Medical Response to Radiation Emergencies: Current Status & Challenges

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Content

• Introduction

• Compatible medical management
  • Topics analyzed, findings & recommendations, challenges

• International medical assistance
  • Topics analyzed, findings & recommendations, challenges

• Conclusion
Medical Response to Radiation Emergencies

What We Mean?
Medical Response Covers

First few hours

On-site (pre-hospital) response

Weeks-months

Hospital response

International assistance

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

145 Member States
100 Parties including FAO, WMO, WHO & EURATOM (Sept 2008)
Way Forward

• What is current status of preparedness for medical response to radiation emergencies worldwide?
• What did we achieve up to now?
• Are we ready to face new challenges?
• What are we lacking in capabilities and arrangements?
To Answer These Questions…

• Numerous national and international activities, e.g. Working Groups/Projects under
  • GHSAG
  • EU
  • Regional networks
  • International organizations
  • Etc…

• IAEA
  • International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies
Action Plan

• Action: “…Develop – in collaboration with WHO – compatible arrangements for the medical managements of radiation injuries, and their diagnosis and treatment, including management of psychological consequences”

• Outcome: to have “compatible arrangements for providing medical assistance in nuclear or radiological emergencies, including triage, taking due care of personal contamination, addressing psychological impact, and specialized treatment of whole body and localized radiation injuries and their follow-up”
Actions

- Existing national and international guidance and scientific publications reviewed
- Areas of general consensus and areas where general consensus is lacking and further actions are required identified
Outcome

• A strategy for establishing compatible medical management ..........by recommending specific activities is developed

• Summarised in “Strategy for compatible medical management in radiation emergencies”
Analysis of practice:
Main topics analyzed
Acute Radiation Syndrome

- Diagnosis, prognosis, treatment & follow up
  - cytokine therapy, transfusion, palliative care and hematopoietic stem cell transplantation
- Changing paradigm in management of ARS
  - multiple organ dysfunction syndrome & multiple organ failure

Treatment of acute radiation syndrome

- Protocols, tactic, decision for bone marrow transplantation, strategy for prevention of infection

Deterministic effects

- Radiation burns - Carcinogen experience

Therapeutical management according to the European consensus conference

European approach for the medical management of mass radiation exposure
Local Radiation Injury

- Diagnosis (protocols, tactic of surgery) prognosis, treatment & follow up

**Peru (1999)**

Accidental overexposure to 192Ir radiography source

**Results of treatment**

<table>
<thead>
<tr>
<th>3 wk</th>
<th>4wk</th>
<th>11wk</th>
<th>13wk</th>
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01.12.2001

18 months after operation

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Local Radiation Injury (2)

- Multidisciplinary team approach
- Dosimetry guided surgery
- Cell therapy
Multiparametrical Dose Assessment

- METREPOL (Medical Treatment Protocols for Radiation Accident Victims as a Basis for a Computerised Guidance System)
- Importance of dose assessment as support for medical management
- Heterogeneity of exposure and decision on medical management

Dose Reconstruction

- Biodosimetry
  - Different methods under different circumstances of exposure
  - Use for mass triage
  - Method for reassurance
Contamination (External & Internal)

• Lack of international criteria for decontamination:
  • Thousands may come to get monitored
  • Increased perception of risk
  • Allocation of resources

• Decorporation
  • Techniques, efficiency, protocols for specific radionuclides

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Psychological Effects

- All serious radiation emergencies have resulted in public taking some actions that were inappropriate or unwarranted, and resulted in significant psychological effects...

- Lack of effective communication can cause physical harm

Some lessons learned from past emergencies:

- Lack of:
  - international criteria for protection of foetus
  - understanding of radiation health effects in medical community
  - plain language explanation of radiation health effects

Thousands of unjustified abortions (no detectable effects expected) after Chernobyl accident

Psychological Effects After Chernobyl

- Persistent (19 years after):
  - Annual anniversaries
  - Triggers for inadequate public reaction
  - Example in 2005
Recommendations
To Reach Consensus on Topics:

• Protocols for decorporation treatment
  • criteria for starting and termination, dosage, duration, contra-indications for children and pregnant women
• Medical indication for special procedures
  • lung & gastric lavage, extracorporal clearance techniques
• Application of novel therapeutic strategies for treatment of ARS
  • growth factors, stem cells, mast cell blockers
• Special treatment & prophylaxis of organ systems complications
To Develop a Standard Protocol/Guidance for Topics:

- Long term follow up of exposed individuals (including criteria, frequency, duration, diagnostic procedures)
- Identification of internal contamination by special methods/techniques
- Criteria for monitoring and sample collection in mass casualty event
- Application of new approaches in biodosimetry (incl. applicability in mass casualty event) for improved & rapid dose assessment
- Different triage methods: clinical signs, dose assessment, “cytogenetic triage”
- Prevention and management of psychological effects
- Treatment of contaminated thermal and chemical burns
- Start & termination of external decon (criteria for different emitters)
- Use of cytokines for treatment of ARS
Further Research

