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Abstract:

Malaysian Nuclear Agency through its Medical Physics Group has been providing Quality Control (QC) services for medical X-ray apparatus used in diagnostic radiology to private clinics and hospitals since the year 1997. The Medical Physics Groups services is endorsed by the Malaysian Ministry Of Health (MOH) and is in accordance with the Malaysian Standard MS 838 and the Atomic Energy Licensing Act, 1984. Until today, the scopes of testing services also include all types of medical x-ray apparatus. The quality control (QC) in diagnostic radiology is considered as part of quality assurance program which provide accurate diagnostic information at the lowest cost and the least exposure of the patients to radiation. Many experience and obstacles were faced by Medical Physics Group. This paper will discuss the experiences and achievements of providing QC service from early stage until now so that it can be shared by the citizens of the Malaysian Nuclear Agency. The results of quality assurance inspection of all types of X-ray apparatus for medical conducted by Agency Nuclear Malaysia will be presented in brief.

INTRODUCTION

Quality control (QC) checks for the X-ray apparatus is an important practice in quality assurance programs in medical diagnostic radiology. The World Health Organization (WHO) has described quality assurance in medical diagnostic X-ray as a business carried on by the employee to inspect the equipment to ensure that diagnostic images produced are of high quality, provide enough information on the cost of the lowest minimum radiation exposure to the patient. The Medical Physics Group was established in 1995 with the objective, among others, is to control the quality of X-ray diagnostic apparatus in the country. Malaysia Nuclear Agency (NM) has been approved conducting related activities in 1997. This approval covers inspection, testing and verification of irradiation apparatus and the monitoring of radiation protection for medical purposes. Until today the scope of testing already covers all X-ray modalities such as general X-ray, fluoroscopy (including lithotripter), mammography, dental, bone densitometer, and computed tomography (including PET CT).

OBJECTIVE

This paper will discuss the experiences and achievements of providing QC services to radiological centers including clinics and hospitals throughout the country.



Figure 1 : Type of X-ray modalities

RESULT AND DISCUSSION

Table 1 : The table indicates achievements during the year 1998 to 2014 according to the type of apparatus and the X-ray test.

Type of Apparatus	Number of machine	Percentage (%)
General X-ray	2804	72.2
Fluoroscopy	497	12.8
Mammography	184	4.7
Computed Tomography	124	3.2
Dental	211	5.4
Bone Densitometer	63	1.6

Table 1 indicates medical X-ray apparatus QC achievements that are based upon Nuclear Malaysia QC from the year 1998 to 2014. During the QC services, namely from 1998 to 2014, more than 400 clients have been dealing with Malaysian Nuclear Agency. Clients are comprised of hospitals and government clinics, medical centers and private clinics throughout the country. Majority of customers is made up of a medical practitioner clinics. Throughout the experience conducting QC, no major problems are observed concerning the safety of the mechanical and electrical installations. The X-ray apparatus has been installed properly and satisfactorily.

