, calls to the stricken areas from other areas rarely got through due to congestion. Within a stricken area, even if the lines were not cut, an increase in calls makes it impossible to communicate by telephone from common houses and offices. To address this congestion problem, NTT has a system of “emergency telephone lines,” designating phones that can get through even in the event of a disaster, for the police, fire department, disaster-preparedness units of municipalities, larger medical institutions, etc., as well as public phones for local residents in general. As for a phone with a representative dial number and several lines (e.g., business phones), dialing with an additionally assigned number makes it an emergency telephone line. The procedure will be discussed with NTT. “

In reality, as telephone stations automatically restrict the congested lines, only a limited number of lines are designated as such among those institutions above, including the blood centers. Some cellular phones can be designated as emergency telephone lines, as well.

(2) **Fax machines also have to be designated as emergency priority telephone lines**

This problem arose when a medical institution placed an order for blood products by fax to a Supply Division at a regional blood center during a disaster. In order for the fax to be received, corrected and confirmed a proper working fax line needed to be in working condition. These procedures of receiving, correcting and confirming an order serve to prevent mistakes or delayed deliveries. However, the fax machines did not work for approximately one week following the last disaster. It was later found that the fax machines also have to be designated as emergency priority telephone lines to maintain their functions during a disaster.

(3) **One or more satellite phones (landlines or mobile) shall be put in place**

As for satellite phones, a revised part in the new Guidelines is “(3) one or more satellite phones (landlines or mobile) shall be put in place,” a change from the previous provision “(5) it is preferable to put one or more satellite phones in place,” in “4. Preparation of disaster-preparedness plan and countermeasures in advance against disasters.....4.4 Supply of communication equipment and its installation are essential in the case of an emergency.”

(4) **Blood centers are a part of the health services institutions**

The prioritized recovery of telephone lines, which has been high-lighted from the previous Guidelines, is laid out in “2.1.4 Prioritized recovery of telephone lines”, which state that “the blood centers shall ensure (confirm) that they are included in the priority lists for service recovery of telephone companies by convincing them that the blood centers are a part of the health services institutions and are to be given a higher priority for the recovery of interrupted telephone lines.”

Kodate (DG): It’s not a digital, but an analogue phone, an old fashioned dial phone that sounds “gee-gee.” It can get through at the time of a disaster. Even though the cellular phones were all down, that phone was used to confirm the safety of many people. Cellular phones would probably be of no use at the time of a disaster.

Ito (DG): I tell my staff to use a black phone for every telephone for emergency call. Black phones are supposed to have been installed in blood centers all over Japan. Our center, of course, had it. However, it was unable to get through at that time.

Kodate (DG): Perhaps restrictions had been imposed on lines at that time?

Ito (DG): That’s correct.

Kodate (DG): A black phone is analogue, isn’t it?

Ito (DG): Yes, it is.

Kodate (DG): So is a public phone. It uses only a telephone line.

Tsuboi (DG): Now I remember that our blood center also has a black phone.

Kodate (DG): It is more convenient than expected.

Tsuboi (DG): Our staff used a green phone in front of a convenience store.

Inoue (ME): According to NTT, there are three types of lines: analogue, digital and fiber-optic. I think that when an analogue line is not so busy, a caller using it can get through well. Unless there are objections, it seems fair to conclude that we should secure several modes of communication suitable for responding to disasters, and utilize the advantages of each.

(5) On business wireless communication system

Kodate (DG): In the Aomori Area, a wireless communication system installed in the bloodmobiles was very effective. It got through across Aomori prefecture.

Inoue (ME): It’s a business wireless communication system, isn’t it?

Kodate (DG): The business wireless communication system is great because communications are often made with and among various parties on bloodmobiles.

Inoue (ME): Our blood center also has a business wireless communication system. At that time, we were not able to use it because the other party was not at a site where the system was accessible. Since the Iwate Prefecture is mountainous, the coverage area has geographic restrictions. When the disaster occurred, we lost contact with a bloodmobile, as I mentioned before, that had been along the coast, crossing over the Kitakami Mountains. However, we sometimes

receive radio waves from the faraway city of Muroran, Hokkaido.

Kodate (DG): If you have a wireless communication device, know the frequency, and are able to get through, you can then communicate with other parties over the wireless system.

Inoue (ME): I would like Director Sakamoto to make a concluding remark for further improvements to the communication equipment.

Sakamoto (D): It goes without saying that there are many options available. It would be better to ensure communication measures by equipping ourselves with several alternatives to replace a failed communication tool, for example, the emergency priority telephone lines. Taking our discussions here into account, I hope that these specifics will be discussed at the Operation Safety Management Committee and others.

4. Ensuring Reliable Lifelines

(1) Ensuring gasoline

Inoue (ME): It is time for us to begin the discussion about “Ensuring reliable lifelines.” According to the “Response of six Blood Centers to the disaster”, there were problems getting gasoline. I would like to ask you about these problems in more detail in terms of blood-delivery vehicles and commuting cars. Is there anyone who can talk about standard ways to obtain gasoline for all vehicles? The Iwate Blood Center’s blood-delivery vehicles were designated as emergency vehicles at the police station immediately following the disaster. They were able to be refueled for cash at gas stations designated by the Prefectural Disaster Response Headquarters. We therefore had very little trouble with the blood-delivery vehicles. However, obtaining fuel for commuting cars was much more difficult. Often, commuting cars has to wait in long lines at gas stations, even for several hours, only to get 20 liters of gasoline. The manager of the general affairs division and other staff were able to negotiate with some gas stations and managed to get a higher priority for fuel supply. However, such circumstances seem to have varied dramatically between prefectures. Are there instructions from the Prefectural Disaster Response Headquarters regarding the provision of gasoline to delivery vehicles if they have been designated as emergency vehicles?

Omokawa (DG): Emergency vehicles for blood distribution were able to get priority refueling. However, gasoline for commuting cars was not ensured.

Inoue (ME): I heard that the Miyagi Blood Center was able to provide some gasoline to the Yamagata Blood Center?

Ito (DG): The Miyagi Blood Center was able to provide gasoline for emergency delivery vehicles just after the disaster. At the same time, we were able to increase the gasoline provision limit from approximately 10 to 20 liters, by designating more people and vehicles for refueling. The vehicles were refueled by using as many portable gas cans as possible, which helped avoid an extreme gasoline shortage for the delivery vehicles. However, we were unable to procure gasoline for our staff’s commuter cars.

As for the gasoline shared with the Yamagata Blood Center, I heard that each blood-delivery vehicle took a 20 liter can of gasoline from the Miyagi Blood Center to the Yamagata Blood Center with every visit, because the blood delivery vehicles were unable to be refueled at gas stations as prioritized cars in Yamagata Prefecture.

Tsuboi (DG): I heard that the gasoline odor remained in the vehicle.

Ito (DG): That’s right.

Inoue (ME): How about the gas supply at the Fukushima Blood Center?

Tsuboi (DG): It was the same as the Miyagi Blood Center for us. Commuting cars were not refilled with gasoline, but the blood-delivery vehicles designated as emergency vehicles were refueled without waiting in line at the gas stations. When absolutely necessary, the vehicles were able to drop in at a gas station on the expressway for refueling.

Ito (DG): However, the general citizens were not provided with gasoline, even on expressways. They had to wait in line.

Tsuboi (DG): Regular vehicles queued in line to fill up with gasoline on expressways, as well.

Osaka (SD): At the time of the Great Hanshin-Awaji Earthquake, many gas stations located along the coast in the Hanshin region, including those adjacent to the Hyogo Blood Center, were damaged and unable to work. It took them quite a long time to resume operations because they had to undergo testing; I remember that they were closed for a long time. It was often the case that we needed to get gasoline from the

Osaka and Himeji Blood Centers. After the new center was built, we requested nearby gas stations to give us a higher priority for refueling in case of a disaster and they agreed. However, the system would not work if those gas stations ceased to function after a mega-earthquake.

Inoue (ME): With regard to the availability of gasoline after the last disaster (3.11), I heard that there was a shortage of gasoline in the Tohoku region due to the impact of the tsunami, partly because some of the main wharfs and oil refineries were not able to function because of the tsunami, and partly because the destruction of harbors made them inaccessible to large tankers along the coast. The distribution of blood products as a national undertaking is too important to stop in a time of crisis, and gasoline had to be secured by all means. The major challenge of securing gasoline seems to be too important for the JRCS to rely only on the self-help efforts of the regional blood centers. It is also essential for the JRCS to ensure refueling for emergency vehicles, in order to respond promptly in the event of a disaster. Are there any solutions?

Osaka (SD): I think that the blood distribution, as the JRCS's one of the number-one mission, would be interrupted if all the gas stations near any blood center were not functioning. In such a case, there should be a special arrangement to ensure gasoline through the JRCS's network.

Inoue (ME): How do you like that suggestion, arguing that the special network of JRCS can mitigate a lack of gasoline in disaster-stricken areas? Japanese law provides that the national government also has the responsibility to ensure the distribution of blood products. Therefore, the national government could direct local government to support the JRCS's blood distribution in the event of a mega-quake. Now is the time to arrange who plays what kind of role in the worst conditions. The Disaster Response Headquarters in Iwate prefecture offered us, at the Iwate Blood Center, a priority in refueling emergency vehicles. They have provided us with information about available gas station locations. I believe one of the important roles of the Blood Service Headquarters would be to promote these kinds of co-operation and arrangements prior to the next disaster. A tanker full of crude oil was donated by Kuwait to the JRCS as part of the international relief effort. This helped to alleviate the gasoline shortage. Proceeds from the sale of the crude oil went towards financial aid for disaster victims. I wonder if the JRCS Disaster Response Headquarters ensured a part of the oil proceeds went towards helping alleviate the gasoline shortage in the disaster region.

It is in emergencies that the blood centers are required all the more to ensure a stable distribution of blood and support for JRCS's disaster response. Therefore, I think the National Headquarters have to secure gasoline as a part of the logistic support for the activities in disaster-stricken areas. If in fact we

force the local staff to transport gas cans filled with gasoline inside the cars with them, that is an unlawful act that will lead to serious damage of the JRCS's brand image if the act becomes a custom and causes a big fire on a road with civilian casualties. As a General Director, who is in a position to forbid unlawful acts, it is difficult for me to tell the staff to drive while transporting portable gas cans.

Osaka (SD): Since there was a request for gasoline when the Hyogo Prefectural Chapter responded to the Great East Japan Earthquake, they appeared to have taken gas cans with them from Hyogo to Miyagi Prefecture.

Ito (DG): They brought gasoline in portable cans. After all, it was the only option.

Inoue (ME): I hope this was the last option to have been taken by JRCS.

At the time of an earthquake with its epicenter located immediately below the capital city, JRCS's disaster response teams from all over the country would not be able to enter Tokyo due to a lack of gasoline, and a lot of lives that would otherwise have been saved may be lost. The issue of procuring gasoline for activities in the disaster-stricken areas is such a very important lesson to be learned from the last disaster that it is requested to consider alternatives, including a stockpile of gasoline.

(2) Obtaining water

Inoue (ME): Now allow me to move on to the issue of obtaining water. Water is essential for blood services, specifically for blood testing, processing of blood products, as well as for cooling the tubes of radiology equipment, maintaining the functions of freezers and refrigerators, and making ice and cleaning equipment.

When I visited the Miyako Prefectural Hospital with a relief team on Thursday, April 17 after the earthquake, the hospital had received water from the Japan Self Defense Force's (JSDF's) water supply vehicles. In the Iwate Prefecture, there was a system in which water was delivered to any official location which made a request. According to the "Response of six Blood Centers to the disaster" in this book, the Miyagi Blood Center contacted the Water Bureau and was able to be refilled with water several times. I think these instances demonstrate that we are entitled to receive responses on request since we, the blood centers, are medical services support organizations.