• Practical biodosimeters such as PCC-FISH in skin fibroblasts to be used for local dose assessment
• Various methods of diagnostic imaging for determining extent and severity of local injury
• Novel therapeutic strategies
  • e.g. growth factors, stem cells, mast cell blockers
• Diagnostic approaches of exposure of different organs
  • e.g. investigation of applicability of labelled red blood cells scintigraphy for evaluation of the extension of GI syndrome; hematological parameters vs non-homogenous exposure
• Transplantation of ex vivo expanded haematopoietic cells combined with mesenchymal stem cells
• Application of new decorporating agents
Actions

- Existing national, regional and international arrangements reviewed
- Existing arrangements and areas lacking guidance and operational arrangements identified
Outcome

• A strategy for enhancing international medical assistance developed

• Summarised in “Strategy for enhancing international medical assistance in radiation emergencies”
Analysis of practice: Main topics analyzed
Arrangements

- International
- Regional
- Bilateral
- Formal arrangements
  - e.g., NATO/Euro-Atlantic Partnership Council (EAPC), Partnership for Peace (PFP) and Euratom
- Informal arrangements and contributions
  - E.g. The European Group for Blood and Marrow Transplantation (EBMT)
Findings

• Response to radiation emergencies involving few injured and/or ~ [dozens] thousands requiring processing and management

• Limited regional capability for international assistance in some regions (e.g., Middle East, South-East Asia, Africa)

• Lack of resources for severely injured victims (stockpiles)
Emergencies Resulting In Mass Casualties

• New concern – threat of malicious acts – requires regional/international networks
  • Mass casualty event may overwhelm national capabilities of a country with advanced resources – depends on number of casualties
  • Recent assessment has shown that most European countries can accommodate 10-20 patients for specialised treatment

• Existing arrangements are not adequate to address needs of response to mass casualty event
  • In probably all States there is a lack of medical capabilities (including lack of stockpiles) to deal with mass casualty events
  • probably, no State which will be able to effectively deal with such event on their own using their own capabilities for medical response
Findings

• International assistance in medical response may be needed & pre-established arrangements are essential
  • Not every country has developed capabilities in highly specialized treatment of radiation injuries
  • Existing centres have limited capacity
    • Some countries can manage about few dozens victims at max
  • Involvement of few countries will be required to manage multiple injuries
• International/regional assistance has proven to be effective
• Arrangements for regional assistance should be in place
  • Timely response
  • Cultural similarities, common/close languages
Special Issues in Medical Assistance

- Legal issues
- Access to medical records in emergency & after
- Team responsibilities
- Transportation of patients & Transportation of bio samples
- Informed consent
- Financial implications for existing arrangements
- Stockpile systems
- Sustainability of the expertise at the international level:
  - Professional recognition
  - Education and training programs
- Research and development
Areas identified as being lacking guidance and operational arrangements
Legal Issues

• Propose actions to facilitate availability of medical data in emergency & afterwards

• Transportation of patients to assisting country: to develop concept of operation (procedures, financial arrangements, & requirements) for:
  - Prompt health-visa arrangements for patients and those accompanying
  - Conditions of transportation of severely injured patients
  - Roles and responsibility of the accompanying physician
  - Roles and responsibilities of health care services of the transit country/ies in case of clinical destabilization or death of the patient during the travel

• Transportation of biological samples: to develop concept of operation including procedures and arrangements

• Establishment of emergency funds for medical treatment (short and long-term) of victims at the international level
Stockpile Systems

• Establishment of international/regional stockpiles
  • WHO initiative on Development of Stockpiles for Radiation Emergencies
Sustainability of Expertise at International Level

• Establishment of actions to raise professional recognition of radiation medicine expertise
• Promoting involvement of young medical professionals in managing radiation emergencies
Sustainability of Expertise at International Level

- Update & maintenance of education & training programs
  - Training courses
  - Fellowships
    - specialized centers
  - Exercises

ConvEx-3 (2008) Participants

- 75 countries
- 10 int. org.

- Duration: 38 hours
  July 2008

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Research and development

- Establishment of research projects for diagnosis and treatment of radiation injuries
- Establishment of practical arrangements for international cooperation and exchange of information about the status and results of research
Challenge

- Improve cooperation between national Competent Authorities [under Emergency Conventions] and national health authorities
Challenge

• To utilize effectively existing regional / international capabilities and arrangements

• To elaborate and to build on the existing arrangements/capabilities taking into account current needs and lessons from past responses

IAEA – MS Operational Arrangements Response Assistance NETwork (RANET)

- Practical implementation of Assistance Convention
- Network of CAs and their National Assistance Capabilities (NAC)

In Conclusion……..

- Lessons learned and identified gaps pose new challenges we need to face............
- Let us move forward together!
Thank you!

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