Dose Reconstruction from Occupational Medical X-Ray Procedures

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PUBLICATION RECORD

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
11/14/2003	00	New document to establish the technical basis for the development of a generic document to use to perform dose reconstruction from occupationally related diagnostic X-ray procedures. First approved issue. Initiated by Judson L. Kenoyer.
12/08/2003	01	Revision that limits the use of this document to post 1970. Approved issue of Revision 01. Initiated by Judson L. Kenoyer
12/29/2003	02	Revision that includes information to reinstate the ability for the document to cover exposures pre-1970. Approved issue of Revision 02. Initiated by Judson L. Kenoyer
08/02/2005	03	Revision to add photofluorography use table and lumbar spine X-rays. Deleted footnote b and adjusted footnote references in Table 8. Approved issue of Revision 03. No retraining required. Initiated by Vernon E. Shockley and Ronald L. Kathren.
12/21/2005	03 PC-1	Approved page change revision. Page change initiated to incorporate recent direction from NIOSH to include DOL review comments on page 8. Deletes two obsolete paragraphs on page 8 in Section 1.0. Corrects table number reference on page 20 in Section 4.0. No sections were deleted. No retraining is required. Initiated by Vernon E. Shockley and Ronald L. Kathren. Signature on File 12/14/2005 Judson L. Kenoyer, Task 3 Manager Signature on File 12/14/2005 Kate Kimpan, Projector Director Signature on File 12/21/2005 James W. Neton, Associate Director for Science
06/11/2011	04	Revision to add organ dose data from lordotic and oblique chest X-rays, chest fluoroscopy, thoracic and cervical spine X-rays, and skin doses for all procedures. Lists additional references in the Reference Section. Incorporates formal internal and NIOSH review comments. Also addresses an additional NIOSH comment. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Elyse M. Thomas.

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
08/13/2018	05	Draft revision initiated to add guidance for organ to be used based on ICD-9 code in Attachment B. Renumbered figures, tables, and equations. Changed part thickness in Table 3-1 for anterior-posterior and posterior-anterior projections to 24 cm, except the cervical spine. Added dose for bone surface anterior-posterior lordotic in Table B-7 for 1971 to 1985. Corrected Table B-10 entrance skin dose through 1970 for anterior-posterior and lateral lumbar spine to account for proper backscatter factor. Corrected Table B-11 through 1970 for anterior-posterior and lateral projections that assigned 100% or 10% entrance skin dose to reflect changes in Table B-10. Corrected Table B-11 lateral lumbar spine through 1970 for back torso: buttocks (iliac crest and below) to include E−02. Corrected Table B-13 fourth column title to left posterior oblique thoracic spine. Corrected Table B-1 to B-3 anterior-posterior lordotic chest dose conversion factors and added footnote. Latest references and SRDB numbers have been updated in References section. Incorporates formal internal and NIOSH review comments. Attachments A and B swapped. Tables in Attachment B were rearranged and renumbered to match text callout order. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Robert C. Winslow.
09/27/2019	06	Revision initiated to incorporate ICD-10 codes. Additional clarification of citation for information to address SC&A comments. Incorporates formal internal and NIOSH review comments. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Robert C. Winslow.

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ACRONYMS AND ABBREVIATIONS

AP	anterior-posterior
AWE	atomic weapons employer
C	coulomb
CFR	Code of Federal Regulations
cGy	centigray
cm	centimeter
cSv	centisievert
DCF	dose conversion factor
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
ENSD	entrance skin dose
eq.	equivalent
ESE	entrance skin exposure
EXSD	exit skin dose
Gy	gray
H_E	effective dose equivalent
HVL	half-value layer
ICD-10	*International Statistical Classification of Diseases and Related Health Problems, Tenth Edition*
ICRP	International Commission on Radiological Protection
in.	inch
J	joule
$K_{a,i}$	incident air kerma
keV	kiloelectron-volt
kg	kilogram
kVp	kilovolts-peak
LAO	left anterior oblique
LAT	lateral
LPO	left posterior oblique
m	meter
mA	milliampere
mAs	milliampere-second
mGy	milligray
min	minute
mm	millimeter
mR	milliroentgen
mrad	millirad
mrem	millirem
NCRP	National Council on Radiation Protection and Measurements

NIOSH	National Institute for Occupational Safety and Health
OBL	oblique
ORAUT	Oak Ridge Associated Universities Team
ORNL	Oak Ridge National Laboratory
PA	posterior-anterior
PFG	photofluorography
R	roentgen
RAO	right anterior oblique
RPO	right posterior oblique
RSD	remote skin dose
s	second
SID	source-to-image distance
SRDB Ref ID	Site Research Database Reference Identification (number)
SSD	source-to-skin distance
Sv	sievert
TB	tuberculosis
TIB	technical information bulletin
U.S.C.	United States Code
§	section or sections

1.0 INTRODUCTION

Technical information bulletins (TIBs) are not official determinations made by the National Institute for Occupational Safety and Health (NIOSH) but are rather general working documents that provide historical background information and guidance to assist in the preparation of dose reconstructions at particular sites or categories of sites. They will be revised in the event additional relevant information is obtained about the affected site(s). TIBs may be used to assist NIOSH staff in the completion of individual dose reconstructions.

In this document, the word "facility" is used as a general term for an area, building, or group of buildings that served a specific purpose at a site. It does not necessarily connote an "atomic weapons employer facility" or a "Department of Energy (DOE) facility" as defined in the Energy Employees Occupational Illness Compensation Program Act of 2000 [42 U.S.C. § 7384l(5) and (12)].

2.0 PURPOSE AND SCOPE

The purpose of this TIB is to describe medical X-ray dose reconstruction in general, and to provide organ dose equivalents that can be used complex-wide when site-specific information is specious or not available.

"External doses from occupational X-ray screening procedures that were provided to the energy employee as a condition of employment and were performed at a covered facility must be included in dose reconstruction. X-rays performed for diagnostic or therapeutic reasons, however, are excluded. Screening X-rays are systematic examinations that are performed on asymptomatic people without history, complaint, physical findings, or physician evaluation. Diagnostic X-rays are careful examinations of people who already have suspicious signs or symptoms of a potential condition, and they are performed after physician evaluation." (NIOSH 2010). Therapeutic X-rays are used to treat cancer and other conditions, not as an aid to diagnosing those conditions.

Many DOE and atomic weapons employer (AWE) sites had their own medical clinics and equipment to perform medical X-ray screening of their workers. Sometimes, however, the sites contracted with offsite private physicians' offices, clinics, or local community hospitals to provide this service to workers (ORAUT 2017). NIOSH has determined that EEOICPA defines covered exposure as the radiation a covered employee received at a covered facility during a covered period (NIOSH 2010). Therefore, screening X-rays taken at offsite facilities that are not covered facilities are not included in the dose reconstruction.

Attributions and annotations, indicated by bracketed callouts and used to identify the source, justification, or clarification of the associated information, are presented in Section 10.0.

3.0 TECHNICAL FACTORS THAT AFFECT MEDICAL X-RAY DOSE

A number of factors determine the dose to the worker from an X-ray procedure. These factors include the X-ray machine settings (typically called technique factors) used for the exposure, such as the kilovoltage (or the kilovolts-peak, kVp), the beam current in milliamperes (mA), and time of exposure (seconds). Other factors that can affect the dose to the worker are the X-ray source-to-image distance (SID), where the X-ray source is defined as the focal spot or target of the X-ray tube, the amount of filtration in the machine, the size of the X-ray beam (collimation), the type of high-voltage generator, the type and speed of the film and screens, the film development procedure, the use of grids, and the physical size of the worker. The effect of these factors on dose reconstruction is discussed in the following sections.

The dose to workers can be estimated with a reasonable degree of accuracy by several methods, depending on what is known about the specific X-ray machine. Direct measurements of the X-ray beam itself can be used to determine dose to the worker from an X-ray procedure. Dose can also be determined using knowledge of the technique factors used on a given X-ray machine along with standard X-ray output tables in the open literature. Using either direct X-ray beam measurements or known technique factors obviates the need for detailed knowledge of some of the other factors that can affect dose. For example, the technique factors should include adjustments for the type and speed of the film and screens, film development, and use of grids. The uncertainty in the dose from many of these factors, including the uncertainty in the size of the worker, is discussed in Section 8.0.

Table 3-1 provides a summary of the effect of various technical factors on the radiation output. Sections 3.1 through 3.5 discuss these factors in more detail.

Table 3-1. Relationship of technical factors to X-ray beam output.

Parameter	Units	Relationship to X-ray beam output
Kilovoltage	kV	Air kerma proportional to 1.7 power of kVp
Tube current	mA	Air kerma proportional to tube current
Exposure time	s	Air kerma proportional to exposure time
Filtration	mm Al	Air kerma decreases by ~40% for each additional mm Al added to the beam
Distance	cm or in.	Air kerma decreases by inverse square relationship

3.1 KILOVOLTAGE, FILTRATION, AND TYPE OF HIGH-VOLTAGE GENERATOR

The maximum energy of the X-ray beam is determined by the voltage applied between the cathode and anode of the X-ray tube. Increasing the kVp increases the maximum energy of the X-ray photons and, therefore, the ability of the X-ray photons to penetrate thicker body parts. Increasing the kVp increases the beam output, defined as the quotient of the air kerma at a specified distance by the product of tube current and exposure time in units of Gy/mAs (ICRU 2005). Numerous empirical studies of beam output as a function of kVp over the years show that increasing the kVp increases the beam output according to the 1.7 power of the kilovoltage for a given amount of filtration (Handloser and Love 1951; Trout, Kelley, and Cathey 1952; BRH 1970). In the absence of specific measurements or empirical data, this relationship can be used to determine or adjust the beam output as a result of changes in kilovoltage.

The X-rays from a medical X-ray machine are predominantly of bremsstrahlung origin and, therefore, exit the beam port with a spectrum of energies. It is difficult to know the precise energy spectrum of an X-ray beam from a particular X-ray machine, so in practice it is common to refer to the “beam quality” as a simple surrogate for detailed information about the energy spectrum (ICRU 1937). The beam quality is a measure of the ability of the beam to penetrate matter (also known as beam hardness), and is expressed in terms of the half-value layer (HVL) of the beam in millimeters of aluminum. The beam quality and the HVL are primarily a function of the target material, kVp, and total filtration in the X-ray machine. Some knowledge of the beam quality is necessary for dose reconstruction. Ideally, machine-specific HVL measurements are available. Without actual HVL measurements, estimates of the HVL can be made with knowledge of the kVp and total filtration in the machine, which is the sum of the inherent filtration in the tube itself and any added filtration.

All X-ray tubes have inherent filtration, which includes the window, aperture, or port in the tube enclosure through which the X-ray beam passes or emerges from the X-ray tube. The tube housing is shielded to eliminate leakage radiation from the tube other than through the port. In medical X-ray machines for radiographic imaging, the window or beam port through which the useful beam emerges is purposely made very thin, typically equivalent to 0.5 mm Al in attenuation, and so provides little beam hardening. It was recognized early that placing additional filters in the X-ray beam to preferentially absorb the lower energy X-rays in the spectrum while allowing the higher energy X-rays

to pass through had the potential to reduce the skin dose to the individual being radiographed. For this reason, minimum filtration requirements for medical X-ray machines have been in existence for a long time.

Recommendations were made in 1937 by the International Committee for Radiological Units and Measurements (ICRU 1937), which specified aluminum filters for X-rays produced from 20 to 120 kVp. The 1936 recommendation of the U.S. Advisory Committee on X-Ray and Radium Protection, the forerunner of the National Council on Radiation Protection and Measurements (NCRP), called for total filtration (permanently mounted) of 0.5 mm Al equivalent (eq.) for radiographic installations, and 1 mm Al eq. for fluoroscopy (NBS 1936). Typical added filtration in the 1940s ranged from zero to 1 mm Al. In 1949, the National Bureau of Standards recommended an additional 1 mm of Al filtration for radiography of thick parts of the body such as the chest (NBS 1949). In 1955, the recommendation for medical radiographic machines called for 2.5 mm Al eq. total filtration (NBS 1955). The recommended total filtration remained at 2.5 mm in 1968 for medical radiographic machines operating above 70 kVp (NCRP 1968). For machines already in operation, these recommended filter thicknesses might not have been used for some time after the date of the recommendation. Since 1974, X-ray machine manufacturers have been required by law to include minimum amounts of filtration (21 CFR Part 1020). In this TIB, an HVL of 2.0 mm Al is assumed for determination of dose equivalent from chest fluoroscopy, lumbar spine, thoracic spine, cervical spine, and pelvis X-rays, 2.5 mm Al for chest X-rays taken through 1985, and 4.0 mm Al for X-rays taken after 1985.

The relationship of beam output to kVp and to filtration is complex, to some extent machine-specific, and best determined empirically. However, in the absence of empirical data for a specific machine, adequate contemporary empirical and theoretical data exist on which to determine the machine output with a reasonable degree of certainty. For a given mAs setting on a machine, additional filtration generally reduces the air kerma in an exponential manner. For a typical single-phase X-ray machine operating in the range of 80 to 100 kVp, each additional millimeter of Al filtration effects a reduction of about 40% in the air kerma (Trout, Kelley, and Cathey 1952; Taylor 1957). Therefore, the approximate reduction in air kerma afforded by any thickness of Al filtration can be determined by the following exponential equation:

$$I = I_0 e^{-0.4t}$$
$$\text{or} \qquad (3\text{-}1)$$
$$\ln\left(I / I_0\right) = -0.4t$$

where t is the thickness of Al in millimeters, and I and I_0 are air kerma with and without the filter, respectively. In the absence of specific measurements or empirical data, this correction can be applied to determine the effect of filtration on air kerma.

The effects of filtration and kVp tend to offset one another; the addition of filtration reduces the air kerma per mAs, while increasing the kVp increases the air kerma per mAs. Higher kVp radiographic techniques typically require fewer mAs per radiograph, and result in lower entrance skin dose (ENSD), but might increase dose to organs at greater depths in the body.

High-voltage X-ray generators for medical radiography since the 1940s have been of three basic types: (1) single-phase full-wave-rectified, typical of virtually all medical radiographic units used through the mid-1980s; (2) three-phase; and (3) high frequency. A single-phase full-wave-rectified generator produces 120 half-sinusoidal pulses of X-rays per second, each with a duration of 1/120 second, with a 100% fluctuation in the voltage. A three-phase generator uses three single-phase voltage lines, each slightly out of phase with the others, producing a more constant (i.e., less

fluctuating) voltage (Selman 1965, p. 5) and therefore a greater beam output (approximately 20%) in comparison with a single-phase full-wave-rectified machine operating at the same kVp and mAs. Three-phase generators were primarily installed in hospitals because they were expensive and required three-phase wiring. A high-frequency generator is the most modern type and produces a voltage waveform with very little fluctuation (2%) in voltage to the X-ray tube (Amman 1991, p. 10). Three-phase high-frequency machines did not become commonplace until the 1980s and 1990s. For dose reconstruction and in the absence of evidence to the contrary, X-ray machines will be assumed to be single-phase full-wave-rectified.

3.2 CURRENT AND EXPOSURE TIME

The "current" in an X-ray tube refers to the number of electrons accelerated across the evacuated volume of the X-ray tube, flowing from the cathode to the anode. For a given kilovoltage, the number of X-ray photons and the air kerma are directly proportional to the X-ray tube current. "Exposure time" refers to the time the beam is on or that the machine is producing X-rays. As with the tube current, the number of X-ray photons and the air kerma are directly proportional to the exposure time for a given kilovoltage. The exposure necessary for a radiograph is typically specified in terms of mAs, the product of X-ray tube current, and the exposure time. All other factors being equal (e.g., kVp, filtration, development, film/screen combination), air kerma is proportional to the mAs.

To avoid or minimize image blurring from involuntary organ motion such as the beating heart, exposure time is minimized, and the current proportionately increased to obtain the desired amount of radiation for a properly exposed radiograph. Earlier medical X-ray machines were equipped with mechanical timers whose accuracy was not as good as the accuracy of the electronic timers on later machines. Gross bias errors in timer accuracy are unlikely in that these would have resulted in over- or underexposure of the radiograph and, thus, would have been quickly detected and corrected. Small random errors in the timers might not have been visible on radiographs, but might have produced uncertainties of perhaps ±20% in the air kerma.

3.3 DISTANCE

X-ray beam output is a function of distance from the source of X-rays in the tube, approximating the inverse square law at large distances (i.e., more than a few tens of centimeters) from the tube. Chest radiographs are taken at a standard SID of 72 in. (183 cm) between the source and the plane of the film. Most other radiographs are taken at a standard SID of 36 in. to 40 in. (102 cm). The distance between the source and the worker's body, expressed as the source-to-skin distance (SSD), is smaller than the SID because the worker is positioned between the source and the film cassette.

The air kerma at the point where the X-ray beam enters the body, known as the incident air kerma ($K_{a,i}$) (ICRU 2005), is a reference point for determining organ dose (see Equation 4-1 in Section 4.1). The $K_{a,i}$ depends on the SID for the X-ray procedure, the body thickness of the person being radiographed, and the thickness of the film holder. While the size of the worker clearly affects the $K_{a,i}$, individual measurements (such as chest thickness) or individual technique factor settings (kVp, mA, and time) were rarely recorded at the time each X-ray was performed on a given worker. This is true not only at EEOICPA sites, but also at any other clinical facility for the same period. In addition, the organ dose conversion factors (DCFs) from International Commission on Radiological Protection (ICRP) Publication 34 (ICRP 1982), which are used to calculate organ-specific doses from incident air kerma, are based on assumed standard body dimensions (Cahoon 1961; Wochos, Detorie, and Cameron 1979; Kereiakes and Rosenstein 1980). As a result, occupational medical X-ray dose reconstruction is based on standard body dimensions and cannot be claimant-specific.

Table 3-2 provides the standard SIDs for the more common X-ray screening procedures and the commonly accepted thicknesses of the involved body parts. It also provides the calculated SSDs for

dose reconstruction assuming a standard 5 cm between the point where the X-ray beam exits the body and the plane of the film to account for the thickness of the cassette and/or cassette holder (Kereiakes and Rosenstein 1980, p. 36).

3.4 COLLIMATION

Collimation refers to the limitation of the size of the X-ray beam. In the early years after the discovery of X-rays, the philosophy was to use a fairly large aperture (i.e., limited collimation) to ensure that the entire area of clinical interest was included in the radiograph. As a result of radiation protection

Table 3-2. Standard body dimensions, SIDs, and SSDs used for dose reconstruction.[a]

Chest

Projection	Part thickness (cm)[b]	Standard SID (in/cm)[c]	Calculated SSD (cm)[d]
PA (PFG)	24	40/102[e]	73
PA	24	72/183	154
LAT	34	72/183	144
OBL	34	72/183	144
AP lordotic	24	72/183	154

Lumbar spine

Projection	Part thickness (cm)[b]	Standard SID (in/cm)[c]	Calculated SSD (cm)[d]
AP and spot	24	40/102	73
LAT and spot	34	40/102	63

Thoracic spine

Projection	Part thickness (cm)[b]	Standard SID (in/cm)[c]	Calculated SSD (cm)[d]
AP	24	40/102	73
LAT	34	40/102	63
OBL	34	40/102	63

Cervical spine

Projection	Part thickness (cm)[b]	Standard SID (in/cm)[c]	Calculated SSD (cm)[d]
AP	15	40/102	82
LAT	15	72/183[f]	153[g]
OBL	15	40/102	82

Pelvis

Projection	Part thickness (cm)[b]	Standard SID (in/cm)[c]	Calculated SSD (cm)[d]
AP	24	40/102	73

a. AP = anterior-posterior; LAT = lateral; OBL = oblique; PA = posterior-anterior; PFG = photofluorography.
b. The chest and abdomen are assumed to be 24 cm thick and 34 cm wide. The neck is assumed to be 15 cm thick and 15 cm wide (ICRP 110 and 116 voxel phantom measurements; ICRP 2009, 2010).
c. Source: standard SID values from ICRP (1982), Tables A2 to A9.
d. The *SSD* = *SID* − *Part thickness* − 5 cm. A 5-cm gap between the worker and the plane of the film is included to account for the thickness of the cassette and/or cassette holder.
e. Source: Laughlin et al. (1957), p.19.
f. The 72-in. SID is used for the LAT cervical spine to reduce magnification (Bontrager and Lampignano 2005, pp. 3, 4; GE 1956, p. 4).

g. The SSD for the LAT cervical spine = 183 cm − 15 cm − 5 cm − 10 cm = 153 cm. The additional 10 cm accounts for the fact that during the LAT cervical spine procedure, the shoulder is up against the cassette holder, and so the side of the neck is not actually in contact with the cassette holder, affecting the SSD calculation.

concerns, beams began to be better collimated, limiting the exposed area of the body and minimizing the dose to organs outside the beam. Limiting the size of the X-ray beam had a beneficial effect on the image quality because there was less scatter produced when smaller volumes of tissue were exposed. Without collimation, organs normally outside of the primary beam are exposed to the primary beam. Figure 3-1 illustrates how poor collimation can unnecessarily irradiate organs outside the actual image area on the film.

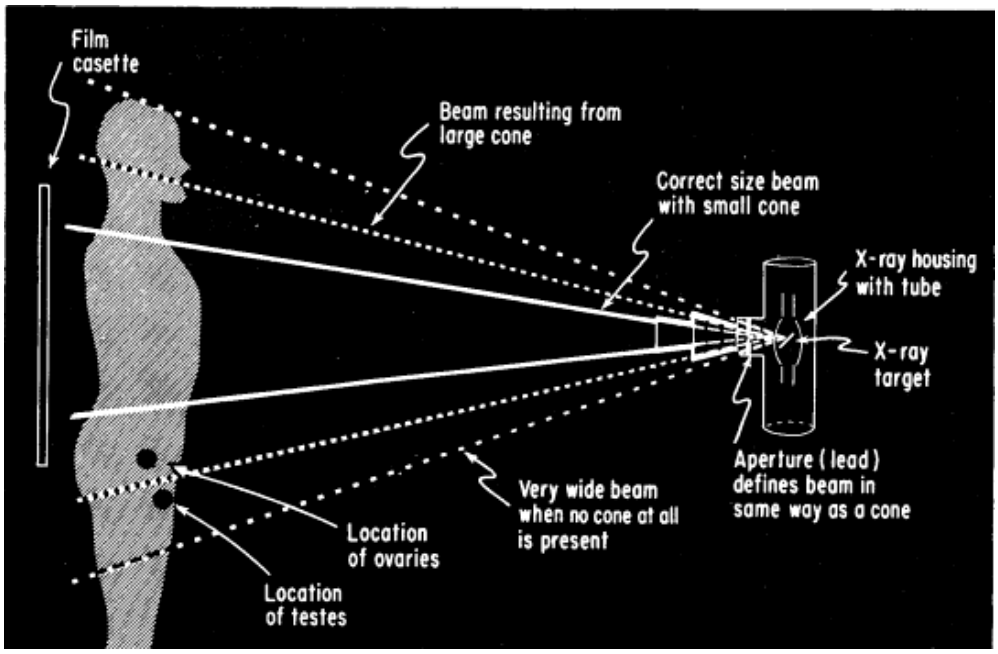

Figure 3-1. Diagram of poor collimation (Price 1958).

Beam-limiting cones were widely used for radiography from the 1940s to the 1960s (Cahoon 1961, p. 4). The cones produced circular beams, and were gradually replaced by variable aperture collimators that produced rectangular beams that more efficiently corresponded to the rectangular shape of the film (Cahoon 1961, p. 6). By the early 1960s, techniques were being modified to incorporate better methods of collimation. The NCRP, in Report 33 (NCRP 1968), updated its guidance on medical X-ray protection, including guidance for restriction of the X-ray beam to the area of clinical interest. While many facilities had probably already incorporated the beam limitation guidance in NCRP Report 33, some smaller facilities might not have incorporated it into their practices for several years.

Wochos, Detorie, and Cameron (1979) analyzed the 1972 to 1975 data from the Nationwide Evaluation of X-Ray Trends and found that at some facilities, primarily internal medicine and general practitioners, the beam area-to-film area ratio could be as high as 2.0, but noted that this ratio was significantly lower at hospitals and radiology facilities where more X-rays were done and radiographers were generally better trained. For dose reconstruction, it is assumed that radiographs from before approximately 1970 were poorly collimated in comparison with radiographs from after 1970. If actual dose measurements or inspection of the radiographs from a particular site indicate that collimation was used before 1970, the site-specific evidence can be used in the development of organ doses in that site's site profile. However, in the absence of information to the contrary with respect to collimation before 1970, a beam area-to-film area ratio of 2.0 is assumed for dose

reconstruction through 1970. This ratio would be achieved by exposure of an additional 3 in. in all directions around a 14- by 17-in. radiographic film.

An assumption of poor collimation of radiographs through 1970 might necessitate the use of DCFs from ICRP Publication 34 (ICRP 1982) other than those for the intended examination, because ICRP Publication 34 DCFs are based on properly collimated beams. This is discussed in more detail in Section 5.2 of this TIB. The tables in Attachment B of this TIB account for poor collimation of radiographs through 1970 and require no further adjustment during application during dose reconstruction.

3.5 SCREENS, GRIDS, AND OTHER FACTORS

Several other factors affect the X-ray exposure necessary to obtain a usable radiographic image and, therefore, have the potential to affect the dose to the worker. However, detailed knowledge of these factors is usually unnecessary for dose reconstruction if beam measurements are available or if the machine technical factors of kilovoltage (kVp), time(s), and current (mA) are known along with the amount of primary beam filtration.

The exposure necessary for a suitable radiographic image is a function of the film/screen combination speed and development. Underdevelopment of films requires additional exposure to achieve satisfactory film density. Intensifying screens are used in the cassette to convert the radiation efficiently to light photons that subsequently expose the film. Because film is more sensitive to light photons than to X-ray photons, using screens and film in combination can reduce the amount of necessary radiation. Film and screen speeds have increased dramatically since the 1940s and are one of the reasons that the dose per X-ray procedure generally shows a downward trend over this period.

Grids are devices that are placed in front of the film cassette to absorb scattered radiation before it reaches the film. The grid itself consists of very thin lead strips placed so the diverging X-ray photons pass between the strips. The strips absorb radiation that is scattered at large angles. Grids are typically used to radiograph thick body parts such as the abdomen, lumbar spine and, in recent times, the chest. The Potter Bucky diaphragm (also known as a Bucky grid) vibrates back and forth rapidly during the exposure, which minimizes the chance the strips will appear on the film image. In any case, the above are all factored into the technique factors (i.e., kVp, mA, and time) that are used to produce images and, therefore, detailed knowledge of them is not always of importance in dose reconstruction.