At the Iwate Blood Center, electric power was recovered within a day, hence the water supply was not significantly interrupted. The Miyagi Blood Center says that its water supply was interrupted for twelve days until city water supply was restored, and a vast volume of water is needed to cool the radiology tubes. Do you have any opinions or ideas to avoid these kinds of disruptions?

Tsuboi (DG): Our tap water was interrupted for about a week, which forced us to take water from a river flowing in front of the blood center.

Inoue (ME): I think the Fukushima Blood Center continued to process blood products. Did you face a shortage of water?

Tsuboi (DG): A hospital in front of our blood center was provided with water in its storage tank by the JSDF upon our request. We were not short of drinking water because a lot of bottled water was given by the Branch located adjacent to the blood center.

Inoue (ME): There was a statement by the Fukushima Blood Center that an "intermediate water supply system using rainwater is being considered" in their response as one of the six blood centers mentioned in Chapter 1 of this book.

Tsuboi (DG): I think that it referred to the fact that water taken from a river was used to flush toilets.

Ito (DG): The Miyagi Blood Center had 12 tons of tap water in stock, but not enough for domestic water, since the center uses about 20 tons a day for testing and production. The functions in the Miyagi Blood Center could not be restored without the resumption

Notes by the Secretariat

(1) Availability of portable gas cans

As for "the fuel resources" the new Guidelines additionally describe "self-directed efforts at regional blood centers in "2. Analysis of disaster preparedness partnerships with external organizations: 2.1 Disaster arrangements with external public entities (3)", stating that "it is necessary for each center to systematically build the capacity to store three days of fuel supplies (equivalent to the amount used on a regular basis for three days) by obtaining consent for a prioritized delivery plan from the suppliers. This would ensure fuel through partnerships with prefectures and municipalities, and increase the stockpile of fuel and water. These resources could be used for emergency power generators and for blood delivery and other vehicles (including the availability of portable gas cans, heavy and light oil drums, transfer pumps, etc.) In addition, it is required to ensure alternative transportation routes in which fuel, water, etc. can be refilled directly to tanks from the outside areas, as well as the necessary equipment for it."

(2) Use vehicles with engines working on various fuels

As for "the fuel for the transport of blood products" the new Guidelines also state that "the regional blood centers shall use vehicles with engines working on various fuels, including electric and diesel vehicles in addition to gasoline vehicles so that they can cope with a lack of auto fuel.

of the water supply. Whenever we requested the Water Bureau to refill the drinking water, they were able to respond to it with a six-ton vehicle. The blood center did not have the capacity to store a lot of water. Generally speaking, thanks to the water refilling, our blood center did not need to worry about an undersupply of domestic water, but we did ration drinking water to some extent during the interruption of the water supply. Since domestic water was not an issue and nearly 70 tons of the intermediate water supply was used to cool the equipment, the waste water was used as usual to flush the toilet.

Omokawa (DG): Then in other words, did the interruption of water significantly contribute to the long time to make it recover to normal functions?

Ito (DG): That’s right.

Omokawa (DG): In addition, there were large misalignments with some large-scale equipment in the examination and production lines?

Ito (DG): The water supply was resumed within 11 days, but testing and production were interrupted for longer. Indeed, testing equipment, especially the CL4800, ceased to work due to a major misalignment caused by the 3.11 earthquake. Engineers checked it on March 12 and 13, and said that the weight of the equipment, around 10 tons, would add to the repair time. The equipment needed to be dismantled and reassembled, and new parts would need to be ordered. The components were not available and had to be ordered from Tokyo. Dismantling the equipment would take a minimum of four weeks to complete. Ultimately, it would take about 40 days, including all equipment validation testing, in order to return to normal operation.

Omokawa (DG): Is it safe to say that we must ensure earthquake-proof structures for the blood centers?

Notes by the Secretariat

(1) X-ray irradiator cannot continue to be used if there is a problem in the water supply

As for tap water, the former Guidelines describe in “4.10 Prior response in the production sector”, the “(4) X-ray irradiator cannot continue to be used if there is a problem in the water supply because it requires an enormous amount of water to cool the x-ray tubes. Therefore, it is important to promptly address the problem with the water supply for its restoration. A radiation monitoring system shall be installed to respond to radioactive contamination of a gamma-ray irradiator. Radio-protective measures shall also be put into place. The excessive weight of an irradiator shall be handled by confirming the strength of the floor where it is installed, repairing the device and conducting reinforcement work as needed,”

Ito (DG): If it were earthquake-proof, operations would have returned to normal after the resumption of the water supply. However, another problem was sewage waste disposal. We were told not to dispose of sewage waste because the wastewater treatment plant was not working at that time. We cannot maintain normal functions for testing or production unless the water supply and the sewer systems are both in operation.

The problem of the water supply, will be resolved, because the irradiation equipment in the Tohoku regional Blood Center is to be replaced with a water circulation model, so it won’t require 20 tons of tap water.

Inoue (ME): In the event of a mega-earthquake, we must ensure the early restoration of testing, production, and product storage, especially in a central blood center like the Miyagi Blood Center, which deals with collected whole blood in Tohoku region.

Osaka (SD): In the case of the Great Hanshin-Awaji Earthquake, water supply was interrupted for about eight days, during which time water tanks were continuously refilled with water supplied by water supply vehicles.

Inoue (ME): The report of the Miyagi Blood Center’s response to the disaster suggests that it was suspected that water had been leaking from a feeding pipe on the first floor. What was finally found?

Ito (DG): In the end, there was no leakage on the first floor. Such a leak was suspected, because the water level was dropping faster than anticipated during an operational test, but a later inspection showed no such leak.

Inoue (ME): It is suggested from the operational test at the Miyagi Blood Center that the radiation equipment requires a lot of water. When the water supply was interrupted, it could not operate. At the beginning of the Round Table Discussion in “2. Establishment

of an emergency power source system for a future mega-earthquake”, you mentioned as follows; “When building the new facility of the Miyagi Blood Center, we did not pay much attention to the type of emergency power generator, either water-cooled or air-cooled. However, we recognize that the water-cooled, system has drawbacks, and a radiator (air-cooled) system should have been chosen.” Judging from your talk you did not prepare how to maintain the functions of blood testing

(3) On ensuring gas

Inoue (ME): Now we are going to discuss ensuring city-supplied natural gas.

After the Great Hanshin-Awaji Earthquake (1995), it took a long time to restore natural gas in the city of Kobe and turn back on the natural gas air conditioning unit. How many days did it take to restore natural gas in Kobe?

Osaka (SD): 48 days.

Inoue (ME): If this information had been shared with the Miyagi Blood Center, you would not have used a similar air conditioning unit. What do you think about this, Director General Ito?

Ito (DG): When the Miyagi Blood Center was established in 2008, staff at the Gas Bureau, in the city of Sendai came to explain that based on the experiences from previous earthquakes, its gas distribution system was changed from a centralized system with a single gas line that extended across the city, to a decentralized system in which the city was divided into eight blocks with a natural gas station in each of them. This way, an interruption of the gas line would not occur. Mid-pressure pipes buried underground were rarely broken as demonstrated in the Off-Shore Mid-Niigata Earthquake, which promoted natural gas air-conditioning units. Consequently, the gas-run air-conditioners were selected rather than the electrical-run, taking into account the operating costs, etc.

Inoue (ME): Based on the experience from the 3.11 disaster, the explanation of the staff at the Gas Bureau was not correct, was it? The lesson is that we

and production at the Miyagi Blood Center, even in a disaster, as the JRC Ishinomaki Hospital implied. As the essential role of a central blood center is to maintain its functions during a great disaster, or quickly recover them if they are lost, the Miyagi Blood Center seems rather to have taken a back seat, at least in its initial response to this earthquake. This was perhaps because of a lack of planning.

should avoid using city gas in blood centers for air-conditioning.

Osaka (SD): Gas leaks are very dangerous in combination with electrical current. It is said that the combination of a natural gas leak and electrical current is what caused the huge fire in the Nagata Ward in Kobe after the Great Hanshin-Awaji Earthquake. Fire-fighters had major problems controlling the blaze, because water was not available for fire-fighting operations. It took 48 days to recover the interrupted natural gas, after confirming that there were no remaining ruptured or leaking gas pipes.

Ito (DG): In the latest case (3.11), the supply of city gas ceased because all the city gas facilities in Shiogama had been washed away. A pipeline was then put in place from Niigata Prefecture and city gas was supplied to Sendai first in the outskirts of the city and subsequently the inner city after completing safety checks. That’s why distribution of natural gas to the center of the city occurred later.

Inoue (ME): I remember that in late March, Osaka Gas Company uniformed staff members were checking for the gas leaks in downtown Sendai. There should be an established emergency priority order for heat source resources such as electricity, natural gas and gasoline, and the pros and cons for each resource should be properly weighed-up. I think that a lesson to be learned here is that we should prepare the construction criteria of the blood center bearing in mind the need for the continuation of blood services in the event of an earthquake.

5. Architectural Preparedness

Inoue (ME): In this session, we will move on to a new topic which is how to design and/or arrange the building structure to preserve the instruments and equipment inside and maintain the function of the medical facility in the huge earthquake. As our Chief Executive Officer Nishimoto stated at the beginning of this round table discussion, “We do not know when and how intense the next earthquake will be. It may be as large as the Great East Japan Earthquake or even more devastating. Therefore, as for the targeted scale of the earthquake, I have no choice but to answer “however big it will be.” As for the resilience target: we will be committed to achieving a preparedness level of 100% - i.e. “total resilience” applying all our human wisdom and scientific expertise to this end.”

The most important lesson to be learned in this latest disaster is that we should always be aware of the importance of our blood services, and we need to do as much as we can to avoid the risk of malfunction at the blood centers.

In addition, judging from the chronological table of earthquakes in Japan, this indicates that earthquakes with a level of “6 Upper”, such as the Great East Japan Earthquake, are not rare in Japan.

Notes by the Secretariat

(1) Seismic intensity

The Great Hanshin-Awaji Earthquake measured an intensity of 7.0. The Great East Japan Earthquake caused a maximum intensity of 7.0 with an intensity of 6 Upper at the Miyagi Blood Center.

(2) Seismic isolation technology in Japan

As for the development (revisions) of the Building Standards Act in Japan, it was originally enacted in 1950 in the wake of the 1948 Fukui Earthquake with its epicenter below an urban area. Following the 1964 Niigata Earthquake, the 1968 Off-Shore Tokachi Earthquake and the 1978 Off-Shore Miyagi Earthquake, a major amendment to the Act in 1981 laid out the new seismic resistance standards to enhance bearing walls, including reinforcing concrete posts. In the wake of the 1995 Great Hanshin-Awaji Earthquake, the 2000 amendment required a ground investigation. Since then, major earthquakes have continued to hit the country, including the 2001 Geiyo Earthquake, the 2003 Northern Miyagi Prefecture Earthquake, the 2004 Mid Niigata Prefecture Earthquake and the 2007 Off-Shore Mid Niigata Prefecture Earthquake. Consequently, buildings constructed after the revised Act in 1981 have been reinforced with robustness against large earthquakes. Building on the experience of two earthquakes with their epicenters below urban areas after the 1995 Great Hanshin-Awaji Earthquake, seismic isolation technology was developed. It is a new architectural method that controls the risk of movement and falling of furniture by reducing vibrations inside rooms, as well as mitigating damage to the building itself. This is done by placing an isolation device at the substructure of the building that separates the ground surface and the building. The seismic isolation technology has become common in residential areas, regardless of solid or soft soil. The cost of a seismic isolation device is said to account for about 10% of the total construction cost, but it seems to vary according to the structural composition of the building and the degree of seismic isolation. Though it requires maintenance, it seems to have had some advantages, including the mitigation of buying earthquake insurance.

(3) Structure and function of the Building

The following charts show the differences between a seismic resistance resistant structure, seismic resistant structure + a partial seismic isolation floor, seismic isolation structure and seismic response control structure.

A seismic resistant structure is characterized by the fact that in the case of a building with few stories, the higher the floor is, the stronger the vibration.

