Risk Management

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Definition of a Hazard and Risk

What is a **Hazard**?

- A **hazard** is any source of **potential** damage, harm or adverse health effect(s) to people or the environment.

What is a **Risk**?

- A **Risk** is the chance or **probability** that a person will be harmed or experience an adverse health effect if exposed to a hazard. It also applies to situations that lead to harmful effects on the environment.
Definition of Risk Management

- The identification, analysis, assessment, control, and avoidance, minimisation, or elimination of unacceptable risks.
- May involve the use of risk assumption, risk avoidance, or other strategy (or combination of strategies) to properly manage and mitigate possible (unwanted) future events.
- The risk management process from a health and safety perspective has the primary objective of eliminating or minimising the risks of harm.
Risk Management – Risk Attributes

- **Risk Description** – identification of the risk being detailed
- **Likelihood** of risk materialising – classification can be numbers (i.e. 0 to 4) or descriptive labels (i.e. unlikely, seldom, occasional, likely, definite)
- **Severity** – Impact of risk should it materialise – classification can be numbers or labels (insignificant, minor, moderate, high, critical)
  - The impact classification needs to consider population size exposed, the impact on **wellbeing** and the **cost** (treatment, lost wages etc.) if risk materialises
- **Mitigation Strategy** to prevent or manage an identified risk
A chart that plots the severity of a risk event vs the probability of it occurring.

### Risk Assessment Matrix

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improbable</td>
<td>Low -1-</td>
<td>Medium -4-</td>
<td>Medium -6-</td>
<td>High -10-</td>
</tr>
<tr>
<td>Possible</td>
<td>Low -2-</td>
<td>Medium -5-</td>
<td>High -8-</td>
<td>Extreme -11-</td>
</tr>
<tr>
<td>Probable</td>
<td>Medium -3-</td>
<td>High -7-</td>
<td>High -9-</td>
<td>Extreme -12-</td>
</tr>
</tbody>
</table>

#### Risk Rating

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - acceptable</td>
<td>1 - ALARA (As low as reasonably achievable)</td>
<td>2 - Generally unacceptable</td>
<td>3 - Intolerable</td>
</tr>
</tbody>
</table>

- **Low**: No Action Required
- **Medium**: Take Mitigation Action
- **High**: Take action – Reconsider all activities leading to risk
- **Extreme**: Stop all actions that will lead to risk

#### Impact Severity

- **Acceptable**
- **Tolerable**
- **Undesirable**
- **Intolerable**
The Problem

Risk Management is **not** about requiring established evidence of harm.

Risk Management is **is** about recognising the **potential for harm** and if, necessary, taking **precautionary measures**.
Current Challenge

- Lack of public awareness of real risks – wireless devices are assumed to be completely safe
- Most studies are not designed to answer the question of whether there are possibly multiple downstream health effects, including those in the second exposed generation
- Experiments performed with controlled exposures not representative of typical real life exposures
  - Are typically short term acute exposures
  - Effects of radiation are additive (different frequencies) and cumulative (cell damage)
- Very limited investigation of synergistic effects with other environmental/man made toxins
  - Cell membrane permeability changes and cellular stress can augment actions of chemicals and other toxins
- Bio-effects routinely found in well conducted studies are not being addressed by health bodies for their potential to cause harm
Missing in Action – A Robust Risk Management Policy

- All potential risks are not being clearly identified – Absence of a formal risk register
- Mantra – “no established evidence of harm” is used to give public false sense of security
- Limited assessment of risks (TR-164) shown to be inaccurate and biased
- Uncertainty is routinely used to downplay risks and cloud the issue
  - How much uncertainty is real vs manufactured? Perhaps a study should be conducted to look at this
- Continued rollout of evolving wireless technologies 2G, 3G, 4G and now 5G when:
  - Wireless products have never been formally tested for health and safety
  - Occurring despite the balance of scientific evidence suggesting serious risks – cancer, neurodegeneration, cardiovascular disease, immune system disorders etc.
- Risk mitigation suggestions are weak and warning labels absent from product packaging
Possible Causes for Inaction

Radiation Protection bodies are often

- Missing essential expertise
  - Lacking experts with specialist biological and medical science proficiency
  - Risk assessments are being performed in the absence of medical advice

