Non-Medical Human Imaging
Case Studies
Australia

RASSC47
Vienna, 20-22 November 2019
Overview

• Australian jurisdictions and national uniformity
• Case Study 1 – Proposed use of backscatter X-ray systems for airport passenger screening
• ARPANSA Regulatory Guidance documents
• Case Study 2 – Authorised use of transmission X-ray system for anti-drug smuggling purposes

3 stage process...TRIAL → PILOT PROGRAM → OPERATIONAL USE

• Assessment – licence application & Justification Case
• Licence issue
• Challenges
Australian Jurisdictions

• Federal (Commonwealth)
• 6 States
• 2 Territories
9 Jurisdictions
9 Radiation Protection Acts!
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<tr>
<th>Queensland</th>
<th>New South Wales</th>
<th>Victoria</th>
<th>South Australia</th>
<th>Tasmania</th>
<th>Western Australia</th>
<th>Northern Territory</th>
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<tr>
<td>Queensland Health</td>
<td>Environmental Protection Authority</td>
<td>Department of Health and Human Services</td>
<td>Environmental Protection Authority</td>
<td>Department of Health and Human Services</td>
<td>Radiological Council</td>
<td>Department of Health</td>
<td>ACT Health</td>
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Case Study 1
Proposed use of whole body backscatter X-ray systems for airport passenger screening

• 2010 – ARPANSA approached by the Office of Transport Security (OTS) - possible use of backscatter X-ray systems for airport passenger screening
• A National approach required - uniform approach to authorisation
• Engaged with all Australian jurisdictions, OTS and stakeholders
• ARPANSA Regulatory Guidance published in 2011 after agreement by all jurisdictions:

Guidance:
*Justification and Optimisation of Practices – Human Imaging for Security Screening Purposes Using Ionising Radiation*

The guidance also addresses ICRP 125 *Radiological Protection in Security Screening*
ARPANSA Regulatory Guidance


• Description of backscatter and transmission X-ray systems
• Sets the framework and specifies the criteria to be addressed by the applicant in their Justification Case:

  It is important that any decision on the justification of a new practice and the need for subsequent optimisation of the radiation dose be made at an early stage in the process.

  A formal justification process should be undertaken when considering the use of specific screening systems based on any human imaging technology. The decision to authorise the use of each type of ionising radiation technology for human imaging purposes should be made by the appropriate authority.

However – after all the preparation - the government decided that RF ‘mm-wave’ technology is the preferred option. Whole body backscatter X-ray systems not used.
Case Study 2

Use of Transmission X-ray System for Anti-Drug Smuggling Purposes
Stage 1 - Proof of Concept Trial

December 2011 ARPANSA receives a licence application from Australian Customs and Border Protection Service (Customs) to conduct a Proof of Concept trial on the efficiency of the use of transmission X-ray systems for the detection of illicit drugs concealed within the body of suspected drug couriers.

February 2012, ARPANSA issued Customs with a licence to conduct the trial

• The imaging of humans not permitted under the licence
• Results of the trial satisfies Customs’ Proof of Concept requirements. Customs decides to apply for approval to proceed to a Pilot Program including screening of suspected drug smugglers.
Use of Transmission X-ray System
Stage 2 - 18 month Pilot Program

March & May 2012 Customs gains approvals culminating in amendments to the licence authorising an 18 month Pilot Program.

Non-medical human imaging permitted.

- Time limited licence
- Licence conditions applied
- Dose constraint applied

The licence also specified the information to be recorded and maintained to ensure sufficient data is available to inform a Justification Case and any further regulatory decisions.
Licence Application Received
Stage 3 - Operational Use of Transmission X-ray System for Anti-Drug Smuggling Purposes

November 2013 ARPANSA received a licence application from Customs to authorise the operational use of transmission X-ray systems for the detection of illicit drugs concealed within the body of suspected drug couriers.
Licence Application Assessment

Matters assessed:
• Effective Control over the practice
• Safety Management systems in place
• Radiation Protection measures
• Ultimate Disposal or Transfer of the scanner
• Security of the scanner
• International Best Practice considered
• Any undue risk associated with the practice
• Net Benefit of the practice
• ALARA principles taken into account
• Capacity to Comply
Justification Case for Operational Use of Transmission X-ray Systems

In addition to the licence application ARPANSA required Customs to submit a Justification Case in accordance with ARPANSA Regulatory Guidance: *Justification and Optimisation of Practices – Human Imaging for Security Screening Purposes Using Ionising Radiation*
Justification Case Assessment

Justification

• The need for the practice was established
• Benefits and Detriments evaluated - Net Benefit established
• Available alternatives were considered
• The legality of the practice is in place, and engagement with multiple Government agencies has occurred
• Ethical requirements complied with
• Measures in place to address privacy concerns
• Written information provide to screened persons (English & 33 other languages)
• The use of interpreters if required
• Informed consent required
• Demonstrated maturity of the operating agency confirmed
• The practice should reduce the use of internal concealment as a drug smuggling method
Justification Case Assessment
Optimisation

- Effective dose to scanned persons in the range 1.7 \( \mu \text{Sv} \) to 2.1 \( \mu \text{Sv} \)
- Dose Constraint applied
- Negligible effective dose to operators
- Persons selected for scanning - risk based - intelligence led profiling – referral from policing and criminal investigation agencies. **No mass or random screening**
- Decision to refer suspect for medical imaging based on report provided by Radiologists practicing from a major hospital
- Approx. 85% of individuals scanned were cleared – avoiding medical imaging doses (< 3 \( \mu \text{Sv} \) dose by scanning compared to up to up to 8 mSv CT medical imaging)
- Pregnant women excluded from the scanning procedure
- Persons in need of protection excluded (under 18 years of age – persons suffering mental or physical conditions - persons ill or suffering medical conditions - persons physically unable to undergo the scanning procedure)
Justification Case Assessment
Optimisation (continued)

• Restricted access to the scanner room
• Continuous dose monitoring
• Interlocks and audible alarms
• CCTV monitoring of scanning procedure
• Safety audits performed as part of routine maintenance
• Annual radiation surveys by radiation safety consultant
• Established policies and training responsibilities
• Instructions and guidelines developed for the practice
• Authorised use only by trained personnel – radiation safety – use of scanner system – image analysis
• Refresher training required
Licence Issued

Specific Licence Conditions:

- Quarterly compliance reporting
- Persons operating the scanner must be trained
- Maintenance personnel must appropriately qualified and trained
- Work procedures must be in place that are approved by the licence holder’s Radiation Safety Committee or Radiation Safety Officer
- Compliance with American National Standard Radiation Protection for Personnel Security Screening Systems Using X-rays or Gamma Radiation (ANSI/HPS N43.17-2009)
- Dose constraint applied
- Ensure screening is conducted with discretion in terms of the number of individual scanned and the number of scans per individual.

Compliance Monitoring:

- ARPANSA compliance inspections conducted under an established Inspection Program
Licence Update

To enhance regulatory oversight as to whether the non-medical human imaging continues to be used in a justified and optimised manner, ARPANSA is considering amending the licence so that the following information must be reported:

- Number of persons scanned
- Number of international arrivals
- Number of persons referred to the cooperating medical facility for further assessment
- Number of persons confirmed with concealed items
Challenges

- Non-medical human imaging – relatively new to operators, government and regulators
- National uniformity issues
- Development of practical guidance
- Collection of relevant and sufficient data to inform decisions
- Justification case – assessment & decisions based on experience
- After authorisation – Ensure operational use is consistent with the that described in the licence application & justification case

https://youtu.be/mASTN1unAEY
THANK YOU

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