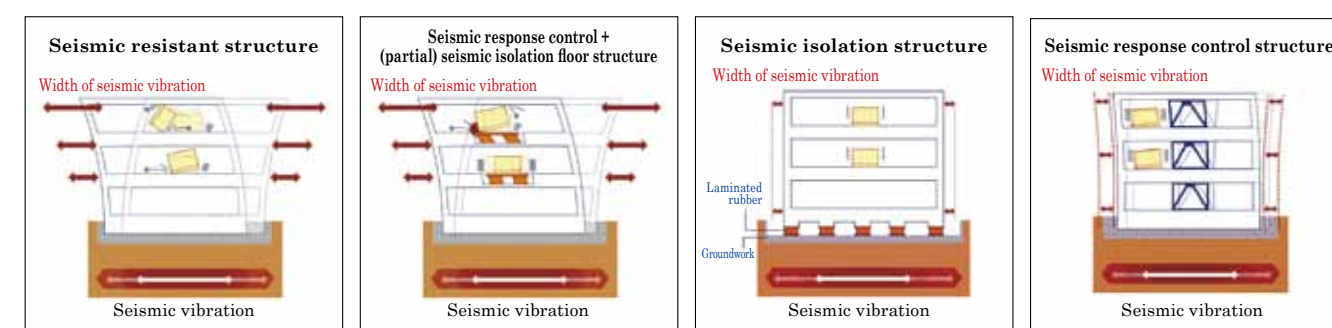
A seismic isolation structure is characterized by the absorbance of vibrations at ground level.

A seismic isolation structure involves a vibration absorbing device placed between the ground surface and the building. Seismic response control is a construction method where vibration absorbers are incorporated into posts and beams of a building, while a partial seismic isolation floor enhances the response control by adding to a seismic resistant structure, but using these alone is not comparable to a seismic isolation building structure in terms of acceptable displacement.

Sendai is notorious for being a huge earthquake-prone city, where on average every 38 years, a mega-quake hits the city. On June 12, 1978 the Miyagi Off Coast Earthquake hit the city (Magnitude 7.4 and seismic intensity 5), and next huge earthquake is expected to come in 2016. In the Sendai area, several medical institutions have adopted this newly developed seismic isolation structure and so have avoided a loss of operation of their facilities in the Great East Japan Earthquake.

In the process of introducing the wide area management system the risk of malfunction in the central blood centers has been pointed out, but the warnings may not be fully considered.

Lessons therefore need to be learned from the last mega-earthquake and in particular to this context, we need to look at the reasons why the Miyagi Blood Center, as well as Tohoku Regional Blood Center, did not adopt a seismic isolation structure from the beginning. Director General Ito, could you explain it? (Note; “The regional blood center” indicates “block blood center” in Japan)



(4) Response of Certain Medical Facilities in Miyagi Prefecture

Here, we compare the effects of the Great East Japan Earthquake on three representative medical facilities in Miyagi prefecture.



A. JRC Miyagi Blood Center, which is located in Sendai City, was seriously damaged and blood examination and production was stopped for around 40 days in the Great East Japan Earthquake. It was built with a seismic resistant structure in 2008. In addition their air conditioning was lost for 17 days until the natural gas supply was restored, because they used natural gas air conditioning.



B. JRC Ishinomaki Hospital, which is located in Ishinomaki City, received little damage from the Great East Japan Earthquake. It was built with a seismic isolation structure in 2006.



C. Miyagi's Children's Hospital, which is located in Sendai City, also received comparatively little damage in the disaster. It was built with a seismic isolation structure in 2003. Natural gas could be relied on for the first three days to maintain emergency electric power, because earthquake resistant gas pipes were installed. Three days after the disaster the electric power supply was restored.

Ito (DG): When we built a new building at the Miyagi Blood Center in 2008 we did not adopt a seismic resistant structure because I believed that a seismic isolation structure would only be suitable for weak ground conditions and higher buildings of more than seven stories such as the JRC Ishinomaki Hospital and the Tokyo Metropolitan Blood Center.

So as the building was only three stories high and the ground was bedrock, a seismic isolation structure was not adopted for the Miyagi Blood Center. There were also considerations of the construction period and cost to be taken into account. The Miyagi Blood Center was self-financed with some subsidies from the prefecture and the municipalities, and there was a certain financial constraint. Also, at that time, we had no plan for a building with a seismic isolation structure. I did not consider that an earthquake would move such large precision machines and cause such extreme dysfunction. We considered it imperative only to make the facility earthquake-resistant so far as was necessary to avoid loss of life due to collapse of the building.

Inoue (ME): The last earthquake did move such large precision machines and instrument and cause malfunction at the Miyagi Blood Center, which is only a three-story building on bedrock ground. Then,

judging from the consequence of the last disaster your consideration would be wrong.

The evidence indicates that the planning and preparation of the Miyagi Blood Center was not adequate as a central blood center of blood testing and processing for collected whole blood to become blood productions in the Tohoku region.

Nishimoto (CEO): It is to be expected that the Tohoku Regional Blood Center has a seismic isolation structure, doesn't it?

Ito (DG): The newly built regional blood centers all over Japan do not have seismic isolation structures, but do have seismic resistant structures following the structural style of the Tohoku Regional Blood Center.

Tsuboi (DG): Was it due to a financial constraints?

Ito (DG): At the time of the last earthquake, the design of the Tohoku Regional Blood Center had already been completed.

Nishimoto (CEO): Are all the regional blood centers seismic resistant?

(5) Comparison of Three Medical Institutions: Type of Structure and Facilities for Disaster Preparation

	Miyagi Blood Center	JRC Ishinomaki Hospital	Children's Hospital (Miyagi)
Structure Completion	2008	2006	2003
Total Structure Cost*	\$24,470,000	\$100,000,000	\$125,000,000
Seismic Isolation Structure (Cost)*	Not installed \$0	Installed \$10,000,000	Installed \$25,000,000
Emergency Power Supply	Installed 625KW	Installed 500KW×2	Installed 220KW×2
Water Storage Tank (purified water +water)	Installed 20+70 tons	Installed 190+470 tons	Installed 200+200 tons + own well
Gas Supply	Low pressure pipe	Medium pressure pipe	Medium pressure pipe
<last disaster>	Stopped for 17 days	Stopped for 30 days	Not stopped at least for initial 3 days
Air Conditioning	Natural gas	Electric power	Electric power
Sewage Disposal Tank	Installed 16 tons	Installed 150 tons	Not installed
Own Swage Works	Not installed	Not installed	Installed
Tolerance Evaluation	Fragile	Tolerable	Tolerable

* Note with current exchange rate of yen/dollar set at 100/1 (¥100=\$1)

Ito (DG): Yes, they are.

Nishimoto (CEO): I should know the answer, but are the Osaka and the Hiroshima Regional Blood Center currently under construction also the same?

Ito (DG): There are no seismic isolation buildings. The design for all the buildings has been completed.

Nishimoto (CEO): Were they finished before the last earthquake occurred?

Ito (DG): I think various factors were taken into account when deciding on the structures, including the height of the building and the condition of the ground.

Nishimoto (CEO): Those decisions were made with sufficient consultations with architect offices and construction companies, weren't they?

Ito (DG): Yes, they were.

Inoue (ME): On June 5th, 2012 the Seismic Control Structure Association gave a special award and acknowledgement to the JRC Ishinomaki Hospital, along with Nikken Design Inc. and the Kashima

Construction Firm, for their heroic rescue activity during the aftermath of the huge earthquake and tsunami. After the Great Hanshin-Awaji Earthquake on January 17th, 1995, the technology for seismic isolation structures rapidly began development because we recognized that the guidelines of the Japanese Standard Construction Act were insufficient under the stress of a huge earthquake. A health care facility built following the guidelines of the Japanese Standard Construction Act was unable properly to protect the building structure, fixtures, and especially the equipment from debilitating damage during a huge earthquake, and that was even if the building was constructed on a solid foundation. In 2006, the JRC Ishinomaki Hospital moved to a newly built facility, inland from Ishinomaki City, to operate as a central hospital for the area. At the time of the building's construction, it had been nearly 30 years since the Miyagi earthquake, which has a history of recurring approximately every 30 years. Experts were predicting an extremely high probability (99%) of a huge earthquake within the next 10 years. The hospital executives and hospital director thoughtfully decided to include a seismic isolation structure in the construction, and incurred an additional 10% in the cost of construction to do so. Thanks to their foresight, nearly everything remained

(6) Estimated Costs of the Malfunction of the Miyagi Blood Center Caused by the Last Disaster

	Breakout	Unit (dollars) **
Building Repairs	Concrete cracks, Tile detachment, Piping fractures	\$30,000
	Ceiling cracks, Panel fracture, Breakage of vent-outlets	\$10,000
Facility Repairs	Falling of cable rack, Broken ceiling lamps and plugs	\$9,000
	Broken air conditioners (Gas), boilers, and ventilation system	\$28,000
Equipment Repairs	Broken LABOSPECT 008	\$6,500
	Broken shakers, Broken cooling cabinets, Broken X-ray radiator	\$39,500
Dispatch Cost ***	Two hundred sixteen staff per thirty days had been dispatched from all over the country (including transportation fee)	\$43,800
Cost of Loss of Production****	Thirty three days of malfunction of Miyagi Blood Center for blood examination and processing	\$4,000,000
Total		\$4,136,800

NOTE;

* This is not the official report of JRCS nor the Blood Service Headquarters.

** Note with current exchange rate of yen/dollar set at 100/1 (¥100=\$1)

*** Regarding labor cost of dispatched staff per day as \$300.00 per day for responding the request of the Miyagi Blood Center's dispatch to help to repair the equipment and resume function, and transportation of the blood products, etc.

**** The malfunction of the Miyagi Blood Center also caused additional burden of loss of blood products. Though they were covered by the JRC blood centers' supports across Japan, their costs were charged to the six blood centers in the Tohoku region.

operable in the hospital after the mega-earthquake on March 11th, 2011. This new building enabled the JRC Ishinomaki Hospital to play a major role in the disaster recovery, since its seismic isolation structure protected the rooftop generator, which made it the only facility in the area to maintain power and function. Thanks to continued technological development, the cost of installing a seismic isolation structure has dropped significantly, from 10% of the project down closer to 5%. In addition, new improvements allow seismic isolation to be added underneath a building, even after construction is complete.

We must learn to understand how the advance decisions of a leader may determine the survival of his subordinates in the future. When the costs of protective measure are set against the costs of the damage to unprotected structures and equipment, the cost-benefit argument is a strong one. It is interesting to note in this context that ten months after the 3.11 disaster, the Director General of the Miyagi Blood Center made an official request for partial seismic isolation modifications to the floors there.

6. Wide-Area Management System

Inoue (ME): When the last disaster occurred, the process of integration was underway in Tohoku. In particular, the blood collected in the six blood centers in the Tohoku region was already being tested at the Miyagi Blood Center. In addition the collected blood in Iwate, Yamagata, and Miyagi was transported to the Miyagi Blood Center for examination and production. As the Miyagi Blood Center had been responsible for the blood examination, production, and supply since the process of integration began.

There are pros and cons in integrating the examination and production.

Originally, partly at the request of the Ministry of Health, Labor and Welfare, such a system was promoted because we believed that it was advantageous for ensuring a stable, sufficient supply of high-quality, safe blood and in reducing the overall cost of the blood service, but we may not have fully considered whether such a system would be effective as part of dealing with a major disaster.

