Health surveillance strategies for long-term exposure after a nuclear or radiological accident

Elisabeth Cardis
Most research generally on **direct somatic health effects of radiation exposures** but ...

- Clear indications that *accident, remediation situation and dosimetric and health surveillance have an impact on health*:
  - Stress of affected populations –
    - Uncertainties: health effects ... conflicting information
    - Relocation – loss of home, social relations, work, control on one’s life
    - Contamination levels of milk, food, water, outside ?????
Health impact of accidents, response, remediation and surveillance

• Morbidity: serious *mental health impact, obesity*, ..

• Mortality
  – relocation and hospital closure in evacuated areas of Fukushima prefecture
  – accidents related to substance abuse and depression (Chernobyl liquidators, ...)
  – mortality from cardiovascular and alcohol related diseases (Russian men, life expectancy )
  – suicides (Chernobyl liquidators, adolescents ...)
• **SHAMISEN:**
  
  **Nuclear Emergency Situations - Improvement of Medical And Health Surveillance**

  – Build upon lessons learned from experiences of populations affected by Chernobyl, Fukushima and other radiation accidents

  – To develop recommendations for medical and health surveillance of populations affected by previous and future radiation accidents.

[radiation.isglobal.org/shamisen](http://radiation.isglobal.org/shamisen)
Expected outcome

• Recommendations for health surveillance and medical follow-up of affected populations, with particular attention to:
  
  • Dose assessment supporting
    ➢ emergency response, including evacuation
    ➢ clinical decision making in the aftermath and
    ➢ long-term follow-up of populations;
  
  • Improvement of living conditions of affected populations,
    ➢ responding to their needs and
    ➢ engaging them in surveillance programmes
    ➢ while avoiding generation of unnecessary anxiety;
Expected outcome

• If and where feasible (in particular in Chernobyl), improvement of estimates of radiation-induced risk
  • for radiation protection and
  • for communication with affected populations,
## List of participating organisations

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ISGlobal</td>
<td>Fundació Instituto de Salut Global de Barcelona</td>
</tr>
<tr>
<td>EPN</td>
<td>Centre d’étude sur l’Evaluation de la Protection dans le domaine Nucléaire</td>
</tr>
<tr>
<td>NMBU</td>
<td>Norwegian University of Life Sciences</td>
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<tr>
<td>UNEW</td>
<td>Newcastle University</td>
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<tr>
<td>IRSN</td>
<td>Institut de radioprotection et de Sûreté Nucléaire</td>
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<tr>
<td>IARC</td>
<td>International Agency for Research on Cancer</td>
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<tr>
<td>ISS</td>
<td>Istituto Superiore de Sanita</td>
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<td>NIRS</td>
<td>National Institute of Radiological Sciences</td>
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<td>WIV-ISP</td>
<td>Belgian Scientific Institute of Public Health</td>
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<td>InVS</td>
<td>Institut de Veille Sanitaire</td>
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<td>UAB</td>
<td>Universidad Autónoma de Barcelona</td>
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<td>NRPA</td>
<td>Norwegian Radiation Protection Authority</td>
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<tr>
<td>BfS</td>
<td>Bundesamt für Strahlenschutz</td>
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<tr>
<td>EURADOS</td>
<td>European Radiation Dosimetry platform</td>
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<td>NERIS</td>
<td>European Platform on Preparedness for Nuclear and Radiological Emergency</td>
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<td>Uhiroshima</td>
<td>Hiroshima University</td>
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<td>Unagasaki</td>
<td>Nagasaki University</td>
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<tr>
<td>FMU</td>
<td>Fukushima Medical University</td>
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</tbody>
</table>
List of experts

• External experts
  • Key actors of the follow-up and screening of populations exposed as a result of Chernobyl in Belarus, Russia and Ukraine
  • In emergency response, psychology, philosophy, psychiatry and ethics

Dimitry Bazyka, Ukraine.             Bjørn Hoffman, Norway
Evelyn Bromet, USA.                  Sergey Igumnov, Belarus.
Andrey Bushmanov, Russia             Viktor Ivanov, Russia.
Zhanat Carr, WHO                     Alexander Rozhko, Belarus.
Bernd Grosche, Germany               Geraldine Thomas, UK
Johan Havenaar, Netherlands           Mykola Tronko, Ukraine

And colleagues
**Subtasks**

**ST1**
Lessons learned from dosimetric and health screening, evacuation and health surveillance

1.1 Critical review of recommendations on and experiences in dose assessment, evacuation, medical assessment of potentially exposed people, and dose reconstruction for intermediate to long-term studies

