

HIP X-RAY

TABLE OF CONTENTS

1. Introduction 2

2. Background and rationale 2

3. Equipment and supplies..... 3

4. Inclusion/exclusion criteria and safety 3

4.1 Which participants get hip x-rays..... 3

4.2 Exclusions..... 3

5. Training and certification..... 3

5.1 Training..... 3

5.2 Site and technologist certification 3

6. Ongoing quality review at x-ray facility and Coordinating Center 4

6.1 Facility 4

6.2 Coordinating Center 4

7. Hip radiograph 5

7.1 Hip radiographic technique..... 5

7.2 Assessing quality of hip radiographs 7

7.3 Examples of hip projection 8

8. Radiograph labeling 10

9. Hip X-ray Tracking Form and X-ray Shipment Log..... 10

10. Packaging and shipping films..... 11

11. Hip x-ray reading 11

11.1 Incidental suspicious findings seen on x-ray 12

Appendix 1 Health ABC X-ray Facility Certification Form 13

Appendix 2 Health ABC X-ray Technologist Identification Form 15

Appendix 3 Technician Certification Form 16

Appendix 4 Health ABC Hip X-ray Shipment Log 17

Appendix 5 Health ABC Hip X-ray Shipment Notification 18

Appendix 6 Hip X-ray Tracking Form..... 19

Appendix 7 Hip X-ray Reading Form 20

HIP X-RAY

1. Introduction

Quality control: The purpose of this manual is to standardize the examination procedures among the centers performing hip radiography in Health ABC. It is intended to support both technologists and radiologists in their respective responsibilities by spelling out technical details and radiological aspects that may otherwise be left vague or inconsistent. These procedures should be carefully reviewed by the technologists at each facility assigned to the Health ABC study.

It is expected that all technologists participating in this study already have an in-depth knowledge and extensive experience in their field. This manual can by no means be regarded as a training course. This manual simply points out details pertaining to this specific study that otherwise are likely to differ between centers. There is no claim that the proposed techniques are the only ones to yield acceptable results. Rather, this manual provides guidelines to make the results of all participating centers consistent and comparable.

Centers that cannot meet the requirements detailed in the imaging technique sections will need to contact Michael Nevitt at the Health ABC Coordinating Center to discuss whether alterations to the specified parameters are acceptable.

The Health ABC Radiology Coordinating Center will review the quality of the hip images during the study, and will notify the centers if problems with image quality are found. Possible sources of error, and possible solutions, will be suggested, but responsibility for the resolution of technical problems rests with the radiology facility and the clinical center.

During the study, questions regarding x-ray procedures should be directed to the Health ABC Coordinating Center or Radiology Technician Consultant.

Health ABC Radiography

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2. Background and rationale

Hip x-rays are being obtained as a portion of a study to better understand the reasons behind ethnic variations in the utilization of lower extremity total joint arthroplasty, that is, total knee arthroplasty and total hip arthroplasty. We will be examining how white and African American men and women with OA may differ with regard to patient-specific factors such as perceptions and preferences that may in turn influence consideration of total joint replacement as a treatment

option. The hip x-rays are being obtained to determine the degree of hip OA for participants who have reported hip pain.

Anterior/posterior (A/P) radiographs of the hip will be obtained on a subcohort of Health ABC participants. For all radiographs, please concentrate on image quality and optimum positioning of the participant.

3. Equipment and supplies

- screen/x-ray film combination: as specified in detailed protocol
- right/left lead markers
- plexiglass frame to keep feet fixed in 5° internal rotation

4. Inclusion/exclusion criteria and safety

4.1 Which participants get hip x-rays

Participants who reported chronic knee or hip pain during Health ABC exam cycles 5 or 6 or who currently have hip pain and reported hip pain in Year 1 or Year 2 will get a hip x-ray.

4.2 Exclusions

Participants who have had a previous knee and/or hip replacement are excluded from having a hip x-ray.

5. Training and certification

5.1 Training

The Coordinating Center/Hip X-ray Reading Center will train the participating radiology facilities. Film quality will continue to be reviewed throughout the study.