Here, we may have partly learned the lesson as to what is to happen to this integration during a disaster, especially when a central blood center loses its blood examination and production functions. Indeed, the senior director of the Akita Blood Center commented, in Chapter 1 of this book: “After the Miyagi Blood Center’s operations were interrupted, the wide-area supply management system worked rather well under leadership of the Blood Service Headquarters in Tokyo, from where the efforts of the support system of blood centers nationwide were co-ordinated. Meanwhile, the senior director of the Yamagata Blood Center commented in the same chapter that, “Upon determination of acceptance of donors on March 13, we decided to deliver the collected blood to Niigata Blood Center for the examination/production processes. However, it took more than three hours to get to the Niigata Blood Center (180 km away), even though we used expressways in Niigata, because we had to go through an area with one of the heaviest snowfalls in Niigata prefecture. Therefore, it was decided to deliver whole blood twice a day, at 3:00 p.m. and 6:00 p.m. Two employees were in charge of the first delivery, given that blood products were also being brought back on the return journey, and a transport operator was used for the second delivery as the return to the blood center would be late at night. Delivery to the Niigata Blood Center continued for about one month, until April 12, when the

blood examination and production functions of the Miyagi Blood Center recovered. Then, even after changing to wide-area management system, alternative blood examination and production facilities had to be prepared in case of malfunction of the central blood centers.”

While, the senior director of the Iwate Blood Center commented, “Since the functionality of the Miyagi Blood Center lost function for examination and production, the information about the ‘Suspension of blood donation due to the quake’ was displayed in the main entrances of the Iwate Blood Center and the donation room, and was also posted on the website of our blood center and in newspapers to inform the prefectural citizens about the suspension of the acceptance of blood donations.

Approximately 10 days after the disaster, the prefectural system for taking blood donations was restored. However, Blood Service Headquarters gave instructions not to resume blood collections for some time after this because of the delay in restoring the functionality of the Miyagi Blood Center, which supervises testing and production. In addition, both the persistent aftershocks, and lack of urgent demand for blood donation (due to an increase in the number of donations from other parts of the country) were reasons which reinforced this delay. Bloodmobiles eventually re-started operations on April 18, except in the coastal area (suspended for a total of 37 days), whilst blood donation rooms resumed operation from April 20 (suspended for a total of 39 days), after restoration of the testing and production at the Miyagi Blood Center’s facility. The disaster affected about 20% of the 930 bloodmobiles which had been planned to operate in FY 2011 (from April 2010 to March 2011). The delay of the restoration of blood collection may discourage the citizen’s mind in Iwate prefecture.

According to the Risk Management Guidelines of Blood Service Headquarters, revised in April 2012, it is stated that if the central blood center loses its functions, the related local blood centers should be placed under another central blood center’s management. Do you think that we could act on those principles?

Tsuboi (DG): The new concept of jurisdiction is the same as the one that was applied after the earthquake. Since the earthquake, three blood centers in the Tohoku district have worked in the same way as if they had been incorporated into another district. The Blood Service Headquarters should adopt such a system, or such a provisional system, every time it is needed.

Ito (DG): This was done by “the disaster backup blood center”, an action that had been decided even before the earthquake. We just did as we were instructed.

Inoue (ME): The failure of the Miyagi Blood Center gave the local blood centers of Tohoku region many restriction in blood collection for examination and production there by causing excess efforts for transportation of whole blood and blood products. This long term suspension caused a loss of revenue and may also have failed donor’s concerns for blood donation caused by disaster. In that sense the integration of blood service management system may have shortcomings for local blood centers if the central blood center has shortcomings when large area disasters strike.

Notes by the Secretariat

(1) **Pro and Con of the wide-area integrated system**
The pros would be a higher quality of testing and production in terms of the technology. Instruments could be provided and a flexible supply of blood product would be available depending on the demand of the individual blood centers. The cons of the integration would be (1) if a wide-area management system was implemented, failure of the regional blood center’s functions might trigger failure of a wide range of functions at blood centers in Tohoku; (2) allocating blood collection, examination, and production processes in each prefecture would be more difficult in the event of a wide-area disaster; (3) the solidarity and cooperation between each blood center, medical institutions and administrative agencies in each prefecture would be weakened; (4) a wide-area management system could not be maintained if a major problem occurred with the transportation and communication networks; and (5) the independence of the blood center in each prefecture in Tohoku region would be lost, and its vitality would be diminished. In that sense, our response to the earthquake was very much wrapped up with the question of whether it was appropriate to implement a wide-area blood service management system.

Tsuboi (DG): As Dr. Ito said at the beginning, I cannot believe that it was possible to keep all blood donors safe without any injury in the other three Tohoku prefectures, Iwate, Miyagi, and Fukushima, amidst the series of aftershocks. Collecting blood while the aftershocks occurred so frequently after the earthquake was extremely dangerous. We could have been in a big trouble if the needle had come out, the donor was covered in blood, or something serious had happened.

Inoue (ME): Unlike the Fukushima and Miyagi, Iwate did not experience the same level of intensity from the earthquake. We suffered less damage, and had fewer aftershocks because we were further away from the epicenter. Therefore, as the records indicate, on March 14 we began to communicate with Director General Ito and the Chief Executive Officer of the Blood Service Headquarters and obtained approval to resume blood collection. We were in a position where we could resume blood collection at any time if we received the go-ahead. In addition, on March 24, I visited the Miyagi Blood Center for preliminary discussions about the resumption of blood collection. On March 27, we

discussed again with Miyagi’s Deputy Director General the specific date and time to resume blood collection in Miyagi, Iwate, and Yamagata. On April 5, we agreed to resume blood collection starting on April 11.

On Monday, March 21, 2011, when Chief Executive Officer Nishimoto visited the Iwate Blood Center for on-site inspection after the earthquake, I remember that I heard from him that a toll-gate clerk at the Morioka South Interchange on the Tohoku Expressway said to him, “You look like a Red Cross Officer (judging from the Red Cross emblem on the car). Please resume blood collection as soon as possible.” As we are supported by the gratuitous goodwill of the people, we need to respect their feelings, too. Essentially, it is not desirable to decline the wish of people to donate their blood for our own reasons.

Based on the lessons learned from the recent earthquake, does anyone have an opinion about the suspension of blood collection for as long as 40 days? Or about the appropriateness of installing the region’s only testing and production facilities in Miyagi, which has repeatedly been struck by earthquakes?

Omokawa (DG): If I am allowed to speak from my own perspective, Akita Prefecture certainly did not suffer damage, and therefore, we strongly felt that we should support Iwate, Miyagi, and Fukushima under the leadership of Aomori, Akita, and Yamagata Blood Centers in the Tohoku region where blood could be collected. We could not collect platelets for one month, but this was because of an instruction from the Blood Service Headquarters. Of course, the collection of platelets involves tests, such as NAT (Nucleic Acid Test). Since the platelets collected must be examined quickly, it would have been more reasonable to obtain them from the Kanto district in retrospect. We wish we could have helped collect platelets in Akita, too, by making the appropriate arrangements. It was extremely unfortunate that we could not actually collect blood for platelets in a co-ordinated way.

Tsuboi (DG): In the case of HLA-matched platelets, the platelets collected in Akita would go to Niigata under the new system. They would not be returned to Akita from Niigata, though.

Omokawa (DG): That is what will happen if the wide-area management system is in place, isn’t it? Last year, there was still a production site in Akita. Since there was one, we could also produce platelets. The only problem was with the testing. In terms of the amount of blood collected, I am sure that an extremely large amount of platelets can be collected in Tokyo and other urban areas, and the Blood Service Headquarters therefore could conclude that it would be sufficient to only provide support. We still feel, however, that it was regrettable that we did not collect platelets.

Shimizu (DG): We collected platelets, but the collected ones were transported to the Niigata Blood Center.

Ito (DG): It was hard for the Yamagata Blood Center to transport them to Niigata by land.

Shimizu (DG): We transported them to the Niigata Blood Center backed by eight blood centers under the Aichi Blood Center’s jurisdiction.

Notes by the Secretariat

(2) A new integration system has started

Divided into seven areas, a wide area management system commenced from April 1st, 2012 in Japan in order to promote the concentration of the blood services. In Tohoku, the building of JRC Tohoku Block Blood Center was also completed next door to the central Miyagi Blood Center in September 2011. Although blood examination and production in the three blood centers (Iwate, Yamagata, and Fukushima) had already been moved from those three blood centers to the Miyagi core Blood Center by the time of the disaster, the transfer of those functions from the Miyagi Blood Center to the Tohoku Block Blood Center and was not finally completed until April 1st, 2012.)

(3) Discussion in Council

On December 26, 2011, the first Sectional Meeting on Blood Service was held, which is under the Pharmaceutical Affairs Committee for the Pharmaceutical Affairs and Food Sanitation Council. Mr. Oto, a member of the meeting, asked Question (A) as described below. Following the question, Chairman Takahashi made Request (B) to the director general Tawara of the Blood Service Headquarters of the JRC, who responded to the request with Answer (C).

- (A) Mr. Oto: “When the Great East Japan Earthquake occurred, the blood center in Miyagi suffered huge damage. Since predictions show that there is a high probability of another massive earthquake in the Tohoku region within the next 30 years, shouldn’t we reconsider concentrating the blood service in Miyagi? (Shouldn’t some of the core functions be left in Fukushima?)”
- (B) Chairman Takahashi: “When the JRC promotes the concentration of the blood service, we would like to give full consideration to the need to act under disaster conditions.”
- (C) “Following the occurrence of the earthquake (3.11), the Miyagi Blood Center and the Fukushima Blood Center suspended production for about one month until operations were resumed on April 13 and April 18, respectively. The acceptance of blood donations was suspended in the Iwate, Miyagi, and Fukushima Prefectures for about the same period. All blood products needed in the three prefectures during the period were transported there from all over

the country, and the JRC simultaneously took measures to stabilize the supply by dispatching ‘supply supporters’ from around the country. Since there is a possibility that a massive disaster will occur, not only in Tohoku but across the country, the Society is currently revising its Crisis Management Guidelines, and stepping up efforts to establish a system to ensure a stable blood supply regardless of the situation. The JRC is introducing helicopters that can operate independently, reviewing the location of blood suppliers, building additional supply locations, and taking other necessary actions in the event of a crisis. The examination and production processes have been consolidated, and the wide-area management system was introduced, at the request of the government, to improve the efficiency of business administration. The objective of these initiatives is to ensure a stable supply of safe blood products. We believe that our wide-area supply-demand management system enabled us to maintain a stable blood supply even after the 3.11 earthquake occurred.”

(4) Comment by Inoue (ME)

Characteristics of the losses caused by the recent earthquake, not to mention the one pointed out by Mr. Oto, was that blood collection completely stopped in at least three Tohoku prefectures for approximately 40 days. This seems to be the first case where failure of the central blood center’s functions due to earthquake damage caused blood centers under its control to suspend blood collection. In this case, since more people than usual offered to donate blood across the country, we had ample blood inventories. However, in the case of the next massive earthquake, a wide range of densely populated areas could be damaged. If five of the seven regional blood centers broke down, it would be difficult to ensure a stable supply of blood ready for transport, regardless of how efficiently the helicopters operated. In that sense, we should not shift to a complete regional management system by the central blood center; it was fortunate that the Aomori and Akita Blood Centers continued to collect blood and produce blood products even after the earthquake. We are concerned that even though things went smoothly this time, it does not guarantee that they will run smoothly following the next massive earthquake.

Omokawa (DG): We sent collected platelets by air from Akita to the Tokyo Blood Center for testing. We wished to act as an agency for Yamagata, but the Blood Service Headquarters told us that it was not necessary for us to act as an agency.

Inoue (ME): Tohoku is about twice the size of other regions in length. We need to consider whether it is appropriate to concentrate the region’s blood services in the Tohoku Regional Blood Center in Sendai’s Izumi Ward. I also feel it is necessary to take a little more time and reconsider letting emergency blood

examination and production facilities remain in Akita or Iwate.

Based on our recent experiences, I must conclude that it is necessary to install a seismic isolation structure in the regional blood center in order to maintain its indispensable functions, i.e. distributing safe and sufficient blood products to medical institutions even during a disaster, before any further decisions are taken about wider area management system.