- All singing from the same ICNIRP hymn book – a minority clique of scientists holding the same ideas and not representative of all scientific opinion

- Are not truly independent - often seen working closely with industry representatives and placing industry and government economic interests ahead of public health
  - Blinded by the economic benefits the technology brings – not looking at the economic costs

- In the case of ARPANSA - limited in freedom to act by ARPANSA Act 1998
  - Act not to prejudice Australia’s defence (Radar, Communications, Missile Guidance, ECM etc.)
  - Act not to prejudice national security (Communications, Surveillance and other covert action)
If we fail to address the risks identified by science this will undoubtedly lead to:

- Increased costs to support those who have been injured
- Increased disease burden and unnecessary suffering
- Lost productivity
- Lost opportunities due to failing health and in some cases, ruined careers
- Threat of serious and/or irreversible environmental damage

Is completely avoidable if Govt. agencies acted responsibly and in the public’s best interest

The general public have the right to know what science is showing without manipulation and filtering

“The greater the risk, the greater the fear to change” - The High Cost of Doing Nothing
Balance of Evidence

SOURCE: ORSAA DATABASE
http://www.orsaa.org/orsaa-database.html
A responsible way of managing risks is to:
1. Look at the balance of scientific evidence; and
2. Assess the probability of harm

Common biological effects found in RF Research are numerous

These bio-effects can be used as a starting point to identify potential health risks

- May have a role in disease pathways/well being
- A known cause of disease

Source: ORSAA Database – RF Bioeffect summary
Identified Risks

- Brain Tumours
- Other Cancers
- Cardiovascular Disease
- Diabetes
- Neurodegeneration
- Mental illnesses
- Pregnancy Complications / Developmental Problems
- Immune Disorders (Allergies & Autoimmune Conditions)
- Infertility/Sterility
- Chronic Illness (CFS, Fibromyalgia etc.)
- Nuisance Effects (headache, hot ear, vertigo, tinnitus etc.)
- Sleep Disorders

Note: Insurance Agencies do not provide cover for EMF induced injuries
Cost/Benefits
What are the costs to be considered?

- **Direct financial costs** to the Government health system – Hospital, nursing homes, GP and specialist services reimbursed from Government medical insurance programs, pharmaceuticals and ‘other’ direct costs.

- **Productivity costs** – patient productivity losses, long term employment impacts, premature mortality etc.

- **Administrative costs** and **other financial costs** include government and non-government programs such as respite, community palliative care, special education, transport etc.

- **Transfer costs** comprise the **deadweight losses** associated with government transfers such as taxation revenue foregone, welfare and disability.

- **Non-financial cost** covers pain, suffering and premature death. Can be analysed in terms of the years of healthy life lost, both quantitatively and qualitatively, known as the ‘**burden of disease**’.
Economic Costs - Cancer

Source: CanTeen Australia (2017), *The economic cost of cancer in adolescents and young adults*
Risk Management – Cost Benefits

- ~1900 Brain tumours are diagnosed each year in Australia
- 3 Million$ cost estimate per person
- 5.7 Billions$ economic loss per year

Question: How many brain cancers can be attributed to RF exposure from cell phones/towers?

- Other cancers and non-cancers also need to be factored in
- Potential savings of many billions$ per year could be easily achieved by simply:
  - Disclosing risks so there is public awareness
  - Advising the public to adopt safer usage habits
  - Providing clear warning labels on packaging
Risk Mitigation Strategies
A Responsible Risk Management Approach

- Risk Management for Radiofrequencies can include:
  - Reinforcing existing hierarchy of controls to follow a similar approach taken by ionising radiation protection
  - Educating the public by providing an honest account of potential risks and how to minimise exposure - it should not be just for those who are concerned as current fact sheets are written
  - Educating the Government (particularly the ACMA) and Industry on a precautionary approach and the concept of ALARA
  - Requiring Industry to create safer devices and transmitters
  - Mandatory labelling of wireless device packaging with health warnings
- The First Step requires a change in mindset
  - Recognition that RF exposure at levels well below current public limits can result in biological effects that are potentially harmful – and is not limited to just cancer
Risk Mitigation Steps

