

# Quality Assurance of X-Ray Protection Clothing at the University Hospital Basel

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## Introduction

It is required that for each X-ray unit there is enough X-ray protection clothing available and it must be employed sensibly [1]. The protection effect depends on the lead equivalence of the material and the energy of the radiation. It also depends strongly on the condition of the material involved. To evaluate the safety of protective clothing we have been performing regular and standardized quality checks at the University Hospital Basel since 2003. The results demonstrate that about 22% of all tested clothing shows defects of the protective layers. All protective clothing is prone to such defects irrespective of age and type of material used.

## Material and Methods

On average we check about 360 pieces of protective clothing in eight departments each year. We defined two distinctly different methods for testing the material: visual and/or by palpation versus using a fluoroscopy unit. According to our judgment as critical positions we established well defined spots for testing on the different pieces of clothing (like e.g. vests, skirts, surgical aprons). The seams are considered mandatory test points. By clearly defining the test positions on the clothing the development of an incipient defect can be traced from one to the next testing cycle. The considered piece of clothing is examined for breaks, tears and discontinuities by palpating with the hands. The questionable positions are marked and made visible under fluoroscopy in addition to the predefined testing spots. For the fluoroscopy we use the following set up parameters: 70 kV, maximum focus-film or image intensifier distance, large focus, field size of 20 cm by 20 cm. The detected defects are classified according to their potential consequences: insignificant, tolerable and under observation, severe. The defects are captured with an X-ray and the results are archived.

## Results

According to our results about 22% of the tested items (357 in total for the year 2008) show defects (from insignificant to severe), where wrap around aprons, skirts and vests are affected most. Two types of material are in regular use in our hospital: lead-vinyl and Xenolite (lead-free material). The items made from Xenolite have been reduced in number by one third over last years and the remaining Xenolite items show more than 50% defects. The corresponding number for lead-vinyl is less than 20%. The visual inspections show an increasing number of defects over the inspection period. We also find increasing numbers of defects that can be detected only under fluoroscopy. In some cases we could clearly follow the development of the defects in the course of time, i.e. the affected regions became thinner and thinner and tears showed in exactly these locations.

## Discussion

The result of 22% defects for all X-ray protective items clearly show the necessity for regular quality checks. One of the main reasons for the development of defects is the careless handling of the objects what leads to demonstrable tears and breaks. The seams often seem to be the origin for tears. It is particularly noticeable that already relatively new items show regions of increased transparency and irregular thickness. It can be assumed that the results are not specific for the Basel hospital and a comparison with corresponding results from other hospitals would be desirable.

## Reference

- [1] Bundesamt für Gesundheit: Schutzmittel für Patienten, Personal und Dritte in der Röntgendiagnostik, Merkblatt R-09-02 vom 29.1.2003