4.0 DETERMINING INCIDENT AIR KERMA

One of the essential parameters used to determine organ dose equivalent is the incident air kerma, $K_{a,i}$ (ICRU 2005), which is the air kerma from the primary beam on the central X-ray beam axis at the SSD (i.e., at the skin entrance plane). Only the primary radiation incident on the skin, without backscattered radiation, is included in the definition of $K_{a,i}$ (ICRU 2005, p. 28). The incident air kerma can be determined from actual X-ray beam measurements, knowledge of technical factors for the X-ray machine in question, or by using air kerma values from the literature and correcting to the SSD of interest. Each of these is discussed in the following sections. Before the quantity “exposure” became obsolete (ICRU 2005), the entrance skin exposure (ESE) was used to describe essentially the same quantity as incident air kerma.

4.1 USING BEAM MEASUREMENTS

Use of actual X-ray beam measurements is the simplest and most direct means of determining the incident air kerma and is most likely to provide the most accurate estimates of organ dose equivalent

from a given machine. Unfortunately, X-ray beam measurements are often unavailable, particularly before about 1980. Because actual measurements are the preferred method for determining incident air kerma, every effort to determine if such measurements have been made is justifiable. Beam measurements are typically quantified in units of roentgens (R) (now obsolete), coulombs per kilogram (C/kg), or grays (Gy). Measurements with R-meters and ionization chambers, if properly performed, are reliable and have a low degree of uncertainty. In general, the uncertainty of properly performed measurements in the energy region of interest should not exceed ±2% of the measured value (Kathren and Larson 1969).

Beam measurements in roentgens must be converted to incident air kerma (see Equation 4.1). Using the inverse square relationship in Table 3-1 and the standard SSDs from Table 3-2, the air kerma at any point on the central axis of the X-ray beam can be converted to the incident air kerma.

$$K_{a,i} = (R)\left(2.58 \times 10^{-4}\,\text{C/kg/R}\right)(33.97\,\text{J/C})(100\,\text{cGy/Gy})(1\,\text{Gy/1J/kg}) \quad (4\text{-}1)$$

where

$K_{a,i}$	=	incident air kerma to be used in organ dose calculations (cGy)
R	=	exposure in roentgens at the skin entrance plane (i.e., ESE)
2.58×10^{-4} C/kg/R	=	conversion factor from R to C/kg
33.97J/C	=	amount of energy required to ionize air

Only the primary radiation incident on the skin, without backscattered radiation, is included in the definition of $K_{a,i}$ (ICRU 2005, p. 28). Therefore, measurements using a phantom would not be appropriate for use in the provided equation.

All information from the sites is evaluated and considered when calculating X-ray doses. While strict guidelines for what specifically needs to be known is not provided, any measurement information from the sites is to be compared to a calculation using the technical factors to determine if the provided values are within reason. In most cases, the Project has not been provided X-ray measurement information but has had to rely on technical factors from the sites.

4.2 USING TECHNICAL FACTORS

In the absence of suitable beam measurements, the incident air kerma can be determined using machine-specific technical factors for a given X-ray examination and projection, and for an individual with the same dimensions as those in Table 3-2. Technical factors are used with published X-ray output data that provide air kerma per mAs as a function of kVp, filtration (or HVL), and distance to determine the incident air kerma. X-ray beam output data are available from several publications, including NCRP Report 102 (NCRP 1989) and ICRP Publication 34 (ICRP 1982). Table B-3 in NCRP Report 102 (p. 56) provides average air kerma rates for medical X-ray equipment operating at various kVp with 2.5-mm Al eq. filtration at distances from 30 to 183 cm from the source. As an alternative, Figure B.1 in NCRP Report No. 102 (p. 61) and Figure A1 in ICRP Publication 34 (p. 44) provide graphical representations of air kerma at 100 cm for various values of kVp and filter thickness greater than 2.5 mm Al eq. Using these tables or graphs, a reasonable estimate of incident air kerma can be obtained with knowledge of the mAs and the SSDs from Table 3-2.

4.3 USING PUBLISHED VALUES FROM MEDICAL LITERATURE

If both machine-specific beam measurements and machine-specific technical factors are unknown or unreliable, values of incident air kerma from the general medical literature of the time can be used. These incident air kerma values are listed in Table 4-1. Published incident air kerma values are

values from measurements reported in the literature for similar X-ray machines and X-ray procedures and for similar periods. Published incident air kerma values are used to calculate many of the organ dose equivalents in this TIB, with a few exceptions where measured doses directly from medical literature are used. More detail about some of the incident air kerma values is provided in the sections on X-ray procedures.

Table 4-1. Published incident air kerma values by procedure and period.[a]

Chest

Projection	HVL (mm Al eq.) through 1970	Incident air kerma (cGy) through 1970	HVL (mm Al eq.) 1971–1985	Incident air kerma (cGy) 1971–1985	HVL (mm Al eq.) after 1985	Incident air kerma (cGy) after 1985
PFG	2.5	2.27[b]	Not used	Not used	Not used	Not used
PA	2.5	0.20[c]	2.5	0.10[k]	4.0	0.05[l]
LAT	2.5	0.50[c]	2.5	0.25[m]	4.0	0.13
OBL	2.5	0.50[d]	2.5	0.25[d]	4.0	0.13
AP lordotic	2.5	0.20[e]	2.5	0.10[e]	Not used	Not used
Fluoroscopy (PA)	2.0	2.50[f]	Not used	Not used	Not used	Not used

Lumbar spine

Projection	HVL (mm Al eq.) through 1970	Incident air kerma (cGy) through 1970	HVL (mm Al eq.) 1971–1985	Incident air kerma (cGy) 1971–1985	HVL (mm Al eq.) after 1985	Incident air kerma (cGy) after 1985
AP and spot	2.0	1.44[g]	2.5	0.78[h]	Not used	Not used
LAT and spot	2.0	3.79[g]	2.5	2.80[h]	Not used	Not used

Thoracic spine

Projection	HVL (mm Al eq.) through 1970	Incident air kerma (cGy) through 1970	HVL (mm Al eq.) 1971–1985	Incident air kerma (cGy) 1971–1985	HVL (mm Al eq.) after 1985	Incident air kerma (cGy) after 1985
AP	2.0	0.985[g]	Not used	Not used	Not used	Not used
LAT	2.0	2.20[g]	Not used	Not used	Not used	Not used
OBL	2.0	2.20[i]	Not used	Not used	Not used	Not used

Cervical spine

Projection	HVL (mm Al eq.) through 1970	Incident air kerma (cGy) through 1970	HVL (mm Al eq.) 1971–1985	Incident air kerma (cGy) 1971–1985	HVL (mm Al eq.) after 1985	Incident air kerma (cGy) after 1985
AP	2.0	0.432[j]	Not used	Not used	Not used	Not used
OBL	2.0	0.432[j]	Not used	Not used	Not used	Not used
LAT	2.0	0.261[j]	Not used	Not used	Not used	Not used

Pelvis

Projection	HVL (mm Al eq.) through 1970	Incident air kerma (cGy) through 1970	HVL (mm Al eq.) 1971–1985	Incident air kerma (cGy) 1971–1985	HVL (mm Al eq.) after 1985	Incident air kerma (cGy) after 1985
AP	2.0	1.52[g]	Not used	Not used	Not used	Not used

a. Not used means projection not used for screening in this period.
b. Incident air kerma of 2.27 cGy is for stereo (two-exposure) PFG (Rising and Soldat 1959, p. 7) (see Section 7.2 for additional information).
c. Source: Stanford and Vance (1955, p. 7).
d. Chest OBL assumed to have same incident air kerma as chest LAT projection based on projection through a longer axis of the body.
e. Chest AP lordotic assumed to have same incident air kerma as chest PA.
f. Fluoroscopy dose based on 5 R/min for 30 seconds with an HVL of 2.0 mm Al eq. (see Section 7.3 for additional information).
g. Source: Lincoln and Gupton (1958, pp. 7–8) and Equation 4-1 or 7-1 in this TIB.
h. Source: Kereiakes and Rosenstein (1980, p. 59).

i. Thoracic spine OBL assumed to have same incident air kerma as thoracic spine LAT projection based on projection through a longer axis of the body.
j. Source: Braestrup and Wycoff (1958, p. 81) (see Section 7.6 for additional information).
k. Source: Rising and Soldat (1959, p. 7) (ESE of 40 mR with additional conservatism to ensure maximum value).
l. Source: WSDH (1983–2001, p. 4) (ESE of 11 mR with additional conservatism to ensure maximum value).
m. Chest LAT incident air kerma assumed to be 2.5 times higher than Chest PA incident air kerma (see Section 7.2 for additional information).

5.0 DETERMINING DOSE EQUIVALENT TO ORGANS OTHER THAN SKIN

Attachment A, Table A-1 provides guidance for the organ to which dose is assigned based on the *International Statistical Classification of Diseases and Related Health Problems, Tenth Edition* (ICD-10) code. Attachment A is organized to use the ICD-10 code (from the dose reconstruction claim) to determine the organ for which medical X-ray dose will be assigned. Table A-1 provides the organ to be used for PFG and chest, lumbar spine, thoracic spine, cervical spine, and pelvis medical X-ray dose assignment. Tables A-2 through A-5 provide additional guidance for organ selection when different organs are appropriate for different views.

To conserve space in this document, a simplification to Tables A-1 through A-4 has been made when all subcodes of any specific code have the same X-ray organ for the X-ray procedures defined for those codes. In such cases, the subcodes have been collapsed to the single higher code in the table and the listed organs and models are to be used for that code and all subcodes with additional extensions.

The method from ICRP Publication 34 (ICRP 1982) was used to estimate many organ dose equivalents. This methodology is based on Monte Carlo calculations for a reference adult in Kereiakes and Rosenstein (1980, Table 94 and Figures 2 and 3) that appear to be more representative of the human body than the simple nonstandardized phantoms used in the 1950s for early studies on gonad dose to the population (Lincoln and Gupton 1958; Laughlin et al. 1957; Billings, Norman, and Greenfield 1957). In the Publication 34 method, organ dose is obtained as the product of entrance kerma and the selected DCF from Tables A2 to A8. Entrance kerma is defined in Publication 34 as "air kerma in air without backscatter." For consistency in this TIB, the term incident air kerma ($K_{a,i}$) from ICRU (2005) is used:

$$ODE = (K_{a,i})(DCF)(1\ \text{cSv/cGy})(1\ \text{rem/cSv}) \quad (5\text{-}1)$$

where

ODE	=	organ dose equivalent (rem)
$K_{a,i}$	=	incident air kerma (cGy)
DCF	=	selected ICRP 34 organ-specific DCF
1 cSv/cGy	=	conversion from absorbed dose to dose equivalent for X-ray photons; 1 cSv = 1 rem

Selection of the appropriate DCF from Tables A2 to A8 in ICRP Publication 34 (ICRP 1982) requires knowledge of the X-ray projection, the organ, and the X-ray beam quality in terms of the HVL in mm Al. If the kVp and total filtration are known, HVLs can be estimated from the data in Tables A16 and A17 of ICRP Publication 34 (p. 44) or Table B.2 in NCRP Report 102 (NCRP 1989, p. 56).

5.1 ICRP 34 ORGAN DOSE CONVERSION FACTOR FOR ORGANS NOT EXPLICITLY GIVEN IN ICRP 34

Tables A2 to A8 in ICRP Publication 34 (ICRP 1982) provides average absorbed dose per entrance air kerma for seven specific organs. Additional organs are used in this document that correspond to

the likely primary cancer site locations used in dose reconstruction. Therefore, a substitute DCF must be selected for organs for which there is no corresponding DCF in ICRP Publication 34. For a properly collimated beam, the substitute DCF is usually selected according to anatomical proximity, with due consideration to other factors such as whether one or both organs are inside or outside the primary beam, organ depth, characteristics of overlying tissue, etc. Figure 5-1 illustrates the relationships between the locations of organs.

In general, for chest, thoracic, and cervical spine X-rays with properly collimated beams, the lung DCF is used for other organs in the thoracic or upper abdominal cavity (i.e., thymus, esophagus, stomach, small intestine, and liver/gallbladder/spleen). Because an appreciable fraction of the skeleton is in the trunk, in particular the trabecular bone, which has a large surface-to-volume ratio, and the sternum, which is a primary location of the red marrow in the adult, the lung DCF is used to determine the dose to bone surfaces for chest, thoracic, and cervical spine X-rays. When the lung DCF is used as a substitute for other organs, the higher of the male or female lung DCF is used to determine the dose to these other organs for either gender. Using the same logic, the ovary DCF is used as a substitute to determine the dose to organs in the lower abdomen such as the urinary bladder, prostate, and colon/rectum, regardless of gender. For the lumbar spine and pelvis X-rays, the ovary DCF is used as a substitute to determine the dose to the liver, gallbladder, spleen, urinary bladder, prostate, colon, rectum, stomach, bone surfaces (in the spine and pelvis), and the remainder organs, again regardless of gender. The thyroid DCF is usually selected as the substitute to determine the dose to the eye/brain. Exceptions to the general substitutions in Table 5-1 are footnoted.

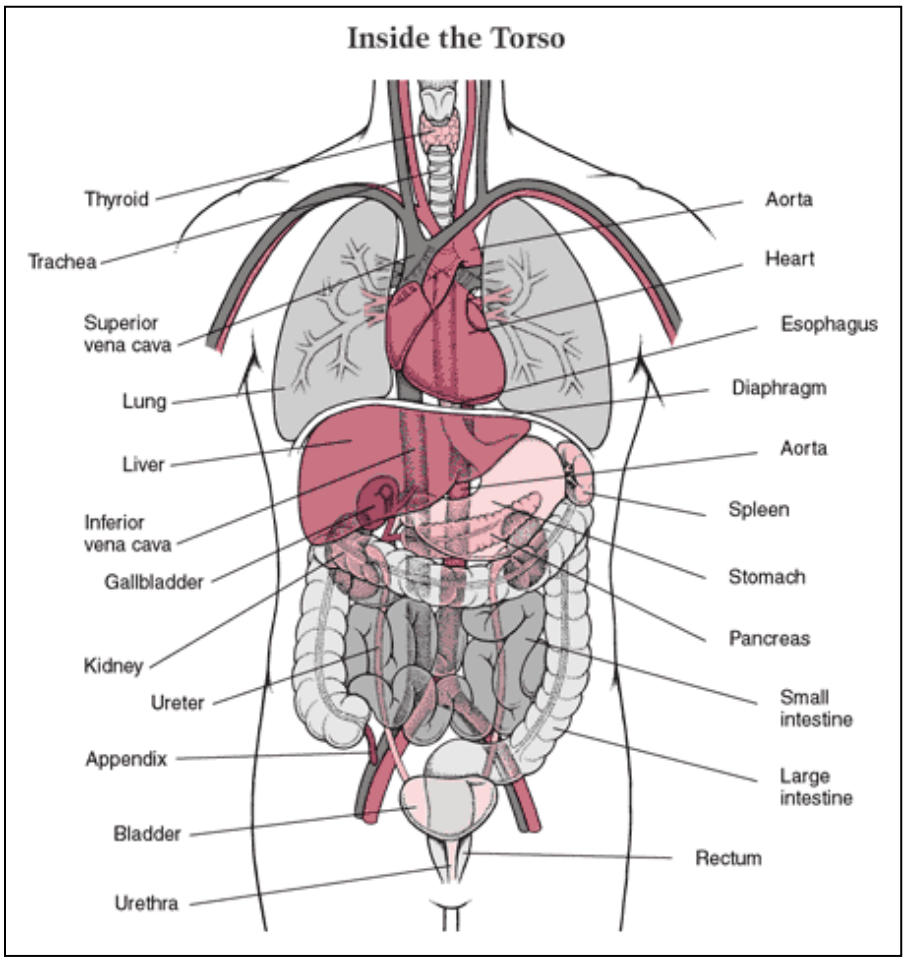

Figure 5-1. Diagram of the torso (Beers 2003, Section 1, Chapter 1).

Table 5-1. ICRP Publication 60 organs used for estimation of external dose which do not have ICRP Publication 34 DCFs for calculating occupational medical dose.[a]

ICRP Publication 60 External Dose Organ[b]	ICRP 34 Organ DCF
Thymus, Esophagus	Lung
Stomach, Bone surface, Liver/gallbladder/spleen, Remainder organs	Lung[c] or ovary
Urinary bladder/prostate Colon/rectum	Ovary
Eye/brain	Thyroid

a. Applies to most properly collimated chest radiographic procedures.
b. Attachment A provides appropriate ICRP 60 organ based on ICD-10 code.
c. The ovary is used as the substitute DCF for these organs for the pelvis or lumbar spine imaging.

5.2 POOR COLLIMATION AND THE CHOICE OF ICRP 34 DOSE CONVERSION FACTORS

Without good collimation, organs normally outside the primary beam are exposed to the primary beam. This necessitates the use of DCFs from ICRP Publication 34 (ICRP 1982) other than those for the intended procedure, because Publication 34 assumes properly collimated beams. For example, the thyroid is normally assumed to be outside the properly collimated beam of a PA chest projection (DCF = 32 mGy/Gy for HVL of 2.5 mm Al) (ICRP 1982, Table A2). However, a poorly collimated PA chest beam is about 2.0 times the size of the film (Section 3.4); therefore, it is assumed to include the thyroid in the primary beam. The dose to the thyroid can then be reasonably estimated by using a DCF for a projection in which the thyroid is clearly in the primary beam, such as the anterior-posterior (AP) cervical spine projection (DCF = 868 mGy/Gy for HVL of 2.5 mm Al) (ICRP 1982, Table A2). However, the thyroid is near the exit surface of the X-ray beam during a PA chest projection and near the entrance surface of the beam during an AP cervical spine projection. A simple depth dose correction can be applied to the AP cervical spine DCF to account for the additional tissue attenuation in the neck when the thyroid is in the primary beam (as it is during an AP cervical spine projection), but nearer the exit surface of the beam (as it is during the PA chest projection). Depth dose factors from Table B.8 of NCRP Report 102 (NCRP 1989) are used to make this correction. The resulting modified thyroid DCF for poorly collimated beams is 174 mGy/Gy assuming the thyroid is approximately 10 cm below the surface of the back of the neck, and using a depth dose factor of 0.2 for 2.5 mm Al HVL from Table B.8 of NCRP Report 102: 868 mGy/Gy × 0.2 = 174 mGy/Gy.

The DCFs that are selected to determine dose as a result of poor collimation are presented in Tables 5-2 and 5-3. They are further discussed in the sections that describe the various screening procedures and projections. A complete table of DCFs is in Attachment B, Tables B-1 to B-3.

6.0 DETERMINING DOSE EQUIVALENT TO SKIN

The dose equivalent to the skin surface in the primary beam on the entrance side of the body, called ENSD in this TIB, can be calculated with the following equation (Equation 6-1 of Wall, Harrison, and Spiers 1988, p.10, with modification for conversion to centisievert):

$$ENSD = \left(K_{a,i}\right)\left(\mu_{en}/\rho\right)_{muscle}\left(\mu_{en}/\rho\right)_{air}^{-1}\left(BSF\right)\left(d/FSD\right)^{2}\left(1\ \text{cSv/cGy}\right) \qquad (6\text{-}1)$$

where

ENSD	=	dose equivalent at the skin surface (cSv)
$K_{a,i}$	=	incident air kerma (cGy)
$(\mu_{en}/\rho)_{muscle}\,(\mu_{en}/\rho)_{air}^{-1}$	=	ratio of energy absorption coefficients for muscle to air, which is 1.04 to 1.07 for the 40- to 140-kVp range, usually set to 1 (Wall, Harrison, and Spiers 1988)
BSF	=	backscatter factor from Table B.8 in NCRP Report 102 (NCRP 1989, p. 58), which provides backscatter factors for different beam qualities and field sizes
d	=	distance dose rate in air taken (cm)
FSD	=	focus to skin distance (cm)
1 cSv/cGy	=	the conversion from absorbed dose to dose equivalent for X-ray photons; 1 cSv = 1 rem

NOTE: *d*/*FSD* is normally equal to 1. This factor would only change if the distance the dose rate is measured in air is different than the distance to the entrance skin.

Table 5-2. DCFs for poorly collimated chest beams through 1970.[a,b]

Organ of interest	PFG[c]	Chest fluoroscopy[d]	PA chest through 1970[c]	LAT/OBL chest through 1970[c]	AP lordotic chest through 1970[c]
Thyroid	Thyroid DCF for AP cervical spine corrected for depth by 0.2	Thyroid DCF for AP cervical spine corrected for depth by 0.2	Thyroid DCF for AP cervical spine corrected for depth by 0.2	Thyroid DCF for LAT skull	Thyroid DCF for AP cervical spine[e]
Eye/brain	Thyroid DCF for PA chest	Thyroid DCF for PA chest	Thyroid DCF for PA chest	Thyroid DCF for LAT chest	Thyroid DCF for AP cervical spine
Ovaries	Measured[b]	Ovaries DCF for PA chest	Measured[b]	Measured[b]	Ovaries DCF for AP abdomen
Liver/gallbladder/spleen	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Urinary bladder/prostate	Measured[b]	Ovaries DCF for PA chest	Measured[b]	Measured[b]	Ovaries DCF for AP abdomen
Colon/rectum	Measured[b]	Ovaries DCF for PA chest	Measured[b]	Measured[b]	Ovaries DCF for AP abdomen
Testes	Measured[b]	Testes DCF for PA chest	Measured[b]	Measured[b]	Testes DCF for AP abdomen
Lungs male	Lung DCF male for PA chest	Lung DCF male for PA chest	Lung DCF male for PA chest	Lung DCF male for LAT chest	Lung DCF male for AP chest
Lungs female	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF female for AP chest
Thymus	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Esophagus	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Stomach	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Bone surfaces	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Remainder	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for PA chest	Lung DCF female for LAT chest	Lung DCF male for AP chest
Breast	Breast DCF for PA chest	Breast DCF for PA chest	Breast DCF for PA chest	Breast DCF for LAT chest	Breast DCF for AP chest
Uterus	Measured[b]	Uterus DCF for PA chest	Measured[b]	Measured[b]	Uterus DCF for AP abdomen
Bone marrow male	Bone marrow male for PA chest	Bone marrow male for PA chest	Bone marrow male for PA chest	Bone marrow male for LAT chest	Bone marrow male for AP chest
Bone marrow female	Bone marrow female for PA chest	Bone marrow female for PA chest	Bone marrow female for PA chest	Bone marrow female for LAT chest	Bone marrow female for AP chest

a. Only substitute DCFs are shown in this table. A complete list of DCFs is in Attachment B, Tables B-1 to B-3.
b. Measured means that a measured dose from literature provided in Table B-10 is used rather than a DCF.
c. HVL = 2.5 mm Al.
d. HVL = 2.0 mm Al.
e. Cervical spine thyroid DCF used to account for poor collimation.

Table 5-3. DCFs for poorly collimated spine and pelvis beams through 1970 (2.0 mm Al HVL).[a,b]

Organ of interest	AP lumbar spine	LAT lumbar spine	AP pelvis	AP thoracic spine	LAT/OBL thoracic spine	AP/OBL cervical spine	LAT cervical spine
Thyroid	Thyroid DCF	Thyroid DCF	Thyroid DCF	Thyroid DCF	Thyroid DCF for LAT cervical spine	Thyroid DCF	Thyroid DCF
Eye/brain	Thyroid DCF	Thyroid DCF	Thyroid DCF	10% of thyroid DCF[c]	Thyroid DCF	Thyroid DCF	Thyroid DCF
Ovaries	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Liver, gallbladder, spleen	Measured[b]	Measured[b]	Measured[b]	Lungs male DCF	Lung female DCF	Lung DCF	Lung DCF
Urinary bladder/prostate	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Colon/rectum	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Testes	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Lungs male	Lung DCF	Lung DCF	Lung DCF	Lung DCF male	Lung DCF male	Lung DCF	Lung DCF
Lungs female	Lung DCF	Lung DCF	Lung DCF	Lung DCF female	Lung DCF female	Lung DCF	Lung DCF
Thymus	Lung DCF	Lung DCF	Lung DCF	Lung DCF male	Lung DCF female	Lung DCF	Lung DCF
Esophagus	Lung DCF	Lung DCF	Lung DCF	Lung DCF male	Lung DCF female	Lung DCF	Lung DCF
Stomach	Measured[b]	Measured[b]	Measured[b]	Lungs male DCF	Lung female DCF	Lung DCF	Lung DCF
Bone surfaces	Measured[b]	Measured[b]	Measured[b]	Lungs male DCF	Lung female DCF	Lung DCF	Lung DCF
Remainder	Measured[b]	Measured[b]	Measured[b]	Lungs male DCF	Lung female DCF	Lung DCF	Lung DCF
Breast	Lung DCF[d]	Lung DCF[d]	Lung DCF[d]	Breast DCF	Breast DCF	Lung DCF[d]	Lung DCF[d]
Uterus	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Bone marrow male	Bone marrow DCF	Bone marrow DCF	Bone marrow DCF	Bone marrow DCF male	Bone marrow DCF male	Bone marrow DCF	Bone marrow DCF
Bone marrow female	Bone marrow DCF	Bone marrow DCF	Bone marrow DCF	Bone marrow DCF female	Bone marrow DCF female	Bone marrow DCF	Bone marrow DCF

a. Only substitute DCFs are shown in this table. A complete table of DCFs is in Attachment B, Tables B-1 to B-3.
b. Measured means that a measured dose from literature from Table B-13 is used rather than a DCF.
c. See Section 7.6 on thoracic spine and Kereiakes and Rosenstein (1980, p. 52).
d. ICRP 34 did not compute a breast DCF for these projections.

6.1 ENTRANCE SKIN DOSE EQUIVALENT

The ENSD from Equation 6-1 is the starting point for determining other skin dose equivalents. The ENSD is assigned to areas of skin in the primary beam on the beam entrance side of the body for a particular radiographic projection. Because the area of skin in the primary beam varies with the type of radiographic procedure, the projection, and collimation, standard areas of skin were defined for use in dose reconstruction. These standard areas are listed in Tables B-4 to B-9 of Attachment B, along with areas of skin that are assigned the ENSD for various procedures, projections, and periods.

