Introduction

Safety assessment of chest x-ray (CXR) facilities was performed by examining the levels of scattered and leakage radiation around the X-ray machines of selected public hospitals. Dose rate maps around a polymethylmethacrylate (PMMA) phantom were generated to identify points of minimum and maximum exposure inside the treatment room. Radiation levels at the control booth were also measured from which annual doses were calculated.

Chest X-ray (CXR) Examination

Chest X-ray exam is the most commonly performed and repeated radiographic procedure due to its efficiency in screening and diagnosis of diseases like pneumonia and tuberculosis which are the 4th and 6th leading cause of death in the Philippines.

Sources of Exposure

- Primary Radiation
- Scattered Radiation
- Leakage Radiation

Results and Discussion

Scattered Radiation Dose Rate Maps

Dose rate maps of hospital B showed that the level of scattered radiation decreased as the distance from the center of the phantom was increased. Largest drop was observed at 225° for the AP projection with dose rate at 200 cm dropping to 1.1% of that in 50 cm. The AP projection resulted to higher levels of dose rate around the phantom due to a shorter source-to-image distance than the PA projection.

Leakage Radiation Test

Leakage test showed that the leakage radiation were well within the limit of 1 mSv/hr set by the regulation.

Control Booth Measurements

CXR rooms for both hospitals are dedicated for emergency patients and are operational 24/7. These hospitals have an average of 80-150 patients/day. Thus, the computed annual doses were 1846 nSv/yr for A and 20.34 nSv/yr for B. These doses were way below the 20 mSv/yr occupational dose limit.

Materials and Methods

Scattered Radiation Measurements

Two projections were considered: postero-anterior (PA) and antero-posterior (AP). Scattered radiation measurements were taken at distances 50, 100, 150 and 200 cm at different angles around the phantom and at specific points of the control booth using a Unfors Xi survey meter. Exposure parameters used in clinical practice were implemented.

Leakage Radiation Measurements

Leakage radiation was measured 100 cm from the focus at each of the four sides of the x-ray tube.

Controlles Booth Measurements

Dose Rate (µSv/hr)

<table>
<thead>
<tr>
<th>Machine</th>
<th>Cathode Side</th>
<th>Anode Side</th>
<th>Tube Front</th>
<th>Tube Rear</th>
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<tbody>
<tr>
<td>A</td>
<td>0.05</td>
<td>2.64</td>
<td>0.132</td>
<td>0.093</td>
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<tr>
<td>B</td>
<td>5.962</td>
<td>5.969</td>
<td>5.043</td>
<td>4.578</td>
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<tr>
<td>C</td>
<td>2.37</td>
<td>0.149</td>
<td>0.011</td>
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</tr>
</tbody>
</table>

Conclusion

Through the scattered and leakage measurements inside the exposure room and control booth, it was proven that existing procedures do not pose a significant threat on the patients, medical personnel and general public.

References


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