Appendix 5
Diagnostic X-Ray Imaging Quality Assurance: An Overview

Hospital Diagnostic Imaging Quality Assurance Program Review

Survey Worksheets

Title: _____

Experience: _____

Experience: _____

Facility: _____

Address: _____

Radiology Manager: _____

QC Technologist: _____ QA Coordinator: _____

Reviewer: _____ Date: _____

Abbreviations:

(D) Daily, (W) Weekly, (SM) Semi-Monthly

(M) Monthly, (Q) Quarterly, (SA) Semi-Annually, (A) Annually, (N) Never

(H) High, (M) Medium, (L) Low, (N) None

1. Hospital and Radiology Department QA Committees

1.1. Hospital Quality Assurance Committee (QAC)

1. Does the hospital have a QAC? ..... Y/N

2. Does the hospital have documented QA program? ..... Y/N

3. Is a copy of the hospital organization available (showing level of responsibility and reporting order)? ..... Y/N

Comments:

1.2. Radiology Department Quality Assurance Committee

1. Does the radiology department have a QAC? ..... Y/N

2. Does the radiology department QAC have an overall strategy with clearly defined work plans?.....Y/N

3. Does the radiology department have a documented QA program? ……..... Y/N

If yes, is a copy of the QA manual available? ..... Y/N

4. Radiology QAC members:

Radiology administrator: _____

Medical physicist: _____

Chief x-ray technologist: _____

Quality control technologist: _____

Hospital service engineer: _____

Private consultants: _____

Others: _____

Comments: _____

5. Radiology department QA program review and reporting structure:

Who reviews the radiology QA program?

_____

Review schedule: ..... (M) (Q) (SA) (A) (N)

Is a summary of the radiology QAC audit plan available? ..... Y/N

Describe the radiology QAC program reporting structure: _____

6. Is a copy of the radiology department's organization chart available (showing the level of responsibility and reporting order)? ..... Y/N

7. Does the radiology QAC serve as an advising committee to give direction, training and/or advice on QA and QC protocols to other hospitals?.....(M) (Q) (SA) (A) (N)

If yes, which hospitals? _____

8. Is a member of the department's QAC on the hospital QAC? : ..... Y/N

Comments: _____

2. Quality Assurance Training

1. Is QA training available? ..... Y/N

2. Type of QA training:

In-house: _____

Other hospitals: _____

Outside agency: _____

Special courses: _____

Refresher courses: _____

Other: _____

3. What priority level is placed on QA training? ..... (H) (M) (L) (N)

Comments: _____

3. Equipment Specification Writing

1. Is the QAC involved in equipment specification writing? ..... Y/N

2. Does QC technologist participate in equipment specification writing? ……. Y/N

3. Who does equipment specification writing? (QAC?, private consultants?)

4. Is a copy of documented equipment specification writing guidelines available? .... Y/N

5. Do equipment specifications include acceptance testing criteria? ..... Y/N

6. Is a copy of the equipment specification document sent out for tender for the last x-ray unit purchased by the hospital available? ..... Y/N

Comments: _____

4. Quality Control Test Equipment List

1. Is QC test equipment available? ..... Y/N

2. List QC test equipment used: (including manufacturer, model and calibration date):

Processing test equipment	**Manufacturer**	**Model**	**Calibration Date**
Sensitometer:			
Densitometer:			
Thermometer:			
Stop watch:			

Darkroom fog test tool: _____

Radiographic test equipment:	**Manufacturer**	**Model**	**Calibration Date**
Exposure and exposure rate meter:			
Electronic irradiation time measuring device:			
Electronic x-ray tube voltage measuring device:			
Collimator and beam alignment tool:			
Aluminum filters:			
Film screen contact wire mesh:			
Step wedge:			

5. Equipment Acceptance Testing

1. Does the QAC have an equipment acceptance testing policy? ..... Y/N

2. Who does the equipment acceptance testing (manufacturer, in-house, private consultants)? :

_____

3. Equipment acceptance test results recorded? ..... Y/N

4. Equipment acceptance test results kept for QC base data? ..... Y/N

5. Is a copy of equipment acceptance testing results available? ..... Y/N

Comments:

_____

6. Quality Control Testing

The following are general questions regarding the QC testing program and the QC technologist's responsibilities.