Notes by the Secretariat

(5) Responsibility of the central blood center
The chart below indicates the blood centers that were responsible for examining blood samples and producing blood products after the earthquake. In Section “4.14 Actions to be taken by blood centers with attached facilities in advance,” the former Guidelines stipulated that “each blood center shall designate another blood center that may perform duties on its behalf in the event that a disaster interrupts its functions; this designation should be shared with all blood centers in the region.” In the section “4.15 Actions to be taken by the central blood centers in advance,” it is provided that “(i) each central blood center shall establish a blood center (primary and secondary support) to assume central blood center responsibilities in the event of a disaster, and this designation should be shared with all facilities in the region, each other central blood center, and the Blood Service Headquarters. (ii) The central blood center in the region receives the training necessary to assume the role as the central blood center. (iii) The designated central blood center which will assume the responsibility for receiving reports on the safety of its personnel and their families shall maintain specialized personnel to receive such reports or have the personnel on standby.”

Blood distribution in the Tohoku region immediately following the earthquake (as of March 17)

Blood Center	Blood production		Blood tests		Blood collection after the earthquake
	Usual	After the earthquake	Usual	After the earthquake	
Aomori	Aomori	Aomori	Miyagi	Tokyo	○
Akita	Akita	Akita	Miyagi	Tokyo	○
Iwate	Miyagi	—	Miyagi	—	Suspended
Yamagata	Miyagi	Niigata	Miyagi	Saitama	○
Miyagi	Miyagi	—	Miyagi	—	Suspended
Fukushima	Fukushima	—	Miyagi	—	Suspended
Usual flow of blood (Yamagata⇄Miyagi)					
Flow of blood after the earthquake (Yamagata)					
Flow of blood after the earthquake (Tokyo⇒Miyagi⇒Iwate)					



7. Communications with Medical Institutions and Blood Donors

(1) A woman from Akita who was transferred to a hospital in Shizuoka for treatment of a blood disease and to perform childbirth

Inoue (ME): As discussions about the establishment of liaison systems have now reached a certain point, I am wondering whether there were cases in which there was a lack of communication between blood centers, medical institutions and blood donors, and patients? Let us start with the North.

The first case occurred at a major hospital in Akita. At first, as the surgery and childbirth approached, the patient wished to receive treatment and give birth in her hometown of Akita. The Akita Blood Center prepared the required blood, but the doctor in charge then decided that the patient should be treated in a Shizuoka hospital. The second case, concerned the hospital director of a central hospital in the Iwate Prefecture. This hospital director had served as an executive of a local council to promote blood donation, and called the Blood Service Headquarters, concerned about a surplus of blood supply. The Blood Service Headquarters was surprised by this inquiry, and called the Iwate Blood Center to ask about the situation. The third case, which was not directly related to the Fukushima Blood Center, involved a person from Fukushima who came to Tokyo but was not able to donate blood out of a fear that the person had been exposed to radiation.

The point here is that when a disaster occurs, even if we believe we have completed preparations for a crisis, we may not have fully addressed the anxiety of some of the people who are involved in medical care. I would like this meeting to be an opportunity to figure out better ways of reducing their anxiety in various situations. First of all, can the Akita Blood Center explain this first case?

Omokawa (DG): This was a case of a pregnant woman. The earthquake occurred on March 11, and she was expected to give birth by Caesarean section on March 16. This patient required regular transfusions for HLA-matched platelets. We had received the orders for the blood transfusion and scheduled the transfusion appointment prior to the earthquake. On March 11, just before the earthquake, we collected blood from donors at the Akita Blood Center and sent the collected platelets to the hospital. The next blood transfusion was scheduled for March 16, the planned day of surgery. We were asked to supply blood for two transfusions, one for the day of surgery and the other for March 17, the day after surgery. We planned for a transfusion of 50 units on March 16 and 20 units on March 17 (5 units contain approximately 1.0 x 10¹¹ platelets). Plans called for the Miyagi Blood Center to collect 50 units of blood from three donors on March 13 for the March

16 transfusion and for the Iwate and Fukushima blood centers each to collect ten units on March 15 for the March 17 transfusion.

Since it then became a problem of how to supply blood for the operation scheduled for March 16 after the earthquake, we communicated closely with the hospital’s blood transfusion department and informed them of the blood distribution status. The Miyagi Blood Center was designated to supply the blood, and when the communication lines with the Miyagi Blood Center returned to normal on the morning of March 14, we were able to confirm that the blood could not be collected in Miyagi. The Miyagi Blood Center initiated a nationally coordinated effort, which involved other regions across the country, on March 14 (two days before the scheduled day for delivery). However, within an hour after the start of the national coordination, the doctor in charge informed us that the hospital

had decided to transfer the patient to Shizuoka. The issue changed to one of how to supply HLA-matched platelets in Shizuoka. By the end of March 14, the hospital had finally decided to transfer the patient to Shizuoka. It was communicated to us that the receiving hospital in Shizuoka would procure HLA-matched platelets on its own, and that evening, the order for platelets was cancelled.

I later asked various sources about what had happened. The central hospital in Akita complained that they could not obtain a definite confirmation about the blood supply. Judging from the fact that the decision to transfer the patient was made less than an hour after the national coordinated effort began, we wondered whether blood supply was the only factor in the decision. The hospital's blood transfusion department did not have any particular problems with the blood supply, and it appears that the hospital decided to transfer the patient to Shizuoka after taking all of the negative factors following the disaster into consideration. It was difficult to collect blood in Miyagi as planned, and there was nothing we could do about it. But the order was cancelled just after we had requested blood collection and supply through a nationally coordinated effort, albeit before it was conclusively determined whether or not the blood could, or could not, be supplied.

Inoue (ME): Immediately following the earthquake, the blood centers were concerned about how to secure a sufficient supply of blood, especially in terms of donation and delivery arrangements for specific and timely requests. In addition, since the distribution of medical equipment and materials had stopped, hospitals in the stricken areas were likely to face the problem of how to obtain blood products and medical supplies. In general, the decision on whether patients should continue to receive treatment at their hospitals had to be left to the hospitals and the doctors in charge. In this particular case, the earthquake occurred when treatment had already started, and it was the first time that our blood service faced the problem of what should be done if patients could not be transported.

Ito (DG): Let me make a few additional comments. Usually, in order to supply HLA-matched platelets to a patient in Akita, the patient's blood is sent to the Miyagi Central Blood Center, where all compatible donors are confirmed. There, blood is collected from

donors during their appointment, and crossover tests are conducted on the collected blood. Only the platelets that pass the tests are delivered to Akita. Therefore, the patient's blood was kept at the Miyagi Blood Center, but the Miyagi Blood Center could not collect the donation blood as intended, partly because we could not contact any of the donors. What procedures should be followed in such a case? In principle, we should switch to a national coordination if donors are not available. If we check donor availability using the unified system and find that there are some compatible donors in Tokyo, we ask the Tokyo Metropolitan Blood Center to supply HLA-matched platelets and send the patient's blood to Tokyo for crossover testing. However, due to the earthquake, we could not deliver the blood from Miyagi to Tokyo. In short, the Miyagi Blood Center's examiners determined that even if they wanted to, there was no means of delivery. It seemed to be a good idea that since blood was transported every day from Tokyo by land, the patient's blood could be transported by the same vehicle when it returned to Tokyo, but this idea never came to fruition. What should be done if there is no patient sample of blood available for crossover tests? We prepare as much blood of the same blood group as possible for transfusion without conducting crossover tests. In short, health care workers test the blood and transfuse it to patients after they confirm that there is no problem with such a transfusion. Things went smoothly up to that point. But in fact, the hospital ended up deciding to transfer the patient to another hospital, partly because there was concern about medical equipment and materials, not to mention the difficulty of blood supply.

Omokawa (DG): On that same day, we also talked directly to the blood transfusion department of the medical institution and its personnel in charge, and we shared the unconfirmed status of the blood collection, and explained that we had a few options we could try, including paper cross matching, to secure the blood. We still waited for responses from other concerned parties. In the end, we told them that we would be able to secure the specified blood by March 16, but since they had not actually received blood yet, they might then have determined that they were not sure that they would obtain it in time.

Ito (DG): The doctor in charge also did not know all the details. After all, the doctor had assumed that blood

was guaranteed to arrive if he/she ordered it.

Inoue (ME): He/she did not know how the blood was collected.

Ito (DG): We do not receive so many orders for HLA-matched platelets.

Inoue (ME): How should we summarize the discussions regarding this subject?

Ito (DG): It is sufficient to establish a set of procedures to obtain HLA-matched platelets when a disaster occurs. We should also make these procedures known to medical institutions so that they are fully aware.

Inoue (ME): That is right. If possible, such procedures should also be included in the guidelines of our blood centers as well as guidelines for medical institutions.

Ito (DG): It would be the best if such guidelines were available.

Inoue (ME): The problem will be solved by providing appropriate information and then distributing that information to all concerned parties. Conversely, it may be important to provide the doctor in charge with the necessary materials for making decisions.

(2) A doctor in Iwate who was concerned about how much blood could be supplied

Inoue (ME): Around noon on March 17, a hospital director heard a member of his medical staff says that it might be difficult to obtain platelets. Concerned about the situation, the hospital director personally called the Blood Service Headquarters to obtain information on the status of platelet supply. When the Manager at the Blood Service Headquarters received the call, he became concerned about whether there was smooth communication between the medical institutions and the Iwate Blood Center. The manager called the Iwate Blood Center for confirmation, and reached the senior director of the Iwate Blood Center who then called a medical engineer in charge of blood transfusion at the hospital. The hospital engineer stated that he informed the hospital director each day that the Iwate Blood Center has ample blood products in stock. When I personally called the hospital director, (partly because he was one of my classmates), he said that he needed some time to check the situation and hung up. The hospital director then called me back and settled the discord by saying that there was no problem with platelet supply and that it had been his misunderstanding. The Iwate Blood Center's disaster response committee had provided mass media, medical institutions, and the prefectural and municipal governments with information on blood supply, referring to the Emergency Management Guidelines. In particular, we had provided sufficient information to those in charge of blood and blood transfusion in hospitals by fax and phone, but if we had informed a slightly wider range of stakeholders, we could have given a sense of security to each doctor in each hospital. For example, the director of each hospital could have reassured doctors in each department of the sufficiency of the blood supply. It would have been even better to inform each medical office of each medical institution directly.

Ito (DG): Indeed, doctors in charge of patients don't seem to check with the transfusion department in order to find out whether blood is available. We learnt that doctors considered transferring their patients to other facilities or taking other measures on their own, thinking that blood would be in short supply

in the aftermath of an earthquake. Therefore, even if we provide information to the blood transfusion department of each hospital, such information might not be conveyed beyond that department. In Akita, as I found out at a local meeting, the Nakadori General Hospital recently started to post a list of inventories

indicating how many units of blood are available on the bulletin board in its medical offices. If such information is posted, the status of blood supply can readily be ascertained. I think that it is necessary to provide status updates directly to the doctors who use the blood.

Omokawa (DG): In Akita, we received many inquiries from doctors who asked us whether we had sufficient amounts of blood for transfusion. Medical staffs were overwhelmed and apprehensive. So, in the end, we informed the major medical institutions each day about our stock of blood, and those communications were well received. The institutions soon understood our efforts. We also sent faxes to the blood transfusion and testing departments, but it will always be necessary to ensure that these departments convey the information to all concerned doctors in their hospital.

Ito (DG): We believe that it is better to make a contact list of doctors in the hematology, internal medicine, cardiac surgery, transplant surgery, and life-saving and emergency departments and contact them directly, in case of an emergency, rather than inform all doctors in all departments.

Omokawa (DG): Judging from the actual cases we had, talking directly to doctors in charge of patients works better as a way of reassuring them.

Inoue (ME): That is right. Unless they are reassured by a blood center’s doctors or their colleagues that everything is all right, they may be concerned about whether they can actually perform surgery safely. Therefore, both are necessary in the sense that we make double sure that they are well informed.