1.2 Critical review of long-term medical surveillance programmes

1.3 Critical review of lessons learned from epidemiology on radiation risks from radiation accidents

**ST2**
Lessons learned from living conditions and health status of populations

2.1 Experiences with the Sámi population relating to Chernobyl fallout in Norway

2.2 Review of socio-psychological consequences of the Chernobyl accident in Belarus, Russia and Ukraine

2.3 Review of current activities carried out after the Fukushima accident in Japan

**ST3**
Preparedness and improvement of post-accident response and health follow-up

3.1 Recommendations for collection and communication of data on dose in early, intermediate, and late post-accidental phases, and on medical assessment in the early emergency phase

3.2 Recommendations for evacuation decisions

3.3 Designing health surveillance programmes that respond to the concerns of the local population and improve their living conditions

3.4 Recommendations for improving professional support of affected populations

3.5 Recommendations for preparedness and post-accidental epidemiology

**ST5 - Project management and coordination**
Stakeholder Consultation
(Web and Paris Stakeholder Workshop 24th March 2017)

Recommendations and procedures for preparedness and health surveillance of populations affected by a radiation accident

Summary

Background

The EU SHAMISEN project started in December 2015, with the goal of producing a set of recommendations that would contribute to health surveillance and related communication during and after a nuclear emergency.
Shamisen Recommendations

• Background and introduction

• 28 Recommendations
  • Why
  • How
  • Who

Drawing from cases and lessons learnt in ST1, ST2, ST4

Authorities, academics, research institutes, NGOs, local stakeholders ... 

• Supporting material (References, Tables)
Structure: Accident Phases

**Preparedness**
- Continuous cycle of planning, organizing, training, exercising, equipping, evaluating and taking corrective action

**Early and Intermediate**
- **Emergency response:** coordination and management of resources
  - **Early:** initial phase of radiation hazard resulting in an emergency exposure situation
  - **Intermediate:** radiation level is no longer increasing

**Long-term Recovery**
- **Activities of populations:** adjust to the prevailing radiation situation.
  - **Focus:** recovery of the affected areas and long-term rehabilitation of living conditions of the populations
• Cover health surveillance, epidemiological studies, dose reconstruction, evacuation and training of health personnel and other actors involved in liaising with affected populations.

• Evacuation

• Health surveillance

• Epidemiology

• Dose assessment

• Communication and Training

• Do not address all aspects of emergency preparedness
• Generic enough to be applied in different countries, recognising that cultural differences will be important
• Provide advice on what type of tools and protocols are needed rather than the tools themselves
• Do not specify absolute doses/levels for implementation of actions
R2. Recognise the difference between health/medical surveillance and epidemiology
R3. Encourage a health surveillance strategy that targets the overall well-being of populations
R4. Ensure that health surveillance respects the autonomy and dignity of affected populations
R5. Review, and if needed improve, existing health monitoring systems for epidemiological surveillance
R6. Adapt dosimetry and individual exposure monitoring to the situation
R7. Build a radiation protection culture

<table>
<thead>
<tr>
<th>Preparedness</th>
<th>Early and Intermediate</th>
<th>Long-term</th>
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<tbody>
<tr>
<td>R9. Plan sheltering, evacuation and stable iodine distribution protocols</td>
<td>R15. Optimise timing and support for sheltering and evacuation</td>
<td>R22. Have plans for lifting of evacuation orders as soon as possible</td>
</tr>
<tr>
<td>R10. Prepare and facilitate training and education material and resources</td>
<td>R17. Collect and store all radiation-related dosimetry data</td>
<td>R23. Consider the preferences of people living in affected areas</td>
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<tr>
<td>R13. Foster participation of stakeholders and communities in emergency and health surveillance planning</td>
<td>R18. Provide support to populations who wish to make their own measurements</td>
<td>R28. Foster long-term participation of affected populations and communities</td>
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<td>R20. Continue dose measurement support to populations</td>
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<td>R11. Prepare frameworks and checklists for epidemiological protocols</td>
<td>R16. Create a common roster of affected populations</td>
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<td>R24. Expand support of populations to take into account economic and social upheavals</td>
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</table>

R3

Encourage a health surveillance strategy that targets the overall well-being of populations and not only addresses radiation effects, but also psychosocial and socio-economic impacts induced by the consequences of a nuclear accident.