6.2 EXIT SKIN DOSE EQUIVALENT

The exit skin dose (EXSD) equivalent is the dose equivalent to areas of skin where the X-ray beam exits the body. The EXSD is determined by dividing the ENSD by an absorption factor from Table B.7 in NCRP Report 102 (NCRP 1989, p. 58) to account for attenuation in the body. The selection of an absorption factor depends on the beam quality and the thickness (in centimeters) of overlying tissue. In this TIB, the standard body dimensions from Table 3-2 are used with the assumed beam qualities (2.0, 2.5, and 4.0 mm Al HVL). The absorption factor is decreased by 10% to allow for differences between the tabulated values and actual values, as specified in the footnote to Table B.7 in Report 102. The areas of skin that are assigned the EXSD for various procedures and projections are listed in Tables B-4 to B-9 of Attachment B for various procedures, projections, and periods.

$$EXSD = (ENSD)(0.9AF)^{-1} \quad (6\text{-}2)$$

where

0.9 = uncertainty factor in the tabulated absorption factors
AF = absorption factor from Table B.7 in NCRP Report 102 (NCRP 1989, p. 58)

6.3 SKIN OUTSIDE BUT NEAR PRIMARY BEAM

ENSD and EXSD to portions of the skin outside but near the beam are assumed to be 10% of the doses in the neighboring region inside the beam. This is based on the finding that the dose to the testes is 10% of the central beam dose when the testes are just outside the beam (Kereiakes and Rosenstein 1980, p. 52). The areas of skin that are assigned the 10% of the ENSD or the EXSD are listed in Tables B-4 to B-9 of Attachment B for various procedures, projections, and periods.

6.4 REMOTE SKIN DOSE EQUIVALENT

The dose equivalent to areas of skin that are remote from the primary beam (entrance or exit) is estimated from the scatter that would be the sole source of irradiation to those areas of skin. The dose equivalent to these areas is called the remote skin dose (RSD) in this TIB. The RSD is estimated using the following equation:

$$RSD = (ENSD)(ADD)(1.1)(0.0005)(1/r^2) \quad (6\text{-}3)$$

where

ENSD = ENSD from the primary beam calculated from Equation 6-1
ADD = average depth dose; percent of the ENSD at a point at the mid-plane of the body from Table B.8 in NCRP Report 102 (NCRP 1989, p. 58)
1.1 = correction for differences between the SSD of 60 cm assumed in Table B.8 and other SSDs specified in the title of Table B.8 (NCRP 1989, p. 58)

0.0005 = ratio of scattered to incident exposure at 1 m from a 70-kVp primary beam that scatters 90° from the path of the incident X-ray beam from Table B-2 in NCRP Report 49 (NCRP 1976, p. 59)

$1/r^2$ = correction for the distance between the center of the primary beam to the remote skin area of interest. The distance is based on the reference adult worker in Kereiakes and Rosenstein (1980, Table 94 and Figures 2 and 3). The units for r is meters (m).

The distances used for calculation of RSD in this TIB are as follows:

- Chest X-rays and thoracic spine X-rays:
  - Skin of thighs to the knees: 0.52 m
  - Skin of knees and below: 0.86 m
- Lumbar spine and pelvis X-rays:
  - Skin of knee and below: 0.60 m
- Cervical spine X-rays:
  - Skin of elbow and below: 0.40 m
  - Skin of thigh to the knees: 0.70 m
  - Skin of knees and below: 1.00 m
  - Torso (front, back, and sides) lowest rib to iliac crest = 0.30 m
  - Torso (front, back, and sides) iliac crest and below = 0.50 m

The areas of skin that are assigned the RSD for various procedures and projections are listed in Tables B-4 to B-9 of Attachment B.

7.0 TYPES AND FREQUENCY OF X-RAY SCREENING

There is some variability from site to site as to which standard projections were included in screening protocols and how frequently they were performed, depending on physician or radiologist preference. The standard screening protocols for workers or small subsets of workers should be addressed in each Occupational Medical Dose section of the site profile for a particular site. X-ray projections that were requested by the physician on a case-by-case basis in addition to the screening protocol fall into the diagnostic category (i.e., not screening) and should not be included in dose reconstruction in compliance with 42 CFR Part 81, with a few exceptions described in the sections below.

The incidence of technically deficient films that required retakes is not known, but it is likely to have been very small, probably no more than a few percent. Trout et al. (1973) in their analysis of the rejection rate of chest radiographs from the Coal Mine "Black Lung" program reported an average rejection rate of 3% among 67,000 radiographs. This low rejection rate occurred in a program that had fairly high standards of training for the radiologists, who interpreted the images, in addition to standards for the image quality of the films. It is doubtful that the retake rate in the DOE complex would have been higher than this when the standards for the film readers and image quality were not formally in place in the DOE complex. Goldman and Beech (1979, p. 44) report that only about 3.64% of the examinations at the Baltimore Public Health Service Hospital involved a retake.

In the DOE complex, Los Alamos National Laboratory reported a retake rate of 2.2% in 1998 (Antonsen 1998, p. 26); Lawrence Berkeley National Laboratory reported a retake rate of 0% in 1991 (Thomas 1991a, p. 3); no retake program was in place at Lawrence Livermore National Laboratory in

1991 (Thomas 1991b, p. 4) or at Brookhaven National Laboratory in 1994 (Bernacki 1994, pp. 13–14). These references do not support the automatic inclusion of retakes as an additional source of exposure to each worker, but if dose reconstructors encounter records of retakes in individual claim file records, the dose from them should be included.

7.1 RADIOGRAPHIC CHEST

The most commonly performed X-ray screening examination or procedure is the conventional radiographic chest projection, which was used in the DOE complex to screen for diseases of the lungs and heart, primarily for tuberculosis (TB) and occupational lung diseases like asbestosis (Wirth 1951; Cantril 1951). The PA chest projection was standard (Merrill 1949, p. 5) and sometimes accompanied by a lateral (LAT) chest projection. The LAT chest was almost always a left LAT (performed with the left side of the body towards the film) to image the heart and the aorta (Merrill 1949, p. 10). Both of these projections were made on 14-in. by 17-in. film at a standard SID of 72 in. (Merrill 1949, p. 5). The PA chest was occasionally performed in stereo, meaning that exposures were made on two separate films using slightly different X-ray tube angles and they were viewed at the same time with a stereoscope (Selman 1965, p. 10). The significance of the word “stereo” for dose reconstruction is that two exposures were made and, therefore, organ doses should be doubled when dose reconstructors find claim file records of stereo projections.

In the complete absence of information about site chest X-ray screening protocol and standard projections (including the lack of X-ray records in the claim files), a preemployment, annual, and termination PA chest X-ray should be assumed (Wirth 1951, p. 51). This is accomplished through the assignment of X-ray dose in the first year of employment followed by an assignment of X-ray dose in each subsequent year. If the termination of employment was after the anniversary date (month and day) of the beginning of employment, an additional termination X-ray procedure should be assumed for that year and the assigned dose should be calculated for two procedures for that year.

The oblique (OBL) chest projection is usually considered an additional projection because it is used to help a physician diagnose suspicious areas on the PA or LAT chest projection. It is not typically performed on all workers as part of a screening protocol. However, there is evidence that OBL projections increase the diagnostic accuracy of asbestosis and, therefore, could have been included as a standard screening projection for asbestos workers (Baker and Greene 1982). OBL chest projections are usually performed with the individual’s right or left anterior chest closest to the film, and are referred to as the right anterior oblique (RAO) or left anterior oblique (LAO). The X-ray beam still enters the individual’s body from the back and exits the front (i.e., PA). If OBL chest projections are listed in the worker’s claim file, dose should be included in the dose reconstruction, unless there is evidence this projection was done for diagnosis. If only one OBL chest projection was performed, dose reconstructors should assume it was the RAO chest.

The OBL chest projection uses essentially the same technical factors as those for the LAT chest projection because the body part thickness is approximately the same for the two projections. When organ doses for the OBL projection are not specified in the site profile, they can be assumed to be the same as those from the LAT projection except for skin doses. For the LAT chest projection, the beam enters on the right side of the body, whereas for the RAO it enters the left side of the body. Tables B-4 and B-8 provide guidance for skin dose assignment for RAO and LAO chest projections.

The lordotic chest projection (also known as the Lindblom position) was another additional projection requested by physicians to better visualize the apices (i.e., the uppermost portion) of the lungs (Merrill 1949, p. 13), a common location for TB. The lordotic projection was most commonly performed AP, where the individual faced the X-ray tube and leaned backwards from the waist toward the cassette for the exposure (Merrill 1949, p. 13). It would not have been performed routinely on all workers as a standard screening projection. This is evidenced by the fact that at the Hanford Site, the number of

lordotic chest projections is only 2% of the number of PA chest projections in the 10-year period from 1946 to 1956 (Kirklin 1969). Because active TB was a cause for rejection of a potential worker (i.e., not hiring) (Cantril 1951), and the lordotic projection might have been necessary to diagnose active TB, the dose from lordotic X-rays in the pre-employment examination should be included in dose reconstruction. In the periodic screening examinations of workers after hire, the lordotic projection should be included in dose reconstruction unless records provide evidence the exam was performed for diagnostic purposes. Organ doses from the lordotic chest projection are not provided after 1985 because it is unlikely to have been performed after that time with the increasing use of computed tomography scans.

The incident air kerma values that were used to determine organ dose equivalents in this TIB are listed in Table 4-1. The incident air kerma for a LAT chest X-ray is assumed to be 2.5 times that of a PA chest, a conservative value based on measurements from Hanford (Kirklin et al. ca. 1969) where a factor of 1.94 was observed and other measurements that suggest the ratio of incident air kerma from LAT and PA chest radiographs could have been somewhat greater than that (Stanford and Vance 1955, p. 7).

The female lung DCF is higher than that for the male lung for all chest projections except the lordotic. The male lung DCF is higher than the female lung DCF for the lordotic chest projection (performed AP). Because the higher of the two lung DCFs is used to determine the dose to the other organs in the chest cavity (see Section 5.1), the female lung DCF is used to determine the dose to the esophagus, stomach, liver/gallbladder/spleen, bone surface, and remainder for all chest projections except the lordotic, and the male lung DCF is used to determine the dose to these organs for the lordotic projection.

The hands are considered to within the primary beam during the period of poor collimation (through 1970) due to the assumption the hands are positioned on the upper, back of the hips during the X-ray procedure (GE 1956, pp. 5, 6).

The organ dose equivalents from all chest projections are in Tables B-10 to B-12 in Attachment B.

7.2 PHOTOFLUOROGRAPHIC CHEST

Photofluorography (PFG, also known as mass miniature radiography, was used for mass chest screenings for TB starting around 1940 (Birkelo et al. 1947). PFG was a mass chest screening technique most suitable to large populations because it was time-efficient and cost-effective (ATS 1957, p. 7). Some of the screening chest X-rays with DOE and its predecessor organizations occurred with PFG. PFG should not be confused with fluoroscopy, which is discussed in Section 7.3.

PFG differed from conventional chest radiography on 14- by 17-in. film in that the X-ray image was miniaturized with a camera lens or mirror optics system to expose 35-mm film, 70-mm film, 4- by 5-in. film, or 4- by 10-in. film for stereo views (two exposures) (Laughlin et al. 1957; Birkelo et al. 1947). The worker was positioned in the same PA manner as for a conventional radiographic chest X-ray. Most PFG equipment was portable, semiportable, or installed in the limited space of a mobile bus (Van Allen 1951, p. 2). Figure 7-1 is a diagram of PFG, and Figure 7-2 is a photograph of a General Electric PFG machine.

PFG typically produces higher doses to workers than conventional chest radiography (Braestrup and Wyckoff 1958, p. 81; Laughlin et al. 1957; Moeller, Terrill, and Ingraham 1953). Moeller, Terrill, and Ingraham (p. 6) stated that the “largest single source of medical radiation exposure in the United States is the mass chest X-ray survey for tuberculosis.” The resolution of PFG systems was not as good as conventional film screen systems; only 6 line/pairs per mm rather than about 9 or 10 line/pairs per mm (Goodwin, Quimby, and Morgan 1970, p. 108). In addition, the small size of the

films made the images difficult to interpret. The higher dose and small film size of PFG, in combination with lower resolution and perfection of the Mantoux skin test for TB screening, eventually led to PFG becoming obsolete, probably in the mid-1960s. By the mid-1970s, the U.S. Environmental Protection Agency recommended, "Whenever possible, Federal agencies should not use photofluorographic equipment to perform X-ray examinations" (EPA 1976, p. 19). Unless a site has specific evidence to the contrary, the default assumption is that use of PFG ended in 1970. Therefore, doses are not assigned after 1970.

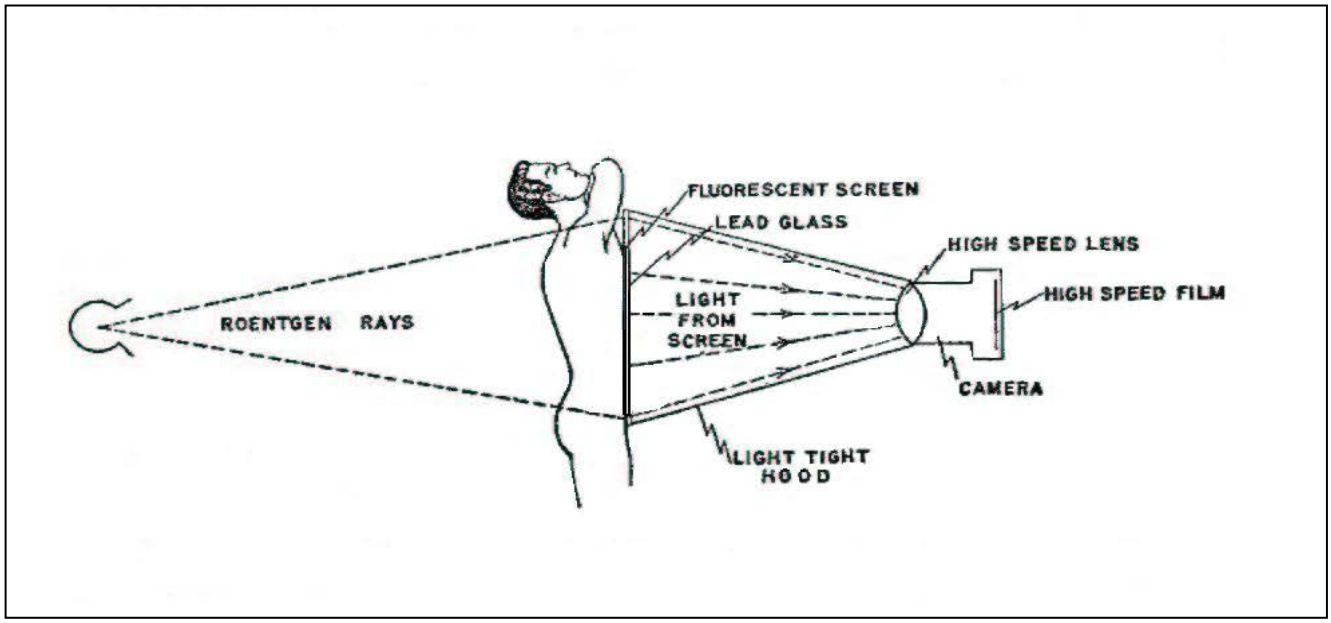

Figure 7-1. Essential components of a PFG unit (Selman 1965, p. 19).

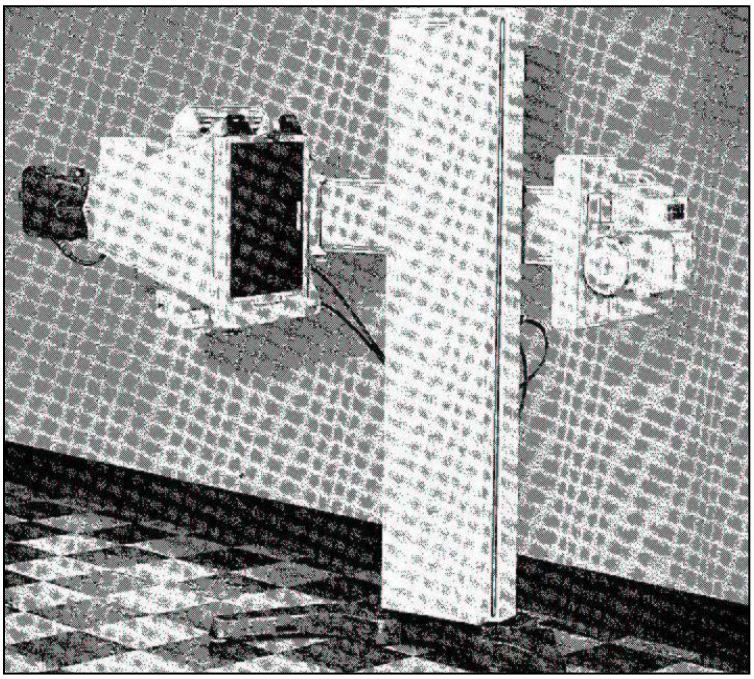

Figure 7-2. Typical General Electric PFG system (GE 1963, p. 7).

Typical reported operating parameters for 1950s PFG were 24 mAs at 83 kVp at a target-to-film distance of 36 in. (Braestrup and Wyckoff 1958, p. 81) and 30 mAs at 90 kVp with a target-to-film

distance of 40 in. and 2.5 mm added filtration (Laughlin et al. 1957). Phantom measurements in the literature indicate an ENSD (including backscatter) of about 0.5 cGy (Laughlin et al. 1957) to 1.53 cGy (Rising and Soldat 1959). The incident air kerma value for PFG was derived from the measured skin dose in Rising and Soldat (1959) and Equation 7-1 below.

The incident air kerma ($K_{a,i}$) corresponding to the published skin dose value is calculated by:

$$K_{a,i} = \frac{ENSD}{BSF}(1\,\text{cGy/rad}) \qquad (7\text{-}1)$$

where

$K_{a,i}$ = incident air kerma to be used in organ dose calculations (cGy in air)
ENSD = ENSD (rad) (1.53 for PFG chest; Rising and Soldat 1959)
BSF = backscatter factor (1.35 for 2.5 mm Al HVL; Table B.8, NCRP 1989)

Because the SID for PFG is shorter than that for conventional radiography, the maximum size of the PFG beam is smaller than a poorly collimated beam at 72 in. in conventional chest radiography. For dose reconstruction, the PFG beam is assumed to include the thyroid, thoracic organs, small intestine, stomach, and liver/gallbladder/spleen, but not the eye/brain, gonads, urinary bladder/prostate, or colon/rectum. To ensure that the thyroid dose reflects the assumption that it is in the primary beam, the dose to the thyroid was determined using the DCF for the AP cervical spine (where the thyroid is definitely in the primary beam) and by correcting for the fact that the PFG chest projection was performed PA rather than AP (as is the case for the cervical spine projection). The correction consists of multiplying the DCF for the AP cervical spine by a depth dose correction factor of 20% (the approximate percentage depth dose at an assumed depth of the thyroid in the neck of 10 cm) (NCRP 1997; ORAUT 2005). The dose to the eye/brain is determined by using the larger of the DCFs for the thyroid for the PA skull or PA chest projections. The DCF for the thyroid dose from the PA chest projection is the larger of the two and was used to calculate the dose to the eye/brain for PFG.

PFG was commonly performed as a stereo procedure, which required two projections from slightly different angles. Therefore, the organ dose equivalents in this TIB assume a stereo exposure. If the size of the film in the claim file records is 4- by 10-in., assume stereo projections and assign the organ doses in Tables B-10 and B-11 in Attachment B. If the film size in the claim file records is 4- by 5-in., assume a single projection and divide the organ doses in Tables B-10 and B-11 in half for dose assignment.

Because PFG was primarily a mass screening technique most suitable to large populations, and therefore unlikely to have occurred on a mass scale at AWE sites, PFG should not be assumed to have occurred at AWE sites unless there is evidence to the contrary.

The hands are considered to within the primary beam during the period of poor collimation (through 1970) due to the assumption the hands are positioned on the upper, back of the hips during the X-ray procedure (GE 1956, p. 5, 6). Organ dose equivalents from PFG chest X-rays are in Tables B-10 and B-11 in Attachment B.

7.3 CHEST FLUOROSCOPY

Fluoroscopy (not to be confused with PFG above), involves real-time viewing of a fluorescent screen continuously activated by X-rays. This procedure was not generally amenable to mass examinations or pre-employment screening of workers, and it was not mentioned as a screening technique in a

study to determine the most efficacious method for mass screening (Birkelo et al. 1947). In a report on chest X-rays, surveys, and radiation exposure, the ATS (1957, p. 7) stated:

> *Screening of groups by fluoroscopy should be strongly discouraged for several reasons: the results are not accurate for diagnostic purposes; there is no permanent film record of the examination; and the radiation exposure involved both for the subject and examiner is excessive. However, special fluoroscopic examination may be indicated for specific diagnostic purposes and for the determination of the dynamics of the chest.*

Although chest fluoroscopy was not a standard pre-employment or occupational screening procedure for the chest, there are indications that fluoroscopic chest examinations were conducted and required by at least two sites (Linde Ceramics and Battelle King Avenue) and it is possible that such examinations were also conducted elsewhere (ORAUT 2015, 2016).

Given the era, the fluoroscopic equipment was most likely to have been "direct" or non-image-intensified fluoroscopy equipment, which is now considered obsolete. While incident air kerma rates for this type of equipment can be found in the literature, average fluoroscopy exposure times, especially for chest screening examinations, are not commonly found. However, a study of the incident air kerma rates, HVLs, and estimated fluoroscopy exposure times was conducted on non-image-intensified fluoroscopy equipment in the modern era in Albania (Marshall et al. 2001). In this study, the exposure time for chest fluoroscopy screening was estimated to be about 20 seconds with an average incident air kerma rate of about 4 cGy/min and an average HVL of about 2.3 mm Al. Based on the Albania study being in the modern era, additional conservativism in relation to incident air kerma rate, time, and HVL was used in this TIB. Chest fluoroscopy dose equivalents in this TIB were calculated using an incident air kerma rate of 5 cGy/min for 30 seconds of fluoroscopy time and assumed HVL of 2.0 mm Al. For chest fluoroscopy, the SSD is short in comparison to standard chest X-ray projection (approximately 40 cm). However, the beam size is estimated to be similar to the beam for a poorly collimated radiographic chest X-ray to account for the fact that the field in chest fluoroscopy is dynamic and could expose a larger area of the body than the short SSD would initially indicate. A diagram of non-image-intensified fluoroscopy is provided in Figure 7-3. The hands are considered to within the primary beam during the period of poor collimation (through 1970) due to the assumption the hands are positioned on the upper, back of the hips during the X-ray procedure (GE 1956, pp. 5, 6). Doses for chest fluoroscopy are included in Tables B-10 and B-11 in Attachment B.

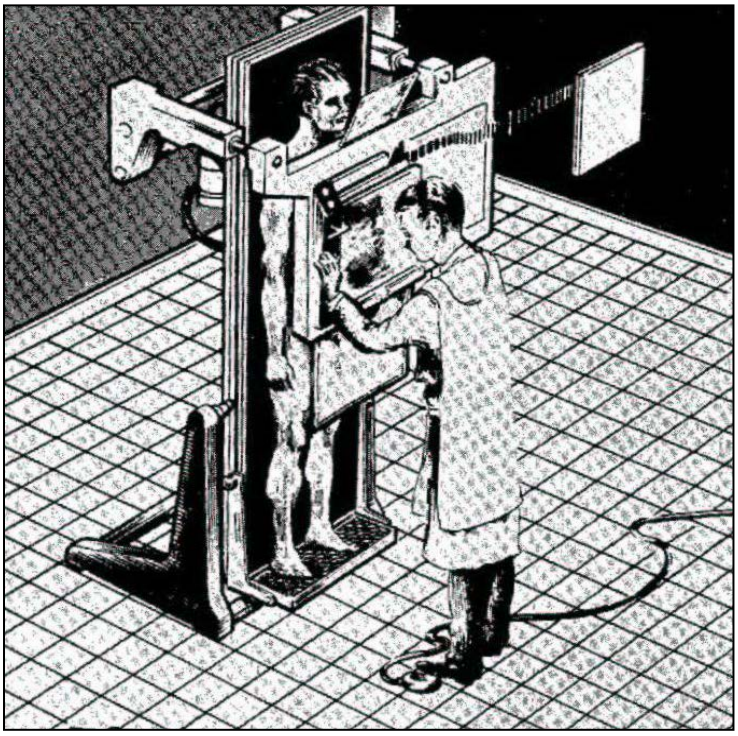

Figure 7-3. Diagram of non-image-intensified fluoroscopy (Massey 1977, p. 90).

7.4 LUMBAR SPINE

Lumbar spine radiographs have been used since the 1930s to determine the presence of back problems or to predict future occurrence of back problems (La Rocca and Macnab 1969, p. 49). At some DOE and AWE sites, lumbar spine radiographs were required for certain classes of workers (usually men) whose work could entail heavy labor. Typically, if lumbar spine radiography was used for screening, it was performed as part of the pre-employment physical examination, and for many workers this might have been the only occasion on which lumbar spine radiographs were taken. However, the possibility of periodic lumbar spine examinations, including a physical examination at the termination of employment, should not be precluded.

The number of lumbar spine projections per examination was likely to have varied from site to site and should be documented in the site profile, if they were performed. In a study of the number of lumbar spine projections to assess applicants for Veteran's Administration compensation for lumbar spine disease or injury, Eisenberg et al. (1980, p. 4) found that on average the number of lumbar spine projections performed at the Administration's facilities was 4.2 per examination. In the absence of evidence to the contrary, a lumbar spine examination for screening should be assumed to consist of four projections: AP, LAT, LAT spot of L4-5, and AP spot. The organ dose equivalents for the individual projections are provided (see Tables B-13 and B-14). However, if claim file records indicate fewer than four projections, dose reconstructors can determine the total dose equivalent accordingly. While both the AP and LAT spot projections were likely to have been made on smaller size film and with smaller beam sizes, it is assumed for dose reconstruction that these were made on full size 14- by 17-in. film.

Eventually, the pre-employment lumbar spine radiographs were shown to have low predictive value for future lumbar spine disability (La Rocca and Macnab 1969, p. 53), and various groups recommended that lumbar spine radiographs be discontinued for screening (AOMA 1979). Due to

this recommendation, unless there is site-specific information to the contrary, the default assumption is that lumbar spine exams ended in 1985.