Ito (DG): Similarly, we should post the relevant information clearly on our website. Previously, we had

primarily targeted blood donors when we created our website, but we did not assume at all that the medical institutions were also visiting our website. At that time, we were not providing them with any information on our blood stock.

Inoue (ME): Some blood centers have touched upon the topic of websites. Director General Ito commented that in the future the blood centers should provide information about blood supply on their websites, and we should consider his comments as an important proposal.

Nishimoto (CEO): Is information properly shared on a routine basis?

Tsuboi (DG): It is difficult to communicate the necessary information to all personnel at hospitals, isn’t it?

Nishimoto (CEO): Blood centers cannot afford to go to hospitals and ask them to do something every time a need arises. Hospitals should introduce such a system as soon as possible.

Inoue (ME): We should also take into consideration Chief Executive Officer Nishimoto’s suggestion that we ought to have at least an annual meeting with the major medical institutions in order to provide information, ask for their requests, and solve problems.

Ito (DG): Certainly.

Nishimoto (CEO): What on earth caused the misunderstanding of the hospital director? I don’t understand based on reading this sentence alone.

Inoue (ME): In short, the hospital director himself had received the information, but what he heard

in the medical office caused him to be concerned and he wanted to confirm with the Blood Service Headquarters directly.

Ito (DG): The doctor in the Department of Cardiac Surgery actually said that the hospital director, talking about blood shortages, told him not to perform an operation. I was astonished that the hospital director would say such a thing.

Inoue (ME): I heard that the medical engineer in charge apologized, saying, “We properly convey information to the hospital director every day, and I am sorry.” This was the response when we made our inquiry.

Ito (DG): The reason was that the information had not been conveyed to the hospital director.

Inoue (ME): The hospital director admitted his mistake. Then, it was a sheer misunderstanding on the part of the hospital director rather than failure to convey the information. At other hospitals, such anxiety did not occur at all...

Nishimoto (CEO): That is what the sentence means. I see.

Inoue (ME): When I recently checked with the head of the cardiovascular department of the hospital, he said, “At that time, since all distribution systems were completely disrupted after the earthquake and the supply of artificial hearts and lungs had stopped, the hospital director instructed us to refrain from performing surgery for some time. In the end, we were forced to suspend all operations for one to two weeks until medical materials started to be delivered. I do not remember any announcement about blood shortages. We thank you for the blood you have supplied abundantly since then. Your continued support is appreciated.” It seems that in an unstable situation, rumors often spread easily. In order to prevent this, it is important to provide correct information widely and swiftly.

(3) A man from Fukushima who was discouraged from donating blood at a blood donation site in Tokyo

Inoue (ME): According to this newspaper article, a man from Iwaki, in Fukushima Prefecture, who visited a blood donation site with bloodmobiles at a special event in Odaiba Tokyo, on March 26, 2011, said, “I may have been exposed to radiation because I came from Iwaki, located close to the nuclear power station.” A doctor at the site replied, “If you are worried, you had better refrain from donating blood,” and did not collect blood from him. But on the following day, March 27, this man’s wife, who had heard from him about what had happened, protested to the blood center, saying, “My husband was told that his genes might have been damaged by radiation and he was not allowed to donate blood.” The Japanese Red Cross Society, which granted an interview to the newspaper, notified all blood centers nationwide of its policy of restricting blood donations by workers at the Fukushima Daiichi and Daini Nuclear power plants who had been exposed to more than 100 mSv of cumulative radiation over half a year.

The newspaper, however, reported that there were no restrictions on blood donations by ordinary residents in Fukushima Prefecture, because it was generally impossible that they could have been exposed to more than 100 mSv of cumulative radiation. It also reported that the Japanese Red Cross commented, “The doctor gave a general explanation of possible damage to genes, but there might be some misunderstanding. It is possible that the doctor paid too much regard to the man’s comments, and we will again advise all blood centers on the purpose of the notice.” The Japanese Red Cross was also quoted as saying that it seemed the doctor did not collect blood from him after considering the physical and psychological burden of blood donation. There was no regulation to decline blood

Notes by the Secretariat

- (1) **Try to inform blood center’s situation directly to the doctors in charge**
The new Guidelines (Fifth Revised Edition) additionally will state that “(9) Blood centers shall provide medical institutions with information on the inventories of blood products. They shall confirm liaison systems within the medical institutions so that such information is conveyed to all relevant doctors in each department and make a list of doctors and other personnel in charge of blood transfusions, so that the relevant hospital staff can be contacted directly if necessary.”

donations from residents in Fukushima, and the Society should provide thorough on-site training, because it seemed that some of the doctors did not have sufficient knowledge about radiation.

We need to be careful when discussing this newspaper article during these round-table discussions. But I would ask you to give your general views on three issues: whether the article describes the facts correctly, what standards the doctor followed when he made his decision, and how blood donation should be done, as we prepare for future massive earthquakes.

Tsuboi (DG): This question has been raised many times throughout Fukushima. If we explain properly, everybody should understand.

Inoue (ME): First, how should we evaluate the doctor’s response in this case? Let us discuss it, focusing on the case in which the doctor declined the man’s offer to donate his blood because he said, “I come from Iwaki. I may have been exposed to radiation.”

Tsuboi (DG): This article says that the doctor did so, but I believe that the decision made by the doctor at that time was appropriate because the Crisis Management Guidelines (Fourth Edition) state that blood should not be collected from persons who may have been exposed to, or may be contaminated with, radiation.

Inoue (ME): Certainly, the Guidelines (Fourth Edition) state as follows:

- (1) Response to blood donors**
- (a) If the blood donation site is outside the area recommended for evacuation
- ① If the blood donation site is outside the recommended evacuation area, the blood collection service shall continue there. However, blood should not be collected from residents in the area, those who have entered the area, and those who may have been exposed to, or may be contaminated with, radiation. Blood collectors should explain the points listed below if they decline people’s offer to donate blood.
- ② If blood is collected from any of the residents in the recommended evacuation area, those who have entered the area, or those who may have been exposed to, or may be contaminated with, radiation, it should be noted on the history card and the blood bag.

Notes by the Secretariat

- (2) Radiation accidents in our old and new guidelines**
- In Section “(1)Response to offers for blood donations” of “Chapter 5 Radiation accidents, 2. Actions to be taken when radiation accidents, etc. occur,” as in the old Guidelines, the new Guidelines stipulate actions to be taken if “(a) blood is donated outside evacuation sites” as follows:
- ① If blood is donated outside the areas recommended for evacuation, it can be collected. However, blood shall not be collected from residents in these areas, from those who have entered any of the areas, and those who may have been exposed to, or may be contaminated with, radiation. Blood collectors shall give the explanations specified below (omitted here) to the blood donors, if the blood donation is declined.
- ② If blood is collected from residents in the areas recommended for evacuation, those who have entered any such areas, or those who may have been exposed to, or may be contaminated with, radiation, the history cards and blood bags shall be indicated to that effect.
- (3) Conducting measure for important information**
- The notice given by the head of the Blood Service Headquarters to the General Directors of all blood centers, which is entitled, “Procedures for accepting blood donors who may have been exposed to radiation,” stipulates that “all blood centers shall decline blood donations from those who had a cumulative dose of radiation exceeding 100 mSv from March 31, 2011, when a declaration of a nuclear emergency situation was issued, to the day when it was cancelled, or those who had a dose of radiation during a short period of time that exceeded 100 mSv within six months from the last day of radiation exposure, taking possible health hazards into consideration.” It also provides that “the notice shall apply to those who worked in or around the Fukushima Daiichi Nuclear Power Plant, and that all blood centers may accept blood donations from those who evacuated from other areas than those recommended for evacuation around the Fukushima Daiichi and the Daini Nuclear Power Plants according to blood donation standards, and giving full consideration to their health and other conditions.”

Tsuboi (DG): It is a little difficult to interpret the Guidelines properly. The doctor made the right decision, but the doctor’s explanation may have been difficult for the man to understand.

Ito (DG): I heard directly from a doctor at the Tokyo Metropolitan Blood Center about the details of his investigation into this case, and the doctor said that he had recommended that the man refrain from donating blood, taking his physical condition into consideration. The doctor said that he understood, went home, and talked to his wife about what happened. This all eventually ended up in what was reported in the newspaper.

Inoue (ME): According to the newspaper article, the Blood Service Headquarters replied that on April 1, it gave notice to all directors of blood centers to incorporate new judgment standards, and that they therefore had to follow the new standards. If these standards are followed, there will be no problem with accepting offers to donate blood. The full details of the April 1 notice may not have reached the doctor. The former guidelines even describe how to decline offers to donate blood.

Nakano, Deputy Director (DD): On April 1, the Blood Service Headquarters issued a notice entitled

“Acceptance of Blood Donors Who May Have Been Exposed to Radiation,” in relation to this case, to all director generals of blood centers. It is true that the Crisis Management Guidelines include the word “decline.” The notice states that in accepting blood donors involved in the recent accident at the nuclear power plant, blood collectors should decline offers from those who have been exposed to more than 100 mSv of cumulative radiation or have been exposed to more than 100 mSv, unless it has been six months since the last day of exposure. This is the guideline because it is believed that doses of radiation lower than these thresholds have only small effects on blood products, based on the government’s view that the radiation, after a six month period, no longer has a significant impact on health. Since the people covered by this notice are strictly limited to people who have worked at or around nuclear power plants, it is not expected at all that the radiation dose of those who come from the surrounding recommended evacuation area will reach these thresholds. Therefore, the notice also states that blood collectors should accept these evacuees’ offers as usual. The report of the investigation conducted by the Blood Service Headquarters states that since the man who visited the event site in Tokyo remarked, “because I am worried...” the doctor replied, “If you are worried, you had better not donate your blood today.”

- (4) Important information from the government**
- On June 7, 2011, following the instructions of the Ministry of Health, Labor and Welfare after this event to notify the purpose of such procedures to all blood centers, the deputy director general of Blood Service Headquarters notified the Directors General of all blood centers of “Procedures for accepting blood donors who may have been exposed to radiation.” Details of the notice are as follows:
- 1. Content**
- 1) Since there are no problems accepting blood donations from evacuees from the areas recommended for evacuation (current restricted areas, deliberate evacuation areas, and emergency evacuation preparation zones) around the Fukushima Daiichi and Daini Nuclear Power Plants, if full attention is paid to their health and other conditions, blood donations from such people can be accepted as usual according to blood collection standards.
- 2) If workers at these nuclear stations wish to donate blood and declare that their cumulative dose of radiation since the occurrence of the accident exceeds 100 mSv, the blood center shall decline their donations for six months from the last day of exposure to radiation, and take the effects of donation on their health into consideration. If the radiation dose is not clear, the blood center shall also decline such donations for the same reason as above.
- 2. Acceptance of blood donors at blood donation sites**
- At blood donation sites, not only personnel who directly receive blood donors, but also doctors responsible for asking them about their physical condition, shall be trained thoroughly so that they can appropriately give detailed, honest explanations to blood donors.

Tsuboi (DG): The Fukushima Blood Center has received many such questions. If we ask the Blood Service Headquarters about it, they say that the Fukushima Blood Center should handle these questions. If we really wish that we had standardized answers, then we would be able to answer all questions in the same way.

Inoue (ME): I do not know whether this is the conclusion of our discussions here, but the recent exposure to radiation from nuclear reactors is our first experience. I assume that the Fukushima Blood Center had problems responding to these blood donors.

Making the most of Fukushima's experience, it would be useful for our future blood service to prepare an anticipated Q&A sheet, with the cooperation of the Blood Service Headquarters, on how to respond to blood donors, including the measures to be taken to ensure the health of personnel.

Nakano (DD): The same applies to the misunderstanding on the part of the medical institution

mentioned earlier, which was concerned that blood may not be delivered. Basically, we consider it necessary to step up public relations based on the recognition that we should ensure that the necessary information actually reaches all blood service sites. For example, in the case of the former, we will strengthen the public relations (PR) with medical institutions, and in the case of the latter, we will bolster those with internal organizations. We always understand that we have to push forward with these initiatives, and therefore, we should learn lessons from our recent experiences when we do so.