6.1 X-Ray Equipment Quality Control

1. QC responsibilities (persons in charge and reporting order):

Radiology department QC program: _____

QC testing: _____

QC record keeping: _____

QC data evaluation: _____

Equipment control parameter setting: _____

Equipment repair and services decisions: _____

2. Does the x-ray department have a documented equipment QC test protocol manual? ..... Y/N

If yes, is a copy of the equipment QC test protocol manual available? ……. Y/N

Does the manual include QC test protocol for the following equipment? :

General radiographic equipment? ..... Y/N

Film processors? ..... Y/N

3. Is the QC testing done by a private consulting agent? ..... Y/N

If yes, who? _____

Reporting protocol: _____

Consultant objectives: _____

Radiation safety survey of equipment? _____

Equipment specification writing? _____

Acceptance testing? _____

QC testing of equipment? _____

Advisor on QA program? _____

Frequency of consultant contract: ..... (M) (SA) (A) (N)

Is copy of consultant contract objectives available? ……..... Y/N

4. QC technologist available? :……..... (Full-time), (Part-time), (Occasional)

To whom does the QC technologist report? :

_____

5. Does the QC technologist have a specific QC test schedule? ..... Y/N

If yes, how strictly is it followed? _____

QC testing schedule priority level: ..... (H) (M) (L) (N)

Is a copy of the equipment QC test schedule available? ……..... Y/N

QC test schedule (time spent):_____h/d; _____ d/w; _____ w/m

Consequences of not meeting the QC schedule:

6. QC technologist responsibility

x-ray rooms darkrooms processors radiographic tubes

7. How much time spent testing equipment (number of tubes, hours/unit)?

General radiography? _____

General film processors?

Other: _____

8. Does QC technologist have adequate time to carry out QC test required? ..... Y/N

9. Does QC technologist have adequate time to evaluate results of QC tests performed? ..... Y/N

10. Does QC technologist have adequate time to update and maintain QC records? ..... Y/N

11. Are samples of QC tests records (blanks) available? ……..... Y/N

12. QC test reporting:

To whom are QC test results reported? ……..... Y/N

What is the reporting structure?

_____

Priority of QC reporting:.....(H) (M) (L) (N)

Consequences of late reporting: _____

13. QC testing review activity:

Is equipment QC test program audited? ..... (W) (M) (Q) (SA) (A) (N)

Review method of audit:

Is a copy of the QC audit plan available? ..... Y/N

Consequences of bad reviews:

_____

14. Is QC testing training available for the QC technologist? ..... Y/N

If yes, where? When? _____

15. Is QC technologist shared with other hospitals? ..... Y/N

If yes, list hospital and days per week: _____

16. Is the Hospital QC performance compared with other large city hospitals? ..... Y/N

If yes, who and frequency: _____ Hospital …… (M) (Q) (SA) (A) (N)

Comments:

_____

6.2. Photographic Equipment Quality Control

The following are general questions regarding the photographic QC testing program and the QC technologist's responsibilities.

1. Number of automatic processors: _____
2. Number of dedicated processors: _____
3. Processor sensitometric evaluation performed? ..... (D) (W) (SM) (N)
4. Is the developer temperature verified using a thermometer? ……(D) (W) (SM) (A)
5. Replenishment rates checked? ..... (D) (W) (SM) (N)
6. Transport time checked? ..... (D) (W) (SM) (N)
7. Is the manufacturer's time/temperature chart followed? ..... Y/N
8. Are film processors cleaned regularly? ..... (D) (W) (SM) (M) (N)
9. Preventive maintenance program for the processor? ..... Y/N
10. Are the cassette screens cleaned regularly? ……..……. (D) (W) (SM) (M) (SA) (A) (N)
11. Are screen contact tests done? ..... (W) (SM) (M) (SA) (A) (N)
12. Safelight integrity verified? ..... (W) (M) (SA) (A) (N)
13. Darkroom fog test? ..... (W) (M) (SA) (A) (N)