- Turn Wi-Fi off if it is not needed
- Do not have wireless transmitters in the bedroom
- Create regulations requiring “smart” power meters not to be installed near main living areas – i.e. recommend garage wall and permit exemptions on health grounds
- Design wireless devices with health and safety in mind
- Attach warning labels to packaging – like cigarette packets
- Use shielding materials on phones/phone covers to deflect signals away from the body
- Prioritise wired connections over wireless options in education and health contexts
- Recommend parents encourage children to avoid the usage of wireless devices
- Advise a precautionary approach to government, industry and the public
- Ban wireless devices and transmitters in elementary school classrooms
It is time to act responsibly

- The current philosophy of putting economic benefits and cost to industry as a roadblock for implementing a precautionary approach is unethical and immoral.
- The balance of evidence is clearly showing the potential for harm, therefore:
  - A moratorium on 5G should be established until it has been fully studied from a health perspective.
  - A proper risk assessment needs to be performed by appropriately credentialed medical professionals.
    - Should not only focus on human health, but environmental impacts also need to be considered.
  - Cell phone towers should not be located in proximity to nursing homes, hospitals or schools.
  - Wireless free zones should be created in each state to allow personal choice.
  - A new biologically based RF Standard is required that provides protection against a range of potentially harmful effects that are observed at non-thermal exposure levels.
- The cost of doing nothing may exceed any economic benefit this technology brings.
<table>
<thead>
<tr>
<th>Identified Risks</th>
<th>Likelihood (Probability)</th>
<th>Impact</th>
<th>Final Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Exposure</td>
<td>Chronic Long-Term Exposure</td>
<td>Size of Pop. Exposed</td>
</tr>
<tr>
<td>Brain Tumours</td>
<td>Improbable</td>
<td>Probable</td>
<td>Very Large</td>
</tr>
<tr>
<td>Other Cancers</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Neurodegeneration</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Mental Illness</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Developmental Issues</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Immune Disorders (Allergies/Autoimmune)</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Infertility</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Chronic Illness</td>
<td>Improbable</td>
<td>Possible</td>
<td>Very Large</td>
</tr>
<tr>
<td>Nuisance Effect (headache, hot ear) (based on duration)</td>
<td>Possible</td>
<td>Probable</td>
<td>Very Large</td>
</tr>
<tr>
<td>Sleep Disorders</td>
<td>Improbable</td>
<td>Probable</td>
<td>Very Large</td>
</tr>
</tbody>
</table>

Special Note: Economic benefit of technology has not been factored into the preparation of this matrix.
Annexure

Supporting materials
<table>
<thead>
<tr>
<th>Group</th>
<th>Exposure Time</th>
<th>Total Papers</th>
<th>Effect</th>
<th>Uncertain Effect</th>
<th>No Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not specified</td>
<td>344</td>
<td>271 (78.8%)</td>
<td>21 (6.1%)</td>
<td>52 (15.1%)</td>
</tr>
<tr>
<td>1</td>
<td>10 seconds to 1 hour</td>
<td>225</td>
<td>188 (83.6%)</td>
<td>6 (2.7%)</td>
<td>31 (13.8%)</td>
</tr>
<tr>
<td>2</td>
<td>1.01 hours to 1 day</td>
<td>390</td>
<td>296 (75.9%)</td>
<td>19 (4.9%)</td>
<td>75 (19.2%)</td>
</tr>
<tr>
<td>3</td>
<td>1 Day to 1 Week</td>
<td>239</td>
<td>206 (86.2%)</td>
<td>9 (3.8%)</td>
<td>24 (10%)</td>
</tr>
<tr>
<td>4</td>
<td>1 Week to 1 Month</td>
<td>67</td>
<td>56 (83.6%)</td>
<td>3 (4.5%)</td>
<td>8 (11.9%)</td>
</tr>
<tr>
<td>5</td>
<td>1 Month +</td>
<td>57</td>
<td>46 (80.7%)</td>
<td>3 (5.3%)</td>
<td>8 (14%)</td>
</tr>
<tr>
<td>Subset of 5</td>
<td>1 Year +</td>
<td>17</td>
<td>13 (76.5%)</td>
<td>2 (11.8%)</td>
<td>2 (11.8%)</td>
</tr>
</tbody>
</table>