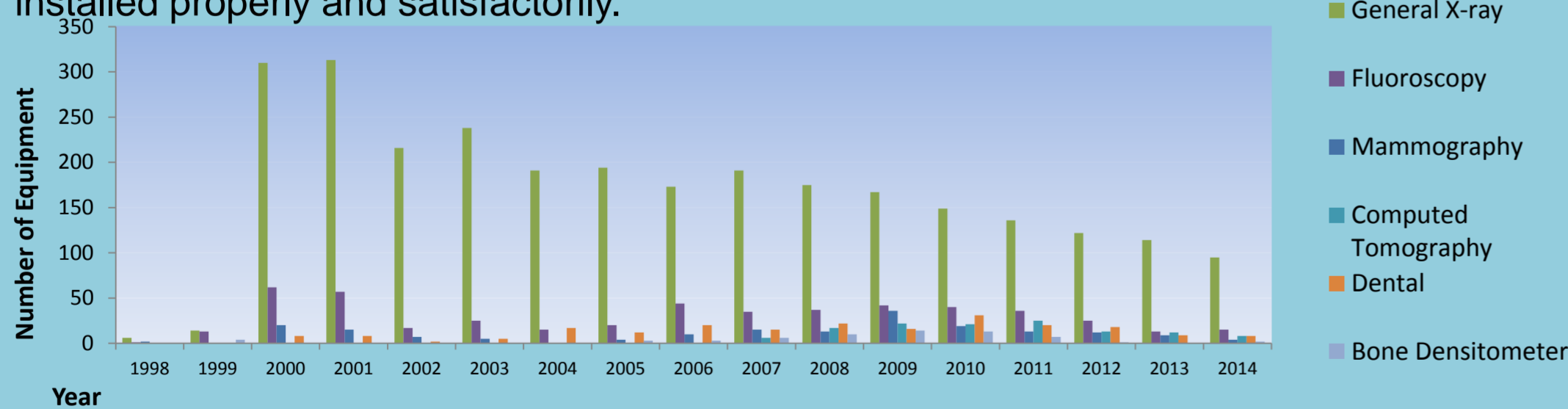


Figure 4 : Distribution of the number of QC achievements from 1998 to 2014

At the beginning, most of the X-ray apparatus does not meet the standard and performance criteria as set by the Ministry Of Health (MOH). For example, in 2000, QC tests carried out on beam irradiation apparatus; it is found the non-compliance recorded as high as 61%. However, this problem is resolved after the QC program implementation. The coming years the standard and performance criteria for X-ray apparatus is improving. Starting in 2004 and subsequent years the QC recorded a successful 100% compliance rate.

CONCLUSION

Service quality control in diagnostic radiology is the core and the strength of the field of Medical Physics in Malaysia Nuclear Agency, whose activities involve huge investments and efforts to improve health services and contribute to the income of the Malaysian Nuclear Agency. The existence of the Medical Physics Group as one of the QC provider is important in providing benchmarking R&D in order to constantly improve or enhance the Quality Assurance program in Diagnostic Radiology in Malaysia. The aim is to improve the understanding of the R&D and innovation in QA services in diagnostic radiology.



Figure 2 : Testing procedure

MATERIALS AND METHOD

In general, QC of facilities for X-ray apparatus comprises three main aspects ;

- I. Mechanical and electrical safety checks
- II. Radiation protection checks
- III. Performance and safety standards of X-ray tube & generator
- IV. QC test of associated facilities such as darkroom and film processor

The measurement are done by using Malaysian Nuclear Agency protocol and with the approval of the MOH. The equipments used (test tools) have valid calibration certificate. This standard was developed based on the Malaysian Standard MS 838 and some other International Standards. In cases where the performance of the X-ray apparatus does not comply with the standards allowed, non-compliance are reported clearly and owner of X-ray apparatus is informed for the purposes of repair.

