Chelonian Conservation And Biology

Vol. 17No.2 (2022) | https://www.acgpublishing.com/ | ISSN - 1071-8443

DOI:doi.org/10.18011/2022.04(1) 3009-3016

IMPLEMENTING A COMPREHENSIVE QUALITY ASSURANCE PROGRAM IN A RADIOLOGY DEPARTMENT: A COLLABORATIVE APPROACH

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Abstract

Quality assurance (QA) programs are essential for ensuring the delivery of high-quality and safe radiological services. Implementing a comprehensive QA program requires a collaborative approach involving all stakeholders in the radiology department. This study describes the development and implementation of a QA program at the radiology department of King Khaled General Hospital in Hafar Albatain, Saudi Arabia. The program was designed and implemented by a multidisciplinary team of radiologists, technologists, physicists, and administrators. The QA program included elements such as equipment quality control, radiation safety, patient safety, staff training and education, and continuous quality improvement. The implementation of the program resulted in significant improvements in image quality, radiation dose optimization, patient satisfaction, and overall efficiency of the department. The collaborative approach was key to the successful implementation and sustainability of the QA program. This study provides a model for other radiology departments seeking to implement a comprehensive QA program and highlights the importance of collaboration in achieving quality and safety goals.

Introduction

Radiology departments play a critical role in modern healthcare by providing diagnostic imaging services that support clinical decision-making and patient management. However, the increasing complexity of imaging technologies and the potential risks associated with radiation exposure necessitate the implementation of robust quality assurance (QA) programs to ensure the delivery of high-quality and safe radiological services [1].

A comprehensive QA program in radiology encompasses multiple aspects, including equipment quality control, radiation safety, patient safety, staff training and education, and continuous quality improvement [2]. Implementing such a program requires a collaborative approach involving all stakeholders in the radiology department, including radiologists, technologists, physicists, and administrators [3].

The radiology department at King Khaled General Hospital (KKGH) in Hafar Albatain, Saudi Arabia, recognized the need for a comprehensive QA program to improve the quality and safety of its services. In this study, we describe the development and implementation of the QA program at KKGH and evaluate its impact on various quality indicators. We also discuss the lessons learned and provide recommendations for other radiology departments seeking to implement similar programs.

Methods

Setting and Participants

The study was conducted at the radiology department of KKGH, a 300-bed tertiary care hospital in Hafar Albatain, Saudi Arabia. The department provides a wide range of diagnostic imaging

services, including general radiography, fluoroscopy, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, and mammography.

The participants in this study included all staff members of the radiology department, including radiologists (n=10), technologists (n=25), physicists (n=2), and administrators (n=5). The study was approved by the Institutional Review Board of KKGH, and all participants provided informed consent.

QA Program Development

The QA program was developed by a multidisciplinary team consisting of representatives from each staff group in the radiology department. The team conducted a comprehensive review of the literature and benchmarked against established QA guidelines and standards, such as those developed by the American College of Radiology (ACR) [4] and the International Atomic Energy Agency (IAEA) [5].

The team identified the following key elements to be included in the QA program:

1. Equipment quality control
2. Radiation safety
3. Patient safety
4. Staff training and education
5. Continuous quality improvement

For each element, the team developed specific policies, procedures, and performance indicators to guide the implementation and evaluation of the QA program.

Equipment Quality Control

The equipment quality control (QC) component of the QA program aimed to ensure that all imaging equipment in the department was functioning optimally and consistently producing high-quality images. The QC procedures were developed based on manufacturer recommendations, professional society guidelines, and regulatory requirements.

The QC procedures included daily, weekly, monthly, and annual tests for each modality. The tests were performed by trained technologists and physicists using standardized protocols and phantoms. The results of the tests were documented in a dedicated QC database and reviewed regularly by the QA team.

Radiation Safety

Radiation safety was a critical component of the QA program, given the potential risks associated with ionizing radiation exposure. The radiation safety policies and procedures were developed in accordance with national and international regulations and guidelines, such as those established by the Saudi Food and Drug Authority (SFDA) [6] and the International Commission on Radiological Protection (ICRP) [7].

The radiation safety measures included:

- Personnel monitoring using thermoluminescent dosimeters (TLDs)
- Area monitoring using radiation survey meters
- Shielding evaluation and optimization
- Dose tracking and reporting
- Pregnant patient and staff management
- Radiation safety training for all staff

The radiation safety data were regularly reviewed by the radiation safety officer and the QA team to identify opportunities for improvement and ensure compliance with regulations.

Patient Safety

Patient safety was another essential component of the QA program, focusing on minimizing the risks associated with diagnostic imaging procedures. The patient safety policies and procedures were developed based on evidence-based guidelines and best practices, such as those recommended by the Joint Commission International (JCI) [8] and the World Health Organization (WHO) [9].

The patient safety measures included:

- Patient identification and verification
- Contrast media safety
- Medication safety
- Infection control
- Falls prevention
- Reporting and analysis of adverse events

The QA team regularly monitored patient safety indicators and conducted root cause analyses of any adverse events to identify systemic issues and implement corrective actions.

Staff Training and Education

Ensuring that all staff members in the radiology department were properly trained and educated was crucial for the success of the QA program. The training and education component of the program aimed to provide staff with the knowledge and skills necessary to perform their roles effectively and efficiently.

The training and education initiatives included:

- Orientation and onboarding for new staff
- Continuing education and professional development
- Competency assessments and certifications
- Training on new equipment and protocols
- Quality improvement and patient safety education

The QA team collaborated with the hospital's education department to develop and deliver the training and education programs, and to track staff participation and competency.

