



Service Priorities and Programmes
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Upcycle process as an added value to the quality assurance program in lead apron against ionizing radiation: from personnel to patients and budget saving aspect

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Introduction

Lead aprons are used in protection against ionizing radiation by medical personnel and under quality assurance program in our institution to ensure their shielding integrity by X-ray imaging method. Defective aprons, defined in the program to have holes, tears or cracks larger than 3 mm, are normally discarded. We describe an upcycle process of defective aprons by optimally cutting those defect free portions into different sizes of blanket to cover radioactive regions in nuclear medicine patients during positioning in order to reduce the occupational exposure to personnel. This practice is also applicable to reduce interventional radiologist exposure from patients infused with radioisotope. Larger size blankets are used as screens during mobile radiography in wards.

Objectives

The upcycle of defective lead aprons, as an added value to the quality assurance program, can be used to personnel and patients as well as a budget saving aspect to Hospital.

Methodology

The defect free regions are optimally cut into different size blankets with plastic wrap for easy cleaning. Some of them are large enough to cover abdomen and pelvis in nuclear medicine patient so that radiation exposure to personnel during patient positioning is reduced. Another application is to cover the abdominal part of patient undergone selective internal radiotherapy under interventional technique to reduce the radiation exposure to radiologists. Larger size blankets are used as shielding screens to intercept radiation scattered from patient undergoing mobile radiography in ward to reduce the exposure to other patients in the imaging vicinity. Measurements have been performed to ensure the effectiveness using these upcycled lead lined blankets in various applications.

Result

The average occupational exposures of personnel from nuclear medicine patients with lead lined blanket covered on abdomen and pelvis during positioning are significantly reduced by a factor of 10 when compared between patients with and without using the blanket (paired t-test, $p < 0.01$). The use of lead lined screens in ward results in a dose reduction of factor of about 20 when compared between patient imaging with and without the screen in place. Commercially available blankets of similar sizes are of cost HK\$10,000 per piece. Therefore the upcycle process saves Hospital budget on these items. The upcycled defective lead aprons extend their clinical application not only to personnel using them but also to patients nearby the mobile radiography and to Hospital budget saving.