5.2 Site and technologist certification

- a. Each x-ray facility should designate a primary contact/supervisor for this study. This person should generally be a chief technologist, technologist supervisor, or supervising radiologist at the facility, with responsibility for seeing that the Health ABC x-ray procedures are carried out correctly.
- b. The primary contact should have a detailed knowledge of the Health ABC x-ray protocols. This person is responsible for assuring that:
 - all x-ray technicians involved in the study are certified on the Health ABC

- x-ray protocol and are assigned a Health ABC staff ID number.
- all Health ABC hip x-rays are taken according to the Health ABC protocol
 - copies of the x-ray protocol are available to Health ABC x-ray technologists at all times.
- c. The primary contact should complete the Health ABC X-ray Facility Certification Form (Appendix 1). The clinical center should send a copy of this form to the Health ABC Coordinating Center.
- d. The primary contact should assign specific technologists to this study. Each technologist is given a Health ABC Staff ID number by the Pittsburgh or Memphis clinical center.
- Two to four technologists are recommended
 - Technologists assigned to Health ABC should be experienced in bone and joint radiography.
- e. All assigned Health ABC technologists should read and have a thorough knowledge of the procedures outlined in the Health ABC protocol and review any questions with the primary contact. A Health ABC X-ray Technologist Identification Form, signed by each x-ray technician and the technologist supervisor should be sent in to the Coordinating Center (see Appendix 2).
- f. Individual technologists are certified by Coordinating Center review of the first 10 sets of radiographs (see Appendix 3 for Technician Certification Form).

6. Ongoing quality review at x-ray facility and Coordinating Center

6.1 Facility

- a. The technologist or the primary contact should review films while the participant is still at the facility so that if necessary a repeat film may be obtained without additional burden on the participant.
- b. The primary contact at each facility should review all hip films for protocol adherence and quality before they are shipped.
- c. In addition, “problem cases” where the technologist or chief technician is unsure of the quality of the image should be identified for review at the Coordinating Center. This is recorded in the “comment” section on the Hip X-ray Shipment Log (See Appendix 4).

6.2 Coordinating Center

- a. The Health ABC Coordinating Center will review the quality of all films during the study, and will assess the performance of each technologist.

- b. Clinic project directors and primary contact will be notified of persistent departures from optimal imaging and examination technique so that corrections can be made.
- c. Repeat films will be requested for films that do not provide valid information on hip OA.

7. Hip radiograph

Anterior/posterior (A/P) radiographs of the hip will be obtained on a subcohort of Health ABC participants. For all radiographs, please concentrate on image quality and optimum positioning of the participant.

7.1 Hip radiographic technique

The film should be exposed to provide optimal visualization of the articular surfaces of the hip.

Exposure Technique

Imaging System	Bucky	Required
FFD	44"	Required
kVp Range	70-80 kVp	Recommended
mAs	Dependent on Film/Screen System	
Focal Point	Large	Required
Collimation	Full Size of the Film	Required
Cassette	14"x 17"	Recommended
Film/Screen Combination	Standard/regular film	Recommended
Lead Markers	Use Right/Left Lead Markers	Required

Examination Procedure

- Explain the procedure to the participant.
- Ensure foreign objects (i.e., zippers) are removed from participant's pelvic region as necessary.
- Ensure the participant's clothing is removed as required.
- Use a drape sheet or a patient gown to cover the participant's pelvic region. Note that participants should not wear pants of any type when they have their hip x-ray. It is OK for participants to wear shorts with an elastic waistband, as long as the shorts have no zippers, belts, rivets, etc., and there should be nothing in the participant's pockets.