Because of the concern in the 1950s about gonad dose to the population as a whole, there are several good studies of measured doses to the skin and gonads from the lumbar spine examinations that were conducted then (Lincoln and Gupton 1958; Laughlin et al. 1957; Billings, Norman, and Greenfield 1957). Measured skin doses with phantoms (i.e., including backscatter) in these studies ranged from 0.25 to 5.2 cGy for the AP lumbar spine projection and from 0.5 to 20.0 cGy for the LAT lumbar spine projection depending on the techniques (e.g., kilovoltage, tube current and the amount of filtration). The higher skin doses for each of the lumbar spine projections were a result of low-kilovoltage techniques that were conducted in London (Stanford and Vance 1955). Values for the same projections using high-voltage techniques were stated to be 1.0 cGy for AP lumbar spine projection and 4.8 cGy for the LAT lumbar spine projection (Stanford and Vance 1955). In this TIB, the measured skin and gonad doses from Lincoln and Gupton (1958, Table VII) were used because the measurements were performed at Oak Ridge National Laboratory (ORNL) Health Center and would be more representative of DOE facility equipment and techniques.

The incident air kerma value for lumbar spine projections through 1970 was derived from the average skin doses at ORNL in Lincoln and Gupton (1958, Table VII). The skin dose value for the AP lumbar spine is 1,900 mrad, measured with a phantom, and therefore includes backscatter. The incident air kerma is derived using Equation 7-1 above. The HVL of 2.0 was determined from the data in Lincoln and Gupton (1958, Tables III and IV). Table III shows that for a skin dose of 2,000 mrad, the kVp was 80 and the filter (assumed to be the added filter) was 1.0 mm Al. Assuming a total filtration of 1.5 mm Al eq., the HVL is 1.8, rounded to 2.0 mm Al at 80 kVp from Table B.2 in NCRP Report 102 (NCRP 1989, p. 56). The incident air kerma for the LAT lumbar spine projection was determined in the same way and results in an incident air kerma value of 3.79 cGy.

The ovary and testes doses for the poor collimation period before 1970 also come directly from Lincoln and Gupton (1958, Table VII) because they were measured with a phantom and include backscatter.

X-rays of the lumbar spine were performed AP, often on 14- by 17-in. film in the lengthwise direction, and using a 40-in. SID. Figure 7-4 is an approximately scaled diagram of the poorly collimated beam (depicted by the green circle) and properly collimated beam (depicted by the blue square) in relation to abdominal organs for the AP lumbar spine and helps to visualize the beams. The ovary dose is used to determine the dose to the liver/gallbladder/spleen, the urinary bladder/prostate, the colon/rectum, bone surfaces, stomach, and remainder organs because these organs are likely to be in the primary beam. The breast dose is calculated using the lung DCF as a surrogate since ICRP 34 does not calculate a DCF for the breast. The DCFs for lumbar spine projections are summarized in Table B-3.

The incident air kerma value for lumbar spine projections after 1970 comes directly from Kereiakes and Rosenstein (1980, p. 8). These data are contemporaneous and relevant for use in this period.

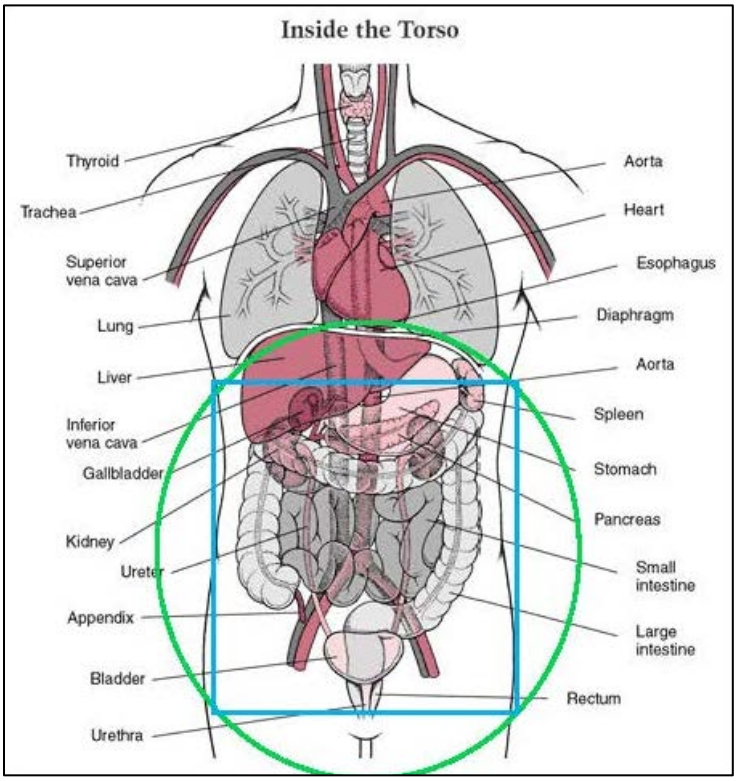

Figure 7-4. Beam areas in relation to body anatomy for the AP lumbar spine – green circle indicating poorly collimated beam and blue square indicating properly collimated beam (modified from Beers 2003, p. 4).

Organ dose equivalents from lumbar spine X-rays are in Tables B-13 and B-14 in Attachment B.

7.5 PELVIS

In 1932, skeletal fluorosis was discovered as an occupational disease in cryolite (natural fluoride of aluminum and sodium) workers in Copenhagen, Denmark (Grandjean 1982). Skeletal fluorosis exhibited a variety of radiologic patterns including increased bone density, calcification of ligaments, and periosteal changes (Chan-Yeung et al. 1983). During the early years of atomic weapons work, the Manhattan Engineer District and the U.S. Atomic Energy Commission sometimes required that pelvis X-rays be taken of personnel who worked with materials containing fluoride to detect bone changes due to fluorosis (Van Horn 1943; Osinski 1947).

X-rays of the pelvis were used in the 1940s for medical monitoring of workers with potential exposure to fluoride and fluoride compounds. It is assumed that by 1960 more specific and sensitive screening methods than spine and pelvis radiographs for fluorosis were available.

Workers in the atomic weapons complex who might have been exposed to fluoride and fluoride compounds include workers at the gaseous diffusion plants. In the absence of specific documented fluorosis monitoring programs at individual sites, organ doses for pelvis, lumbar, thoracic, and cervical spine X-rays should be included in dose reconstructions for workers who were exposed to fluoride and fluoride compounds.

Lincoln and Gupton (1958) measured skin and gonad doses (including backscatter) using a tissue-equivalent phantom for various examinations including the AP pelvis. Table V in Lincoln and Gupton provides dose information for X-ray examination of the pelvis from some facilities and other literature.

Review of this information indicates some facilities using cones and no beam filtration or lack of information regarding filtration. In this TIB, the measured skin and gonad doses from Table VII of Lincoln and Gupton were used because the measurements were performed at ORNL with techniques and filtration that are assumed to be similar to those across DOE facilities. An HVL of 2 mm Al was assumed based on the data in Lincoln and Gupton. The incident air kerma was derived using Equation 7-1, which resulted in an incident air kerma value for the pelvis of 1.52 cGy.

X-rays of the pelvis were performed AP, often on 14- by 17-in. film placed in the crosswise direction and using a 40-in. SID. Figure 7-5 is an approximately scaled diagram of the poorly and properly collimated beams in relation to abdominal organs for the AP pelvis and helps to visualize the beam. The measured ovary dose was used to determine the dose to the liver/gallbladder/spleen, the urinary bladder/prostate, the colon/rectum, stomach, bone surfaces, and remainder organs because these organs are likely to be in the primary beam. The breast dose is calculated using the lung DCF as a surrogate since ICRP 34 does not calculate a DCF for the breast.

The DCFs for pelvis projections are summarized in Table B-3. Organ dose equivalents from pelvis X-rays are in Tables B-13 and B-14 in Attachment B.

7.6 THORACIC AND CERVICAL SPINE

X-rays of the thoracic spine (also called dorsal spine) or cervical spine were used in the 1940s for medical monitoring of workers with potential exposure to fluoride and fluoride compounds similar to the X-rays of the pelvis described in Section 7.5. In the absence of specific documented fluorosis monitoring programs at individual sites, organ dose equivalents for thoracic and cervical spine X-rays should, therefore, be included in dose reconstructions for workers exposed to fluoride and fluoride compounds.

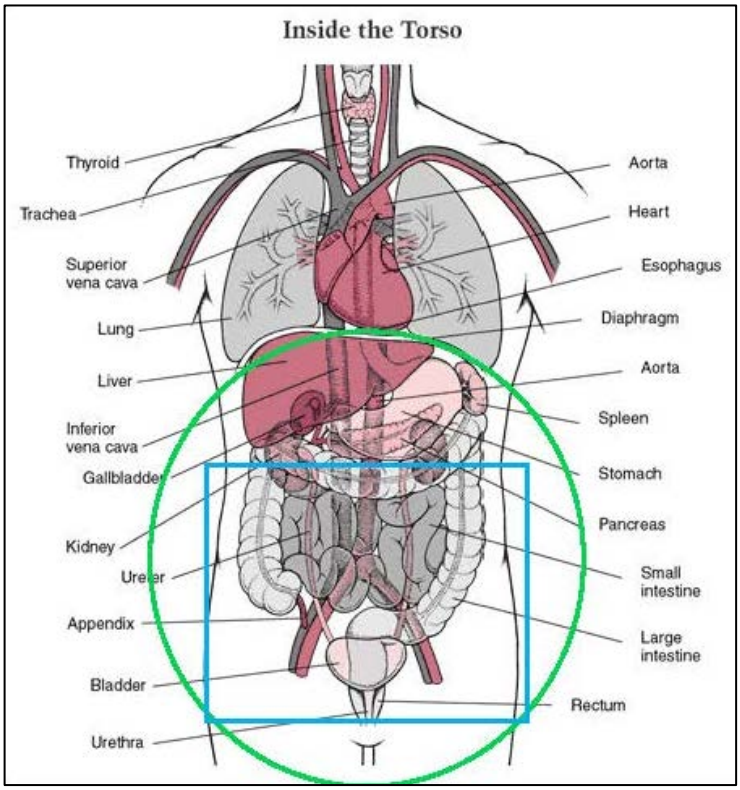

Figure 7-5. Beam areas in relation to body anatomy for the AP pelvis – green circle indicating poorly collimated

beam and blue square indicating properly collimated beam (modified from Beers 2003, p. 4).

Routine protocols for thoracic and cervical spine X-rays are listed in Table 7-1. While it is possible that fewer exposures were made for fluorosis monitoring, organ doses for a complete set of projections should be assumed unless there is evidence to the contrary in the individual employee's record.

Table 7-1. Typical protocols for thoracic and cervical spine examinations through 1970.

Procedure	Projections
Thoracic spine	AP, LAT, RPO, LPO, total of four
Cervical spine	AP, LAT, RPO, LPO, total of four

a. RPO = right posterior oblique; LPO = left posterior oblique.

The incident air kerma for the thoracic spine was derived from measured skin dose (1.3 and 2.9 rad for the AP and LAT/OBL, respectively) in Lincoln and Gupton (1958, Table VII), and Equation 7-1, which resulted in an incident air kerma of 0.985 cGy and 2.20 for the AP and LAT/OBL, respectively, and an HVL of 2.0 mm Al. It was assumed that all four projections were taken on 14- by 17-in. film with a poorly collimated beam. Figure 7-6 illustrates the approximately scaled poorly and well-collimated beams for the AP thoracic spine.

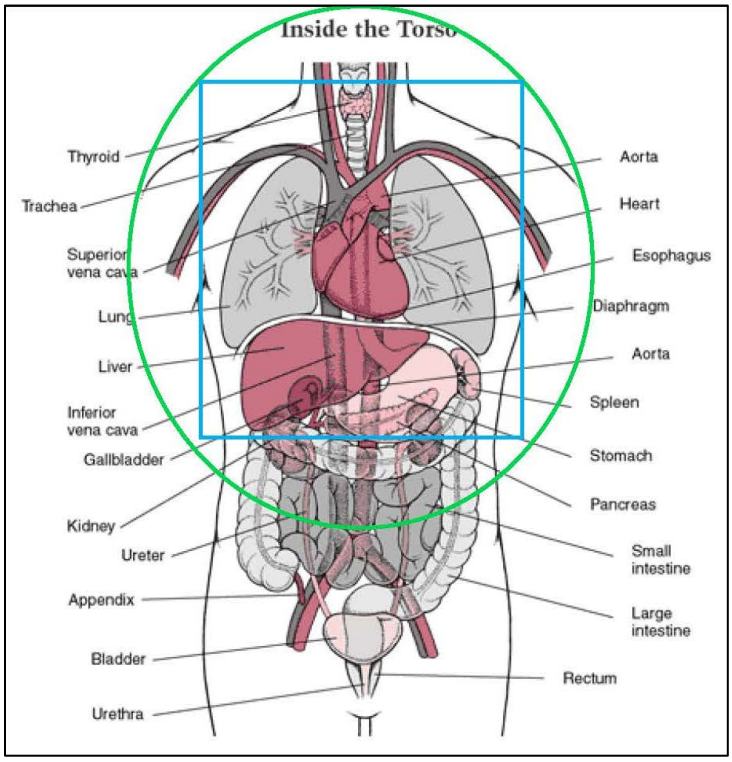

Figure 7-6. Beam areas in relation to body anatomy for the AP thoracic spine – green circle indicating poorly collimated beam and blue square indicating properly collimated beam (modified from Beers 2003, p. 4).

DCFs were selected from ICRP Publication 34 (ICRP 1982) tables according to the location of the organs in relation to the beam. The thyroid is assumed to be in the poorly and properly collimated beams while the eye/brain is assumed to not be in the beam. The dose to the eye/brain is usually

determined using the thyroid DCF. For thoracic spine procedures, the dose equivalent to the eye/brain is assumed to be 10% of the dose equivalent to the thyroid. This estimate is based on the finding that scattered radiation produces a dose to the testes equal to 10% of the central beam dose when the testes are just outside the beam (Kereiakes and Rosenstein 1980, p. 52). The dose equivalents for the ovaries and testes are from measured doses reported in Lincoln and Gupton (1958, Table VII). The dose equivalents for the urinary bladder, prostate, colon, and rectum are based on the measured ovaries dose. The dose equivalents to the lungs, liver, gallbladder, spleen, thymus, esophagus, stomach, bone surfaces and remainder organs are all based on the lung DCF.

The thyroid DCF for the LAT thoracic spine projection does not seem to reflect irradiation by the primary beam. Therefore, for the LAT thoracic spine projection, the thyroid dose equivalent was based on the DCF for the LAT cervical spine, where the thyroid is definitely in the primary beam. The dose equivalent to the eye/brain seems to be approximately 10% of the dose equivalent to the thyroid simply by using the thyroid DCF for the LAT thoracic spine and, therefore, that DCF was used.

The right posterior oblique (RPO) and left posterior oblique (LPO) projections of the thoracic spine are positioned similarly to the LAT thoracic spine position (i.e., about 20° from the LAT). The organ dose equivalents, then, are assumed to be the same for the LAT thoracic spine and the RPO and LPO. The skin dose equivalents, however, are different depending on whether the right or left side is closest to the beam. Organ dose equivalents for the thoracic spine are in Table B-15, and the skin dose equivalents are in Table B-16 in Attachment B.

There is much less data in the literature for the cervical spine. Data on technical factors for cervical spine X-rays are from Braestrup and Wyckoff (1958, Tables VI and VII, p. 81). The pertinent data from these tables is excerpted in Table 7-2.

Table 7-2. Relevant technical factors for cervical spine projections, HVL = 2.0 mm Al. .

Projection	kVp[a]	mAs[a]	SID (cm)[a]	R/100 (mAs)[a,b]	SSD (in.)[c]	HVL (mm Al)[d]
AP cervical spine	58	100	91	0.4	82	2.0
LAT cervical spine	70	150	152[e]	0.2	153[f]	2.0
Posterior OBL cervical spine	Not applicable	Not applicable	Not applicable	Not applicable	82	2.0

a. Excerpted data from Braestrup and Wyckoff (1958, Tables VI and VII, p. 81).
b. Interpolated for the kVp closest to the kVp listed in the technique factor column, and for the listed SSD.
c. SSD from Table 3-2.
d. Based on kVp and 2.5 mm Al eq. total filtration in Braestrup and Wyckoff (1958).
e. Longer SID used for the LAT cervical spine to reduce magnification.
f. The SSD for the LAT cervical spine = 183 cm − 15 cm − 5 cm − 10 cm = 153 cm. The additional 10 cm accounts for the fact that during the LAT cervical spine the shoulder is against the cassette holder, so the side of the neck is not actually in contact with the cassette holder, which affects the SSD calculation.

Incident air kerma values for the AP, LAT, and OBL cervical spine projections were derived from the Braestrup and Wyckoff data in Table 4-1 and Equation 7-2:

$$K_{a,i} = (R/100\,\text{mAs})(\textit{Actual mAs})\left(\frac{SID}{SSD}\right)^2 \left(2.58\times10^{-4}\,\text{C/kg R}^{-1}\right)(33.97\,\text{J/C})(100\,\text{cGy/Gy})\left(1\,\text{Gy/1 J kg}^{-1}\right) \quad (7\text{-}2)$$

where

$K_{a,i}$ = incident air kerma to be used in organ dose calculations (cGy in air)
R/100 mAs = from Table 7-2
Actual mAs = from Table 7-2
$(SID/SSD)^2$ = inverse square correction for the exposure at *SID* (91 cm from Table 7-2) to the *SSD* of interest from Table 4-1

2.58×10^{-4} C/kg R^{-1} = conversion factor for converting exposure in R to C/kg
33.97 J/C = the mean energy expended per ion pair formed in air

When positioned for a LAT cervical spine radiograph, the worker's shoulder is against the cassette holder, and the neck is assumed to be another 10 cm away from, and not in contact with, the cassette holder, which affects the SSD calculation. Incident air kerma for the posterior OBL cervical spine is estimated to be the same as the incident air kerma for the AP projection because the position is similar and the tissue thickness of the neck is the same. The HVL is based on the kVp listed in Table 7-2 and 2.5 mm Al eq. total filtration from Braestrup and Wyckoff (1958, Table VI). Since the OBL cervical spine and AP cervical spine incident air kerma and HVL are the same, the organ doses for these projections are also the same. It is assumed that all four projections were taken on 10- by 12-in. film with a poorly collimated beam. Figure 7-7 illustrates the approximately scaled poorly and well-collimated beams for the LAT cervical spine.

The DCF values in ICRP Publication 34 (ICRP 1982) for the cervical spine are based on the assumption that the image receptor is 102 cm from the X-ray source and the beam is collimated to an image receptor size of 25.4 by 30.5 cm (where 30.5 cm represents the dimension parallel to the height of the worker). DCFs for the breast are not computed in Publication 34 for the cervical spine procedure. The lung DCF was used instead. The DCFs used for dose reconstruction in this TIB are provided in Table B-1.

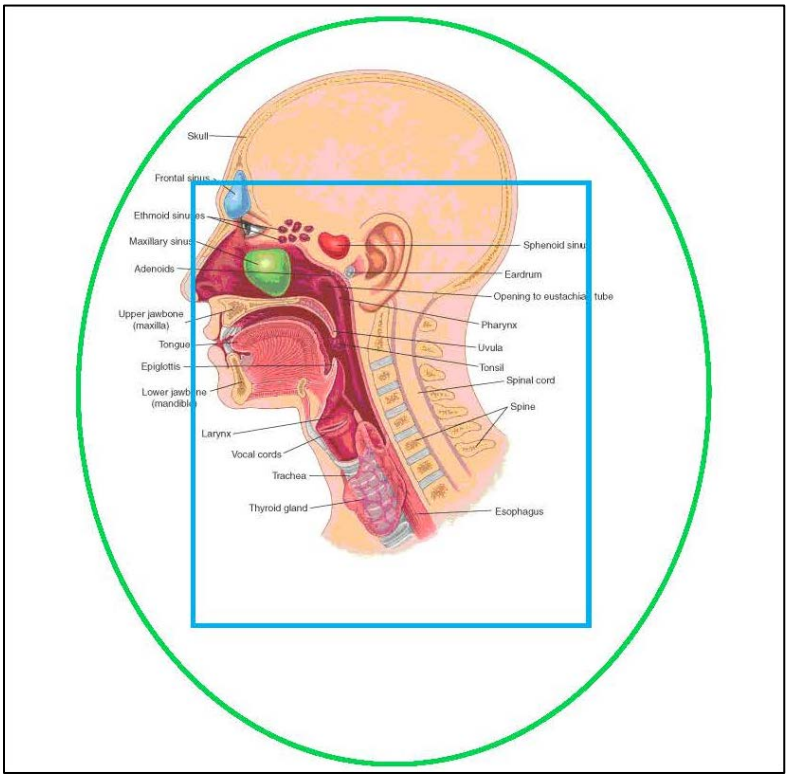

Figure 7-7. Beam areas in relation to body anatomy for the LAT cervical spine – green circle indicating poorly collimated beam and blue square indicating properly collimated beam (modified from Beers 2003, p. 3).

Again, measured doses for the ovaries and testes were used from Braestrup and Wyckoff (1958). The measured dose for the ovary should also be assigned to the urinary bladder, prostate, colon, rectum, and uterus. Organ dose equivalents for the cervical spine are in Table B-15, and the skin dose equivalents are in Table B-16 in Attachment B.

Information from the sites and claim records has not indicated that any thoracic or cervical spine X-ray procedures have been required as a condition of employment after 1970. Therefore, X-ray DCFs and doses are not provided in this TIB post 1970. If site-specific information becomes available indicating that thoracic or cervical spine X-ray procedures have been required as a condition of employment, it will be addressed in the site-specific site profile.

7.7 CHRONIC LYMPHOCYTIC LEUKEMIA

The B-lymphocytes are the tissue at risk for chronic lymphocytic leukemia. The dose equivalent to the B-lymphocytes was determined using the method in ORAUT-OTIB-0082, *Dose Reconstruction Method for Chronic Lymphocytic Leukemia* (ORAUT 2012), and International Commission on Radiological Protection (ICRP) Publication 34 dose conversion factors (DCFs) (ICRP 1982). The dose distributions and corresponding statistical parameters for the dose to the B-lymphocytes for each projection and period is listed in Table 7-3.

8.0 UNCERTAINTY ANALYSIS FOR OCCUPATIONAL MEDICAL X-RAY DOSES

Error (deviation from the correct, true, or conventionally accepted value of a quantity) and uncertainty (potential range of a stated, measured, assumed, or otherwise determined value of a quantity) provide an indication of the confidence of the dose estimates. Error implies knowledge of what the correct or actual value is, which is, of course, not known. Therefore, the more appropriate factor is uncertainty, which is expressed in terms of a confidence level (e.g., a 99% confidence level indicates that the correct or true value, although not actually known, has a 99% probability of falling within the cited range). Uncertainty includes both precision (i.e., reproducibility of the measurement) and accuracy (i.e., how close the measurement or estimate of dose comes to the actual or correct value).

Table 7-3. Summary table of distribution parameters for CLL.

Projection	Period	Distribution	Parameter 1	Parameter 2	Parameter 3
Stereo PFG	1942–1965	Weibull 3	2.089366	0.439531	1.09381E–3
PA Chest	≤1970	Weibull 2	2.919104	0.055807	Not applicable
LAT Chest	≤1970	Weibull 3	2.708458	0.061275	7.31349E–05
Lordotic Chest	≤1970	Weibull 2	3.031503	0.064706	Not applicable
PA Chest	1971–1985	Weibull 3	2.053324	0.019034	2.60356E–05
LAT Chest	1971–1985	Weibull 3	2.062635	0.023261	4.39471E–05
Lordotic Chest	1971–1985	Weibull 3	2.019203	0.019588	-2.15618E–06
PA Chest	1986–present	Weibull 3	2.121224	0.014800	1.54897E–05
LAT Chest	1986–present	Weibull 3	2.121337	0.019882	2.55603E–05
AP LS (or AP spot)	≤1970	Weibull 3	3.256128	0.204115	-1.06405E–03
AP LS (or AP spot)	≥1971	Weibull 2	3.220421	0.148508	Not applicable
LAT LS (or LAT spot)	≤1970	Normal	0.100425	0.031274	Not applicable
LAT LS (or LAT spot)	≥1971	Normal	0.1112166	0.0346928	Not applicable

In theory, a large number of factors can introduce uncertainties or affect X-ray machine output and dose to the worker. However, in practice only five factors can be reasonably considered to have a meaningful or significant impact on dose uncertainty. These are:

1. Measurement error,
2. Variation in kilovoltage (kVp),
3. Variation in beam current (mA),
4. Variation in exposure time (s), and
5. Distance from the worker to the source of the X-rays (SSD).

The influence of other factors such as use of screens, grids, film speed, and development, while potentially variable, do not affect the beam output per se except indirectly because they can influence the machine settings (i.e., kVp, mA, and time).

The organ dose equivalents in this TIB are based on incident air kerma values from published literature. These actual X-ray beam measurements were made with R-meters or similar ionization chamber instruments suitably designed for measurement of photons in the medical X-ray energy range. If properly calibrated and used, R-meters and similar instruments typically and historically have had an uncertainty of ±2% for photon energies below 400 keV (Kathren and Larson 1969). Although more recent versions of these instruments might provide a somewhat smaller uncertainty, perhaps on the order of ±1% (NBS 1982; Lamperti, Loftus, and Loevinger 1988), for conservatism the uncertainty range of ±2% is applied to measurements of air kerma.

For a given set of machine settings and parameters, X-ray output is theoretically constant. In general, for a given kVp setting, variation in kVp falls within ±5% of the machine setting (Rossi 1991, p. 14). As noted above, beam intensity is approximately proportional to the 1.7 power of the kilovoltage; this translates to an uncertainty of approximately ±8.6% in output beam intensity in the 80- to 100-kVp range used in medical radiography. For conservatism, this is rounded up to ±9%.

Similarly, slight variations in tube current are normal; as a tube ages or heats up from use, current can change and typically drops. With all other factors constant, beam output reduces in direct proportion to the change in tube current. The reduction in beam output from current variation is not more than a few percent under normal operating conditions; large decreases are readily detectable and result in maintenance on the machine to restore the output or, as a temporary measure, an increase in the current or kilovoltage to provide the necessary exposure for proper film density. The estimated uncertainty in beam intensity or output attributable to current variation is ±5% (Rossi 1991, p. 18).

Another parameter that has potential to affect dose from a radiographic procedure, perhaps significantly, is the time of exposure. A single-phase, full-wave-rectified machine produces 120 pulses of X-rays per second. In an exposure time of 1/20 of a second, only six pulses result. A small error in the timer that resulted in a change of only ±1 pulse would correspondingly affect the output by ±17%; for an exposure time of 1/30 of a second, the change in output corresponding to a deviation of ±1 pulse is ±25%. Early mechanical timers were inaccurate; accuracy improved significantly with the introduction of electronic timers. The assumed uncertainty in beam output attributable to timers is ±25% (derived by author).