*Excludes all Industry Funded Studies

**Bio-effect rankings based on exposure duration (Group 5 being the longest)**

<table>
<thead>
<tr>
<th>Top 5 Bio Effects</th>
<th>Group 0</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>Group 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>Enzyme Activity (65)</td>
<td>Enzyme Activity (71)</td>
<td>Enzyme Activity (61)</td>
<td>Oxidative Stress (108)</td>
<td>Enzyme Activity (30)</td>
<td>Enzyme Activity (15)</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>Cell irregularities/ Damage (33)</td>
<td>Oxidative Stress (31)</td>
<td>Gene Expression (31)</td>
<td>Oxidative Stress (60)</td>
<td>Enzyme Activity (99)</td>
<td>Oxidative Stress (24)</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>Oxidative Stress (29)</td>
<td>DNA Damage (25)</td>
<td>Cell irregularities/ Damage (30)</td>
<td>DNA Damage (34)</td>
<td>DNA Damage (9)</td>
<td>Haemotological Effects (8)</td>
</tr>
</tbody>
</table>
EXPERIMENT - RF EXPOSURE TIMES

- 1.01 hours to 1 day, 390, 40%
- 1 Day to 1 Week, 239, 24%
- 10 seconds to 1 hour, 225, 23%
- 1 Week to 1 Month, 67, 7%
- 1 Month+, 57, 6%
### Carcinogenic Rating: Neoplastic Lesions - GSM Modulation

<table>
<thead>
<tr>
<th>Carcinogenic Rating</th>
<th>Neoplastic Lesions: GSM Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz</td>
<td>Combined incidences of fibrosarcoma, sarcoma, or malignant fibrous histiocytoma in the skin.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Incidences of alveolar/bronchiolar adenoma or carcinoma (combined) in the lung.</td>
</tr>
<tr>
<td>Female B6C3F1/N mice, exposed to GSM-modulated cell phone RFR at 1,900 MHz</td>
<td>Incidences of malignant lymphoma (all organs)</td>
</tr>
<tr>
<td>Male Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz</td>
<td>Incidences of malignant schwannoma in the heart.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Incidences of benign or malignant granular cell tumors in the brain.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Incidences of adenoma in the pars distalis of the pituitary gland.</td>
</tr>
<tr>
<td>Some Evidence</td>
<td>Incidences of pheochromocytoma (benign, malignant, or complex combined) in the adrenal medulla.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Incidences of pancreatic islet cell adenoma or carcinoma (combined).</td>
</tr>
<tr>
<td>Female Hsd:Sprague Dawley SD rats, exposed to GSM-modulated cell phone RFR at 900 MHz</td>
<td>Incidences of malignant schwannomas in the heart.</td>
</tr>
</tbody>
</table>

Based on the IARC preamble to the monographs, RF radiation should be classified as Group 1: The agent is *carcinogenic* to humans.
<table>
<thead>
<tr>
<th>Carcinogenic Rating</th>
<th>Neoplastic Lesions: CDMA Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivocal Evidence</td>
<td>Male B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz incidences of hepatoblastoma in the liver.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Female B6C3F1/N mice, exposed to CDMA-modulated cell phone RFR at 1,900 MHz incidences of malignant lymphoma (all organs).</td>
</tr>
<tr>
<td>Clear Evidence</td>
<td>Male Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz Incidences of malignant schwannoma in the heart.</td>
</tr>
<tr>
<td>Some Evidence</td>
<td>Equivocal Evidence incidences of malignant glioma in the brain.</td>
</tr>
<tr>
<td>Equivocal Evidence</td>
<td>Female Hsd:Sprague Dawley SD rats, exposed to CDMA-modulated cell phone RFR at 900 MHz Incidences of adenoma in the pars distalis of the pituitary gland.</td>
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<td>Equivocal Evidence Incidences of malignant schwannoma in the heart.</td>
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</table>

Based on the IARC preamble to the monographs, RF radiation should be classified as Group 1: The agent is carcinogenic to humans.
Source of funding matters

**NO FUNDING FILTER APPLIED**
- No Effect, 559, 25%
- Uncertain Effect, 207, 9%
- Effect, 1513, 66%
- Retraction, 1, 0%

**INDUSTRY FUNDED PAPERS REMOVED**
- No Effect, 363, 19%
- Uncertain Effect, 159, 8%
- Effect, 1405, 73%
- Retraction, 1, 0%