Positioning the Participant

- The anterior wall of the SynaFlexer is in complete contact with the Bucky or cassette holder or reclining tabletop of the radiographic unit being used such that there is no angle or gap between them (Fig. 1).
- Participant is standing upright on the frame, facing the X-ray tube with the back against the Bucky.
- The heels of both feet are placed in contact with the anterior wall of the frame, below the film (Fig. 1).
- Both feet are fixed in internal rotation against the V-shaped support on the base of the frame.
- Heels and medial aspects of the feet are in contact with the frame and foot angulation support.
- Body weight is distributed equally between the two legs.
- The participant is not moving
- The exposure is made appropriately

Please include a note in the Comments section of the Hip X-ray Tracking form if the optimal positioning was not achieved, if the participant could not stop moving, if the body weight could not be distributed equally, or any other diversion from the protocol.

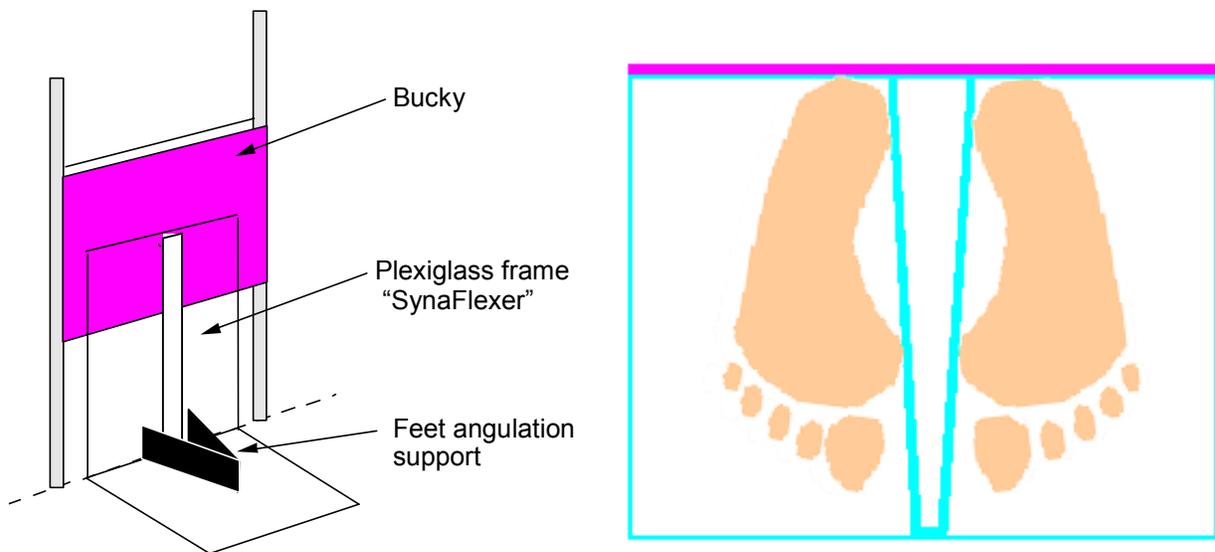


Figure 1— SynaFlexer for reproducible feet fixation. The frame is positioned with its anterior wall in contact with the Bucky (or cassette holder or reclining table top). With the heels touching the anterior wall of the frame, both feet (in diagram above right) are fixed in 5° internal rotation by placing them against the V-shaped support on the base of the frame. Body weight is distributed equally between the two legs.

Positioning the x-ray Tube and Film Comments

- Position the tube so that the X-ray beam is perpendicular to the plane of the film and centered two inches above the symphysis pubis (at the level of the great trochanters). The symphysis pubis is identified by manual palpation.
- Collimate to the size of the film and include iliac bones entirely.

Side markers

- Use small lead right/left side markers and place them on the film where they will not be obscured by the study label, preferably on the lateral side. Place the markers right side up, so they can be read without reorientation of the radiograph.

Special Remarks

To assist with participant confidentiality, the biographical information flashed onto the films should include participant study information, not the participant's name. The flash region may be covered with the self-adhesive study label, but do not apply multiple layers of labels.

7.2 Assessing quality of hip radiographs***Common Mistakes***

- Incorrect beam centering, superimposition and unsharp contours of the joints.
- Overexposure (radiographs too dark) or underexposure (radiographs too light).
- Motion during image acquisition identified by blurring of bone edges and poor resolution of anatomical structures.