The final factor likely to affect worker dose relates to distance from the source of the X-rays, which is an important determinant of the incident air kerma. For a given procedure using a standard SID, the SSD is determined largely by the body thickness of the worker and the accuracy of the positioning. Information on worker thickness is rarely available, even in the medical literature. Information from published literature is provided in Table 8-1. The estimated variation in SSD is no more than a few centimeters, with a conservative assumed upper limit of 7.5 cm for typical workers. Using the inverse square law, the entrance skin dose is calculated based on the part thickness for PA Chest and LAT Chest exams both adding and subtracting 7.5 cm. This results in calculated doses within about 10% of the entrance skin dose applied in this document. Therefore, an uncertainty of ±10% is assumed due to body thickness variation (derived by author).

Table 8-1. Adult body thickness from literature (cm).

Thorax/abdomen AP thickness	Thorax/abdomen LAT thickness	Neck cervical vertebrae AP thickness	Neck cervical vertebrae LAT thickness	Source
Thor. vert. 20–24 Lumb. vert. 18–22 Pelvis 19–23 Chest 20–25	Thor. vert. 28–32 Lumb. vert. 27–32 Chest 27–32	11–14	10–13	Cahoon 1961, pp.16–17
23	Not provided	13	Not provided	Wochos, Detorie, and Cameron 1979, p. 3
20	34.4	Not provided	Not provided	Kereiakes and Rosenstein 1980, p. 34

A reasonable approach is to assume that the uncertainties are in fact random, and therefore to compute the combined statistical uncertainty as the square root of the sum of the squares of all the uncertainties: $(2^2 + 9^2 + 5^2 + 25^2 + 10^2)^{1/2}$ which equals ±28.9%. Rounding this up to ±30% provides an adequate and suitably conservative indication of uncertainty. Therefore, for a derived dose equivalent to an individual organ, a total combined standard uncertainty of ±30% can be assumed. Dose reconstructors should, therefore, input the organ dose equivalent as the mean of a normal distribution, with a standard uncertainty of ±30%.

ENSD measurements were made on nine workers of varying chest thicknesses (builds) at the Savannah River Site (Cooley 1967). While Cooley does not report the measured chest thicknesses for these nine workers, the ENSDs were reported and reflect the increase in exposure needed to radiograph thicker body parts (chests in this case). The measured ENSDs in this small study already include the uncertainty in the technical factors (kVp, mA, and time) that were used to make the exposures, and can therefore be used a reasonable check of the uncertainty calculated above. The standard uncertainty of the range of measurements in Cooley is 5.6, or 21%. This would seem to indicate that the 30% assumed uncertainty above is a reasonable estimate to use in dose reconstruction of organ dose from medical X-ray procedures.

9.0 X-RAY DOSE ASSIGNMENT BY ICD-10 CODE

Under the EEOICPA, the organs and tissues for which doses must be estimated are those that are delineated by the specified ICD-10 code that is received from the U.S. Department of Labor. Additional guidance is necessary to identify the appropriate organs or tissues for X-ray dose estimation based on the ICD-10 code.

Attachment A provides guidance by ICD-10 code for the various X-ray views in this TIB. For some ICD-10 codes that involve the skin of the body, the specific location of the cancer can influence the assignment of X-ray dose. Attachment A refers the dose reconstructor to Attachment B for those ICD-10 codes to allow for a more appropriate assignment of dose. For claims in which the specific cancer location cannot be determined from the records, the location that results in the X-ray dose most favorable to the claimant should be used.

10.0 ATTRIBUTIONS AND ANNOTATIONS

All information requiring identification was addressed via references in the reference section of this document.

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ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES

LIST OF TABLES

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

Table A-1. Selection of organs for X-ray dose assignment during dose reconstruction based on ICD-10 code.

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C00	Malignant neoplasm of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C01	Malignant neoplasm of base of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.0	Malignant neoplasm of dorsal surface of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.1	Malignant neoplasm of border of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.2	Malignant neoplasm of ventral surface of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.3	Malignant neoplasm of anterior two-thirds of tongue, part unspecified	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.4	Malignant neoplasm of lingual tonsil	Esophagus	Esophagus	Esophagus	Esophagus	Esophagus
C02.8	Malignant neoplasm of overlapping sites of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C02.9	Malignant neoplasm of tongue, unspecified	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C03	Malignant neoplasm of gum	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C04	Malignant neoplasm of floor of mouth	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C05	Malignant neoplasm of palate/uvula	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C06	Malignant neoplasm of mouth	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C07	Malignant neoplasm of parotid gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C08	Malignant neoplasm of salivary gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C09	Malignant neoplasm of tonsil	Esophagus	Esophagus	Esophagus	Esophagus	Esophagus
C10	Malignant neoplasm of oropharynx	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C11	Malignant neoplasm of nasopharynx	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C12	Malignant neoplasm of pyriform sinus	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C13	Malignant neoplasm of hypopharynx	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C14	Malignant neoplasm of pharynx/oral cavity	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C15.3	Malignant neoplasm of upper third of esophagus	Esophagus	Esophagus	Esophagus	Esophagus	Esophagus
C15.4	Malignant neoplasm of middle third of esophagus	Esophagus	Esophagus	Esophagus	Esophagus	Esophagus
C15.5	Malignant neoplasm of lower third of esophagus	Stomach	Stomach	Stomach	Stomach	Stomach
C15.8	Malignant neoplasm of overlapping sites of esophagus	Stomach	Stomach	Stomach	Stomach	Stomach
C15.9	Malignant neoplasm of esophagus, unspecified	Stomach	Stomach	Stomach	Stomach	Stomach
C16	Malignant neoplasm of stomach	Stomach	Stomach	Stomach	Stomach	Stomach
C17.0	Malignant neoplasm of duodenum	Stomach	Stomach	Stomach	Stomach	Ovaries
C17.1	Malignant neoplasm of jejunum	Stomach	Stomach	Stomach	Stomach	Stomach
C17.2	Malignant neoplasm of ileum	Colon	Colon	Colon	Colon	Colon
C17.3	Meckel's diverticulum, malignant	Colon	Colon	Colon	Colon	Colon

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C17.8	Malignant neoplasm of overlapping sites of small intestine	Stomach	Stomach	Stomach	Stomach	Stomach
C17.9	Malignant neoplasm of small intestine, unspecified	Stomach	Stomach	Stomach	Stomach	Stomach
C18.0	Malignant neoplasm of cecum	Colon	Colon	Colon	Colon	Colon
C18.1	Malignant neoplasm of appendix	Colon	Colon	Colon	Colon	Colon
C18.2	Malignant neoplasm of ascending colon	Stomach	Stomach	Stomach	Stomach	Stomach
C18.3	Malignant neoplasm of hepatic flexure	Stomach	Stomach	Stomach	Stomach	Stomach
C18.4	Malignant neoplasm of transverse colon	Stomach	Stomach	Stomach	Stomach	Stomach
C18.5	Malignant neoplasm of splenic flexure	Stomach	Stomach	Stomach	Stomach	Stomach
C18.6	Malignant neoplasm of descending colon	Stomach	Stomach	Stomach	Stomach	Stomach
C18.7	Malignant neoplasm of sigmoid colon	Stomach	Stomach	Stomach	Stomach	Stomach
C18.8	Malignant neoplasm of overlapping sites of colon	Stomach	Stomach	Stomach	Stomach	Stomach
C18.9	Malignant neoplasm of colon, unspecified	Stomach	Stomach	Stomach	Stomach	Stomach
C19	Malignant neoplasm of rectosigmoid junction	Colon	Colon	Colon	Colon	Colon
C20	Malignant neoplasm of rectum	Colon	Colon	Colon	Colon	Colon
C21	Malignant neoplasm of rectum, anus, and anal cavity	Colon	Colon	Colon	Colon	Colon
C22	Liver carcinoma	Liver	Liver	Liver	Liver	Liver
C23	Malignant neoplasm of gallbladder	Gallbladder	Gallbladder	Gallbladder	Gallbladder	Gallbladder
C24	Malignant neoplasm of biliary tract	Gallbladder	Gallbladder	Gallbladder	Gallbladder	Gallbladder
C25	Malignant neoplasm of pancreas	Liver	Liver	Liver	Liver	Liver
C26.0	Malignant neoplasm of intestinal tract, part unspecified	Stomach	Stomach	Stomach	Stomach	Stomach
C26.1	Malignant neoplasm of spleen	Liver	Liver	Liver	Liver	Liver
C26.9	Malignant neoplasm of ill-defined sites within the digestive system	Stomach	Stomach	Stomach	Stomach	Stomach
C30	Malignant neoplasm of nasal cavity/middle ear	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C31	Malignant neoplasm of sinus	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C32	Malignant neoplasm of larynx	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C33	Malignant neoplasm of trachea	Lung	Lung	Lung	Lung	Lung
C34	Malignant neoplasm of bronchus/lung	Lung	Lung	Lung	Lung	Lung
C37	Malignant neoplasm of thymus	Thymus	Thymus	Thymus	Thymus	Thymus
C38	Malignant neoplasm of heart	Lung	Lung	Lung	Lung	Lung
C39	Malignant neoplasm of upper/lower respiratory tract, part unspecified	Lung	Lung	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C40.0	Malignant neoplasm of scapula and long bones of upper limb	ENSD	10% ENSD	ENSD	See Table A-6	10% ENSD
C40.1	Malignant neoplasm of short bones of upper limb	ENSD	see Table A-4	ENSD	RSD (0.40 m)	10% ENSD
C40.2	Malignant neoplasm of long bones of unspecified lower limb	RSD (0.52 m)	10% ENSD	RSD (0.52 m)	RSD (0.40 m)	10% ENSD
C40.3	Malignant neoplasm of short bones of lower limb	RSD (0.86 m)	RSD (0.60 m)	RSD (0.86 m)	RSD (1.00 m)	RSD (0.60 m)
C40.8	Malignant neoplasm of overlapping sites of bone and articular cartilage of limb	ENSD	see Table A-4	ENSD	See Table A-6	10% ENSD
C40.9	Malignant neoplasm of unspecified bones and articular cartilage of limb	ENSD	see Table A-4	ENSD	See Table A-6	10% ENSD
C41.0	Malignant neoplasm of bones of skull and face	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C41.1	Malignant neoplasm of mandible	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C41.2	Malignant neoplasm of vertebral column	Bone surface	Bone surface	Bone surface	Bone surface	Bone surface
C41.3	Malignant neoplasm of ribs, sternum and clavicle	Bone surface	Lung	Bone surface	Bone surface	Lung
C41.4	Malignant neoplasm of pelvic bones, sacrum and coccyx	Colon	Bone surface	Bone surface	Bone surface	Bone surface
C41.9	Malignant neoplasm of bone and articular cartilage, unspecified	Bone surface	Bone surface	Bone surface	Bone surface	Bone surface
C43.0	Malignant melanoma of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C43.1	Malignant melanoma of eyelid, including canthus	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.2	Malignant melanoma of ear and external auricular canal	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.3	Malignant melanoma of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.4	Malignant melanoma of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.51	Malignant melanoma of anal skin	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.52	Malignant melanoma of skin of breast	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.59	Malignant melanoma of other part of trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C43.60	Malignant melanoma of unspecified upper limb, including shoulder	ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
C43.61	Malignant melanoma of right upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.62	Malignant melanoma of left upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.70	Malignant melanoma of unspecified lower limb, including hip	See Tables A-2 and A-3	ENSD	10% ENSD	RSD (0.50 m)	ENSD
C43.71	Malignant melanoma of right lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.72	Malignant melanoma of left lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.8	Malignant melanoma of overlapping sites of skin	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C43.9	Malignant melanoma of skin, unspecified	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.0	Unspecified malignant neoplasm of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C44.1	Unspecified malignant neoplasm of skin of eyelid, including canthus	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.2	Unspecified malignant neoplasm of skin of ear and external auricular canal	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.3	Unspecified malignant neoplasm of skin of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.4	Malignant neoplasm/BCC/SCC of skin of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.5	Malignant neoplasm/BCC/SCC of trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.6	Malignant neoplasm/BCC/SCC of skin of upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.7	Malignant neoplasm/BCC/SCC of skin of lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.8	Malignant neoplasm of overlapping sites of skin	ENSD	ENSD	ENSD	ENSD	ENSD
C44.9	Malignant neoplasm/BCC/SCC of skin, unspecified	ENSD	ENSD	ENSD	ENSD	ENSD
C45.0	Mesothelioma of pleura	Lung	Lung	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C45.1	Mesothelioma of peritoneum	Stomach	Stomach	Stomach	Stomach	Stomach
C45.2	Mesothelioma of pericardium	Lung	Lung	Lung	Lung	Lung
C45.7	Mesothelioma of other sites	Remainder	Remainder	Remainder	Remainder	Remainder
C45.9	Mesothelioma, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C46.0	Kaposi's sarcoma of skin	ENSD	ENSD	ENSD	ENSD	ENSD
C46.1	Kaposi's sarcoma of soft tissue	Remainder	Remainder	Remainder	Remainder	Remainder
C46.2	Kaposi's sarcoma of palate	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C46.3	Kaposi's sarcoma of lymph nodes	Remainder	Remainder	Remainder	Remainder	Remainder
C46.4	Kaposi's sarcoma of gastrointestinal sites	Stomach	Stomach	Stomach	Stomach	Stomach
C46.50	Kaposi's sarcoma of unspecified lung	Lung	Lung	Lung	Lung	Lung
C46.51	Kaposi's sarcoma of right lung	Lung	Lung	Lung	Lung	Lung
C46.52	Kaposi's sarcoma of left lung	Lung	Lung	Lung	Lung	Lung
C46.7	Kaposi's sarcoma of other sites	Remainder	Remainder	Remainder	Remainder	Remainder
C46.9	Kaposi's sarcoma, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C47.0	Malignant neoplasm of peripheral nerves of head, face and neck	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C47.1	Malignant neoplasm of peripheral nerves of upper limb, including shoulder	ENSD	10% ENSD	ENSD	See Table A-6	10% ENSD
C47.2	Malignant neoplasm of peripheral nerves of lower limb, including hip	10% ENSD	See Tables B-5 and B-9	10% ENSD	RSD (0.50 m)	ENSD
C47.3	Malignant neoplasm of peripheral nerves of thorax	Remainder	Remainder	See Table A-5	See Table A-6	Lung
C47.4	Malignant neoplasm of peripheral nerves of abdomen	Remainder	Remainder	See Table A-5	Remainder	ENSD
C47.5	Malignant neoplasm of peripheral nerves of pelvis	Colon	Colon	Colon	Colon	ENSD
C47.6	Malignant neoplasm of peripheral nerves of trunk, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C47.8	Malignant neoplasm of overlapping sites of peripheral nerves and autonomic nervous system	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C47.9	Malignant neoplasm of peripheral nerves and autonomic nervous system, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C48	Malignant neoplasm of retroperitoneum and peritoneum	Stomach	Stomach	Stomach	Stomach	Stomach
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C49.1	Malignant neoplasm of connective and soft tissue of upper limb, including shoulder	ENSD	10% ENSD	ENSD	See Table A-6	10% ENSD
C49.2	Malignant neoplasm of connective and soft tissue of lower limb, including hip	10% ENSD	See Tables B-5 and B-9	10% ENSD	RSD (0.50 m)	ENSD
C49.3	Malignant neoplasm of connective and soft tissue of thorax	Remainder	Remainder	See Table A-5	See Table A-6	Lung
C49.4	Malignant neoplasm of connective and soft tissue of abdomen	Remainder	Remainder	See Table A-5	Remainder	ENSD
C49.5	Malignant neoplasm of connective and soft tissue of pelvis	Colon	Colon	Colon	Colon	ENSD
C49.6	Malignant neoplasm of connective and soft tissue of trunk, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.8	Malignant neoplasm of overlapping sites of connective and soft tissue	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.9	Malignant neoplasm of connective and soft tissue, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.A	Gastrointestinal stromal tumor	Stomach	Stomach	Stomach	Stomach	Stomach
C44.39	Other specified malignant neoplasm of skin of parts of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.4	Malignant neoplasm/BCC/SCC of skin of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.5	Malignant neoplasm/BCC/SCC of anal skin, breast, trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.6	Malignant neoplasm/BCC/SCC of skin of upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.7	Malignant neoplasm/BCC/SCC of skin of unspecified lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C44.8	Malignant neoplasm/BCC/SCC of overlapping sites of skin	ENSD	ENSD	ENSD	ENSD	ENSD
C44.9	Malignant neoplasm/BCC/SCC of skin, unspecified	ENSD	ENSD	ENSD	ENSD	ENSD
C45.0	Mesothelioma of pleura	Lung	Lung	Lung	Lung	Lung
C45.1	Mesothelioma of peritoneum	Stomach	Stomach	Stomach	Stomach	Stomach
C45.2	Mesothelioma of pericardium	Lung	Lung	Lung	Lung	Lung
C45.7	Mesothelioma of other sites	Remainder	Remainder	Remainder	Remainder	Remainder
C45.9	Mesothelioma, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C46.0	Kaposi's sarcoma of skin	ENSD	ENSD	ENSD	ENSD	ENSD
C46.1	Kaposi's sarcoma of soft tissue	Remainder	Remainder	Remainder	Remainder	Remainder
C46.2	Kaposi's sarcoma of palate	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C46.3	Kaposi's sarcoma of lymph nodes	Remainder	Remainder	Remainder	Remainder	Remainder
C46.4	Kaposi's sarcoma of gastrointestinal sites	Stomach	Stomach	Stomach	Stomach	Stomach
C46.50	Kaposi's sarcoma of unspecified lung	Lung	Lung	Lung	Lung	Lung
C46.51	Kaposi's sarcoma of right lung	Lung	Lung	Lung	Lung	Lung
C46.52	Kaposi's sarcoma of left lung	Lung	Lung	Lung	Lung	Lung
C46.7	Kaposi's sarcoma of other sites	Remainder	Remainder	Remainder	Remainder	Remainder
C46.9	Kaposi's sarcoma, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C47.0	Malignant neoplasm of peripheral nerves of head, face and neck	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C47.1	Malignant neoplasm of peripheral nerves of upper limb, including shoulder	ENSD	10% ENSD	ENSD	See Table A-6	10% ENSD
C47.2	Malignant neoplasm of peripheral nerves of lower limb, including hip	10% ENSD	See Tables B-5 and B-9	10% ENSD	RSD (0.50 m)	ENSD
C47.3	Malignant neoplasm of peripheral nerves of thorax	Remainder	Remainder	See Table A-5	See Table A-6	Lung
C47.4	Malignant neoplasm of peripheral nerves of abdomen	Remainder	Remainder	See Table A-5	Remainder	ENSD
C47.5	Malignant neoplasm of peripheral nerves of pelvis	Colon	Colon	Colon	Colon	ENSD
C47.6	Malignant neoplasm of peripheral nerves of trunk, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C47.8	Malignant neoplasm of overlapping sites of peripheral nerves and autonomic nervous system	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C47.9	Malignant neoplasm of peripheral nerves and autonomic nervous system, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C48.	Malignant neoplasm of retroperitoneum and peritoneum	Stomach	Stomach	Stomach	Stomach	Stomach
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C49.1	Malignant neoplasm of connective and soft tissue of upper limb, including shoulder	ENSD	10% ENSD	ENSD	See Table A-6	10% ENSD
C49.2	Malignant neoplasm of connective and soft tissue of lower limb, including hip	10% ENSD	See Tables B-5 and B-9	10% ENSD	RSD (0.50 m)	ENSD