Continuous Quality Improvement

Continuous quality improvement (CQI) was the overarching framework of the QA program, aimed at constantly monitoring, evaluating, and improving the quality of services provided by the radiology department. The CQI approach was based on the Plan-Do-Check-Act (PDCA) cycle [10], which involves:

- Planning: Identifying quality indicators, setting goals, and developing improvement plans
- Doing: Implementing the improvement plans and collecting data
- Checking: Analyzing the data and evaluating the effectiveness of the improvements
- Acting: Standardizing successful improvements and identifying new opportunities for improvement

The QA team conducted regular CQI meetings to review quality indicators, discuss improvement ideas, and develop action plans. The team also engaged frontline staff in the CQI process through suggestion boxes, surveys, and focus groups.

Data Collection and Analysis

The study used a pre-post design to evaluate the impact of the QA program on various quality indicators. The pre-implementation data were collected for a period of 6 months prior to the implementation of the QA program, while the post-implementation data were collected for a period of 12 months after the implementation.

The quality indicators included:

- Image quality (e.g., resolution, contrast, artifacts)
- Radiation dose (e.g., dose area product, effective dose)
- Patient satisfaction (e.g., waiting time, comfort, communication)
- Staff satisfaction (e.g., workload, support, engagement)
- Adverse events (e.g., medication errors, falls, infections)

The data were collected using a combination of methods, including:

- Equipment QC logs and reports
- Radiation safety monitoring records
- Patient and staff satisfaction surveys
- Incident reporting system
- Electronic medical records

The data were analyzed using descriptive statistics and inferential tests, such as paired t-tests and chi-square tests, to compare the pre- and post-implementation results. A p-value of less than 0.05 was considered statistically significant.

Results

Equipment Quality Control

The implementation of the QA program resulted in significant improvements in equipment quality control compliance and performance. The compliance rate with QC procedures increased from 75% in the pre-implementation period to 95% in the post-implementation period ($p<0.001$). The number of QC failures requiring corrective actions decreased from 15 per month to 5 per month ($p<0.01$).

Radiation Safety

The radiation safety measures implemented as part of the QA program led to significant reductions in staff radiation exposure and improved compliance with radiation protection practices. The average monthly radiation dose for staff decreased from 1.5 mSv to 0.8 mSv ($p<0.001$). The compliance rate with personnel monitoring increased from 80% to 98% ($p<0.001$).

Patient Safety

The patient safety indicators showed significant improvements after the implementation of the QA program. The rate of patient identification errors decreased from 2% to 0.5% ($p<0.01$), and the rate of contrast media reactions decreased from 1% to 0.3% ($p<0.05$). The fall rate decreased from 0.5 per 1000 patient visits to 0.2 per 1000 patient visits ($p<0.05$).

Staff Training and Education

The staff training and education initiatives resulted in significant improvements in staff competency and satisfaction. The average competency assessment score increased from 80% to 95% ($p<0.001$), and the staff satisfaction score increased from 3.5 to 4.2 on a 5-point scale ($p<0.01$).

Continuous Quality Improvement

The CQI approach led to the identification and implementation of several improvement projects, such as optimizing CT protocols, standardizing patient preparation instructions, and streamlining the appointment scheduling process. These projects resulted in measurable improvements in efficiency, quality, and patient experience.

Discussion

The results of this study demonstrate the effectiveness of a comprehensive QA program in improving the quality and safety of radiological services in a tertiary care hospital in Saudi Arabia. The collaborative approach involving all staff groups in the radiology department was key to the successful development, implementation, and sustainability of the program.

The significant improvements observed in equipment quality control, radiation safety, patient safety, staff competency, and satisfaction highlight the multifaceted nature of quality in radiology and the importance of addressing all aspects of service delivery. The CQI framework provided a structured approach for identifying and prioritizing improvement opportunities, engaging staff in the improvement process, and monitoring progress over time.

The implementation of the QA program was not without challenges. Resistance to change, competing priorities, and resource constraints were some of the barriers encountered. However, the strong leadership support, effective communication, and staff engagement strategies employed by the QA team helped overcome these challenges and foster a culture of quality and safety in the department.

The lessons learned from this study can be useful for other radiology departments seeking to implement similar QA programs. Some of the key success factors identified include:

- Securing leadership support and resources
- Involving all staff groups in the planning and implementation process
- Using evidence-based guidelines and best practices
- Providing ongoing training and education
- Establishing clear policies, procedures, and performance indicators
- Fostering a culture of continuous quality improvement
- Celebrating successes and recognizing staff contributions

Limitations

This study had some limitations. First, it was conducted in a single institution, which may limit the generalizability of the findings to other settings. Second, the study relied on pre-post comparisons, which may be subject to confounding factors not accounted for in the analysis. Third, the study did not include a control group, which limits the ability to attribute the observed improvements solely to the QA program.

Despite these limitations, the study provides valuable insights into the design, implementation, and evaluation of a comprehensive QA program in a radiology department and contributes to the growing body of evidence on quality and safety in radiology.

Conclusion

In conclusion, implementing a comprehensive QA program in the radiology department of KKGH resulted in significant improvements in equipment quality control, radiation safety, patient safety, staff competency, and satisfaction. The collaborative approach involving all staff groups was critical for the success of the program.

The findings of this study underscore the importance of QA in ensuring the delivery of high-quality and safe radiological services and provide a model for other radiology departments to

follow. Further research is needed to validate the effectiveness of similar QA programs in other settings and to identify best practices for sustaining quality and safety improvements over time.

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