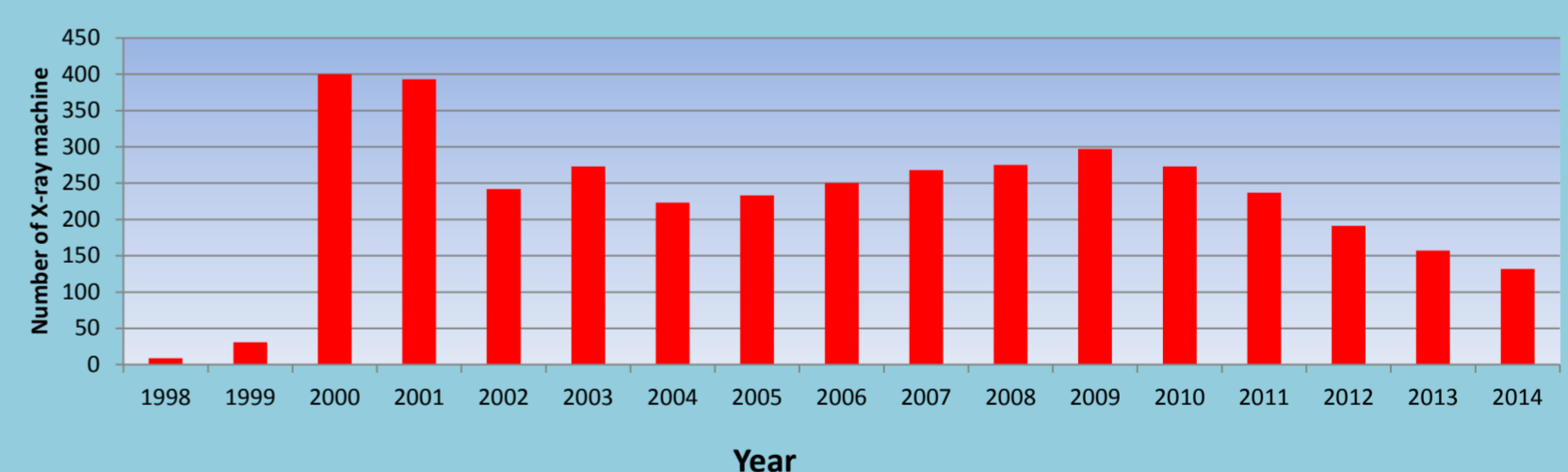


Figure 3: Overall QC achievement (1998-2014)

From figure 3, the performance of QC services peaked from 2000 up to 2001, as a quality control program has been enforced by the Ministry of Health in 2000 under the Atomic Energy Licensing Act 1984 (Act 304). At that time the Malaysian Nuclear Agency is a pioneer and the first government agency with license H to run the service. However, since 2001 the achievement of quality control services deteriorating because more and more companies that have been obtaining class H license. As of 2014 there are nine companies that are legally registered to carry out activities license class H. The strategy undertaken by each company to do business.

It is quite difficult for a government to compete with such companies, especially in terms of price, package services, even the NM QC services are recognized among the best. The NM QC services provided are not purely profit-oriented. Elements of R&D is also emphasized for improving the health and knowledge.

After the implementation of QC, many clinics are realizing the importance of the security aspects of radiation protection and take steps to comply with the safety standards of radiation protection as specified. On this day nearly all the clinics have an X-ray apparatus with a systematic organization of radiation protection. In providing services to Sabah and Sarawak, logistical and financial problems are among the challenges that had to be faced. However, all these problems are solved through cooperation between the staffs.

REFERENCES

- [Standard and Industrial Research Institute of Malaysian Standard (SIRIM), Code of Practice for Radiation Protection (Medical X-ray Diagnostic) MS 838 : 1983.
A.A. M Ramli, M.J.M.Isa, H. Salleh, M. R. Arsyad, A.T. Aliyasaq, Z. Jamaluddin., Kawalan Mutu bagi Radas Sinar X-Diagnostik Perubatan, MTC MINT, 2001.
Malaysian Institute for Nuclear Technology Research (MINT), Performance and Safety Testing Procedure for General X-ray Apparatus and Associated Facilities, Unpublished Document, October 2001.
A.A. M Ramli, M.J.M.Isa, H. Salleh, Quality Control: A Measure For Optimization Of Dose In Diagnostic Radiology, Seminar R&D MINT, 2002.
M.K. Matori, A.A. M Ramli, M. J. M. Isa, H. Salleh, M. R. Arsyad, A.T. Aliyasaq, Z. Jamaluddin, Quality Control In Diagnostic Radiology For General X-ray Machine : MINT's Experience, MTC MINT, 2003.
M.K. Matori, A.A. M Ramli, M. J. M. Isa, H. Salleh, M. R. Arsyad, A.T. Aliyasaq, Z. Jamaluddin, Quality Control In Diagnostic Radiology : Experience and Challenges, MTC MINT, 2005.