

EVALUATION OF DIAGNOSTIC RADIOLOGY SERVICES IN FIVE LATIN AMERICAN COUNTRIES: RESULTS FOR MAMMOGRAPHY

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Abstract

Under the auspices of PAHO/WHO, a multicentric investigation is carried out in five Latin American countries. Its aim is to correlate quality indicators of radiology services with the accuracy of the radiological interpretation as determined by a panel of experts. We present preliminary results from mammographic imaging facilities, which indicate that the failure to comply with the international standards of quality control produces images of unacceptable quality, as measured either by using a phantom or by an independent evaluation of the clinical images.

1. Introduction

Quality assurance programs in health services, in particular in radiology services are slowly being implemented in Latin America and the Caribbean some under Government Regulations. They will require the conjunction of strong political will, financial support and professional training to become a relevant factor in the routine service offered by radiological facilities. The Pan American Health Organization/World Health Organization, (PAHO/WHO) coordinates and partially funds an investigation aimed at *correlating quality indicators of radiology services with the accuracy of the radiological interpretation*. Grants have been awarded to government, academic and/or professional multidisciplinary teams in Argentina, Bolivia, Colombia, Cuba and Mexico to pursue these studies following common procedures based on internationally accepted protocols. The project should be completed after 12 months of work, and here we present preliminary results obtained during the first half of the grant duration.

2. Experimental procedure

2.1. Selection

The selected pathologies (and their associated radiological technologies) are: breast lumps (screening and diagnostic mammography), gastrointestinal ailments (radiography and fluoroscopy), back pain (computed tomography) and tuberculosis (radiography). The selected services belong to the medium complexity classification and are located in urban areas. The common quality control protocols are based on those endorsed by the American College of Radiology (ACR) [1], the American Association of Physicists in Medicine (AAPM) [2], the European Community (EC) [3], etc. The panels of radiology experts in charge of evaluating the accuracy of the radiological interpretation are endorsed by the national radiological societies.

2.2. Documentation

Records are collected in relation to the population covered by the services (public vs. private), the type of facility, the patient workload, the radiological, imaging and processing equipment and supplies, the staff education and training, the quality assurance and maintenance programs and the radiation safety standards.

2.3. Measurements

The measurements performed include the evaluation of devices (X-ray units, image receptors, and image processors), darkroom and viewing conditions, patient dose, and image quality. The clinical film evaluation by the expert panels considers imaging aspects (view and labeling, patient positioning, contrast and latitude, and artifacts) as well as the radiological interpretation report performed at the radiological service by the local physicians.

3. Results for mammography

Results from the study of mammography services are available from the five teams. The IFUNAM group evaluated a total of 31 parameters in three mammo units [4] functioning in two Mexico City public hospitals. The out-of-compliance results corresponded to beam collimation and alignment (in the three units), viewbox illuminance and homogeneity (in the three units), and darkroom conditions. One of the units, "Number 1", operated at an X-ray tube potential 10% higher than the nominal value and the cleanliness of the intensifying screens was considered totally unacceptable. In this unit "Number 1", chemicals' temperature in the two film processors was monitored during one month, finding unacceptable results (discrepancy larger than 2° C between the unit temperature reading and that given by the control thermometer). Image quality was evaluated using the ACR accreditation phantom under five technical factors, as indicated by the ACR protocol [1]. Unit Number 1 failed the criterion for acceptable contrast, optical density and resolution at all five tube factors. The other two systems passed the test in either one or two, out of the five technical modalities. Mean glandular doses were calculated out of kerma in air measurements performed according to the ACR manual; the obtained values are 1.4, 1.6 and 1.0 mGy respectively.

The RFSF group studied four mamography units, each at a different hospital in the city of Santa Fé. All systems passed the 8 tests performed on the equipment performance (focal spot size, beam alignment, tube potential accuracy and reproducibility, timer accuracy, HVL, air kerma rate, SID, leakage radiation). However, all of the viewboxes were out-of-compliance due to their poor illuminance homogeneity. The radiological interpretation study was performed with 25, 20 and 16 clinical images obtained in three of the hospitals. The image quality was evaluated by a Panel that gave qualifications equal to 2.9, 3.2 and 4.2, over a maximum of 5. The lowest grade was due to finding 24/25 films dirty, 17/25 scratched and 12/25 with artifacts which simulated microcalcifications. The positioning was evaluated by the Panel with grades equal to 3.3, 4.3 and 3.6 over a maximum of 5. The diagnosis by the Panel coincided with that by the hospital facility in 60/61 cases.

The CCEEM group evaluated 255 clinical films corresponding to 80 patients in 2 hospitals. Positioning problems were detected and correlated with technologist training. The radiological interpretation by the Expert Panel coincided with that by the institution in 68/80 patients. Of the 80 patients, 27 received fine needle aspiration biopsy, as part of their clinical management. In 21 of them, the biopsy was done in patients where the panel and the facility physician

concluded in the radiological interpretation. 2 biopsies confirmed the institution's assessment, and 4 concurred with the Panel.

The IBTEN group evaluated 64 clinical films from 28 patients obtained at 2 hospitals and one clinic. The Panel detected positioning problems as well as inadequate film labeling for 27/28 patients.

The INCAN group performed quality control measurements on 3 units belonging to 2 hospitals in Bogota. 24 tests on equipment performance were used. The units were out-of-compliance in 4%, 4% and 30% of these tests, respectively. The system which presented the most serious problems, "Hospital 2", lacks a maintenance program and the radiation safety conditions were considered inadequate. The mammo Expert Panel analyzed 20 films obtained with this same system. The results showed that none of the films had a label recording the technical parameters. Furthermore, 28% of the oblique and 18% of the craneocaudal views were considered non acceptable in terms of technical quality, and 45% of the films were considered to present a non acceptable optical density.

4. Conclusions

We have presented partial results for the evaluation of mammographic equipment performance, image quality, dose and radiological interpretation corresponding to 14 systems in five Latin American countries. Even though the study is still in progress, some general results seem to appear already. The UNAM and INCAN results indicate a correlation between the failure to pass the equipment quality control tests and the poor quality of the image; this one assessed either using the accreditation phantom or as determined by the panel of radiology experts. Concerning the dose to the patient, the only calculations to date (UNAM) indicate values well below the guidance levels published in the BSS [5], but similar to those published by the FDA in their MQSA program [6]. Since the ultimate goal is an image of sufficient diagnostic quality to produce an accurate radiological interpretation, the possibility that low values indicate insufficient film exposure needs to be explored. The completion of the tests, and a careful statistical analysis of the results, as well as the study of other radiological techniques, should help better understand the intricate relation among the various equipment parameters and the final image quality in radiological procedures. The knowledge and experience gained by the participants of these five research teams should promote better conditions for radiological services in Latin America and the Caribbean.

References

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