Past incidents and lessons learned.

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Health & Environment – Protection of Health

FANC AFCN
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www.fanc.fgov.be

Past incidents and lessons learned.

1. How to deal with incidents.
2. Some examples of incidents.
3. Lessons learned from past incidents.
4. Future perspectives.

Past incidents and lessons learned.

1. How to deal with incidents.
   - Notification.
   - Health physics.
   - Recognized occupational physician.
2. Some examples of incidents.
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4. Future perspectives.

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2. How to deal with incidents. Notification.

- GRR-2001: mandatory reporting by the operator of certain incidents to FANC :
  - Accidental exposure of a workers
  - Exposure in emergency situation
  - Every loss or theft of a radioactive substance/source
  - Any event with a potential impact on personal or public health or on the environment
- Reporting by the workers/outside workers to the health physics service of every anomaly or defect in the protective equipment

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2. How to deal with incidents. Notification.

- Operating licences can contain conditions on procedures and communication channels in case of emergency
- Guidelines for incident reporting in nuclear installations & industrial applications *(http://www.fanc.fgov.be, profile "Industrial facilities of class II and III")*
- Guidelines for voluntary incident reporting in the medical world *(http://www.fanc.fgov.be, profile "Radiotherapy")*

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2. How to deal with incidents. Notification.

Guidelines for incident reporting in nuclear installations & industrial applications:

- Types of events to report to FANC:
  - exceeding of dose limits, accidental contamination
  - unexpected/uncontrolled situation leading to (risk of) accidental exposure)
  - …
- Prior reporting (health physics service/authorised inspection organisation)
- Reporting modalities
- REX process: share experience/lessons learned => continuous improvement
- REX aspects (event description + follow up, possible causes, lessons learned, action plan, …)

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2. How to deal with incidents. Notification.

Guidelines for voluntary incident reporting in the medical world:

- Different categories (worker – patient – public – environment)
- Types of events involving workers (whether or not occupationally exposed, employees and self-employed) to report:
  - Exposure/uncontrolled situation having resulted/which could result in exceeding dose limits
  - accidental exposure of a pregnant worker
  - unexpected situation that resulted in the exceeding ¼ of the annual dose limit in one single operation
- Other declarations in parallel (health physics/occupational physician, other public entities/authorities)
- Reporting modalities
- Role of FANC: Support, advice, REX (respect of anonymity)
  - ➡ *No blame, no shame, no name*

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Past incidents and lessons learned.

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2. How to deal with incidents. Health Physics.

Appointed by the operator to ensure the radiation protection of the workers, the public and the environment by his facility including:

- The determination of:
  - The individual doses, including doses resulting from internal exposure and doses due to an accidental exposure or an exposure in an emergency situation;
  - The radioactive contamination of people who's decontamination measures required medical intervention;

  To be done in consultation with the occupational physician!!
- Analysis of the necessary measures to prevent any incident, accident, loss or theft of radioactive or fissile substances;

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2. How to deal with incidents. Health Physics.

- In case of an incident: health physics immediately takes all relevant measures to minimise the identified risk
  - Notifying the occupational physician:
    - If a (professionally exposed) individual has experienced an accidental exposure (whether or not it exceeds the dose limits).
    - If a serious risk of exposure occurs.
  - Investigating the circumstances
  - Evaluating the doses (in consultation with physician!!)
  - Reporting to operator: immediate and preventive actions
- If no internal health physic service ➔ surveillance officer (deputy of the health physics on-site) in early stage, establishes contact with external health physic service

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2. How to deal with incidents.
Health Physics.

- Support to prevent incidents
- Support for analysis and evaluation of doses and procedures after an incident and for implementation of preventive measures

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2. How to deal with incidents.
Recognized occupational physician.

Medical monitoring of professionally exposed workers and evaluation of the health risks associated with exposure to ionising radiation

In case of incident: participation to evaluation of doses (with health physics) and if exceeding dose limits => exceptional medical check including judgment concerning:

- Additional medical examination and/or biomedical analyses
- Emergency medical treatment including decontamination procedure (if required)
- Worker maintained or removed from working station (fit, fit under certain conditions or unfit)
- Continued medical surveillance

Remark: Exceptional medical check legally obligatory only after exceeding dose limits; good practice, after each incident!

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2. How to deal with incidents.
Recognized occupational physician.

Role of support concerning the evaluation of the possible health impact and necessary treatment and follow-up after an incident

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Past incidents and lessons learned.

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   - Irradiation of an industrial radiographer.
   - Industrial worker over-exposed to X-ray.
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3. Some examples of incidents.
Irradiation of an industrial radiographer.

A radiographer went in a bunker where industrial radiography operations using an X-ray unit (225kV - 4mA) were performed. The radiographer thought the irradiation was finished, this was however not the case.

- Exposure of the hand and partial exposure of the thoracic area.
- The active dosimeter registered a dose of 948 mSv.
- The reading of the passive dosimeter resulted in a dose of 1.4 mSv.

⇒Interpretation of doses??

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3. Some examples of incidents.
Irradiation of an industrial radiographer.

Actions by health physics and occupational physician:

- Medical examination (acute effects? Psychological impact?).
- Temporary removal from radiation risk.
- Physical dosimetry and dose reconstruction.
- Cytogenetic (biological) dosimetry (possible high dose on significant part of the body).
- Evaluation and adjustment of existing procedures.

Consequences:

Worker received significant dose and was removed from radiation risk with continued medical follow-up.

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3. Some examples of incidents.
Irradiation of an industrial radiographer.