WHY

According to the WHO, “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948). One of the most important lessons learnt from previous accidents is that the negative consequences and potential benefits of health surveillance go beyond the direct impacts of radiation exposure. These include psychosocial and health impacts caused by stress and anxiety, or by emergency evacuation, as well as socio-economic, cultural and other societal impacts, such as access to community areas, or safeguarding traditional practices and lifestyles. The long-lasting societal and economical disturbances can also be linked to a range of lifestyle-related diseases among the exposed populations. Failure to capture the full impacts of surveillance means that an efficient surveillance strategy cannot be readily identified.

HOW

A multidisciplinary approach to health surveillance is needed to identify, measure, assess and alleviate psychosocial and other indirect health impacts of socio-economic and social upheavals of the consequences of the accident (see also R24). It should include the participation of psychologists, mental health specialists, sociologists, health economists, radiation protection experts, epidemiologists, general physicians and other stakeholders able to take into account the concerns and expectations of local populations. Since the revitalisation of community welfare is a particularly important consideration, and often challenged by mistrust of authorities, the participation of local health practitioners and actors should be especially encouraged.

WHO

Health authorities, medical professionals, academic and other research centres, local citizens.
RECOMMENDATIONS TO IMPROVE HEALTH SURVEILLANCE AND LIVING CONDITIONS OF POPULATIONS IN CASE OF A NUCLEAR ACCIDENT

**GENERAL PRINCIPLES**

- Consider the overall well-being of the population (including the psychological, social and economic impact).
- Engage the general public and other stakeholders.
- Respect the autonomy and dignity of affected populations.

**BEFORE**

- Train medical personnel and other professionals.
- Establish/improve disease registries.
- Plan early response and communication protocols.
- Establish sheltering and evacuation protocols.

**DURING**

- Provide timely and reliable communication on the accident and the risks.
- Provide sheltering advice and support.
- Balance radiation exposure risk with other health risks before evacuating.
- Collect and store the minimum information from affected populations to facilitate follow-up.

**AFTER**

- Offer health screening to the population, with adequate information and counseling.
- Launch public health studies only if informative and sustainable over time.
- Support and engage the affected populations:
  - Listen to their needs and worries.
  - Support them in making their own dose measurements.
  - Help them make informed decisions, including whether and when to return to their homes.

For more information, visit: WWW.RADIATION.ISGLOBAL.ORG
放射線災害における人々への健康調査と居住環境の改善への提案

一般原則

人々の全体的な幸福を考慮。
（精神的、社会的、経済的な影響も考慮に含む）

住民と専門家の交流。

被災者の自立性と尊厳の重視

準備

医療従事者と関連する専門家へのトレーニング

疾病登録の確立（もしくは、改善）

早期対応とコミュニケーション手順
の計画

避難と屋内退避の手順の確立

被災直後

事故とリスクに関する迅速で信頼のある
コミュニケーションの提供

屋内退避のアドバイスとサポートの提供

避難前に放射線被ばくのリスクと他のリスクのバランスの考慮

復興期

適切な情報と相談窓口による人々への健康スクリーニング
の提供

長期間の情報共有と継続性を持った公衆衛生的な研究
を立ち上げる

被災者へのサポートと交流

被災者の心配事とニーズを聴く

被災者独自の線量測定をサポート

どのように、いつ地元にも戻れるかを含めた効果的な議論の補助

さらなる情報の入手は下記のサイトまで：WWW.RADIATION.ISGLOBAL.ORG
A1.2: Critical review of long-term medical (health) surveillance programmes after Chernobyl and Fukushima – Overall objective

To provide a set of lessons learned from medical surveillance on physical and mental health of populations exposed to fallout from the Chernobyl and Fukushima accidents

ST3: Recommendations for designing long-term health surveillance programs
A1.2: Critical review of long-term medical (health) surveillance programmes after Chernobyl and Fukushima – Questions to be answered

What is/was the goal of the health surveillance programmes:

- to improve general health of the affected populations?
- to prevent/reduce impact of accident and occurrence of radiation or accident related health effects?
- or both?
Chernobyl Follow-Up

- Directive of the Ministry of Public Health of the USSR in 1987:
  - creation of an "All-Union Distributed Registry" located in Obninsk, Russian Federation,
  - comprehensive registration and follow-up system for persons most affected by the accident throughout the former USSR.