Inoue (ME): Through these three representative cases which occurred in the disaster we may learn three important lessons; Firstly, important information should be swiftly communicated by writing the relevant person in charge; Secondly, this information should be sent by various different modes of communication; Thirdly, important information in local blood centers must be shared with blood centers across Japan and probably across the world.



8. Ensuring Staff Safety during a Nuclear Accident

Inoue (ME): Now I would like to ask Director General Tsuboi, who experienced the extreme difficulty of performing duties in the aftermath of the accident at the nuclear power plant, to talk about the problems in the early days following to accident and those of today. How can we ensure the safety of personnel, but more specifically, when did the problem of radiation emerge and how? When did you start to think about what should be done to meet requests for blood delivery and whether it was all right to deliver blood in the same way as before? There was also a problem with FFP (Fresh Frozen Plasma) transportation. I would also like you to talk about this subject as much as possible. How did you respond to official advice to evacuate when it was issued? From the viewpoint of protecting the health of personnel, how did you pay attention to the results of the measured radioactive doses? I do not know whether there were isolated areas after the recent earthquake, but I would like you to talk about all these subjects, including whether it is necessary to pay attention to it as part of our daily training.

Tsuboi (DG): We had not imagined the problem of radiation at all. Nobody in Fukushima Prefecture had imagined that such an accident could occur.

One or two days after the explosion, certain surrounding areas were designated as evacuation areas. The closest area to the nuclear power plant in the evacuation areas was the Haranomachi Supply Station. After talking with the JRC National Headquarters and the Blood Service Headquarters, we immediately retreated from the station and moved the blood products to Fukushima City. We transported blood products to a site near a hospital located north of the distribution station by car every day, and waited there for orders to come. Eventually, after more than a year had passed, since no progress had been made with decontamination, we closed both sites – the local office and the distribution station – and transferred all their functions to Soma.

Fukushima Prefecture's FFP had been stored in Iwaki. I guess that there were about 6,000 units of FFP in storage. At that time, the air radiation level of Fukushima City was higher than that of Iwaki City. This was based on the Blood Service Headquarters' instruction, but at first it was hard to understand why the Blood Service Headquarters issued such an instruction. In Iwaki people were in a panic because the radiation level (from the nuclear station) was high. In fact, the radiation level in Fukushima was high, and the level in Iwaki was low. Personnel at the Blood Service Headquarters were extremely worried.

Incidentally, all gates at the Iwaki Interchange were opened so that people could freely evacuate the area.

The expressway came to be free of charge, and there was no longer a gate check, so everyone left. It was stated in a report that the Blood Service Headquarters in Tokyo had a lot of trouble, and I assume that they were very worried. At the Blood Service Headquarters, Chief Executive Officer Nishimoto provided lots of support to us. Thank you for your support.

Ito (DG): You told me that the JRCS President Konoe also made tremendous efforts.

Tsuboi (DG): We caused much trouble to Chief Executive Officer Nishimoto, and he came all the way to Fukushima. When we look back upon those days, we thank you for coming early on. We received instructions from the Blood Service Headquarters concerning procedures to close the Iwaki Blood Center, and according to these instructions, we moved blood products to other places, transferred personnel to other locations, and made various necessary arrangements. This is what the Fukushima Blood Center was doing at that time with the cooperation of the Blood Service Headquarters.

The Crisis Management Guidelines of those days stated that blood should not be transported to places with a radiation level of 20 mSv. There was no mention of whether the threshold was 20 mSv/h or 20 mSv/day, but the new edition of the Crisis Management Guidelines, published in April of this year (2012), specifies the permissible upper limit as 20 mSv/year. They state that blood should not be used if the local radiation level exceeds 20 mSv/year. At that time, relief

squads (relief teams) from various prefectures came to our blood center, and we invited doctors from the JRC in the Hiroshima and Nagasaki Hospitals to give these squads lectures on radioactivity. These doctors instructed them to come back immediately if the radiation level for places they visited exceeded 1 mSv. There were significant differences between personnel at the Blood Center in terms of what they were instructed to do.

Nishimoto (CEO): This is also a year-based threshold, isn't it?

Tsuboi (DG): We did not clearly know whether it was year-based or not. Since some young personnel were concerned about radiation in various ways, I had them carry film badges with them, since we were fairly certain that they were easy to use. Film badges cost money each month, but we asked them to measure the radiation dose once every two weeks.

Inoue (ME): Are these the same ones that are used at university hospitals and other medical institutions?

Tsuboi (DG): Yes, they are film badges that radiologists use, and we also used them. We thought that they were the easiest option to use.

Inoue (ME): They check radiation levels at certain intervals, don't they?

Tsuboi (DG): Usually, they check once every month. We asked them to measure once every two weeks because an interval of a month was too long.

Inoue (ME): That is fine.

Tsuboi (DG): We negotiated so that personnel could have them measured once every two weeks. Some people considered their radiation dose as high, and others considered them low. There are various opinions, but we cannot tell them how to think or behave. Overwhelmed by uneasiness, many people continue to leave the prefecture, even today. We did not have dosimeters for measuring radioactivity. Fukushima is a large prefecture, and since Fukushima City is 60 km away from the site of the nuclear accident, we

have not thought that we needed to provide protective clothes and Geiger counters. Since they were certainly available at an adjacent JRC chapter, we could have used them if we had wished to. There are some blood centers closer to nuclear power plants, and at a recent meeting of director generals, we were asked whether we had dosimeters. We should buy dosimeters.

Inoue (ME): Were dosimeters delivered from the Blood Service Headquarters?

Tsuboi (DG): The Headquarters provided Geiger counters on 13th March, and the local chapter provided dosimeters to us in the evening on March 14, 2011.

Inoue (ME): The main office of the JRC National Headquarters was working hard, wasn't it?

Tsuboi (DG): You mean relief squads, don't you? I hope such an accident will never happen again, but there is such a possibility, even if nuclear power plants are not operating.

Inoue (ME): Did anyone face a situation where he or she was exposed to radioactive material before full information was received?

Tsuboi (DG): Yes, we did. It was because neither the national nor the prefectural government published SPEEDI data. The radioactive material was released from the nuclear reactors upon melt down, which headed towards Fukushima City from Namie Town, and moved along National Road No. 114 and reached the area near my house.

Inoue (ME): As a summary of discussions about this subject, can you tell us how we should respond if we do not have the necessary supplies and we are suddenly urged to prepare for disasters such as accidents at nuclear power plants?

Tsuboi (DG): We should work closely with local chapters rather than the regional blood center. Since the chapters have relief squads, I recommend that we work closely with the nearest JRC chapter when we prepare for such disasters.

Notes by the Secretariat

1) Direct-measuring personal dosimeters shall be inspected in radiation accident

(1) In Section "6. Early response when a disaster occurs near the blood collection site, 6.5 Special cases for the handling of donated blood," as in the old Guidelines, the new Guidelines state that "blood, vehicles, materials, reagents, equipment, etc. that may be contaminated shall be stored at designated places and indicated to that effect."

Similarly, in Section "1. Response at normal times, (2) Blood center' s response, (a) Implementation items," the new Guidelines provide that "(5) if a medical institution is located in any of the areas recommended for evacuation or a supply channel includes any of the areas, the blood service personnel shall be equipped with direct-measuring personal dosimeters. Direct-measuring personal dosimeters shall be inspected at least once a year, the natural radiation level will be confirmed, and the results of inspection and measurement shall be recorded."

In Section "2. Actions to be taken when a radiation accident etc. occurs, (2) Actions for supply operations, (b) If medical institutions are located in the area recommended for evacuation," the new Guidelines state that "if a blood center is forced to supply blood to medical institutions in an area recommended for evacuation, blood service personnel shall be equipped with direct-reading personal dosimeters, and if there is a risk that the exposure dose exceeds 20 mSv/year, personnel shall immediately discontinue blood supply and evacuate to a safe place." In addition, the Guidelines prescribe that "(c) if medical institutions are located in any of the areas that have been exposed to, or are contaminated with, radiation, the blood center shall not supply blood to them. It shall consult with an out of area center, the police, and other parties concerned about how to supply blood, and how to inform the medical institutions requesting blood supply of the results of this policy.

(2) After the recent earthquake, the occurrence of a radiation accident was not predicted, and news of the release of radioactive material and the direction of its dispersion was not released at an early stage of the event. The designation of evacuation areas were delayed, and the designated evacuation areas were different from the direction in which the radioactive material was dispersing. All these factors made it considerably difficult for the blood centers to take appropriate actions.

(3) On May 24, 2012, Tokyo Electric Power Company (TEPCO) published the results of the calculations that estimated the radiation level of radioactive material released into the air due to the accident at its Fukushima Daiichi Nuclear Power Plant to be at 900,000 trillion. Reactor unit 2 released the largest amount of radioactive material, and this supports the view that on Tuesday, March 15, 2011, the area northwest of the nuclear power plant was heavily contaminated mainly due to that release. It became clear that on March 16, too, a large amount of radioactive material might have been released into the ocean, which TEPCO said had come from reactor unit 3.




(4) Shown on the right are the dosimeters obtained by the Fukushima Blood Center and the periods when they were used.

(5) It is desirable for the regional blood centers and other facilities to prepare dosimeters for the possible exposure of employees to radiation during blood supply in the event of a nuclear power plant accident.

What actions did the Fukushima Blood Center take when the accident occurred at the nuclear power plant?

4. Hygiene management of employees that may be contaminated with radiation

1) Types of dosimeters used

Electronic pocket dosimeter	Quixel Badge	Electronic personal dosimeter
Used from March 14, 2011	Used from March 18, 2011 to June 30, 2011	Used from May 19, 2011
		
Range of measured dose equivalent X/Gamma rays 1μSv~0.995Sv	Range of measured dose equivalent X/Gamma rays 10μSv~105μ Beta ray 100μSv~105μ	Range of measured dose equivalent X/Gamma rays 0.0μSv~165μ
Used for supply operations	Attached to individual personnel engaged in operations, blood collection, supply, and medical information	Used for operations, blood collection, supply, and medical information Dose equivalent quantities were measured using one dosimeter for each team

Inoue (ME): We should ask the nearest JRC Chapter in advance to help us if an emergency arises.

Tsuboi (DG): Should we also ask for help from the JRC chapter?

Inoue (ME): It is better to have a commitment from the chapter to help the blood center’s activities.

Tsuboi (DG): ... so that we can work together.

Osaka (SD): In the Hyogo Prefecture, the JRC chapter and blood center are both located in the same facility, which allows us to feel that we can work together easily. When the Great Hanshin-Awaji Earthquake occurred, the two organizations were located far away from each other. In terms of cooperation between the two, considerable improvement has been made compared to those days.

Inoue (ME): Director Sakamoto, can we have your comments on how to respond to future radiation accidents?

Sakamoto (D): The guidelines have been newly revised, so...

Inoue (ME): Basically, how should we respond to such accidents? Should we work with the local chapter?

Sakamoto (D): Are you asking about dosimeters or something?

Inoue (ME): I am talking about how the director general protects the health of the staff and maintains the function of the blood center to allow the distribution of blood products under the high radioactive conditions, as I pointed out earlier.

Sakamoto (D): Based on the earlier discussions, I have the impression that the JRC chapters are also one of the possible options.

Inoue (ME): Do you have any comments, Chief Executive Officer Nishimoto?

Nishimoto (CEO): If a radiation accident should occur, it would be difficult to establish a perfect response system using the blood centers alone. In various senses, there will be much that we cannot understand, and scientifically, there will be various opinions. After all, we will respond with all the resources of our JRC chapters and the Blood Service Headquarters. There are sometimes gaps between information that can only be obtained at the site of relief activities and information obtained from Tokyo, particularly at a time of confusion. Therefore, we thought that we had to transport FFP by all means as long as we heard that transportation was necessary.