Comments:

_____

1. What happens to old or reject-repeat radiograms? _____

Comments:

_____

7. Equipment Performance Records and Record Keeping

1. Are equipment performance records kept? ..... Y/N
2. Do the equipment performance records include acceptance testing results? ……..... Y/N
3. Are the initial and current radiation safety surveys reports available?.....Y/N
4. Are the current year QC tests and results recorded? ..... Y/N
5. Are the past year QC tests and results recorded? ..... Y/N
6. Are the equipment repairs and servicing recorded (frequency and costs)? ..... Y/N

7. Is the equipment down time recorded? ..... Y/N

8. Is a copy of the equipment performance record available? ..... Y/N

Comments:

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8. Equipment Appraisal and Replacement Policy

1. Does the QAC have an equipment appraisal and replacement policy? ..Y/N

2. Planned budget allocations for future purchases? ..... Y/N

3 Describe the equipment appraisal and replacement policy budget strategy:

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4. Is a copy of the equipment appraisal and replacement policy available? ……...Y/N

9. Standardization of Exposure

9.1. Radiographic Positioning

1. Is a standard radiographic positioning manual available in each room? ……..…….Y/N

If no, is it easily accessible? ..... Y/N

Is a copy (sample) of radiographic positioning manual available? ..... Y/N

Comments:

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2. Current condition of the radiographic positioning manual (indicate on a scale of 1 to 5):

1	2	3	4	5
Poor	___	___	___	Good
Disorganized	___	___	___	Tidy
Ambiguous	___	___	___	Clear
Vague	___	___	___	Precise

Incomplete				Comprehensive
	___	___	___	
Neglected				Updated
	___	___	___	

Comments: _____

3. Does the radiographic positioning manual provide instructions about:

Body part to be x-rayed? .....
Y/N

___ Number of projections required? .....
Y/N

___ Size of image receptor to use? .....
Y/N

___ Part rotation? .....
Y/N

___ Tube angle? .....
Y/N

___ Central ray location? .....
Y/N

___ source-to-image receptor distance? .....
Y/N

___ detail of structures to be shown?.....
Y/N

___ general instructions for positioning?.....
Y/N

___ illustrations? .....
Y/N

___
Comments:

4. Radiographic positioning manual update:

Is the radiographic positioning manual updated? ..... Y/N

Who authorizes changes? _____

Are changes reported through QAC reporting channels? ..... Y/N

Are changes unreported and adopted? ..... Y/N

Comments: _____

9.2. Loading Factors

1. Is there a loading factors chart (or manual) posted in each x-ray room? ……Y/N

Is a copy (sample) of loading factors manual available?..... Y/N

2. Current condition of Loading Factor charts (indicate on a scale of 1 to 5):

1	2	3	4	5
Poor	___	___	___	Good
Disorganized	___	___	___	Tidy
Ambiguous	___	___	___	Clear
Careless	___	___	___	Precise
Incomplete	___	___	___	Comprehensive
Neglected	___	___	___	Updated
Comments:	___	___	___	

3. Does the loading factors chart contain the following information? :

Patient thickness? ……..... Y/N

_____ Child/adult technique? ……..... Y/N

_____

_____ Optimum kVp? ……..... Y/N

_____ Optimum time, mA, mAs or automatic exposure control? …….....Y/N

_____ Focal spot size? ..... Y/N

_____ Grid/no grid? ..... Y/N

_____ Film-screen combination? ..... Y/N

_____ Comments:

4. Is the loading factors chart strictly followed? ……..... Y/N

If not, why? _____

5. Loading factors chart changes:

Is the loading factors chart updated or changed to compensate for equipment or processor problem ……..... Y/N

Who sets the loading factors chart factors? _____

Who authorizes the loading factors chart changes? _____

Is the loading factors chart changes reported to QC technologist? ……..... Y/N

Are changes unreported and adopted? ……..... Y/N

10. Acceptance Criteria for Diagnostic Radiograms

1. Have acceptance criteria for diagnostic radiograms established? ……..... Y/N

2. Do the acceptance criteria cover the following points:

1) The visibility of predetermined landmarks clearly defined for each view? ..... Y/N