Debriefing on management of the incident:

(-) Delayed notification of the incident by employer due to human error
(+) Reaction of the health physics within reasonable delay
(+) Medical examination on the day of notification to the physician
(-) Medical examination 'in urgency' by an unrecognized physician
(-) Delayed blood sampling for cytogenetic analyses
(-) No direct communication between health physics & physician in the early phase after notification
(-) Inconsistent communication concerning possible consequences by health physics and occupational physician
(+) Good communication between FANC & the different actors

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3. Some examples of incidents.
Irradiation of an industrial radiographer.

Lessons learned

- Unclear situation and dose information:
  - ⇒ Good communication and understanding between occupational physician and health physics.
  - ⇒ Familiarity with physical basics and measurement techniques of radiation.
  - ⇒ Know-how concerning biological methods for dose estimation.
  - ⇒ Consistent information towards employee/employer.
- Employer expects best possible medical follow-up:
  - ⇒ Medical follow-up by a recognized occupational physician.

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3. Some examples of incidents.
Industrial worker over-exposed to X-ray

In a company producing industrial gauges equipped with X-rays, a worker made a technical operation on such a device while the X-ray beam was in action (shutter was open)=> possible irradiation of his hands. Immediate notification of his hierarchy.

Immediate actions of the operator (surveillance officer):

- Removal of the worker from his working station
- Temporary stop of all other similar working stations
- Emergency reading of the whole body dosimeter : 0mSv
- Contact with external health physics and occupational physician

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3. Some examples of incidents.
Industrial worker over-exposed to X-ray

Actions occupational physician, health physics:

- Investigation on circumstances (day 3)
- Dose reconstruction :
  - Intermediate estimation for hand dose of 40 Gray !!
  - Final conservative estimations: 7.3 Sv right hand; 5.5 Sv left hand
- Medical surveillance (day 0 & day 6): No effects, normal blood analysis
- Cytogenetic test asked by the operator: no biological justification (not enough blood pool in the hands) but psychologically beneficial
- Adjustment of protective collective equipment & existing procedures (avoid any risk of exposure) + worker info session

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3. Some examples of incidents.
Industrial worker over-exposed to X-ray

Medical decision:

- Worker maintained at working station (reassuring medical results, doubts on actual doses received to the hands, no possibilities for changing of workstation)
- Continuous medical follow-up and psychological assistance

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3. Some examples of incidents.
Industrial worker over-exposed to X-ray

Debriefing on management of the incident:

(+) Quick and adequate reaction of the worker and the operator

(+) Medical examination (recognized physician) on the day of the incident

(+) Reaction of the health physics within reasonable delay

(+) Good communication between FANC & the different actors

(-) No direct communication between health physics & physician before day 6 : the communication of preliminary dose estimation to the physician by FANC did not contain enough nuanced information on hypothesis and experimental conditions which caused some stress

(+) Psychological aspects taken into account

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3. Some examples of incidents.
Industrial worker over-exposed to X-ray

Lesson learned

- Importance of a direct and continuous communication between recognized occupational physician and health physics, in particular concerning the process of dose reconstruction.
- Communication on preliminary estimations of the doses between these 2 actors is important and should be accompanied by the assumptions made, the experimental conditions and all other information that allows for a correct and nuanced interpretation by the occupational physician => preparedness for potential appropriate medical reaction while avoiding unnecessary stress (psychological aspect)!

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   - What can the FANC do for you.
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4. Lessons learned from past incidents. Communication and understanding.

Direct communication between occupational physician and health physics is essential!

(FANC should not be the only communication link between essential partners in the analyses of the incident!).

→ Physician needs information concerning incident circumstances and dose for evaluation of health effects.

→ When preliminary dose estimations are communicated: include clarification of uncertainties (psychological impact possible high doses).

→ Health physics needs feedback from occupational physician to ensure consistent information to employee/employer.

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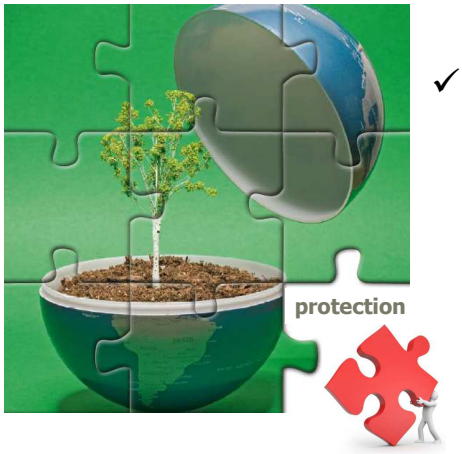
4. Lessons learned from past incidents.
What can the FANC do for you?



- ✓ Additional support and advice.
- ✓ Central point of contact and collection point for:
  - specific information.
  - experience.

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4. Future perspectives. Continued education

- Yearly continual education for occupational physicians (BVS/FANC).
- Status 'new' recognition criteria (art 75):
  - The general principles are already in use:
    - Requirements for initial recognition (3 years; class I, II & III or class II & III).
    - Requirements for renewal (6 years):
      - activity report (www.fanc.fgov.be, professional profile occupational physician)
      - continued education.

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4. Future perspectives. Continued education

- Status 'new' recognition criteria:
  - Continued education will be based on a point system:
    - 20 points/year for class II, III & 30 points/year for class I, II, III
    - Several kinds of activities taken into account, e.g.:
      - Scientific events
      - Local scientific meetings
      - Participation in working groups on medical surveillance of exposed workers/radioprotection
      - Teaching/tutoring activities
      - Publications/studies
      - Planned self directed learning
    - Active/passive role in the activity

It should be easier to reach the requirements!!!

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Q&A

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