Criteria of good quality hip radiographs

- Central ray is properly centered two inches above symphysis pubis.
- The entire hip is depicted, including both hip joints and iliac bones (see example on page 9).
- Joint space margins of both hips are clearly delineated.
- Left/Right markers are on the film.
- The film is not underexposed or overexposed.

7.3 Examples of hip projection

See examples of acceptable and unacceptable quality hip radiographs below.

Unacceptable



The radiograph is underexposed.

Acceptable



Example of good radiograph.

8. Radiograph labeling

- a. The x-ray films should include the following information on the ID stamp:
 - clinic site (Memphis; Pittsburgh) and x-ray facility name
 - Health ABC ID (and four-letter namecode [acrostic])
 - date of x-ray
 - x-ray tech ID (may be on a stick-on label)
- b. Be sure the ID stamp is on the right side and that each film has a left/right marker that is clearly visible.
- c. To ensure legibility, all label information should be typed whenever possible.

IMPORTANT: It is the responsibility of the clinical center to verify the legibility, completeness and accuracy of all identifying information on the x-ray label before the x-ray is shipped to the Coordinating Center. Missing or illegible information should be typed on a separate stick-on label, and placed next to (NOT OVER) the ID stamp. The x-ray tech ID may also be recorded on a stick on label.

In general, additional stick-on labels with redundant information (e.g., film date) are unnecessary and are discouraged. Any stick-on labels used should be placed next to (but not over) the imaged ID plate.

9. Hip X-ray Tracking Form and X-ray Shipment Log

Each Health ABC participant who will be having a hip x-ray will have a Hip X-ray Tracking Form (see Appendix 6) which is partly filled out before the participant goes to the x-ray facility and completed when they go for their x-ray.

Section of Hip X-ray Tracking form that is filled out in clinic:

- the participant's name
- the participant's enrollment ID# and acrostic

Section of the Hip X-ray Tracking form that is filled out at the x-ray facility:

- whether x-ray was obtained, and if not obtained, why not
- X-ray tech study ID number

As each participant's hip film is completed, fill in the information requested on the Hip X-ray Shipment Log (Appendix 4). The original of this log should be kept at the X-ray facility.

Two xerox copies of the current log should be provided with the x-rays to the Health ABC clinical center at the end of each two-week accumulation period.

10. Packaging and shipping films

- a. Before leaving the facility, each participant's set of hip films should be placed in a paper jacket labeled with:
 - clinic site (Memphis; Pittsburgh) and x-ray facility name
 - Health ABC ID and four-letter namecode (acrostic)
 - date of x-ray
- b. Films will be inventoried, boxed and shipped by staff at the Health ABC clinical center.
- c. A sturdy shipping container or other packaging should be used for each batch of x-rays shipped (i.e., x-rays should be double wrapped).
- d. Package a copy of the Health ABC Hip X-ray Shipment Log with the shipment. The Log will be checked against the films contained in the shipment at the Coordinating Center. Keep a copy of the X-ray Shipment Log at the Health ABC clinical center.
- e. Fax a copy of the X-ray Shipment Notification Form to the Coordinating Center when the shipment is sent (Appendix 5). Fax to:
Clara Yeung Health ABC Hip X-Rays: (415) 597-9213.
- f. Send all films to:

Clara Yeung
Health ABC Hip X-Rays
Health ABC Coordinating Center/UCSF
74 New Montgomery, Suite 600
San Francisco, CA 94105

Phone: (415) 597-9271
Fax: (415) 597-9213

- g. For security and speed of delivery, use of second day courier service (e.g., UPS second day air) is recommended.
- h. Accumulated films should be shipped **every two weeks (except for the first few weeks that the x-rays are obtained when they should be shipped every week).**

11. Hip x-ray reading

The hip x-ray will be read at the Reading Center (Appendix 7). The reader will look for osteophytes, joint space narrowing, sclerosis, cysts, deformity, and buttress.