2) An acceptable density range measured at predetermined anatomical landmarks? ..... Y/N

3) also include three limits of acceptability clearly defined where:

a) The x-ray technologist forwards radiogram to radiologist for reporting? ..... Y/N

b) Or the x-ray technologist consults with the radiologist? ..... Y/N

c) Or the radiogram is rejected and a repeat is done? ……..... Y/N

3. Are the acceptance criteria followed by technologist? ..... Y/N

4. Are the acceptance criteria reviewed? ……..... Y/N

Frequency of review: .....(M) (Q) (SA) (A) (N)

5. Are acceptance criteria compared with that of other major city hospitals? ..... Y/N

6. If yes, Who?, How often? .....(M) (Q) (SA) (A) (N)

7. If a QA criteria has not been established against which standard are the radiograms checked when the radiologist is not available? (e.g., evening or weekends) _____

How does that affect the repeat rate when the radiologist does become available? _____

8. Is a copy of the acceptance criteria available? ..... Y/N

Comments: _____

11. Reject-Repeat Analysis Program (RRAP)

1. Does the radiology department have a comprehensive RRAP? ……..... Y/N

2. Is a copy of the documented RRAP parameters available? ..... Y/N

3. Who sets the RRAP parameters? :

_____

4. Reject-Repeat Analysis parameters:

_____

_____	patient positioning	_____	patient motion
_____	radiograms too dark	_____	radiograms too light
_____	artifacts	_____	fog
_____	static	_____	medical reasons
_____	processor malfunction	_____	mechanical quality
_____	control films	_____	Clear
_____	black film	_____	Good radiograms
_____	Other	_____	

_____ Total waste _____ Total rejects _____ Total repeats

Comments: _____

5. Do the RRAP results show how many rejects or repeats were acceptable and should not have been repeated? ..... Y/N

6. Are the RRAP results posted? ……..... Y/N

7. Is the repeat percentage analysis evaluated:

Per technologist? _____ Per room? ..... Y/N _____

8. What is the current reject-repeat rate? _____

9. What is the reject-repeat rate for the last six months? :

10. What corrective action is used to reduce the reject-repeat rate? _____

11. Reject-repeat rate is based on what workload? _____

12. What is radiology department total workload? _____

13. Is the RRAP compared with other hospitals?..... Y/N

If yes, who? How often?: .....(M) (Q) (SA) (A) (N)

Note: RRAP should look at three separate categories:

1) Total waste films: all films in the scrap bin? ..... Y/N

2) Total rejects: all films except clear and QC films? ..... Y/N

3) Total repeats: only those where an additional radiogram was made?... Y/N

RRAP should not include radiograms from special procedures areas (cardiovascular, neurological copy, nor subtraction films.)

Comments: _____

12. QA/QC Document Assessment (Summary)

The following (current) documents should be collected as examples for assessing the Radiology Department's QA/QC program.

Section		**Reference Documents**
1.1.3.	_____	Hospital organization chart (with reporting order)
1.2.3.	_____	Radiology department QA manual

1.2.5.		Summary of radiology department's QAC audit plan
1.2.6.		Radiology department's organization chart (with reporting order)
3.4.		Equipment specification writing guidelines
3.6.		Equipment specification document (e.g., last purchase)
4.2.		List of all QC test equipment
5.5.		Equipment acceptance test results
6.1.2.		Equipment QC test protocol manual
6.1.3.		QC consultant contract objectives
6.1.5.		Equipment QC test schedule
6.1.11.		Sample QC test records (blanks)
6.1.13.		QC audit plan
7.8.		Equipment performance record
8.4.		Equipment appraisal replacement policy
9.1.1		. Radiographic positioning manual (sample)
9.2.1.		Loading factors chart (sample)
10.8.		Acceptance criteria for diagnostic radiograms
11.2.		Reject-Repeat Analysis Program parameters