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Quality control of individual radioprotection equipment: methodology and organization in the University Hospitals of Geneva

Introduction: In 2018 the new Radioprotection Ordinance in Switzerland came into forced requiring the radiation protection equipment to be checked annually for its proper performance. Indeed, to provide safe operating conditions for staff working with ionizing radiation, the personal protective equipment (PPE)(protective aprons, skirts,jackets,goggles and thyroid shields) should be checked at least once a year. It is up to the radiation protection expert to make an inventory of the existing radiation protection equipment in the institution and to setup a quality control procedure to ensure its performance. A lot of work has been done with the hospital's internal equipment management database system (EMDS) to identify and include the protective equipment in the follow up system. Moreover, a quality control procedure has been established considering the most logical and optimized method inside the Institution. We present here the preliminary results.

Materials and methods: self-adhesive labels were used to identify all 670 radiation protective equipment and the information gathered into the EMDS. Once identified, the aprons, skirts, jackets and protective thyroid shields were tested using different methods: first visually (tear in the outer layer, defects at the fasteners) then tactilely (suspicious mass, internal tear, tear at the fasteners/seams) *(fig. a, b, c and d)* and at the end radiographically. For this last method, several options were considered but the EOS® system was chosen since it provides 2 acquisitions at the same time front/profile *(fig. e, f, g, h, i and j)* in vertical position (wearing position) and without further exposure of the staff. A score, established according to the location of the detected defects *(fig. k)* is provided and the results qualifies the equipment as: 0-2 -> OK; 3-5: to be withdraw in the coming months (until new replacement equipment arrives); larger than 5: waste.

Results: Quality controls are time-consuming, requiring extensive logistics. Three students checked nearly 400 pieces of equipment. The preliminary results of the comparison of the visual and tactile checks performed by different inspectors shows a great disparity in the rate of agreement, from 58% to 91% of agreement depending on the point checked. Furthermore, it turned out that there was only 50% agreement between the visual/tactile and radiological inspection results. The equipment were scored and the results validated by a radioprotection expert. In total, on the 400 equipment checked, 15 items were deemed non-compliant for clinical use and were withdrawn, 10 had an intermediate result and should be changed in the upcoming months. Concerning their lifespan, major defects were observed on equipment over 6 years old used in operating theaters, cardiology and angiology rooms.

Conclusions and outlook: Visual and tactile checks are insufficient to guarantee the integrity of personal radiation protection equipment, imaging is therefore necessary. We observe that their lifespan depends greatly on their use but also on their storage. A more detailed analysis of the data (being collected) will allow us to define an expiry date for PPE according to their class of use, allowing us to target quality controls while offering controls on demand.

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