Environmental Risk Assessment of UV Phototherapy Centres in Ireland

Neil O’Hare
Medical Physics & Bioengineering Dept.
St. James’s Hospital
UV Users Group

- Approx 2001 – started to pull together a UV Users group for ROI.
- Involvement of Dermatologists, Nurses, Physios and Physicists
- Desire for guidance and support.
Objectives

- An environmental risk assessment was carried out at 11 of the 20 Phototherapy centres in Ireland.

- The study involved the assessment of a number of areas:
  - Patient & Staff Safety
  - Room Design
  - UV Leakage / Staff Exposure Measurements

- The aim of this study was to identify hazards in Phototherapy centres and present recommendations for reducing these common risks.
Methodology

- Assessment in the form of questionnaire.
- Filled out during site visit with assistance of Dermatology / Physiotherapy staff.
Methodology

Survey addressed aspects such as:

- **Patient Safety**
  - Perspex shields, handrails, shields / goggles, non-skid flooring, information leaflets, etc.

- **Staff Safety**
  - Training, exclusion zones around cabinets; shields / goggles, incidences of over exposure

- **General Safety**
  - Storage of tubes, electrical safety aspects, ventilation, separate room for skin testing, etc.

- **Room Layout**

- **Stats on Phototherapy Units**
  - Manufacturer, age, etc.

- **Leakage Measurements**

- **General Comments**
Results – Patient Safety

- Results showed that overall there was a good level of safety awareness amongst staff regarding both patient & staff safety.

- Patient safety:
  - 100% of PUVA wholebody cabinets had no perspex shields
  - 82% of centres have good air conditioning systems.
  - In 100% of centres, staff are present in treatment area at all times.
Results – Patient Safety

- At each centre, patients wear either UV-opaque goggles or face shields.
- All patients are given an information leaflets.
- Four (36%) of the Phototherapy centres are relying solely on the internal detectors in whole-body cabinet to determine the dose.
- In three Phototherapy Centres, it was found that there are no “Radiation Hazard” or “Authorised Personnel Only” warning signs either on the walls of the treatment area or on the front of UV units.
Results – Staff Safety

- It was found that some training regarding UV safety and hazards was given in all centres.

- Typically this involved one member of staff attending a training course and then training other staff members in-house.

- This response shows an improvement on a previous study where staff members in three centres in Ireland received no UV Phototherapy training [Donohoe et al, 2001].
Results – Staff Safety

- Protective equipment is used in all centres by staff.

- 1 centre reported an incidence of erythema as a result of occupational exposure.

- Staff are aware of the need to keep a distance away from open-front units such as skin-testing units.

- 1 centre stated that they do not use either sunscreen or gloves.

- 2 centres stated that gloves or sunscreen are only used occasionally.
Results – Staff Safety

- Doors on cabinets can be opened to a significant distance before the door sensors cause the exposure to terminate.

- Leakage measurements showed that the Maximum Permissible Exposure (MPE) could be exceeded by as little as 2 minutes in front of this door opening:
  - distance = 15cm
  - measured TL01 leakage = 2.50mW/cm²

- This would be a worst-case scenario. The exposure will be dramatically reduced by the use of personal protective equipment such as UV-opaque clothing, goggles and gloves.
## Results - Average Leakage UVR

<table>
<thead>
<tr>
<th>Location</th>
<th>Staff Desk</th>
<th>Inside Curtain</th>
<th>Outside Curtain</th>
<th>Wholebody Unit (Door Opening)</th>
<th>Wholebody Unit Base</th>
<th>Wholebody Unit Top (Direct)</th>
<th>Wholebody Unit Top (Indirect)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UVA (mW/cm²)</strong></td>
<td>0.00</td>
<td>0.05</td>
<td>0.01</td>
<td>2.48</td>
<td>0.57</td>
<td>2.45</td>
<td>0.45</td>
</tr>
<tr>
<td>(0.00–0.00)</td>
<td>(0.00–0.37)</td>
<td>(0.00–0.08)</td>
<td>(0.00–9.40)</td>
<td></td>
<td>(0.00–1.00)</td>
<td>(1.00–3.70)</td>
<td>(0.00–1.30)</td>
</tr>
<tr>
<td><strong>Maximum Duration (mins)</strong></td>
<td>N/A</td>
<td>326</td>
<td>N/a</td>
<td>7</td>
<td>29</td>
<td>7</td>
<td>37</td>
</tr>
<tr>
<td><strong>TL01 (mW/cm²)</strong></td>
<td>0.00</td>
<td>0.03</td>
<td>0.00</td>
<td>1.08</td>
<td>0.25</td>
<td>1.54</td>
<td>0.13</td>
</tr>
<tr>
<td>(0.00–0.01)</td>
<td>(0.00–0.15)</td>
<td>(0.00–0.01)</td>
<td>(0.00–2.60)</td>
<td></td>
<td>(0.12–0.56)</td>
<td>(0.44–2.44)</td>
<td>(0.00–0.35)</td>
</tr>
<tr>
<td><strong>Maximum Duration (mins)</strong></td>
<td>N/a</td>
<td>186</td>
<td>N/a</td>
<td>5</td>
<td>20</td>
<td>3</td>
<td>39</td>
</tr>
</tbody>
</table>

23 May 2007

Neil O'Hare
Results - Leakage UVR

- Inside the treatment area / curtain, the MPE for TL01 radiation could be exceeded in just over 3 hours.

- Reflected radiation can also be significant (MPE could be exceeded in 39 mins).

- It is important that staff wear protective clothing at all times within the curtained treatment area.

- The amount of reflected radiation can be reduced by painting the ceiling a matt black colour. This was the case in one Phototherapy centre and the measured reflected radiation was almost zero.
Results – General Safety

- Electrical safety tests were performed on wholebody cabinets to assess the Earth Leakage Current and the Protective Earth Resistance. It was found that all units were within acceptable limits for permanently installed devices.
Results – Phototherapy Units

- Details on Phototherapy equipment currently in use was recorded. Information on 44 units in total was recorded and of these, only one wholebody unit was greater than ten years old.

- A large percentage of the units (82%) have only been in use for six years or less.
Recommendations

- Good air-conditioning systems: Installed directly over each whole-body treatment cabinet, and in any adjoining skin-testing rooms.

- Staff should also ensure that all gloves, including disposable gloves are UV opaque.

- Warning signs should be used to mark areas where UVR is being used and to classify equipment which is for use by authorised staff members only.

- Keys for operating wholebody cabinets should be locked away at the end of each clinic to prevent unauthorised use.
Recommendations

- Staff should be aware of the hazard from UVR leakage when opening the door on wholebody cabinets.
- Staff should also be aware that there may be significant levels of UVR exposure from reflected radiation in the treatment area.
- Family members accompanying the patient should also wait outside the curtained area.
- Curtains must provide floor-to-ceiling coverage and be UV-opaque.
Conclusions

- Overall: good level of risk management in Irish Phototherapy centres.
- Clinics are generally well designed, with separate rooms for skin-testing units and curtains used to prevent stray UV radiation from exposing staff and patients.
- Consistent use of protective equipment for both patients and staff. This is reflected in the low incidence of erythema from occupational exposure.
- Strong interest in UV Research by staff and results are encouraging.
- Phototherapy centres in Ireland are becoming more standardised and continued research and education on UV safety is recommended to maintain high standards.
A bit of perspective....
Thank You