11.1 Incidental suspicious findings seen on x-ray

Occasionally, an x-ray technician will see a finding on the x-ray that should be further investigated. If the field center suspects a problem, they should flag the image. To flag the image, the technician should write their impression in the Comments section of the tracking form. Ultimately, the Reading Center will look at the images, decide if there are suspicious findings, and write a letter to the PI that describes the problem found on the x-ray. It will be up to the clinical sites to decide what to do with this information. Usually a call is made to the participant to ask them to see their primary care physician.

Appendix 1 Health ABC X-ray Facility Certification Form

Yes No If no, specify

A. Imaging Technique - Facility

Our facility can meet the following protocol specifications:

Imaging system: Erect Bucky tray for 14" x 17" film

Screen/Film combination is standard regular film

Focal point is large

Plexiglass positioning frame

B. Imaging Technique - Technologists

The *film/focus distance* will be as specified for each image.

It is critical to maintain this distance carefully.

44 inches

Exposure level:

70 to 80 kVp

C. Positioning

Protocols will be followed with respect to specified:

- plexiglass positioning frame used properly
- participant's back against Bucky
- both feet fixed in internal rotation
- body weight distributed equally between the two legs
- exposure made appropriately
- review for acceptable image quality and repeat x-ray if necessary

Technologist Supervisors statement: Only identified technologists will be involved in this study. If personnel need to be added, they should be identified to the clinic and Coordinating Center.

Clinical center

X-ray facility location

Last name, first name

Position

Phone number

Date

Signature

Address

Appendix 2 Health ABC X-ray Technologist Identification Form

I have carefully read the Health ABC x-ray manual. I will adhere to the protocol as stated in the manual as closely as possible.

Last name	First name	Health ABC Staff ID #	Date	Signature of X-ray Technologist

Technologist Supervisors statement:

The above-listed individuals are qualified to perform the required x-ray examinations.

Clinical center

X-ray facility location

Last name, first name

Position

Phone number

Date

Signature

Address

Appendix 5 Health ABC Hip X-ray Shipment Notification

TO: Clara Yeung
FAX: (415) 597-9213

FROM: _____

SITE ID: Memphis

Pittsburgh

FAX: _____

RE: X-ray Shipment of Health ABC Participant Data

Message

The following data is being sent to you today _____
(today's date)

For delivery on _____
(date)

VIA: Mail Delivery service: _____ Airbill # _____
(airbill number)

Exam Date Range of Participants Included:

// to //
Month Day Year Month Day Year

Please call _____ at _____ if you have any questions.
(name) (telephone number)

Response from Coordinating Center

Shipment received on: //
Month Day Year

Not received as of: //
Month Day Year

Comments: _____

Appendix 7 Hip X-ray Reading Form

	HABC Enrollment ID #	Acrostic	Date Form Completed			Staff ID #
	<input type="text" value="H"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			

HIP X-RAY READING FORM

Hip x-ray status: First hip x-ray Repeat hip x-ray

1. HIP REPLACEMENT

None
 Left hip
 Right hip
 Both hips

2. OSTEOPHYTES

	Left Hip				Right Hip			
	None	Mild	Moderate	Severe	None	Mild	Moderate	Severe
a. Lateral acetabular	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
b. Lateral femoral	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
c. Inferior acetabular	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
d. Inferior femoral	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3

3. JOINT SPACE NARROWING (JSN)

	Left Hip					Right Hip				
a. Lateral JSN	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
b. Medial JSN	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
c. Narrowing type	None <input type="radio"/>	Concentric <input type="radio"/>	Lateral <input type="radio"/>	Medial <input type="radio"/>		None <input type="radio"/>	Concentric <input type="radio"/>	Lateral <input type="radio"/>	Medial <input type="radio"/>	
d. Minimal joint space (mm)	<input type="text"/> . <input type="text"/> mm (0.0 to 6.0 mm)					<input type="text"/> . <input type="text"/> mm (0.0 to 6.0 mm)				

4. OTHER FEATURES

	Left Hip				Right Hip			
	None	Mild	Moderate	Severe	None	Mild	Moderate	Severe
a. Sclerosis	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
b. Cysts	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
c. Deformity	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
d. Buttress	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3

