

Old and outdated radiology equipment in Croatia – radiation safety and economic consequences

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Introduction

Ionising radiation from medical imaging accounts for a considerable proportion of the radiation exposure experienced by the general population. The benefit of imaging and interventional procedures is well known, but also carries some risks. Appropriate quality and security of radiological services can be achieved only with the use of state-of-the-art imaging equipment, the operation and maintenance of which is technically demanding. The ESR position statement¹ adopted general rules endorsed by The Canadian Association of Radiologists regarding the life cycle of various types of equipment². Radiological equipment up to 5 years is state-of-the-art, properly maintained equipment between 6 and 10 years old is still suitable for use, and equipment older than 10 years is no longer state-of-the-art and replacement is essential¹. It is recommended that more than 60% of the installed equipment in radiology departments should be less than 5 years old, less than 30% 6–10 years old, and less than 10% should be older than 10 years^{1,3}.

Materials and methods

The data on the number and age of CT, angiography and mammography units installed in Croatia were collected on November 1, 2014, and compared with available data from other European countries. The sources for the data were the radiology equipment registry of the Croatian State Institute for Radiological and Nuclear Safety and COCIR's country age profile overview for 2013¹.

Results: The percentage of angiography and CT equipment classified according to age are given in Tables 1 and 2.

AGE(YEARS)/COUNTRY	CROATIA	SERBIA	ROMANIA	GERMANY	UK	EUROPE
0-5	46.6%	40%	33%	47%	40%	42%
5-10	10%	55%	62%	30%	42%	37%
10+	43.4%	15%	5%	23%	18%	21%

Table 1. The age of angiography equipment in surveyed countries with comparison to EU average.

AGE(YEARS)/COUNTRY	CROATIA	SERBIA	ROMANIA	GERMANY	UK	EUROPE
0-5	22%	35%	66%	50%	45%	50%
5-10	32.5%	45%	29%	39%	45%	38%
10+	45.5%	20%	5%	11%	10%	12%

Table 2. The age of CT equipment in surveyed countries with comparison to EU average.

Mammography units in Croatia classified according to age: 17% 0-5 years, 21% 5-10 years, and 62% more than 10 years.

Taking into account number of exams per year, the radiology equipment in Croatia falls into the middle of the equipment utilisation range, based on guidelines adopted from the Canadian Radiological Society. Accordingly, life expectancy for angiography and CT scanners is 10 years, and for mammography 9 years. Hence, the percentage of outdated equipment is 43.4%; 45.5% and 67%, respectively.

Discussion

Radiology is the main source of man-made ionising radiation today for the public, with angiography and CT as procedures with high doses per exam, and mammography as a procedure used in nationwide screening programmes. The state of radiology equipment in use today is not satisfactory. Compared to countries in the region with comparable economies and developed EU countries, Croatia has the highest percentage of old angiography units (>10 years), with the oldest one installed in 1986. There is also a considerable amount of up-to-date equipment, resulting from the replacement of units which have been out of service for years due to inappropriateness and frequent faults. The situation is similar with CT units, with almost a half of them older than 10 years, some of which are even located in clinical hospitals. However, some new technically advanced units have been placed in institutions of local importance with low patient workload.

Sixty-two percent of mammography units are more than 10 years old, and nationwide screening programmes will become questionable if new equipment is not urgently acquired. At the beginning of the programme, 8 years ago, more than a hundred mammography were at the 10-year limit. Subsequently the equipment was rarely renewed, and recently only a half of the units are of satisfactory age. Older analogue units cannot be included in an up-to-date communicating environment. Mammography is a justified preventive procedure only if high image quality is achieved with a reasonable radiation dose. Despite the best efforts of a quality assurance and quality control programme, the technological conditions could prevent the programme from continuing if new equipment does not become available soon.

New technological breakthroughs render some equipment obsolete altogether. If the estimated cost of maintenance per year amounts to 5–6% of the price of a new device, then outdated equipment is actually quite expensive^{4,5}. Older and outdated radiology equipment does not represent state-of-the-art technology, is less reliable, needs more maintenance, carries a higher risk of failure and breakdown and decreases diagnostic accuracy, especially if overused or not adequately serviced^{2,6,7}. Since the devices for patient dose measurement and display are lacking in older equipment, it may expose patients and staff to unacceptable radiation levels.

Conclusion

Croatia has an unacceptably high proportion of old and outdated radiology equipment. Radiologists should control the quality of the equipment in use and have an impact in decisions in the process of comprehensive planning and renewal. This has both safety and economic consequences, and will help guarantee that the benefits of radiological procedures outweigh the risks and provide a good health service for a reasonable price.

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