- The directive identified four groups of subjects (groups of "primary registration") for whom registration and follow-up was mandatory:
  - "liquidators" or recovery operation workers (600-800 000)
  - subjects evacuated from the most contaminated territories (300 000)
  - persons living in “strict control zones” (250-300 000)
  - children of the above individuals.
The Chernobyl Registries

• Original plan
  – Annual visits of all subjects with over 10 different specialists
  – Registration of health data from local polyclinics and hospitals
  – *Proposal was too ambitious and was not supported*

• Current status
  – a Registry exists in each New Independent State
  – completeness of follow-up is *low and selective*
  – accuracy of information on diseases, residences, etc – doubtful
  – absence of dose estimates and when available accuracy doubtful
  *... but it does provide a roster of exposed populations*
Follow-up of populations exposed from Fukushima

• **Workers**
  – RERF – on-site (TEPCO) workers – NEW study ... started in 2014
  – REA – on and off site workers - underway

• **General population** - Fukushima Medical University –
  – a basic survey medical sheet for all the residents
  – further examination of target populations.
**Fukushima Health Management (FHM) Survey**

**Basic Survey**
- Subjects: Residents (2 million) as of March 11, 2011
- Method: Self-administered questionnaire survey
- Content: Details of whereabouts and daily routine from March 11 onwards to estimate exposure.

**Detailed Surveys**

- **Thyroid Ultrasound Examination**
  - Subjects: Residents aged 18 years or younger
  - Content: Ultrasound examination
  - Survey period: Three years

- **Comprehensive Health Check**
  - Subjects: Residents in evacuation zones
  - Content: General health checkup items with differential leukocyte count

- **Mental Health and Lifestyle Survey**
  - Subjects: Residents outside evacuation zones
  - Content: General health checkup items
  - Promotion of municipal and workplace health checkups

- **Pregnancy and Birth Survey**
  - Additional health checkups to reach residents not included in current services

**Database**
- To provide long-term monitoring of residents’ health
- To guide treatment
- To inform and guide future generations

**Follow-ups**

**Health Status Assessment**

**External Exposure Estimation**

**Consultation and support**

**Follow-up**

**Treatment**

**'Health Management File'**

- To keep health checkup records
- To provide information on radiation

**Whole Body Counter**

**Dosimeter**
Dosimetry

• Individual dose now estimated for 565,484 persons (97% of respondents) residents who responded to the Basic survey (response rate 27.5%)

• Individual dose estimate reported to each participant by FMU – “aspect of health care service”

• Dose distribution
  – 62% <1 mSv; 94% < 2; 99.7% < 3; 99.8% < 5 mSv
  – Maximum: 66 mSv; Mean: 0.9 mSv

Source: http://fmu-global.jp/?wpdmdl=1870
“Medical/health surveillance/screening raises a number of ethical issues and challenges, many of which are of direct relevance to screening and health surveillance after radiation accidents”.

Biomedical Ethics

Radiation Protection

Public Health Ethics
Biomedical Ethical Principles

- **Respect for autonomy** (a norm of respecting the free-will and decision-making capacities of self-governing persons)
- **Nonmaleficence** (a norm of avoiding the causation of harm)
- **Beneficence** (a group of norms for providing benefits)
- **Justice** (a group of norms for distributing benefits, risks and costs fairly)

Beauchamps and Childress, 1979
• Why me?
  • Stigma, discrimination
  • Stress
  • Distrust when surveillance stops or message is reassuring

To screen or not to screen?
And whom?
Those are the questions ...

• Why not me / my children?
  – Administrative border
  – Discrimination
  – Stress
  – Distrust
Principles of systematic screening

WHO

• Purpose
  • detect early abnormality (pre-malignant changes/early malignancy)
  ➢ preventive strategies or treatment that will improve health outcome
• But ...
  • Early detection of abnormality/cancer doesn’t always improve health
    (eg Pap for cervical cancer, PSA for prostate)
• The potential benefits must outweigh any potential harms – ETHICS!
• There must be strong evidence, that a screening program is
  • EFFECTIVE in reducing mortality from cancer.
  • COST-EFFECTIVE
Increase in thyroid cancer in young people observed in Belarus, Ukraine and Russia starting in 1991 – w.o ultrasound and varying degrees of screening intensity

Mainly papillary thyroid cancer / very good prognosis
- Related to incorporation of radioactive iodine (milk consumption) and potentiated by iodine deficiency

In Belarus, peak of childhood thyroid cancer incidence – 1995-96
- 50-60 cases/year in 2 000 000
- average dose 150 mGy (600 Gomel)
- Hundreds of children more than 10 Gy
If doses are much less

• Are criteria met to justify screening ???
  • Fukushima
    • Doses 10-100 times less
    • No iodine deficiency
    • How many radiation induced cases can we expect in 300,000 children ?