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C49.3	Malignant neoplasm of connective and soft tissue of thorax	Remainder	Remainder	See Table A-5	See Table A-6	Lung
C49.4	Malignant neoplasm of connective and soft tissue of abdomen	Remainder	Remainder	See Table A-5	Remainder	ENSD
C49.5	Malignant neoplasm of connective and soft tissue of pelvis	Colon	Colon	Colon	Colon	ENSD
C49.6	Malignant neoplasm of connective and soft tissue of trunk, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.8	Malignant neoplasm of overlapping sites of connective and soft tissue	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.9	Malignant neoplasm of connective and soft tissue, unspecified	Remainder	Remainder	See Table A-5	See Table A-6	ENSD
C49.A0	Gastrointestinal stromal tumor, unspecified site	Stomach	Stomach	Stomach	Stomach	Stomach
C49.A1	Gastrointestinal stromal tumor of esophagus	Stomach	Stomach	Stomach	Stomach	Stomach
C49.A2	Gastrointestinal stromal tumor of stomach	Stomach	Stomach	Stomach	Stomach	Stomach
C49.A3	Gastrointestinal stromal tumor of small intestine	Stomach	Stomach	Stomach	Stomach	Stomach
C49.A4	Gastrointestinal stromal tumor of large intestine	Stomach	Stomach	Stomach	Stomach	Stomach
C49.A5	Gastrointestinal stromal tumor of rectum	Colon	Colon	Colon	Colon	Colon
C49.A9	Gastrointestinal stromal tumor of other sites	Stomach	Stomach	Stomach	Stomach	Stomach
C4A.0	Merkel cell carcinoma of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
C4A.1	Merkel cell carcinoma of eyelid, including canthus	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.2	Merkel cell carcinoma of ear and external auricular canal	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.3	Merkel cell carcinoma of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.4	Merkel cell carcinoma of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.5	Merkel cell carcinoma of anal skin, breast, trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.6	Merkel cell carcinoma of upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.7	Merkel cell carcinoma of lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C4A.8	Merkel cell carcinoma of overlapping sites	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C4A.9	Merkel cell carcinoma, unspecified	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C50	Malignant neoplasm of nipple and areola, breast	Breast	Breast	Breast	Breast	Breast
C51	Malignant neoplasm of labium, clitoris, vulva	Uterus	Uterus	Uterus	Uterus	Uterus
C52	Malignant neoplasm of vagina	Uterus	Uterus	Uterus	Uterus	Uterus
C53	Malignant neoplasm of cervix	Uterus	Uterus	Uterus	Uterus	Uterus
C54	Malignant neoplasm of corpus uteri	Uterus	Uterus	Uterus	Uterus	Uterus
C55	Malignant neoplasm of uterus, part unspecified	Uterus	Uterus	Uterus	Uterus	Uterus
C56	Malignant neoplasm of ovary	Ovaries	Ovaries	Ovaries	Ovaries	Ovaries
C57	Malignant neoplasm of fallopian tube, ligament, female genital organs	Ovaries	Ovaries	Ovaries	Ovaries	Ovaries
C58	Malignant neoplasm of placenta	Uterus	Uterus	Uterus	Uterus	Uterus
C60.0	Malignant neoplasm of prepuce, penis	Testes	Testes	Testes	Testes	Testes
C61	Malignant neoplasm of prostate	Bladder	Bladder	Bladder	Bladder	Bladder
C62	Malignant neoplasm of undescended testis	Testes	Testes	Testes	Testes	Testes
C63	Malignant neoplasm of epididymis, male genital organ	Testes	Testes	Testes	Testes	Testes
C64	Malignant neoplasm of kidney, except renal pelvis	Liver	Liver	Liver	Liver	Liver
C65	Malignant neoplasm of renal pelvis	Liver	Liver	Liver	Liver	Liver
C66	Malignant neoplasm of ureter	Bladder	Bladder	Bladder	Bladder	Bladder
C67	Malignant neoplasm of bladder	Bladder	Bladder	Bladder	Bladder	Bladder
C68.0	Malignant neoplasm of urethra	Bladder	Bladder	Bladder	Bladder	Bladder
C68.1	Malignant neoplasm of paraurethral glands	Bladder	Bladder	Bladder	Bladder	Bladder
C68.8	Malignant neoplasm of overlapping sites of urinary organs	Liver	Liver	Liver	Liver	Liver
C68.9	Malignant neoplasm of urinary organ, unspecified	Liver	Liver	Liver	Liver	Liver
C69	Malignant neoplasm of eye	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C70.0	Malignant neoplasm of cerebral meninges	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C70.1	Malignant neoplasm of spinal meninges	Remainder	Remainder	Remainder	Eye/brain	Remainder
C70.9	Malignant neoplasm of meninges, unspecified	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C71	Malignant neoplasm of brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C72.0	Malignant neoplasm of spinal cord	Remainder	Remainder	Remainder	Eye/brain	Remainder
C72.1	Malignant neoplasm of cauda equina	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C72.2	Malignant neoplasm of olfactory nerve	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C72.3	Malignant neoplasm of optic nerve	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C72.4	Malignant neoplasm of acoustic nerve	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C72.5	Malignant neoplasm of cranial nerves	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C72.9	Malignant neoplasm of central nervous system, unspecified	Remainder	Remainder	Remainder	Eye/brain	Remainder
C73	Malignant neoplasm of thyroid gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C74	Malignant neoplasm of cortex of adrenal gland	Remainder	Remainder	Remainder	Remainder	Remainder
C75.0	Malignant neoplasm of parathyroid gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C75.1	Malignant neoplasm of pituitary gland	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C75.2	Malignant neoplasm of craniopharyngeal duct	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C75.3	Malignant neoplasm of pineal gland	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C75.4	Malignant neoplasm of carotid body	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C75.5	Malignant neoplasm of aortic body and other paraganglia	Remainder	Remainder	Remainder	Eye/brain	Remainder
C75.8	Malignant neoplasm with pluriglandular involvement, unspecified	Remainder	Remainder	Remainder	Eye/brain	Remainder
C75.9	Malignant neoplasm of endocrine gland, unspecified	Remainder	Remainder	Remainder	Eye/brain	Remainder
C76.0	Malignant neoplasm of head, face and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C76.1	Malignant neoplasm of thorax	Remainder	Remainder	Remainder	Remainder	Remainder
C76.2	Malignant neoplasm of abdomen	Remainder	Remainder	Remainder	Remainder	ENSD
C76.3	Malignant neoplasm of pelvis	Remainder	Remainder	Remainder	Remainder	ENSD
C76.40	Malignant neoplasm of unspecified upper limb	ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
C76.41	Malignant neoplasm of right upper limb	See Tables B-4 and B-8	See Tables B-5 and B-9	ENSD	See Table B-7	10% ENSD
C76.42	Malignant neoplasm of left upper limb	See Tables B-4 and B-8	See Tables B-5 and B-9	ENSD	See Table B-7	10% ENSD
C76.50	Malignant neoplasm of unspecified lower limb	RSD (0.52 m)	10% ENSD	RSD (0.52 m)	RSD (0.70 m)	10% ENSD
C76.51	Malignant neoplasm of right lower limb	RSD (0.52 m)	10% ENSD	RSD (0.52 m)	RSD (0.70 m)	10% ENSD
C76.52	Malignant neoplasm of left lower limb	RSD (0.52 m)	10% ENSD	RSD (0.52 m)	RSD (0.70 m)	10% ENSD
C76.8	Malignant neoplasm of other specified ill-defined sites	Remainder	Remainder	Remainder	Remainder	Remainder
C77	Secondary Cancer – Lymph nodes of head, face and neck	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C78.0	Secondary Cancer – Lung, respiratory, lymph, digestive	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]
C7B	Secondary Cancer – Lymph nodes, liver, bone, peritoneum, Merkel cell	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]
C79	Secondary Cancer – Urinary organs, skin, brain, bone, ovary	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]
C7A.00	Malignant carcinoid tumor of unspecified site	Remainder	Remainder	Remainder	Remainder	Remainder
C7A.010	Malignant carcinoid tumor of the duodenum	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.011	Malignant carcinoid tumor of the jejunum	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.012	Malignant carcinoid tumor of the ileum	Colon	Colon	Colon	Colon	Colon
C7A.019	Malignant carcinoid tumor of the small intestine, unspecified portion	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.020	Malignant carcinoid tumor of the appendix	Colon	Colon	Colon	Colon	Colon
C7A.021	Malignant carcinoid tumor of the cecum	Colon	Colon	Colon	Colon	Colon
C7A.022	Malignant carcinoid tumor of the ascending colon	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.023	Malignant carcinoid tumor of the transverse colon	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.024	Malignant carcinoid tumor of the descending colon	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.025	Malignant carcinoid tumor of the sigmoid colon	Colon	Colon	Colon	Colon	Colon
C7A.026	Malignant carcinoid tumor of the rectum	Colon	Colon	Colon	Colon	Colon
C7A.029	Malignant carcinoid tumor of the large intestine, unspecified portion	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.090	Malignant carcinoid tumor of the bronchus and lung	Lung	Lung	Lung	Lung	Lung
C7A.091	Malignant carcinoid tumor of the thymus	Thymus	Thymus	Thymus	Thymus	Thymus
C7A.092	Malignant carcinoid tumor of the stomach	Stomach	Stomach	Stomach	Stomach	Stomach
C7A.093	Malignant carcinoid tumor of the kidney	Liver	Liver	Liver	Liver	Liver
C7A.094	Malignant carcinoid tumor of the foregut, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C7A.095	Malignant carcinoid tumor of the midgut, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C7A.096	Malignant carcinoid tumor of the hindgut, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C7A.098	Malignant carcinoid tumors of other sites	Remainder	Remainder	Remainder	Remainder	Remainder
C7A.1	Malignant poorly differentiated neuroendocrine tumors	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C7A.8	Other malignant neuroendocrine tumors	Remainder	Remainder	Remainder	Remainder	Remainder
C7B	Secondary carcinoid tumors, neuroendocrine tumors	Remainder	Remainder	Remainder	Remainder	Remainder
C80	Malignant neoplasm, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
C81.00	Nodular lymphocyte predominant Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.01	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.02	Nodular lymphocyte predominant Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.03	Nodular lymphocyte predominant Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.04	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.05	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.06	Nodular lymphocyte predominant Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.07	Nodular lymphocyte predominant Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.08	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.09	Nodular lymphocyte predominant Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.10	Nodular sclerosis Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.11	Nodular sclerosis Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.12	Nodular sclerosis Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.13	Nodular sclerosis Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.14	Nodular sclerosis Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C81.15	Nodular sclerosis Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.16	Nodular sclerosis Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.17	Nodular sclerosis Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.18	Nodular sclerosis Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.19	Nodular sclerosis Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.20	Mixed cellularity Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.21	Mixed cellularity Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.22	Mixed cellularity Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.23	Mixed cellularity Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.24	Mixed cellularity Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.25	Mixed cellularity Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.26	Mixed cellularity Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.27	Mixed cellularity Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.28	Mixed cellularity Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.29	Mixed cellularity Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.30	Lymphocyte depleted Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.31	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.32	Lymphocyte depleted Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.33	Lymphocyte depleted Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C81.34	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.35	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.36	Lymphocyte depleted Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.37	Lymphocyte depleted Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.38	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.39	Lymphocyte depleted Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.40	Lymphocyte-rich Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.41	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.42	Lymphocyte-rich Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.43	Lymphocyte-rich Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.44	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.45	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.46	Lymphocyte-rich Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.47	Lymphocyte-rich Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.48	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.49	Lymphocyte-rich Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.70	Other Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.71	Other Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.72	Other Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C81.73	Other Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.74	Other Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.75	Other Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.76	Other Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.77	Other Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.78	Other Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.79	Other Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.90	Hodgkin lymphoma, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.91	Hodgkin lymphoma, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C81.92	Hodgkin lymphoma, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C81.93	Hodgkin lymphoma, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C81.94	Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C81.95	Hodgkin lymphoma, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C81.96	Hodgkin lymphoma, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C81.97	Hodgkin lymphoma, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C81.98	Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C81.99	Hodgkin lymphoma, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.00	Follicular lymphoma grade I, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.01	Follicular lymphoma grade I, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C82.02	Follicular lymphoma grade I, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.03	Follicular lymphoma grade I, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.04	Follicular lymphoma grade I, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.05	Follicular lymphoma grade I, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.06	Follicular lymphoma grade I, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.07	Follicular lymphoma grade I, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.08	Follicular lymphoma grade I, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.09	Follicular lymphoma grade I, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.10	Follicular lymphoma grade II, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.11	Follicular lymphoma grade II, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.12	Follicular lymphoma grade II, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.13	Follicular lymphoma grade II, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.14	Follicular lymphoma grade II, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.15	Follicular lymphoma grade II, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.16	Follicular lymphoma grade II, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.17	Follicular lymphoma grade II, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.18	Follicular lymphoma grade II, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.19	Follicular lymphoma grade II, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.20	Follicular lymphoma grade III, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C82.21	Follicular lymphoma grade III, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.22	Follicular lymphoma grade III, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.23	Follicular lymphoma grade III, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.24	Follicular lymphoma grade III, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.25	Follicular lymphoma grade III, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.26	Follicular lymphoma grade III, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.27	Follicular lymphoma grade III, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.28	Follicular lymphoma grade III, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.29	Follicular lymphoma grade III, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.30	Follicular lymphoma grade IIIa, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.31	Follicular lymphoma grade IIIa, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.32	Follicular lymphoma grade IIIa, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.33	Follicular lymphoma grade IIIa, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.34	Follicular lymphoma grade IIIa, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.35	Follicular lymphoma grade IIIa, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.36	Follicular lymphoma grade IIIa, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.37	Follicular lymphoma grade IIIa, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.38	Follicular lymphoma grade IIIa, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C82.39	Follicular lymphoma grade IIIa, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.40	Follicular lymphoma grade IIIb, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.41	Follicular lymphoma grade IIIb, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.42	Follicular lymphoma grade IIIb, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.43	Follicular lymphoma grade IIIb, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.44	Follicular lymphoma grade IIIb, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.45	Follicular lymphoma grade IIIb, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.46	Follicular lymphoma grade IIIb, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.47	Follicular lymphoma grade IIIb, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.48	Follicular lymphoma grade IIIb, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.49	Follicular lymphoma grade IIIb, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.50	Diffuse follicle center lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.51	Diffuse follicle center lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.52	Diffuse follicle center lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.53	Diffuse follicle center lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.54	Diffuse follicle center lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.55	Diffuse follicle center lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.56	Diffuse follicle center lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.57	Diffuse follicle center lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C82.58	Diffuse follicle center lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.59	Diffuse follicle center lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.60	Cutaneous follicle center lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.61	Cutaneous follicle center lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.62	Cutaneous follicle center lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.63	Cutaneous follicle center lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.64	Cutaneous follicle center lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.65	Cutaneous follicle center lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.66	Cutaneous follicle center lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.67	Cutaneous follicle center lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.68	Cutaneous follicle center lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.69	Cutaneous follicle center lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.80	Other types of follicular lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.81	Other types of follicular lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.82	Other types of follicular lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.83	Other types of follicular lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.84	Other types of follicular lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.85	Other types of follicular lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C82.86	Other types of follicular lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.87	Other types of follicular lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.88	Other types of follicular lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.89	Other types of follicular lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.90	Follicular lymphoma, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.91	Follicular lymphoma, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C82.92	Follicular lymphoma, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C82.93	Follicular lymphoma, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C82.94	Follicular lymphoma, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C82.95	Follicular lymphoma, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C82.96	Follicular lymphoma, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C82.97	Follicular lymphoma, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C82.98	Follicular lymphoma, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C82.99	Follicular lymphoma, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.00	Small cell B-cell lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.01	Small cell B-cell lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.02	Small cell B-cell lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.03	Small cell B-cell lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.04	Small cell B-cell lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C83.05	Small cell B-cell lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.06	Small cell B-cell lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.07	Small cell B-cell lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.08	Small cell B-cell lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.09	Small cell B-cell lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.10	Mantle cell lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.11	Mantle cell lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.12	Mantle cell lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.13	Mantle cell lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.14	Mantle cell lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C83.15	Mantle cell lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.16	Mantle cell lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.17	Mantle cell lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.18	Mantle cell lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.19	Mantle cell lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.30	Diffuse large B-cell lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.31	Diffuse large B-cell lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.32	Diffuse large B-cell lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.33	Diffuse large B-cell lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.34	Diffuse large B-cell lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C83.35	Diffuse large B-cell lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.36	Diffuse large B-cell lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.37	Diffuse large B-cell lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.38	Diffuse large B-cell lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.39	Diffuse large B-cell lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.50	Lymphoblastic (diffuse) lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.51	Lymphoblastic (diffuse) lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.52	Lymphoblastic (diffuse) lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.53	Lymphoblastic (diffuse) lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.54	Lymphoblastic (diffuse) lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C83.55	Lymphoblastic (diffuse) lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.56	Lymphoblastic (diffuse) lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.57	Lymphoblastic (diffuse) lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.58	Lymphoblastic (diffuse) lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.59	Lymphoblastic (diffuse) lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.70	Burkitt lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.71	Burkitt lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.72	Burkitt lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.73	Burkitt lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.74	Burkitt lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C83.75	Burkitt lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.76	Burkitt lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.77	Burkitt lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.78	Burkitt lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.79	Burkitt lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.80	Other non-follicular lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.81	Other non-follicular lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.82	Other non-follicular lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.83	Other non-follicular lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C83.84	Other non-follicular lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C83.85	Other non-follicular lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.86	Other non-follicular lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.87	Other non-follicular lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.88	Other non-follicular lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.89	Other non-follicular lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.90	Non-follicular (diffuse) lymphoma, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.91	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C83.92	Non-follicular (diffuse) lymphoma, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C83.93	Non-follicular (diffuse) lymphoma, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C83.94	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C83.95	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C83.96	Non-follicular (diffuse) lymphoma, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C83.97	Non-follicular (diffuse) lymphoma, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C83.98	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C83.99	Non-follicular (diffuse) lymphoma, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.00	Mycosis fungoides, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.01	Mycosis fungoides, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.02	Mycosis fungoides, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.03	Mycosis fungoides, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.04	Mycosis fungoides, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.05	Mycosis fungoides, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.06	Mycosis fungoides, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.07	Mycosis fungoides, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.08	Mycosis fungoides, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.09	Mycosis fungoides, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.10	Sezary disease, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.11	Sezary disease, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.12	Sezary disease, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.13	Sezary disease, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.14	Sezary disease, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C84.15	Sezary disease, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.16	Sezary disease, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.17	Sezary disease, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.18	Sezary disease, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.19	Sezary disease, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.40	Peripheral T-cell lymphoma, not classified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.41	Peripheral T-cell lymphoma, not classified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.42	Peripheral T-cell lymphoma, not classified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.43	Peripheral T-cell lymphoma, not classified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.44	Peripheral T-cell lymphoma, not classified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.45	Peripheral T-cell lymphoma, not classified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.46	Peripheral T-cell lymphoma, not classified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.47	Peripheral T-cell lymphoma, not classified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.48	Peripheral T-cell lymphoma, not classified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.49	Peripheral T-cell lymphoma, not classified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.60	Anaplastic large cell lymphoma, ALK-positive, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.61	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.62	Anaplastic large cell lymphoma, ALK-positive, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.63	Anaplastic large cell lymphoma, ALK-positive, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C84.64	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.65	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.66	Anaplastic large cell lymphoma, ALK-positive, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.67	Anaplastic large cell lymphoma, ALK-positive, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.68	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.69	Anaplastic large cell lymphoma, ALK-positive, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.70	Anaplastic large cell lymphoma, ALK-negative, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.71	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.72	Anaplastic large cell lymphoma, ALK-negative, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.73	Anaplastic large cell lymphoma, ALK-negative, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.74	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.75	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.76	Anaplastic large cell lymphoma, ALK-negative, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.77	Anaplastic large cell lymphoma, ALK-negative, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.78	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.79	Anaplastic large cell lymphoma, ALK-negative, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.90	Mature T/NK-cell lymphomas, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.91	Mature T/NK-cell lymphomas, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C84.92	Mature T/NK-cell lymphomas, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.93	Mature T/NK-cell lymphomas, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.94	Mature T/NK-cell lymphomas, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.95	Mature T/NK-cell lymphomas, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.96	Mature T/NK-cell lymphomas, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.97	Mature T/NK-cell lymphomas, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.98	Mature T/NK-cell lymphomas, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.99	Mature T/NK-cell lymphomas, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.A	Cutaneous T-cell lymphoma	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
C84.Z0	Other mature T/NK-cell lymphomas, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C84.Z1	Other mature T/NK-cell lymphomas, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C84.Z2	Other mature T/NK-cell lymphomas, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C84.Z3	Other mature T/NK-cell lymphomas, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C84.Z4	Other mature T/NK-cell lymphomas, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C84.Z5	Other mature T/NK-cell lymphomas, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C84.Z6	Other mature T/NK-cell lymphomas, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C84.Z7	Other mature T/NK-cell lymphomas, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C84.Z8	Other mature T/NK-cell lymphomas, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C84.Z9	Other mature T/NK-cell lymphomas, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.10	Unspecified B-cell lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.11	Unspecified B-cell lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C85.12	Unspecified B-cell lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C85.13	Unspecified B-cell lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C85.14	Unspecified B-cell lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C85.15	Unspecified B-cell lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C85.16	Unspecified B-cell lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C85.17	Unspecified B-cell lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C85.18	Unspecified B-cell lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.19	Unspecified B-cell lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.20	Mediastinal (thymic) large B-cell lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.21	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C85.22	Mediastinal (thymic) large B-cell lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C85.23	Mediastinal (thymic) large B-cell lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C85.24	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C85.25	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C85.26	Mediastinal (thymic) large B-cell lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C85.27	Mediastinal (thymic) large B-cell lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C85.28	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.29	Mediastinal (thymic) large B-cell lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.80	Other specified types of non-Hodgkin lymphoma, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.81	Other specified types of non-Hodgkin lymphoma, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C85.82	Other specified types of non-Hodgkin lymphoma, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C85.83	Other specified types of non-Hodgkin lymphoma, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C85.84	Other specified types of non-Hodgkin lymphoma, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C85.85	Other specified types of non-Hodgkin lymphoma, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C85.86	Other specified types of non-Hodgkin lymphoma, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C85.87	Other specified types of non-Hodgkin lymphoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C85.88	Other specified types of non-Hodgkin lymphoma, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.89	Other specified types of non-Hodgkin lymphoma, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.90	Non-Hodgkin lymphoma, unspecified, unspecified site	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.91	Non-Hodgkin lymphoma, unspecified, lymph nodes of head, face, and neck	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C85.92	Non-Hodgkin lymphoma, unspecified, intrathoracic lymph nodes	Lung	Lung	Lung	Lung	Lung
C85.93	Non-Hodgkin lymphoma, unspecified, intra-abdominal lymph nodes	Stomach	Stomach	Stomach	Stomach	Stomach
C85.94	Non-Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	See Tables A-2 and A-3	Lung	Breast	Lung	Breast

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C85.95	Non-Hodgkin lymphoma, unspecified, lymph nodes of inguinal region and lower limb	Bladder	Bladder	Bladder	Bladder	Bladder
C85.96	Non-Hodgkin lymphoma, unspecified, intrapelvic lymph nodes	Bladder	Bladder	Bladder	Bladder	Bladder
C85.97	Non-Hodgkin lymphoma, unspecified, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C85.98	Non-Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C85.99	Non-Hodgkin lymphoma, unspecified, extranodal and solid organ sites	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C86.0	Extranodal NK/T-cell lymphoma, nasal type	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
C86.1	Hepatosplenic T-cell lymphoma	Liver	Liver	Liver	Liver	Liver
C86.2	Enteropathy-type (intestinal) T-cell lymphoma	Colon	Colon	Colon	Colon	Colon
C86.3	Subcutaneous panniculitis-like T-cell lymphoma	Lung	Lung	Lung	Lung	Lung
C86.4	Blastic NK-cell lymphoma	Lung	Lung	Lung	Lung	Lung
C86.5	Angioimmunoblastic T-cell lymphoma	Lung	Lung	Lung	Lung	Lung
C86.6	Primary cutaneous CD30-positive T-cell proliferations	ENSD	ENSD	ENSD	ENSD	ENSD
C88.0	Waldenstrom macroglobulinemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C88.2	Heavy chain disease	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C88.3	Immunoproliferative small intestinal disease	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C88.4	Extranodal marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue [MALT-lymphoma]	Lung	Lung	Lung	Lung	Lung
C88.8	Other malignant immunoproliferative diseases	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C88.9	Malignant immunoproliferative disease, unspecified	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C90	Multiple myeloma and malignant plasma cell neoplasms	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C90.32	Solitary plasmacytoma in relapse	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C91	Leukemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C92	Leukemia, myeloid sarcoma	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C93	Leukemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C94	panmyelosis	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C95	Leukemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
C96.0	Multifocal and multisystemic (disseminated) Langerhans-cell histiocytosis	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C96.20	Malignant mast cell neoplasm, unspecified	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.20	Malignant mast cell neoplasm, head	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C96.20	Malignant mast cell neoplasm, thorax	Lung	Lung	Lung	Lung	Lung
C96.20	Malignant mast cell neoplasm, abdom	Stomach	Stomach	Stomach	Stomach	Stomach
C96.20	Malignant mast cell neoplasm, axilla	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C96.20	Malignant mast cell neoplasm, inguin	Bladder	Bladder	Bladder	Bladder	Bladder
C96.20	Malignant mast cell neoplasm, pelvic	Bladder	Bladder	Bladder	Bladder	Bladder
C96.20	Malignant mast cell neoplasm, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C96.20	Malignant mast cell neoplasm, multiple	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.21	Aggressive systemic mastocytosis, unspecified	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.21	Aggressive systemic mastocytosis, head	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C96.21	Aggressive systemic mastocytosis, thorax	Lung	Lung	Lung	Lung	Lung
C96.21	Aggressive systemic mastocytosis, abdom	Stomach	Stomach	Stomach	Stomach	Stomach
C96.21	Aggressive systemic mastocytosis, axilla	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C96.21	Aggressive systemic mastocytosis, inguin	Bladder	Bladder	Bladder	Bladder	Bladder
C96.21	Aggressive systemic mastocytosis, pelvic	Bladder	Bladder	Bladder	Bladder	Bladder
C96.21	Aggressive systemic mastocytosis, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C96.21	Aggressive systemic mastocytosis, multiple	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.22	Mast cell sarcoma, unspecified	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.22	Mast cell sarcoma, head	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C96.22	Mast cell sarcoma, thorax	Lung	Lung	Lung	Lung	Lung
C96.22	Mast cell sarcoma, abdom	Stomach	Stomach	Stomach	Stomach	Stomach
C96.22	Mast cell sarcoma, axilla	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C96.22	Mast cell sarcoma, inguin	Bladder	Bladder	Bladder	Bladder	Bladder
C96.22	Mast cell sarcoma, pelvic	Bladder	Bladder	Bladder	Bladder	Bladder
C96.22	Mast cell sarcoma, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C96.22	Mast cell sarcoma, multiple	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
C96.29	Other malignant mast cell neoplasm, unspecified	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.29	Other malignant mast cell neoplasm, head	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C96.29	Other malignant mast cell neoplasm, thorax	Lung	Lung	Lung	Lung	Lung
C96.29	Other malignant mast cell neoplasm, abdom	Stomach	Stomach	Stomach	Stomach	Stomach
C96.29	Other malignant mast cell neoplasm, axilla	See Tables A-2 and A-3	Lung	Breast	Lung	Breast
C96.29	Other malignant mast cell neoplasm, inguin	Bladder	Bladder	Bladder	Bladder	Bladder
C96.29	Other malignant mast cell neoplasm, pelvic	Bladder	Bladder	Bladder	Bladder	Bladder
C96.29	Other malignant mast cell neoplasm, spleen	Stomach	Stomach	Stomach	Stomach	Stomach
C96.29	Other malignant mast cell neoplasm, multiple	See Tables A-2 and A-3	Lung	Lung	Thyroid	Lung
C96.4	Sarcoma of dendritic cells (accessory cells)	Lung	Lung	Lung	Thyroid	Lung
C96.9	Malignant neoplasm of lymphoid, hematopoietic and related tissue, unspecified	Lung	Lung	Lung	Lung	Lung
C96.A	Histiocytic sarcoma	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
C96.Z	Other specified malignant neoplasms of lymphoid, hematopoietic and related tissue	Lung	Lung	Lung	Lung	Lung
D00.0	Carcinoma in situ of oral cavity	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D00.1	Carcinoma in situ of esophagus	Stomach	Stomach	Stomach	Stomach	Stomach
D00.2	Carcinoma in situ of stomach	Stomach	Stomach	Stomach	Stomach	Stomach
D01.0	Carcinoma in situ of colon	Stomach	Stomach	Stomach	Stomach	Stomach
D01.1	Carcinoma in situ of rectosigmoid junction	Colon	Colon	Colon	Colon	Colon
D01.2	Carcinoma in situ of rectum	Colon	Colon	Colon	Colon	Colon
D01.3	Carcinoma in situ of anus and anal canal	Colon	Colon	Colon	Colon	Colon
D01.4	Carcinoma in situ of part of intestine	Stomach	Stomach	Stomach	Stomach	Stomach
D01.5	Carcinoma in situ of liver, gallbladder and bile ducts	Liver	Liver	Liver	Liver	Liver
D01.7	Carcinoma in situ of other specified digestive organs	Stomach	Stomach	Stomach	Stomach	Stomach
D01.9	Carcinoma in situ of digestive organ, unspecified	Stomach	Stomach	Stomach	Stomach	Stomach
D02.0	Carcinoma in situ of larynx	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D02.1	Carcinoma in situ of trachea	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D02.2	Carcinoma in situ of bronchus and lung	Lung	Lung	Lung	Lung	Lung
D02.3	Carcinoma in situ of other parts of respiratory system	Lung	Lung	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D02.4	Carcinoma in situ of respiratory system, unspecified	Lung	Lung	Lung	Lung	Lung
D03.0	Melanoma in situ of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
D03.1	Melanoma in situ of eyelid, including canthus	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.2	Melanoma in situ of ear and external auricular canal	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.3	Melanoma in situ of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.4	Melanoma in situ of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.5	Melanoma in situ of anal skin, breast, trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.6	Melanoma in situ of upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.7	Melanoma in situ of lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.8	Melanoma in situ of other sites	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D03.9	Melanoma in situ, unspecified	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.0	Carcinoma in situ of skin of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
D04.1	Carcinoma in situ of skin of eyelid, including canthus	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.2	Carcinoma in situ of skin of ear and external auricular canal	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.3	Carcinoma in situ of skin of part of face	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.4	Carcinoma in situ of skin of scalp and neck	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.5	Carcinoma in situ of skin of trunk	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.6	Carcinoma in situ of skin of upper limb, including shoulder	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D04.7	Carcinoma in situ of skin of lower limb, including hip	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.8	Carcinoma in situ of skin of other sites	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D04.9	Carcinoma in situ of skin, unspecified	See Tables B-4 and B-8	See Tables B-5 and B-9	See Table B-6	See Table B-7	See Table B-5
D05	Lobular carcinoma in situ of breast	Breast	Breast	Breast	Breast	Breast
D06	Carcinoma in situ of cervix	Uterus	Uterus	Uterus	Uterus	Uterus
D07	Carcinoma in situ of female genital organs	Uterus	Uterus	Uterus	Uterus	Uterus
D07.4	Carcinoma in situ of penis	Testes	Testes	Testes	Testes	Testes
D07.5	Carcinoma in situ of prostate	Bladder	Bladder	Bladder	Bladder	Bladder
D07.6	Carcinoma in situ of male genital organs	Testes	Testes	Testes	Testes	Testes
D09.0	Carcinoma in situ of bladder	Bladder	Bladder	Bladder	Bladder	Bladder
D09.1	Carcinoma in situ of urinary organ	Bladder	Bladder	Bladder	Bladder	Bladder
D09.2	Carcinoma in situ of eye	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D09.3	Carcinoma in situ of thyroid and other endocrine glands (thyroid)	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D09.3	Carcinoma in situ of thyroid and other endocrine glands (adrenal)	Remainder	Remainder	Remainder	Remainder	Remainder
D09.3	Carcinoma in situ of thyroid and other endocrine glands (parathyroid)	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D09.3	Carcinoma in situ of thyroid and other endocrine glands (pituitary)	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D09.3	Carcinoma in situ of thyroid and other endocrine glands (pineal gland)	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D09.3	Carcinoma in situ of thyroid and other endocrine glands (carotid body)	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D09.3	Carcinoma in situ of thyroid and other endocrine glands (paraganglia NEC)	Remainder	Remainder	Remainder	Remainder	Remainder
D09.3	Carcinoma in situ of thyroid and other endocrine glands (endocrine NEC)	Remainder	Remainder	Remainder	Eye/brain	Remainder
D09.3	Carcinoma in situ of thyroid and other endocrine glands (endocrine NOS)	Remainder	Remainder	Remainder	Eye/brain	Remainder
D09.8	Carcinoma in situ of other specified sites	Remainder	Remainder	Remainder	Remainder	Remainder
D09.9	Carcinoma in situ, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D37.01	Neoplasm of uncertain behavior of lip	See Tables A-2 and A-3	Eye/brain	See Table A-5	ENSD	Eye/brain
D37.02	Neoplasm of uncertain behavior of tongue	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D37.03	Neoplasm of uncertain behavior of the salivary glands	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D37.04	Neoplasm of uncertain behavior of the minor salivary glands	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D37.05	Neoplasm of uncertain behavior of pharynx	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D37.09	Neoplasm of uncertain behavior of other specified sites of the oral cavity	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D37.1	Neoplasm of uncertain behavior of stomach	Stomach	Stomach	Stomach	Stomach	Stomach
D37.2	Neoplasm of uncertain behavior of small intestine	Stomach	Stomach	Stomach	Stomach	Stomach
D37.3	Neoplasm of uncertain behavior of appendix	Colon	Colon	Colon	Colon	Colon
D37.4	Neoplasm of uncertain behavior of colon	Stomach	Colon	Stomach	Stomach	Stomach
D37.5	Neoplasm of uncertain behavior of rectum	Colon	Colon	Colon	Colon	Colon
D37.6	Neoplasm of uncertain behavior of liver, gallbladder and bile ducts	Liver	Liver	Liver	Liver	Liver
D37.8	Neoplasm of uncertain behavior of other specified digestive organs	Stomach	Colon	Stomach	Stomach	Stomach
D37.9	Neoplasm of uncertain behavior of digestive organ, unspecified	Stomach	Colon	Stomach	Stomach	Stomach
D38.0	Neoplasm of uncertain behavior of larynx	Esophagus	Esophagus	Esophagus	Esophagus	Esophagus
D38.1	Neoplasm of uncertain behavior of trachea, bronchus and lung	Lung	Lung	Lung	Lung	Lung
D38.2	Neoplasm of uncertain behavior of pleura	Lung	Lung	Lung	Lung	Lung
D38.3	Neoplasm of uncertain behavior of mediastinum	Lung	Lung	Lung	Lung	Lung
D38.4	Neoplasm of uncertain behavior of thymus	Thymus	Thymus	Thymus	Thymus	Thymus
D38.5	Neoplasm of uncertain behavior of other respiratory organs	Lung	Lung	Lung	Lung	Lung
D38.6	Neoplasm of uncertain behavior of respiratory organ, unspecified	Lung	Lung	Lung	Lung	Lung
D39.0	Neoplasm of uncertain behavior of uterus	Uterus	Uterus	Uterus	Uterus	Uterus
D39.10	Neoplasm of uncertain behavior of unspecified ovary	Ovaries	Ovaries	Ovaries	Ovaries	Ovaries
D39.11	Neoplasm of uncertain behavior of right ovary	Ovaries	Ovaries	Ovaries	Ovaries	Ovaries
D39.12	Neoplasm of uncertain behavior of left ovary	Ovaries	Ovaries	Ovaries	Ovaries	Ovaries

