Routine Medical Surveillance and Assessment of Accidental RF Over-exposure Incidents

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Assumptions about protection of the ICNIRP Guideline

- Covers all effects
- Assumes critical effects are from power not energy
  - The critical dose is an acute level and not accrued.
- Effects are deterministic
  - No stochastic effects
- There are absolute thresholds of significant effects

Assumptions about protection of Standards

Low Frequency

- Prevention of neurostimulation

High Frequency

- Prevention of whole body heating
- Prevention of local tissue heating
- Prevention of disruption of thermal homeostatic mechanisms
- Prevention of behavioural responses
- *Possibly* prevention of perception

Assumptions about protection of Standards

Safety Margins cover all risks

- critical effect
- worst case exposure conditions
- inaccuracies of measurement within tolerance of the Guideline

Variation of Sensitivity over populations

Sensitivity is onset of effects at predictable levels

- Normal distribution is assumed
- Contiguous population for species is assumed
- Special risks eg electronic or metal implants
- Generalised "hypersensitive" group is not acceptable in RF worker population

Concept of a Working Population

- Defined or known numbers
- Health status specified and verified
  - Healthy worker effect
- Some degree of surveillance
- Risks minimised using systematic approach, but residual risk accepted.

Types of Assessments

Pre-Placement assessment (PPA)

- For existing employees
- Fit for work
- Safe for work
- Risks identified and mitigated

Incident Investigation

- Reactive after event
- What happened?
- Consequences
- Return to PPA

Data Collection - Questionnaires

Passive questionnaire

- Form filled in by worker as applicant entering class of work

Active questionnaire

- Questions follow by health professional based on form.

Required Documentation

- Medical Statement
  - Compilation of data from questionnaire confirming disclosed conditions
- Medical Examination
  - Responsible physician
- Medical Records
  - Medico-legal documents to be retained
  - Includes reports

Medical Assessment

Medical Examination

- Conducted by doctor
  - with RF knowledge
  - With specialist physician clinical skills
- General and targeted

Medical Documentation (S-O-A-P)

- Subjective
- Objective
- Assessment
- Plan

Subjective

- Workers concerns and fears
  - What happened?
- Employer's history
- Other workers or witnesses
- Technical Data
- Site visit if practical
- Photographs, plans and elevations of Site (all cases)
- Measurements if available
  - Do not need to be done specially at this stage

Objective

- Total power available at source
- Maximum conceivable coupling
  - Radiating aperture
- Maximum plausible energy transfer
  - Error of up to 10x may not matter

Risks

Partial Body Heating

- Dysfunction
- Damage
- Long term effects

Whole Body Heating

- Hypothermia
- Behavioural changes
- Electrostimulation
- Unpleasant and sudden effects
- Nerve or tissue damage

Rules for the Clinical Encounter

- Examiner must be familiar with relevant issues
- Worker becomes patient, ? aware patient?
- Unequivocal understanding of quantities
- Agreement on biophysics and engineering
- Common ground about what happened
  - *Clear understanding and explanation of potential effects and thresholds*
- Examination rituals as part of standard procedure or comprehensive assessment.
- Refer for tests and provide follow up explanations

Medical examination

General and Targeted Occupational Medicine Assessment

- COMAR paper and further…
  - Neurological
    - Sensation proprioception reflexes and balance
    - Behaviour, orientation, thought and affect
    - Cognition and memory
    - Vision & Hearing
  - Skin
  - Musculoskeletal
  - Cardiovascular and Respiratory

Is all this really necessary?
(no, but it helps!)

- Both the employer and employee are compromised
  - *So take nothing for granted*
- Examiner needs optimal communication with the patient
  - *The examination provides a clinical encounter hard to otherwise achieve*
- Examination usually builds confidence and provides part of a secure basis for a medical report
  - *Places the worker in the role of a patient*

Assessment

- Use objective conclusions
- Accept worst case possibility
- Predict any conceivable effects including all issues raised in history
- Document in detail as a medical report
  - Forward as "Medical in Confidence"
- Separate report to management
  - Forward as incident report
- Make unequivocal judgment based on evidential criteria
  - Beyond reasonable doubt (criminal threshold)
  - Balance of probabilities (civil threshold)

Plan

- Immediate clear and unequivocal advice to patient
  - Allow for detailed explanation
  - Provide written information
  - Allow for follow up
- Schedule ongoing surveillance
- Recommend workplace remediation if needed

Summary and Conclusions

- Prompt authoritative investigation and advice to patient and employer
- Make the worker a patient and take over their worries
- Unequivocal evidence based decision
- Fully document as a medical record and provide reports