• Are we doing more good then harm ? Is it ethical? Is it cost-efficient ?
Thyroid screening

1.5-3 Flow chart

<table>
<thead>
<tr>
<th>Judgment</th>
<th>Primary Examination</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>(A1, A2)</td>
</tr>
<tr>
<td>(A1)</td>
<td></td>
</tr>
<tr>
<td>(A2)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cyst with ≥20.1mm</td>
</tr>
<tr>
<td></td>
<td>Required immediately</td>
</tr>
<tr>
<td></td>
<td>examination</td>
</tr>
<tr>
<td></td>
<td>Urgent confirmatory</td>
</tr>
<tr>
<td></td>
<td>examination</td>
</tr>
</tbody>
</table>

Test results

- A(A1, A2)
- (A1)
- (A2)
- B
- C
- Confirmatory examination
- Follow-Up
- Next Screening

Fig. 1 Flow chart
Thyroid screening

Effective dose distribution in suspicious or confirmed cases of TC with dose estimation from Basic Survey

http://fmu-global.jp/?wpdmdl=1889
A1.2: Critical review of long-term medical (health) surveillance programmes after Chernobyl and Fukushima

Lessons learned

• Recommending long-term follow-up should be based on exposure levels sufficiently high to cause adverse health effects (keep in mind knowledge gaps at low doses)

• Long-term follow-up, particularly if it involves intense screening, can be reassuring but it can also increase anxiety

• Stopping surveillance can be detrimental – consider sustainability before starting

• Overtreatment can worsen quality of life and morbidity
A1.2: Critical review of long-term medical (health) surveillance programmes after Chernobyl and Fukushima

Lessons learned

• Population can reject/ignore the proposed monitoring or reduce participation over time
  • OK – as health surveillance is to help populations – not to do epidemiology
• Difficult to judge the effectiveness of the follow-up programmes because of the non-standardised outcome reporting, absence of outcome measure
• Missing standardised approach to assess and address mental health effects
Health surveillance/Epidemiology
(Lessons learned)

• Often confusion between health surveillance and epidemiology

  • **Health/medical surveillance**: evaluate whether individuals affected by an accident suffer from some health (including psychosocial) conditions.

  • involves contact with and follow-up of affected individuals (e.g. in the form of medical check-ups, questionnaire surveys)

  • basis for providing support or treatment as required – not necessarily optimal basis for epidemiology.
• Epidemiological can have one of two objectives – often confused:
  • Evaluating whether the accident has impacted disease rates – “epidemiological surveillance” through ecological studies;
  • Improving our knowledge on effects of radiation and/or accident through analytical studies (cohort or case-control studies with individual information) where justified (levels of doses, affected populations, power, …).

➢ Objectives of epidemiological studies were often not clear
General practical recommendations

• Ensure that information on doses and dose-rate measurements is stored and has identifiers that can be linked to the information on health effects
• Start registration as early as possible
• Before introducing surveillance measures, explain to the population:
  • the aim of the surveillance
  • what outcomes can be expected...
• Use standardised diagnostic criteria
• Combine mental health surveillance with other programmes
• Listen to the needs of affected population to tailor/modify follow-up programmes...
• Proper communication with affected population is crucial to explain risks and benefits of screening
Tailoring long-term medical follow-up

• Define outcomes to be measured
  • Cancer
  • Other radiation-related health effects
  • Non radiation-related health effects

• **Psycho-social follow-up** should be an integrated component of medical follow-up
  • Assessing resilience
  • Providing long-term education, training programs
Tailoring long-term medical follow-up (II)

- Identifying concurrent factors which could contribute to development of adverse health effects
- Define **scope of surveillance programme** based on
  - Assessment of exposure levels / affected areas
  - Vulnerability, e.g. *in utero* exposed, elderly
  - Severity of health condition(-s), e.g. ARS
- Adapting to the needs and concerns of the affected population through continuous communication
ST3.3 Key Recommendations

Successful Health Surveillance Strategies should:

• Recognise and address the positive and negative consequences of health surveillance (ST1.2, CCA2)

• Engage with affected populations in designing health surveillance programmes (ST2, CCA1)

• Provide access to and advice on use of personal dosimetry and monitoring (ST2)

• Respect autonomy, empowerment and free-choice (ST2, CCA3)

• Identify the needs, concerns and communication requirements of different groups (ST1.1, ST2)
Practical aspects to be addressed

Accountability:
• Clarification on responsibilities for screening, follow-up, funding, ...