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D39.2	Neoplasm of uncertain behavior of placenta	Uterus	Uterus	Uterus	Uterus	Uterus
D39.8	Neoplasm of uncertain behavior of other specified female genital organs	Uterus	Uterus	Uterus	Uterus	Uterus
D39.9	Neoplasm of uncertain behavior of female genital organ, unspecified	Uterus	Uterus	Uterus	Uterus	Uterus
D40.0	Neoplasm of uncertain behavior of prostate	Bladder	Bladder	Bladder	Bladder	Bladder
D40.1	Neoplasm of uncertain behavior of testis	Testes	Testes	Testes	Testes	Testes
D40.8	Neoplasm of uncertain behavior of other specified male genital organs	Testes	Testes	Testes	Testes	Testes
D40.9	Neoplasm of uncertain behavior of male genital organ, unspecified	Testes	Testes	Testes	Testes	Testes
D41.0	Neoplasm of uncertain behavior of kidney	Liver	Liver	Liver	Liver	Liver
D41.1	Neoplasm of uncertain behavior of renal pelvis	Liver	Liver	Liver	Liver	Liver
D41.2	Neoplasm of uncertain behavior of ureter	Liver	Liver	Liver	Liver	Liver
D41.3	Neoplasm of uncertain behavior of urethra	Liver	Liver	Liver	Liver	Liver
D41.4	Neoplasm of uncertain behavior of bladder	Bladder	Bladder	Bladder	Bladder	Bladder
D41.8	Neoplasm of uncertain behavior of other specified urinary organs	Liver	Liver	Liver	Liver	Liver
D41.9	Neoplasm of uncertain behavior of unspecified urinary organ	Liver	Liver	Liver	Liver	Liver
D42.0	Neoplasm of uncertain behavior of cerebral meninges	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D42.1	Neoplasm of uncertain behavior of spinal meninges	Remainder	Remainder	Remainder	Remainder	Remainder
D42.9	Neoplasm of uncertain behavior of meninges, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
D43.0	Neoplasm of uncertain behavior of brain, supratentorial	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D43.1	Neoplasm of uncertain behavior of brain, infratentorial	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D43.2	Neoplasm of uncertain behavior of brain, unspecified	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D43.3	Neoplasm of uncertain behavior of cranial nerves	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D43.4	Neoplasm of uncertain behavior of spinal cord	Remainder	Remainder	Remainder	Remainder	Remainder
D43.8	Neoplasm of uncertain behavior of other specified parts of central nervous system	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D43.9	Neoplasm of uncertain behavior of central nervous system, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
D44.0	Neoplasm of uncertain behavior of thyroid gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D44.1	Neoplasm of uncertain behavior of adrenal gland	Remainder	Remainder	Remainder	Remainder	Remainder
D44.2	Neoplasm of uncertain behavior of parathyroid gland	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D44.3	Neoplasm of uncertain behavior of pituitary gland	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D44.4	Neoplasm of uncertain behavior of craniopharyngeal duct	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D44.5	Neoplasm of uncertain behavior of pineal gland	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D44.6	Neoplasm of uncertain behavior of carotid body	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
D44.7	Neoplasm of uncertain behavior of aortic body and other paraganglia	Remainder	Remainder	Remainder	Remainder	Remainder
D44.9	Neoplasm of uncertain behavior of unspecified endocrine gland	Remainder	Remainder	Remainder	Eye/brain	Remainder
D45	Polycythemia vera	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D46	Refractory anemia, Myelodysplastic syndrome, Refractory cytopenia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.01	Cutaneous mastocytosis	ENSD	ENSD	ENSD	ENSD	ENSD
D47.02	Systemic mastocytosis	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.09	Other mast cell neoplasms of uncertain behavior	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.1	Chronic myeloproliferative disease	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.3	Essential (hemorrhagic) thrombocythemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.4	Osteomyelofibrosis	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.9	Neoplasm of uncertain behavior of lymphoid, hematopoietic and related tissue, unspecified	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.Z2	Castleman disease	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D47.Z9	Other specified neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D48.0	Neoplasm of uncertain behavior of bone and articular cartilage	Bone surface	Bone surface	Bone surface	Bone surface	Bone surface
D48.1	Neoplasm of uncertain behavior of connective and other soft tissue	Remainder	Remainder	Remainder	Remainder	Remainder
D48.2	Neoplasm of uncertain behavior of peripheral nerves and autonomic nervous system	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D48.3	Neoplasm of uncertain behavior of retroperitoneum	Stomach	Stomach	Stomach	Stomach	Stomach
D48.4	Neoplasm of uncertain behavior of peritoneum	Stomach	Stomach	Stomach	Stomach	Stomach
D48.5	Neoplasm of uncertain behavior of skin	ENSD	ENSD	ENSD	ENSD	ENSD
D48.60	Neoplasm of uncertain behavior of unspecified breast	Breast	Breast	Breast	Breast	Breast
D48.61	Neoplasm of uncertain behavior of right breast	Breast	Breast	Breast	Breast	Breast
D48.62	Neoplasm of uncertain behavior of left breast	Breast	Breast	Breast	Breast	Breast
D48.7	Neoplasm of uncertain behavior of other specified sites	Remainder	Remainder	Remainder	Remainder	Remainder
D48.9	Neoplasm of uncertain behavior, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
D49.0	Neoplasm of unspecified behavior of digestive system	Stomach	Stomach	Stomach	Stomach	Stomach
D49.1	Neoplasm of unspecified behavior of respiratory system	Lung	Lung	Lung	Lung	Lung
D49.2	Neoplasm of unspecified behavior of bone/skin (bone)	Bone surface	Bone surface	Bone surface	Bone surface	Bone surface
D49.2	Neoplasm of unspecified behavior of bone/skin (skin)	ENSD	ENSD	ENSD	ENSD	ENSD
D49.3	Neoplasm of unspecified behavior of breast	Breast	Breast	Breast	Breast	Breast
D49.4	Neoplasm of unspecified behavior of bladder	Bladder	Bladder	Bladder	Bladder	Bladder
D49.51	Neoplasm of unspecified behavior of kidney	Liver	Liver	Liver	Liver	Liver
D49.59	Neoplasm of unspecified behavior of other genitourinary organ	Bladder	Bladder	Bladder	Bladder	Bladder
D49.6	Neoplasm of unspecified behavior of brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D49.7	Neoplasm of unspecified behavior of other parts of nervous system	Remainder	Remainder	Remainder	Remainder	Remainder
D49.7	Neoplasm of unspecified behavior of endocrine glands	Remainder	Remainder	Remainder	Remainder	Remainder
D49.81	Neoplasm of unspecified behavior of retina and choroid	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
D49.89	Neoplasm of unspecified behavior of other specified sites	Remainder	Remainder	Remainder	Remainder	Remainder
D49.9	Neoplasm of unspecified behavior of unspecified site	Remainder	Remainder	Remainder	Remainder	Remainder

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG and chest	Lumbar spine	Thoracic spine	Cervical spine	Pelvis
D68	Activated protein C resistance, Prothrombin, Thrombophilia, Antiphosholipid syndrome, Lupus	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D74	Methemoglobinemia	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D75	Myelofibrosis, Disease of blood and blood-forming organs	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
D89.2	Hypergammaglobulinemia, unspecified	Bone marrow	Bone marrow	Bone marrow	Bone marrow	Bone marrow
E31.22	Multiple endocrine neoplasia [MEN] type IIA	Remainder	Remainder	Remainder	Remainder	Remainder
J91.0	Malignant pleural effusion	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]
Q85.00	Neurofibromatosis, unspecified	Remainder	Remainder	Remainder	Remainder	Remainder
Q85.01	Neurofibromatosis, type 1	Remainder	Remainder	Remainder	Remainder	Remainder
Q85.02	Neurofibromatosis, type 2	Remainder	Remainder	Remainder	Remainder	Remainder
R18.0	Malignant ascites	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]	Likely site[a]

a. For secondary cancers, doses are assessed for the likely primary cancer site(s), which are selected using guidance in Table 3-2 of ORAUT-OTIB-0005 (ORAUT 2019).

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

Table A-2. Selection of organs for chest X-ray dose assignment through 1970 based on ICD-10 code when referred from Table A-1.[a]

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C00	Malignant neoplasm of lip	Eye/brain	Eye/brain	Eye/brain	ENSD	ENSD	ENSD	Eye/brain
C41.0	Malignant neoplasm of bones of skull and face	10% ENSD	10% ENSD	Eye/brain	10% ENSD	10% ENSD	10% ENSD	10% ENSD
C43.0	Malignant melanoma of lip	Eye/brain	Eye/brain	Eye/brain	ENSD	ENSD	ENSD	Eye/brain
C43.70	Malignant melanoma of unspecified lower limb, including hip	10% ENSD	10% ENSD	10% Lung	10% ENSD	10% ENSD	10% ENSD	10% ENSD
C44.0	Malignant neoplasm BCC, SCC of skin of lip	Eye/brain	Eye/brain	Eye/brain	ENSD	ENSD	ENSD	Eye/brain
C47.0	Malignant neoplasm of peripheral nerves of head, face and neck	10% ENSD	ENSD	ENSD	ENSD	ENSD	ENSD	ENSD
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck	10% ENSD	ENSD	ENSD	ENSD	ENSD	ENSD	ENSD
C4A.0	Merkel cell carcinoma of lip	Eye/brain	Eye/brain	Eye/brain	ENSD	ENSD	ENSD	Eye/brain
C81.00	Nodular lymphocyte predominant Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.04	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.08	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.09	Nodular lymphocyte predominant Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.10	Nodular sclerosis Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.14	Nodular sclerosis Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.18	Nodular sclerosis Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.19	Nodular sclerosis Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.20	Mixed cellularity Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C81.24	Mixed cellularity Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.28	Mixed cellularity Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.29	Mixed cellularity Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.30	Lymphocyte depleted Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.34	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.38	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.39	Lymphocyte depleted Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.40	Lymphocyte-rich Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.44	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.48	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.49	Lymphocyte-rich Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.70	Other Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.74	Other Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C81.78	Other Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.79	Other Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.90	Hodgkin lymphoma, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.94	Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C81.98	Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C81.99	Hodgkin lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.00	Follicular lymphoma grade I, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.04	Follicular lymphoma grade I, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.08	Follicular lymphoma grade I, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.09	Follicular lymphoma grade I, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.10	Follicular lymphoma grade II, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.14	Follicular lymphoma grade II, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.18	Follicular lymphoma grade II, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.19	Follicular lymphoma grade II, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.20	Follicular lymphoma grade III, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.24	Follicular lymphoma grade III, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.28	Follicular lymphoma grade III, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.29	Follicular lymphoma grade III, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.30	Follicular lymphoma grade IIIa, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.34	Follicular lymphoma grade IIIa, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.38	Follicular lymphoma grade IIIa, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C82.39	Follicular lymphoma grade IIIa, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.40	Follicular lymphoma grade IIIb, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.44	Follicular lymphoma grade IIIb, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.48	Follicular lymphoma grade IIIb, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.49	Follicular lymphoma grade IIIb, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.50	Diffuse follicle center lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.54	Diffuse follicle center lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.58	Diffuse follicle center lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.59	Diffuse follicle center lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.60	Cutaneous follicle center lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.64	Cutaneous follicle center lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.68	Cutaneous follicle center lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.69	Cutaneous follicle center lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.80	Other types of follicular lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.84	Other types of follicular lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.88	Other types of follicular lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.89	Other types of follicular lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.90	Follicular lymphoma, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C82.94	Follicular lymphoma, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C82.98	Follicular lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C82.99	Follicular lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.00	Small cell B-cell lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.04	Small cell B-cell lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.08	Small cell B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.09	Small cell B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.10	Mantle cell lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.14	Mantle cell lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.18	Mantle cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.19	Mantle cell lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.30	Diffuse large B-cell lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.34	Diffuse large B-cell lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.38	Diffuse large B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.39	Diffuse large B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.50	Lymphoblastic (diffuse) lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.54	Lymphoblastic (diffuse) lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.58	Lymphoblastic (diffuse) lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C83.59	Lymphoblastic (diffuse) lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.70	Burkitt lymphoma, unspecified site	Breast	Lung	Breast	Breast	Breast	Breast	Lung
C83.74	Burkitt lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.78	Burkitt lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.79	Burkitt lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.80	Other non-follicular lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.84	Other non-follicular lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.88	Other non-follicular lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.89	Other non-follicular lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.90	Non-follicular (diffuse) lymphoma, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.94	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C83.98	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C83.99	Non-follicular (diffuse) lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.00	Mycosis fungoides, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.04	Mycosis fungoides, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.08	Mycosis fungoides, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.09	Mycosis fungoides, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.10	Sezary disease, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C84.14	Sezary disease, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.18	Sezary disease, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.19	Sezary disease, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.40	Peripheral T-cell lymphoma, not classified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.44	Peripheral T-cell lymphoma, not classified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.48	Peripheral T-cell lymphoma, not classified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.49	Peripheral T-cell lymphoma, not classified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.60	Anaplastic large cell lymphoma, ALK-positive, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.64	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.68	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.69	Anaplastic large cell lymphoma, ALK-positive, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.70	Anaplastic large cell lymphoma, ALK-negative, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.74	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.78	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.79	Anaplastic large cell lymphoma, ALK-negative, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.90	Mature T/NK-cell lymphomas, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C84.94	Mature T/NK-cell lymphomas, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.98	Mature T/NK-cell lymphomas, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.99	Mature T/NK-cell lymphomas, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.Z0	Other mature T/NK-cell lymphomas, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.Z4	Other mature T/NK-cell lymphomas, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C84.Z8	Other mature T/NK-cell lymphomas, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C84.Z9	Other mature T/NK-cell lymphomas, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.10	Unspecified B-cell lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.14	Unspecified B-cell lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C85.18	Unspecified B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.19	Unspecified B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.20	Mediastinal (thymic) large B-cell lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.24	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C85.28	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.29	Mediastinal (thymic) large B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.80	Other specified types of non-Hodgkin lymphoma, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PFG	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest	Chest fluoroscopy
C85.84	Other specified types of non-Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C85.88	Other specified types of non-Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.89	Other specified types of non-Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.90	Non-Hodgkin lymphoma, unspecified, unspecified site	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.94	Non-Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C85.98	Non-Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C85.99	Non-Hodgkin lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.20	Malignant mast cell neoplasm, unspecified	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.20	Malignant mast cell neoplasm, axilla	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C96.20	Malignant mast cell neoplasm, multiple	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.21	Aggressive systemic mastocytosis, unspecified	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.21	Aggressive systemic mastocytosis, axilla	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C96.21	Aggressive systemic mastocytosis, multiple	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.22	Mast cell sarcoma, unspecified	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.22	Mast cell sarcoma, axilla	Breast	Lung	Lung	Breast	Breast	Breast	Lung
C96.22	Mast cell sarcoma, multiple	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.29	Other malignant mast cell neoplasm, unspecified	Lung	Lung	Lung	Thyroid	Lung	Lung	Lung
C96.29	Other malignant mast cell neoplasm, axilla	Breast	Lung	Lung	Breast	Breast	Breast	Lung
D0.30	Melanoma in situ of lip	Eye/Brain	Eye/Brain	Eye/Brain	ENSD	ENSD	ENSD	Eye/Brain
D0.40	Carcinoma in situ of skin of lip	Eye/Brain	Eye/Brain	Eye/Brain	ENSD	ENSD	ENSD	Eye/Brain
D37.01	Neoplasm of uncertain behavior of lip	Eye/Brain	Eye/Brain	Eye/Brain	ENSD	ENSD	ENSD	Eye/Brain

a. X-ray organs based guidance provide in OCAS TIB-0012 and selecting organ in OCAS-TIB-0012 grouping that provides highest dose (NIOSH 2006).

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

Table A-3 Selection of organs for chest X-ray dose assignment after 1970 based on ICD-10 code when referred from Table A-1.

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C00	Malignant neoplasm of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
C41.0	Malignant neoplasm of bones of skull and face	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD
C43.0	Malignant melanoma of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
C43.70	Malignant melanoma of unspecified lower limb, including hip	10% ENSD	10% Lung	10% ENSD	10% ENSD	10% ENSD
C44.0	Malignant neoplasm, BCC, SCC of skin of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
C47.0	Malignant neoplasm of peripheral nerves of head, face and neck	10% ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck	10% ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
C4A.0	Merkel cell carcinoma of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
C81.00	Nodular lymphocyte predominant Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.04	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of axilla and upper limb	Breast	Breast	Breast	Breast	Breast
C81.08	Nodular lymphocyte predominant Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.09	Nodular lymphocyte predominant Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C81.10	Nodular sclerosis Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.14	Nodular sclerosis Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.18	Nodular sclerosis Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.19	Nodular sclerosis Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C81.20	Mixed cellularity Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.24	Mixed cellularity Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.28	Mixed cellularity Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.29	Mixed cellularity Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C81.30	Lymphocyte depleted Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.34	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.38	Lymphocyte depleted Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.39	Lymphocyte depleted Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C81.40	Lymphocyte-rich Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.44	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.48	Lymphocyte-rich Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.49	Lymphocyte-rich Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C81.70	Other Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.74	Other Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.78	Other Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.79	Other Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C81.90	Hodgkin lymphoma, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C81.94	Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C81.98	Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C81.99	Hodgkin lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.00	Follicular lymphoma grade I, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.04	Follicular lymphoma grade I, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.08	Follicular lymphoma grade I, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C82.09	Follicular lymphoma grade I, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.10	Follicular lymphoma grade II, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.14	Follicular lymphoma grade II, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.18	Follicular lymphoma grade II, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.19	Follicular lymphoma grade II, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.20	Follicular lymphoma grade III, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.24	Follicular lymphoma grade III, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.28	Follicular lymphoma grade III, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.29	Follicular lymphoma grade III, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.30	Follicular lymphoma grade IIIa, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.34	Follicular lymphoma grade IIIa, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.38	Follicular lymphoma grade IIIa, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.39	Follicular lymphoma grade IIIa, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.40	Follicular lymphoma grade IIIb, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.44	Follicular lymphoma grade IIIb, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.48	Follicular lymphoma grade IIIb, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.49	Follicular lymphoma grade IIIb, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.50	Diffuse follicle center lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.54	Diffuse follicle center lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.58	Diffuse follicle center lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C82.59	Diffuse follicle center lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.60	Cutaneous follicle center lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.64	Cutaneous follicle center lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.68	Cutaneous follicle center lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.69	Cutaneous follicle center lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.80	Other types of follicular lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.84	Other types of follicular lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.88	Other types of follicular lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.89	Other types of follicular lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C82.90	Follicular lymphoma, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C82.94	Follicular lymphoma, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C82.98	Follicular lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C82.99	Follicular lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.00	Small cell B-cell lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.04	Small cell B-cell lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.08	Small cell B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.09	Small cell B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.10	Mantle cell lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.14	Mantle cell lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.18	Mantle cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C83.19	Mantle cell lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.30	Diffuse large B-cell lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.34	Diffuse large B-cell lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.38	Diffuse large B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.39	Diffuse large B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.50	Lymphoblastic (diffuse) lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.54	Lymphoblastic (diffuse) lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.58	Lymphoblastic (diffuse) lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.59	Lymphoblastic (diffuse) lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.70	Burkitt lymphoma, unspecified site	Lung	Breast	Breast	Breast	Breast
C83.74	Burkitt lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.78	Burkitt lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.79	Burkitt lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.80	Other non-follicular lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.84	Other non-follicular lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.88	Other non-follicular lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.89	Other non-follicular lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C83.90	Non-follicular (diffuse) lymphoma, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C83.94	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C83.98	Non-follicular (diffuse) lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C83.99	Non-follicular (diffuse) lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C84.00	Mycosis fungoides, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.04	Mycosis fungoides, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.08	Mycosis fungoides, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.09	Mycosis fungoides, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.10	Sezary disease, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.14	Sezary disease, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.18	Sezary disease, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.19	Sezary disease, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.40	Peripheral T-cell lymphoma, not classified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.44	Peripheral T-cell lymphoma, not classified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.48	Peripheral T-cell lymphoma, not classified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.49	Peripheral T-cell lymphoma, not classified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.60	Anaplastic large cell lymphoma, ALK-positive, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.64	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.68	Anaplastic large cell lymphoma, ALK-positive, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.69	Anaplastic large cell lymphoma, ALK-positive, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.70	Anaplastic large cell lymphoma, ALK-negative, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.74	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.78	Anaplastic large cell lymphoma, ALK-negative, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.79	Anaplastic large cell lymphoma, ALK-negative, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.90	Mature T/NK-cell lymphomas, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C84.94	Mature T/NK-cell lymphomas, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.98	Mature T/NK-cell lymphomas, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.99	Mature T/NK-cell lymphomas, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C84.Z0	Other mature T/NK-cell lymphomas, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C84.Z4	Other mature T/NK-cell lymphomas, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C84.Z8	Other mature T/NK-cell lymphomas, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C84.Z9	Other mature T/NK-cell lymphomas, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C85.10	Unspecified B-cell lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C85.14	Unspecified B-cell lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C85.18	Unspecified B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C85.19	Unspecified B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C85.20	Mediastinal (thymic) large B-cell lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C85.24	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C85.28	Mediastinal (thymic) large B-cell lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C85.29	Mediastinal (thymic) large B-cell lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C85.80	Other specified types of non-Hodgkin lymphoma, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C85.84	Other specified types of non-Hodgkin lymphoma, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C85.88	Other specified types of non-Hodgkin lymphoma, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	PA chest	LAT chest	AP lordotic chest	RAO chest	LAO chest
C85.89	Other specified types of non-Hodgkin lymphoma, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C85.90	Non-Hodgkin lymphoma, unspecified, unspecified site	Lung	Lung	Thyroid	Lung	Lung
C85.94	Non-Hodgkin lymphoma, unspecified, lymph nodes of axilla and upper limb	Lung	Breast	Breast	Breast	Breast
C85.98	Non-Hodgkin lymphoma, unspecified, lymph nodes of multiple sites	Lung	Lung	Thyroid	Lung	Lung
C85.99	Non-Hodgkin lymphoma, unspecified, extranodal and solid organ sites	Lung	Lung	Thyroid	Lung	Lung
C96.20	Malignant mast cell neoplasm, unspecified	Lung	Lung	Thyroid	Lung	Lung
C96.20	Malignant mast cell neoplasm, axilla	Lung	Breast	Breast	Breast	Breast
C96.20	Malignant mast cell neoplasm, multiple	Lung	Lung	Thyroid	Lung	Lung
C96.21	Aggressive systemic mastocytosis, unspecified	Lung	Lung	Thyroid	Lung	Lung
C96.21	Aggressive systemic mastocytosis, axilla	Lung	Breast	Breast	Breast	Breast
C9621	Aggressive systemic mastocytosis, multiple	Lung	Lung	Thyroid	Lung	Lung
C96.22	Mast cell sarcoma, unspecified	Lung	Lung	Thyroid	Lung	Lung
C96.22	Mast cell sarcoma, axilla	Lung	Breast	Breast	Breast	Breast
C96.22	Mast cell sarcoma, multiple	Lung	Lung	Thyroid	Lung	Lung
C96.29	Other malignant mast cell neoplasm, unspecified	Lung	Lung	Thyroid	Lung	Lung
C96.29	Other malignant mast cell neoplasm, axilla	Lung	Breast	Breast	Breast	Breast
D0.30	Melanoma in situ of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
D0.40	Carcinoma in situ of skin of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD
D37.01	Neoplasm of uncertain behavior of lip	Eye/brain	Eye/brain	ENSD	10% ENSD	10% ENSD

Table A-4. Selection of organs for lumbar spine X-ray dose assignment based on ICD-10 code when referred from Table A-1 .

ICD-10 code	Cancer code explanation	AP lumbar spine through 1970	AP lumbar spine after 1970	LAT lumbar spine through 1970	LAT lumbar spine after 1970
C40.1	Malignant neoplasm of short bones of upper limb	ENSD	10% ENSD	10% ENSD	10% ENSD
C40.8	Malignant neoplasm of overlapping sites of bone and articular cartilage of limb	ENSD	10% ENSD	10% ENSD	10% ENSD
C40.9	Malignant neoplasm of unspecified bones and articular cartilage of limb	ENSD	10% ENSD	10% ENSD	10% ENSD

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

Table A-5. Selection of organs for thoracic spine X-ray dose assignment based on ICD-10 code when referred from Table A-1.