Inoue (ME): In the recent event, nobody predicted that such a radiation accident would occur. In the early stage, people were not informed of the radioactivity that was being released and the direction in which it was traveling. The designation of evacuation areas was delayed, and there were differences between the designated evacuation areas and the direction of the radioactive material dispersion. These complicated our response considerably.

I sincerely hope that in order to relieve the anxiety of people from Fukushima, the decommissioning of the still unstable nuclear power plant will be completed as soon as possible, and that the prefecture’s land will be restored swiftly so that its residents can return to their hometown and lead happy lives.

(6) Labor Disaster Standards Law in Japan

Name of disease*	Exposure (mSv)**
Leukemia	more than 5 mSv/year and developed after one year
Malignant lymphoma	more than 25 mSv/year
Multiple myeloma	more than 50 mSv accumulated
Gastric, esophageal, colon cancer	more than 100 mSv accumulated and developed after 5 years

*, **: minimal requirement
(This table is quoted and modified from Asahi Shinbun on Aug. 5, 2013)

9. Identification of Prioritized Distribution Destinations

Inoue (ME): The new Guidelines (fifth edition) present the new concept of priority distribution. They have added a new provision to the effect that each local blood center designated with the regional blood center responsibilities shall refer to guidelines for disaster measures to be taken in the area it supervises. Each local blood center shall confirm which medical institutions will serve as disaster response bases. A list of priority recipients will be prepared. This list will set the priorities for blood and blood product delivery. The content of this guideline is easily understood, but it is important that all prefectural residents know the location of their disaster priority-designated hospital and will be able to travel there without difficulty. Not all doctors and patients will know this priority at the time of the emergency, which may cause some confusion, so we must be flexible enough to accommodate as many needs as possible. Is it alright to inform all parties concerned that our policy is basically as described in the new Guidelines? Can you make any comments on this, Director Sakamoto?

Sakamoto (D): It is necessary to provide relevant information to major hospitals in advance.

Inoue (ME): If we provide the relevant information, I believe that each blood center must provide it to all hospitals, including smaller hospitals, in advance. If many people rush to other hospitals other than the one which has been previously designated, or a doctor plans an operation at a hospital other than the designated hospital, people may complain if blood is not delivered properly. So I understand that we

might face difficulties unless we take flexible actions according to the situation? Is it all right to inform all parties concerned that our policy is basically as described in the new Guidelines?

We have to prepare for a scenario where wide ranging great earthquakes of intensity 7 occur in Tokyo or elsewhere. So we ought to start the development of a new system for distributing blood products under emergency conditions.

Notes by the Secretariat

(1) Disaster priority-designated hospitals

“Priority distribution” to certain blood users is a new concept that is introduced in the new Guidelines. In Section “2.2 Investigation of disaster prevention plans for external organizations related to blood transfusion, 2.2.1 Specific examples of blood-related external organizations, (2) Disaster priority-designated hospitals and medical institutions,” the new Guidelines state that the blood center should inform all its personnel of the disaster medical-care base hospitals stipulated in the prefectural government’s plan, and that at the time of a disaster, blood should mainly be supplied to disaster medical-care bases. Disaster medical-care base hospitals are designated by prefectural governments, but depending on the scale of the disaster, not all of these hospitals can necessarily maintain their functions when they suffer damage. Therefore, they are called “disaster medical-care bases” in the second part of the provision above because the Guidelines seem to leave some room for such bases to include “any hospitals playing a central part in disaster medical care” at any particular time.

10. Daily Training in Disaster-Relief Activities

Inoue (ME): This is the last subject for today's meeting. What we have learned from the disaster, as pointed out in several blood centers' disaster reports, is that unless we conduct disaster relief trainings on a routine basis, we cannot be of much help or be able to complete our functions in the event of a disaster. This time, our relief activities consisted mainly of (1) transporting relief supplies and relief corps as requested by the JRC chapters, (2) receiving relief squads (relief teams) and disaster-prevention volunteers at local disaster response headquarters as requested by the JRC chapters, (3) assisting nurses at hospitals, (4) transporting personnel and medical equipment as requested by local medical associations, (5) collecting blood at relief facilities as requested by prefectural disaster response headquarters, and (6) assisting with the needs of mental care teams at evacuation sites (which began in the later phases).

In addition to the work of the relief teams, it is important to resume the functions of the regional blood center as soon as possible, if they are lost. For these reasons, we have to make advance arrangements about how staff should be deployed.

Immediately after the earthquake, an officer reported after returning from his job that "the JRC chapter asked us to go to Tono City to help set up a local disaster response offices, but we did not know what to do there." Many nurses said, "We were mobilized to help disaster relief squads. We are good at blood collection, but could not provide nursing care properly because we had not done it for some time." There were also nurses who said, "We did not know what to do. We should have trained on a regular basis," Each medical employee has their own set of regular responsibilities, but in the event of an emergency, their job responsibilities can change. Can you discuss how we should cope with this problem as part of our daily training in the future?

Ito (DG): I know the typical emergency practices because of my experience at the JRC Ishinomaki Hospital. The hospital prepares for emergencies by organizing about six teams and assigning the personnel to each of them. When you prepare in advance, each team should consist of doctors, nurses, pharmacists, laboratory technicians, and other personnel as well. Since blood centers cannot respond in the same way as the hospital, each blood center must train their personnel so that they can execute their relief operation responsibilities at the time of a disaster. Examples include delivering relief supplies to evacuation sites, providing hygiene management, and giving mental care to victims. Blood centers can organize teams that do such jobs.

Inoue (ME): That is right. A few nurses were even instructed to work as receptionists.

Ito (DG): Relief squads could not be organized easily.

Tsuboi (DG): They could be assigned to evacuation sites for similar tasks.

Ito (DG): Relief squads could do similar tasks, such as checking vital signs and looking at general health and safety.

Tsuboi (DG): We did tasks like measuring blood pressure, checking medicine, talking to victims, and taking them to clinics if they had a fever, but I do not think we can provide medical services at a disaster and relief operations site.

Ito (DG): No, we cannot.

Nishimoto (CEO): I think so, too.

Inoue (ME): We do not need to reach a conclusion hastily, but how about considering again what we can do and then training ourselves accordingly?

Ito (DG): We should organize what we really have to do.

Inoue (ME): May I suggest that in the future, the Blood Service Headquarters works with the blood centers to consider what we really have to do?

Osaka (SD): It is of course impossible for a blood center to set up a whole relief squad, but in the case of Hyogo Prefecture, ever since the earthquake, the blood center has been working with the local JRC chapter to register its personnel as ERU (Emergency Response Unit) members and mobilize them for disaster relief operations. By doing so, we could ensure that all blood center personnel can clearly maintain their awareness and function as JRCS's employees.

Inoue (ME): From the earthquake until now, you have continued to train your personnel to a considerable extent each year at the Hyogo Blood Center, haven't you?

Osaka (SD): Yes.

Inoue (ME): I also believe that training is important. Can you talk about how future training should be organized and implemented, Director Sakamoto?

Sakamoto (D): The Blood Service Headquarters will discuss how training and other programs should be implemented after gathering staff and executive opinions.

Omokawa (DG): It is necessary to consider this issue from the perspective of routine training rather than disaster relief operations. If the blood testing center in Miyagi breaks down as it did after the recent earthquake, how should blood samples be transported? I favorably evaluate the results of this operation, thinking that samples were transported smoothly this time. I believe that we need training based on the assumption that a disaster has occurred, and one based on simulated supply systems in the six Tohoku prefectures. Training, such as sample transportation, is also necessary.

Ito (DG): I also believe that such training is necessary.

Omokawa (DG): Today, the Block Blood Center happened to hold a fire drill, and when I heard about it, I thought that such practice is necessary. Hospitals always hold fire drills with personnel assigned to the roles of patients and patient transporters. When I asked one of the division heads whether the blood center holds fire drills, the division head replied that it has not held such training. I believe that in addition to fire

drills, all blood centers in the Tohoku region should simulate what will happen in the region when an earthquake or similar disaster occurs.

Osaka (SD): When the Great Hanshin-Awaji Earthquake occurred, the entire city suffered tremendous damage. Many of the blood center personnel were affected by the event. A training program based on the lessons from the recent massive earthquake should paint a scenario that calls for each blood center to first set up a disaster response committee within the organization, and then confirm the damage situation so that superior managers can give appropriate instructions. In fact, the actions taken up to this point in the period immediately following a disaster are very important, because it is unknown who can report to work. When the Great Hanshin-Awaji Earthquake occurred, neither the Director General nor any of the division heads could actually come to the office immediately. Other senior officers could not either. In such confusion, some of the personnel that can report to work have to take the leadership in giving instructions and working with the JRC National Headquarters in Tokyo and blood centers in other regions. It is extremely important to ensure that all personnel keep this in mind at all times.

Nishimoto (CEO): It must have been extremely difficult for personnel at the blood centers to receive specialized disaster training as part of their daily operations. In other words, I presume that it is necessary to remain keenly aware that they are members of the JRCS as a relief organization, while completing their regular responsibilities during their daily operations; probably they feel that their only focus is the extremely specialized operations of blood service. However, health care workers at the JRCS Hospitals are essentially organized relief squads, and employees have been involved in wider relief operations since the establishment of the JRCS, but the blood service portion of the job is thought of as different and separate from disaster relief. Given this perspective, it was probably too demanding to expect blood center personnel to train by themselves on a routine basis during their daily operations, to prepare in the wider sense for the threat of a disaster.

Ito (DG): As we move forward, we will have to work on disaster training programs on some level.



11. Summary

Inoue (ME): Thank you for taking your valuable time to participate in today’s round-table discussions. The meeting is ending much later than originally scheduled, and I apologize for this delay.

Through the discussions today, let me summarize particularly what the blood service could do and could not do in the aftermath of the Great East Japan Earthquake. On the one hand, it seemed that regional managers keenly demonstrated their abilities, and the Blood Service Headquarters displayed remarkable leadership, overcoming the difficulties, and this is worthy of admiration. On the other hand, regional managers and the Blood Service Headquarters would likely have recovered from the difficulties more easily if they had made preparations in advance about how to prevent loss of functionality and maintain the function in the regional blood center, and it is regrettable that it was not the case.

Executives from the Blood Service Headquarters and the Director Generals of the six blood centers in the Tohoku region, who had come through the disaster, have today gathered in one place to review all events they experienced through these round table discussions, and to share their understanding in order to clarify the direction that the JRC’s blood service should take in the future. This will not only be remembered as a unique event, but I am also sure that the conclusion reached here will provide useful knowledge for further development of the blood service for years to come. Indeed, this will lead to “turning a misfortune into a blessing” as the Chief Executive Officer said. I would like to express my heartfelt appreciation to the Director Generals of the six blood centers in the Tohoku region, who provided this opportunity, as well as Chief Executive Officer Nishimoto and other parties concerned, who made this opportunity a reality. I earnestly hope that the information on crisis management for massive earthquakes, which has been organized through today’s discussions, will be of help to parties concerned with all blood service employees and facilities in the nation. This is the end of my summary, and I would like the Chief Executive Officer to give us his words at the conclusion of the meeting.

Nishimoto (CEO): Thank you for participating in today’s discussions. As I said in my greeting at the beginning, we may have a second opportunity of “turning a misfortune into a blessing” though I realize I may run the risk of being misunderstood. Today, we gathered here to discuss various subjects under the tragic theme of the Great East Japan Earthquake. So at future meetings, I hope that you will further strengthen this atmosphere of solidarity under different themes. Today’s discussions focused on the rather heavy subject of disaster, but opportunities to have discussions like this are necessary to ensure the independence of each region in many ways, and to allow the blood centers in each region to carry out activities that suit the characteristics of each region. I sincerely hope that you will use this as an opportunity to deepen the discussions. If you need me again, please call me. I will be happy to join in the discussions no matter what the subject is. Thank you for taking part in the round-table discussion today.

Inoue (ME): Thank you for your cooperation. The meeting is concluded.