Transparency
• Clarity on expectations and purpose of screening
• Communication strategy, including media, public health official
• Information to participants

Stakeholder Participation
• Critical for success of screening
• Health professionals, communities, parents, ...
“Health is a state of complete physical, mental and social wellbeing, and not only absence of disease (WHO, 1948)
R9. Plan sheltering, evacuation and stable iodine distribution protocols

Preparedness

R12. Prepare action frameworks focused on dose assessment for

Early and Intermediate

Evacuation

R13. Foster participation of stakeholders and communities in emergency and health surveillance planning

Communication and Timing

R15. Optimise timing and support for sheltering and evacuation

R22. Have plans for lifting of evacuation orders as soon as possible

R23. Consider the preferences of people living in affected areas
R28. Foster long-term participation of affected populations and communities

R25. Launch systematic health screening based on appropriate justification and design
R26. Clarify objectives and expected results of epidemiological studies
R27. Ensure long-term sustained follow-up of populations affected by irradiation

Temporary Housing
Asahi Shimbun photo; Satoko Kawasaki.
R8. Establish early response and communication protocols
R10. Prepare and facilitate training and education material and resources
R13. Foster participation of stakeholders and communities in emergency and health surveillance planning

R14. Ensure prompt sharing of accurate and reliable information

R23. Consider the preferences of people living in affected areas
R28. Foster long-term participation of affected populations and communities
### General
R1. The fundamental ethical principle of doing more good than harm should be maintained. Each decision made should be supported by clear justification that it is in the best interest of all and that any potential harms are outweighed by expected benefits. This principle should be applied to all community decision-making processes.

### Dosimetry

<table>
<thead>
<tr>
<th>R12. Prepare action frameworks focused on dose assessment for workers and populations</th>
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</thead>
</table>

### Communication and Training

| R8. Establish early communication networks and support for evacuations |
| R10. Prepare and distribute educational materials to stakeholders in emergency surveillance programs |
| R13. Foster participatory stakeholders in emergency planning programs |

### D-Suttle: courtesy M. Miyasaka
http://www.c-technol.co.jp
Launch systematic health screening based on appropriate justification and design.

Do not recommend systematic thyroid cancer screening, but make it available (with appropriate counselling) to those who request it.
Changes in mortality rates among institutionalised elderly before and after the Fukushima accident – Yasumura et al 2016
SHAMISEN Final Product: Dissemination and Implementation

Scientific publications: Journal special issue (e.g., Environment International)

Shamisen D3.1 (plus a stand-alone, publically available report)

Interactive infographics – SHAMISEN Website with recommendations

Press release

Press communication
RECOMMENDATIONS TO IMPROVE HEALTH SURVEILLANCE AND LIVING CONDITIONS OF POPULATIONS IN CASE OF A NUCLEAR ACCIDENT

GENERAL PRINCIPLES

Consider the overall well-being of the population (including the psychological, social and economic impact).
Engage the general public and other stakeholders.
Respect the autonomy and dignity of affected populations.

BEFORE

- Train medical personnel and other professionals
- Establish/improve disease registries
- Plan early response and communication protocols
- Establish sheltering and evacuation protocols

DURING

- Provide timely and reliable communication on the accident and the risks
- Provide sheltering advice and support
- Balance radiation exposure risk with other health risks before evacuating
- Collect and store the minimum information from affected populations to facilitate follow-up

AFTER

- Offer health screening to the population, with adequate information and counseling
- Launch public health studies only if informative and sustainable over time
- Support and engage the affected populations:
  - Listen to their needs and worries
  - Support them in making their own dose measurements
  - Help them make informed decisions, including whether and when to return to their homes

For more information, visit: WWW.RADIATION.ISGLOBAL.ORG
WP1. Stakeholder needs
(consultation, engagement and feedback)

WP2. Citizen participation in radiation measurements

WP3. Citizen participation in health and well-being

WP4 – Concept and specification of Apps and tools

WP5 - Management, communication and dissemination

SHAMISEN
SINGS
Stakeholder Involvement in Generating Science After Nuclear Emergencies

EUROPEAN JOINT PROGRAMMES FOR THE INTEGRATION OF NUCLEAR RESEARCH

CONCERT
Thank you!

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