ICD-10 code	Cancer code explanation	AP thoracic spine	LAT thoracic spine	RPO thoracic spine	LPO thoracic spine
C00.0	Malignant neoplasm of external upper lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.1	Malignant neoplasm of external lower lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.2	Malignant neoplasm of external lip, unspecified	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.3	Malignant neoplasm of upper lip, inner aspect	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.4	Malignant neoplasm of lower lip, inner aspect	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.5	Malignant neoplasm of lip, unspecified, inner aspect	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.6	Malignant neoplasm of commissure of lip, unspecified	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.8	Malignant neoplasm of overlapping sites of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C00.9	Malignant neoplasm of lip, unspecified	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C41.0	Malignant neoplasm of bones of skull and face	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C43.0	Malignant melanoma of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C44.00	Unspecified malignant neoplasm of skin of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C44.01	Basal cell carcinoma of skin of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C44.02	Squamous cell carcinoma of skin of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C44.09	Other specified malignant neoplasm of skin of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
C47.0	Malignant neoplasm of peripheral nerves of head, face and neck	ENSD	10% ENSD	ENSD	ENSD
C47.3	Malignant neoplasm of peripheral nerves of thorax	ENSD	Lung	ENSD	ENSD
C47.4	Malignant neoplasm of peripheral nerves of abdomen	ENSD	Lung	ENSD	ENSD
C47.6	Malignant neoplasm of peripheral nerves of trunk, unspecified	ENSD	Lung	ENSD	ENSD
C47.8	Malignant neoplasm of overlapping sites of peripheral nerves and autonomic nervous system	ENSD	Lung	ENSD	ENSD
C47.9	Malignant neoplasm of peripheral nerves and autonomic nervous system, unspecified	ENSD	Lung	ENSD	ENSD
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck	ENSD	10% ENSD	ENSD	ENSD
C49.3	Malignant neoplasm of connective and soft tissue of thorax	ENSD	Lung	ENSD	ENSD
C49.4	Malignant neoplasm of connective and soft tissue of abdomen	ENSD	Lung	ENSD	ENSD
C49.6	Malignant neoplasm of connective and soft tissue of trunk, unspecified	ENSD	Lung	ENSD	ENSD
C49.8	Malignant neoplasm of overlapping sites of connective and soft tissue	ENSD	Lung	ENSD	ENSD
C49.9	Malignant neoplasm of connective and soft tissue, unspecified	ENSD	Lung	ENSD	ENSD
C4A.0	Merkel cell carcinoma of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
D03.0	Melanoma in situ of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD
D04.0	Carcinoma in situ of skin of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	AP thoracic spine	LAT thoracic spine	RPO thoracic spine	LPO thoracic spine
D37.01	Neoplasm of uncertain behavior of lip	10% ENSD	Eye/brain	10% ENSD	10% ENSD

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

Table A-6. Selection of organs for cervical spine X-ray dose reconstruction based on ICD-10 code when different organ selection is required based on view.

ICD-10 code	Cancer code explanation	AP cervical spine	LAT cervical spine	RPO cervical spine	LPO cervical spine
C40.00	Malignant neoplasm of scapula and long bones of unspecified upper limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.01	Malignant neoplasm of scapula and long bones of right upper limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.02	Malignant neoplasm of scapula and long bones of left upper limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.80	Malignant neoplasm of overlapping sites of bone and articular cartilage of unspecified limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.81	Malignant neoplasm of overlapping sites of bone and articular cartilage of right limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.82	Malignant neoplasm of overlapping sites of bone and articular cartilage of left limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.90	Malignant neoplasm of unspecified bones and articular cartilage of unspecified limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.91	Malignant neoplasm of unspecified bones and articular cartilage of right limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C40.92	Malignant neoplasm of unspecified bones and articular cartilage of left limb	10% ENSD	ENSD	10% ENSD	10% ENSD
C47.10	Malignant neoplasm of peripheral nerves of unspecified upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
C47.11	Malignant neoplasm of peripheral nerves of right upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
C47.12	Malignant neoplasm of peripheral nerves of left upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
C47.3	Malignant neoplasm of peripheral nerves of thorax	ENSD	10% ENSD	ENSD	ENSD
C47.6	Malignant neoplasm of peripheral nerves of trunk, unspecified	ENSD	10% ENSD	ENSD	ENSD
C47.8	Malignant neoplasm of overlapping sites of peripheral nerves and autonomic nervous system	ENSD	10% ENSD	ENSD	ENSD
C47.9	Malignant neoplasm of peripheral nerves and autonomic nervous system, unspecified	ENSD	10% ENSD	ENSD	ENSD
C49.10	Malignant neoplasm of connective and soft tissue of unspecified upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD

ATTACHMENT A
SELECTION OF ORGAN BASED ON ICD-10 CODE TABLES (continued)

ICD-10 code	Cancer code explanation	AP cervical spine	LAT cervical spine	RPO cervical spine	LPO cervical spine
C49.11	Malignant neoplasm of connective and soft tissue of right upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
C49.12	Malignant neoplasm of connective and soft tissue of left upper limb, including shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
C49.3	Malignant neoplasm of connective and soft tissue of thorax	ENSD	10% ENSD	ENSD	ENSD
C49.6	Malignant neoplasm of connective and soft tissue of trunk, unspecified	ENSD	10% ENSD	ENSD	ENSD
C49.8	Malignant neoplasm of overlapping sites of connective and soft tissue	ENSD	10% ENSD	ENSD	ENSD
C49.9	Malignant neoplasm of connective and soft tissue, unspecified	ENSD	10% ENSD	ENSD	ENSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES

LIST OF TABLES

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-1. DCFs used in determining dose equivalents from thoracic and cervical spine projections through 1970 (rem/cGy)[a].

Organ	AP thoracic spine	LAT/OBL thoracic spine	AP/OBL cervical spine	LAT cervical spine
Thyroid	9.40E−02	5.60E−02	7.53E−01	5.60E−02
Eye/brain	9.40E−03	4.00E−03	7.53E−01	5.60E−02
Ovaries	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Liver/gallbladder/spleen	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Urinary bladder/prostate	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Colon rectum	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Testes	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Lungs male	3.32E−01	1.07E−01	1.50E−02	2.30E−02
Lungs female	2.37E−01	1.28E−01	1.50E−02	2.30E−02
Thymus	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Esophagus	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Stomach	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Bone surfaces	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Remainder	3.32E−01	1.28E−01	1.50E−02	2.30E−02
Breast	7.34E−01	5.60E−03	1.50E−02	2.30E−02
Uterus	Measured[b]	Measured[b]	Measured[b]	Measured[b]
Bone marrow male	2.90E−02	1.80E−02	1.10E−02	1.70E−02
Bone marrow female	2.30E−02	1.40E−02	1.10E−02	1.70E−02

a. HVL = 2.0 mm Al.
b. Measured means that a measured dose from literature is used rather than a DCF.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-2. DCFs used in determining dose equivalents for chest projections through 1985 (rem/cGy).

Organ	PFG through 1970[a]	Chest fluoroscopy through 1970[b]	PA chest through 1970[a]	LAT/OBL chest through 1970[a]	AP lordotic chest through 1970[a]	PA chest 1971–1985[a]	LAT/OBL chest 1971–1985[a]	AP lordotic chest 1971–1985[a]
Thyroid	1.74E−01[c]	1.50E−01[c]	1.74E−01[c]	1.37E−01	8.68E−01[d]	3.20E−02	1.15E−01	3.17E−01
Eye/brain	3.20E−02	2.10E−02	3.20E−02	1.15E−01	8.68E−01[d]	3.20E−02	1.15E−01	3.17E−01
Ovaries	Measured[e]	6.00E−04	Measured[e]	Measured[e]	2.33E−01	1.00E−03	6.00E−04	2.00E−03
Liver/ gallbladder/spleen	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Urinary bladder/prostate	Measured[e]	6.00E−04	Measured[e]	Measured[e]	2.33E−01	1.00E−03	6.00E−04	2.00E−03
Colon rectum	Measured[e]	6.00E−04	Measured[e]	Measured[e]	2.33E−01	1.00E−03	6.00E−04	2.00E−03
Testes	Measured[e]	1.00E−05	Measured[e]	Measured[e]	1.80E−02	1.00E−05	1.00E−04	1.00E−05
Lungs male	4.19E−01	3.35E−01	4.19E−01	1.93E−01	4.73E−01	4.19E−01	1.93E−01	4.73E−01
Lungs female	4.51E−01	3.55E−01	4.51E−01	2.20E−01	3.53E−01	4.51E−01	2.20E−01	3.53E−01
Thymus	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Esophagus	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Stomach	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Bone surfaces	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Remainder	4.51E−01	3.55E−01	4.51E−01	2.20E−01	4.73E−01	4.51E−01	2.20E−01	4.73E−01
Breast	4.90E−02	3.20E−02	4.90E−02	2.55E−01	8.36E−01	4.90E−02	2.55E−01	8.36E−01
Uterus	Measured[e]	7.00E−04	Measured[e]	Measured[e]	3.05E−01	1.30E−03	6.00E−04	1.50E−03
Bone marrow male	9.20E−02	6.90E−02	9.20E−02	3.70E−02	4.80E−02	9.20E−02	3.70E−02	4.80E−02
Bone marrow female	8.60E−02	6.30E−02	8.60E−02	2.90E−02	4.80E−02	8.60E−02	2.90E−02	4.80E−02

a. HVL = 2.5 mm Al.
b. HVL = 2.0 mm Al.
c. Dose Conversion Factor for AP cervical spine, corrected for depth by multiplying by 0.2
d. Cervical spine Thyroid DCF used to account for poor collimation.
e. Measured means that a measured dose from literature is used rather than a DCF.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-3. DCFs used in determining dose equivalents for chest projections 1986 and later, and for lumbar spine and pelvis for all periods (rem/cGy).

Organ	PA chest 1986 and later[a]	LAT/OBL chest 1986 and later[a]	AP lumbar spine through 1970[b]	LAT lumbar spine through 1970[b]	AP lumbar spine 1971−1985[c]	LAT lumbar spine 1971−1985[c]	AP pelvis through 1970[b]
Thyroid	7.80E−02	1.64E−01	2.00E−04	1.00E−05	3.00E−04	1.00E−05	1.00E−05
Eye/brain	7.80E−02	1.64E−01	2.00E−04	1.00E−05	3.00E−04	1.00E−05	1.00E−05
Ovaries	5.20E−03	2.50E−03	Measured[d]	Measured[d]	2.16E−01	4.70E−02	Measured[d]
Liver/gallbladder/spleen	6.74E−01	3.51E−01	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Urinary bladder/prostate	5.20E−03	2.50E−03	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Colon rectum	5.20E−03	2.50E−03	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Testes	1.00E−05	1.00E−04	Measured[d]	Measured[d]	4.20E−03	8.00E−04	Measured[d]
Lungs male	6.28E−01	3.13E−01	6.20E−02	1.00E−02	7.90E−02	1.40E−02	1.00E−03
Lungs female	6.74E−01	3.51E−01	6.20E−02	1.00E−02	7.90E−02	1.40E−02	1.00E−03
Thymus	6.74E−01	3.51E−01	6.20E−02	1.00E−02	7.90E−02	1.40E−02	1.00E−03
Esophagus	6.74E−01	3.51E−01	6.20E−02	1.00E−02	7.90E−02	1.40E−02	1.00E−03
Stomach	6.74E−01	3.51E−01	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Bone surfaces	6.74E−01	3.51E−01	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Remainder	6.74E−01	3.51E−01	Measured[e]	Measured[e]	2.16E−01	4.70E−02	Measured[e]
Breast	1.16E−01	3.43E−01	6.20E−02	1.00E−02	7.90E−02	1.40E−02	1.00E−03
Uterus	5.20E−03	2.10E−03	Measured[d]	Measured[d]	2.87E−01	3.10E−02	2.44E−01
Bone marrow male	1.78E−01	7.60E−02	2.40E−02	1.50E−02	3.70E−02	2.20E−02	2.30E−02
Bone marrow female	1.72E−01	5.90E−02	2.40E−02	1.50E−02	3.70E−02	2.20E−02	2.30E−02

a. HVL = 4.0 mm Al.
b. HVL = 2.0 mm Al.
c. HVL = 2.5 mm Al.
d. Measured means that a measured dose from literature is used rather than a DCF.
e. Measured means that this dose is assigned based on the measured ovary dose from literature.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-4. Skin dose guidance for chest projections for the poor collimation period through 1970.

Area of skin	PFG 1943–1970	PA chest through 1970[a]	LAT chest through 1970	AP lordotic chest through 1970	RAO chest through 1970	LAO chest through 1970	Chest fluoroscopy through 1970[a]
R front shoulder	EXSD	EXSD	ENSD	ENSD	EXSD	EXSD	EXSD
R back shoulder	ENSD	ENSD	ENSD	EXSD	ENSD	ENSD	ENSD
L front shoulder	EXSD	EXSD	EXSD	ENSD	EXSD	EXSD	EXSD
L back shoulder	ENSD	ENSD	EXSD	EXSD	ENSD	ENSD	ENSD
R upper arm to elbow	10% ENSD	ENSD	ENSD	ENSD	ENSD	ENSD	ENSD
L upper arm to elbow	10% ENSD	ENSD	EXSD	ENSD	ENSD	ENSD	ENSD
L hand	ENSD	ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD	ENSD
R hand	ENSD	ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD	ENSD
L elbow, forearm, wrist	10% ENSD	ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD	ENSD
R elbow, forearm, wrist	10% ENSD	ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD	ENSD
R side of head (including temple and ear)	10% ENSD	10% ENSD	Eye/brain	10% ENSD	10% EXSD	10% ENSD	10% ENSD
L side of head (including temple and ear)	10% ENSD	10% ENSD	Eye/brain	10% ENSD	10% ENSD	10% EXSD	10% ENSD
Front L thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back L thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Front R thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back R thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
L knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
R knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
L side of face	Eye/brain	Eye/brain	Eye/brain	ENSD	ENSD	EXSD	Eye/brain
R side of face	Eye/brain	Eye/brain	Eye/brain	ENSD	EXSD	ENSD	Eye/brain
L side of neck	10% ENSD	ENSD	Eye/brain	ENSD	ENSD	EXSD	ENSD
R side of neck	10% ENSD	ENSD	Eye/brain	ENSD	EXSD	ENSD	ENSD
Back of head	10% ENSD	10% ENSD	Eye/brain	EXSD	10% ENSD	10% ENSD	10% ENSD
Front of neck	Eye/brain	Eye/brain	Eye/brain	ENSD	Eye/brain	Eye/brain	Eye/brain
Back of neck	10% ENSD	ENSD	Eye/brain	EXSD	ENSD	ENSD	ENSD
Front torso: base of neck to end of sternum	EXSD	EXSD	Lung[b]	ENSD	EXSD	EXSD	EXSD
Front torso: end of sternum to lowest rib	EXSD	EXSD	Lung[b]	ENSD	EXSD	EXSD	EXSD
Front torso: lowest rib to iliac crest	EXSD	EXSD	Lung[b]	ENSD	EXSD	EXSD	EXSD
Front torso: iliac crest to pubis	10% EXSD	10% EXSD	10% Lung[b]	10% ENSD	10% EXSD	10% EXSD	10% EXSD
Back torso: base of neck to mid-back	ENSD	ENSD	Lung[b]	EXSD	ENSD	ENSD	ENSD
Back torso: mid-back to lowest rib	ENSD	ENSD	Lung[b]	EXSD	ENSD	ENSD	ENSD
Back torso: lowest rib to iliac crest	ENSD	ENSD	Lung[b]	EXSD	ENSD	ENSD	ENSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	PFG 1943–1970	PA chest through 1970[a]	LAT chest through 1970	AP lordotic chest through 1970	RAO chest through 1970	LAO chest through 1970	Chest fluoroscopy through 1970[a]
Back torso: buttocks (Iliac crest and below)	10% ENSD	10% ENSD	10% Lung[b]	10% EXSD	10% ENSD	10% ENSD	10% ENSD
Right torso: base of neck to end of sternum	ENSD	ENSD	ENSD	ENSD	EXSD	ENSD	ENSD
Right torso: end of sternum to lowest rib	ENSD	ENSD	ENSD	ENSD	EXSD	ENSD	ENSD
Right torso: lowest rib to iliac crest	ENSD	ENSD	ENSD	ENSD	EXSD	ENSD	ENSD
Right torso: iliac crest to pubis (R hip)	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD	10% ENSD
Left torso: base of neck to end of sternum	ENSD	ENSD	EXSD	ENSD	ENSD	EXSD	ENSD
Left torso: end of sternum to lowest rib	ENSD	ENSD	EXSD	ENSD	ENSD	EXSD	ENSD
Left torso: lowest rib to iliac crest	ENSD	ENSD	EXSD	ENSD	ENSD	EXSD	ENSD
Left torso: iliac crest to pubis (L hip)	10% ENSD	10% ENSD	10% EXSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD

a. Skin dose guidance for chest fluoroscopy is the same as the guidance for the PA chest through 1970.
b. The higher of the male or female lung dose value should be used for both genders.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-5. Skin dose guidance for lumbar spine and pelvis projections for the poor collimation period through 1970.

Area of skin	AP and AP spot lumbar spine through 1970	LAT and LAT spot lumbar spine through 1970	LPO lumbar spine through 1970	RPO lumbar spine through 1970	AP pelvis through 1970
R front shoulder	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD
R back shoulder	10% EXSD	10% ENSD	10% ENSD	10% EXSD	10% EXSD
L front shoulder	10% ENSD	10% EXSD	10% EXSD	10% ENSD	10% ENSD
L back shoulder	10% EXSD	10% EXSD	10% EXSD	10% EXSD	10% EXSD
R upper arm to elbow	10% ENSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD
L upper arm to elbow	10% ENSD	10% EXSD	10% EXSD	10% ENSD	10% ENSD
L hand	ENSD	10% EXSD	10% EXSD	10% ENSD	ENSD
R hand	ENSD	10% ENSD	10% ENSD	10% EXSD	ENSD
L elbow, forearm, wrist	ENSD	10% EXSD	10% EXSD	10% ENSD	ENSD
R elbow, forearm, wrist	ENSD	10% ENSD	10% ENSD	10% EXSD	ENSD
R side of head (including temple and ear)	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
L side of head (including temple and ear)	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front L thigh	10% ENSD	10% EXSD	10% ENSD	10% ENSD	10% ENSD
Back L thigh	10% EXSD	10% EXSD	10% EXSD	10% EXSD	10% EXSD
Front R thigh	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD
Back R thigh	10% EXSD	10% ENSD	10% EXSD	10% EXSD	10% EXSD
L knee and below	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)
R knee and below	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)
L side of face	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
R side of face	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
L side of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
R side of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Back of head	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Back of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front torso: base of neck to end of sternum	10% ENSD	Lung[a]	10% ENSD	10% ENSD	10% ENSD
Front torso: end of sternum to lowest rib	ENSD	Lung[a]	ENSD	ENSD	ENSD
Front torso: lowest rib to iliac crest	ENSD	Lung[a]	ENSD	ENSD	ENSD
Front torso: iliac crest to pubis	ENSD	Lung[a]	ENSD	ENSD	ENSD
Back torso: base of neck to mid-back	10% EXSD	Lung[a]	10% EXSD	10% EXSD	10% EXSD
Back torso: mid-back to lowest rib	EXSD	Lung[a]	EXSD	EXSD	EXSD
Back torso: lowest rib to iliac crest	EXSD	Lung[a]	EXSD	EXSD	EXSD
Back torso: buttocks (Iliac crest and below)	EXSD	Lung[a]	EXSD	EXSD	EXSD
Right torso: base of neck to end of sternum	10% ENSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP and AP spot lumbar spine through 1970	LAT and LAT spot lumbar spine through 1970	LPO lumbar spine through 1970	RPO lumbar spine through 1970	AP pelvis through 1970
Right torso: end of sternum to lowest rib	ENSD	ENSD	ENSD	EXSD	ENSD
Right torso: lowest rib to iliac crest	ENSD	ENSD	ENSD	EXSD	ENSD
Right torso: iliac crest to pubis (R hip)	ENSD	ENSD	ENSD	EXSD	ENSD
Left torso: base of neck to end of sternum	10% ENSD	10% EXSD	10% EXSD	10% ENSD	10% ENSD
Left torso: end of sternum to lowest rib	ENSD	EXSD	EXSD	ENSD	ENSD
Left torso: lowest rib to iliac crest	ENSD	EXSD	EXSD	ENSD	ENSD
Left torso: iliac crest to pubis (L hip)	ENSD	EXSD	EXSD	ENSD	ENSD

a. The higher of the male or female lung dose value should be used for both genders.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-6. Skin dose guidance for thoracic spine projections for the poor collimation period through 1970.

Area of skin	AP thoracic spine through 1970	LAT thoracic spine through 1970	RPO thoracic spine through 1970	LPO thoracic spine through 1970
R front shoulder	ENSD	ENSD	ENSD	ENSD
R back shoulder	EXSD	ENSD	EXSD	EXSD
L front shoulder	ENSD	EXSD	ENSD	ENSD
L back shoulder	EXSD	EXSD	EXSD	EXSD
R upper arm to elbow	ENSD	ENSD	ENSD	ENSD
L upper arm to elbow	ENSD	EXSD	ENSD	ENSD
L hand	10% ENSD	10% ENSD	10% ENSD	10% ENSD
R hand	10% ENSD	10% ENSD	10% ENSD	10% ENSD
L elbow, forearm, wrist	ENSD	10% ENSD	10% ENSD	10% ENSD
R elbow, forearm, wrist	ENSD	10% ENSD	10% ENSD	10% ENSD
R Side of head (including temple and ear)	10% ENSD	10% ENSD	10% EXSD	10% ENSD
L Side of head (including temple and ear)	10% ENSD	10% ENSD	10% ENSD	10% EXSD
Front left thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back left thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Front right thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back right thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
L knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
R knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
L side of face	10% ENSD	Eye/brain	10% ENSD	10% EXSD
R side of face	10% ENSD	Eye/brain	10% EXSD	10% ENSD
L side of neck	ENSD	Eye/brain	ENSD	EXSD
R side of neck	ENSD	Eye/brain	EXSD	ENSD
Back of head	10% EXSD	Eye/brain	10% ENSD	10% ENSD
Front of neck	ENSD	Eye/brain	Thyroid	Thyroid
Back of neck	EXSD	Eye/brain	EXSD	EXSD
Front torso: base of neck to end of sternum	ENSD	Lung[a]	ENSD	ENSD
Front torso: end of sternum to lowest rib	ENSD	Lung[a]	ENSD	ENSD
Front torso: lowest rib to iliac crest	ENSD	Lung[a]	ENSD	ENSD
Front torso: iliac crest to pubis	10% ENSD	10% lung[a]	10% ENSD	10% ENSD
Back torso: base of neck to mid-back	EXSD	Lung[a]	EXSD	EXSD
Back torso: mid-back to lowest rib	EXSD	Lung[a]	EXSD	EXSD
Back torso: lowest rib to iliac crest	EXSD	Lung[a]	EXSD	EXSD
Back torso: buttocks (Iliac crest and below)	10% EXSD	10% lung[a]	10% EXSD	10% EXSD
Right torso: base of neck to end of sternum	ENSD	ENSD	EXSD	ENSD
Right torso: end of sternum to lowest rib	ENSD	ENSD	EXSD	ENSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP thoracic spine through 1970	LAT thoracic spine through 1970	RPO thoracic spine through 1970	LPO thoracic spine through 1970
Right torso: lowest rib to iliac crest	ENSD	ENSD	EXSD	ENSD
Right torso: iliac crest to pubis (R hip)	10% ENSD	10% ENSD	10% EXSD	10% ENSD
Left torso: base of neck to end of sternum	ENSD	EXSD	ENSD	EXSD
Left torso: end of sternum to lowest rib	ENSD	EXSD	ENSD	EXSD
Left torso: lowest rib to iliac crest	ENSD	EXSD	ENSD	EXSD
Left torso: iliac crest to pubis (L hip)	10% ENSD	10% EXSD	10% ENSD	10% EXSD

a. The higher of the male or female lung dose value should be used for both genders.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-7. Skin dose guidance for cervical spine projections for the poor collimation period through 1970.

Area of skin	AP cervical spine through 1970	LAT cervical spine through 1970	RPO cervical spine through 1970	LPO cervical spine through 1970
R front shoulder	10% ENSD	ENSD	10% ENSD	10% ENSD
R back shoulder	10% EXSD	ENSD	10% EXSD	10% EXSD
L front shoulder	10% ENSD	EXSD	10% ENSD	10% ENSD
L back shoulder	10% EXSD	EXSD	10% EXSD	10% EXSD
R upper arm to elbow	10% ENSD	10% ENSD	10% EXSD	10% ENSD
L upper arm to elbow	10% ENSD	10% EXSD	10% ENSD	10% ENSD
L hand	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)
R hand	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)
L elbow, forearm, wrist	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)
R elbow, forearm, wrist	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)	RSD (0.40 m)
R side of head (including temple and ear)	ENSD	ENSD	EXSD2[a]	ENSD
L side of head (including temple and ear)	ENSD	EXSD2[a]	ENSD	EXSD2[a]
Front left thigh	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)
Back left thigh	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)
Front right thigh	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)
Back right thigh	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)	RSD (0.70 m)
L knee and below	RSD (1.00 m)	RSD (1.00 m)	RSD (1.00 m)	RSD (1.00 m)
R knee and below	RSD (1.00 m)	RSD (1.00 m)	RSD (1.00 m)	RSD (1.00 m)
L side of face	ENSD	EXSD2[a]	ENSD	EXSD2[a]
R side of face	ENSD	ENSD	EXSD2[a]	ENSD
L side of neck	ENSD	EXSD2[a]	ENSD	EXSD2[a]
R side of neck	ENSD	ENSD	EXSD2[a]	ENSD
Back of head	EXSD	ENSD	ENSD	ENSD
Front of neck	ENSD	ENSD	ENSD	ENSD
Back of neck	EXSD2[a]	EXSD2[a]	EXSD2[a]	EXSD2[a]
Front torso: base of neck to end of sternum	ENSD	10% ENSD	ENSD	ENSD
Front torso: end of sternum to lowest rib	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Front torso: lowest rib to iliac crest	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Front torso: iliac crest to pubis	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)
Back torso: base of neck to mid-back	EXSD	10% ENSD	EXSD	EXSD
Back torso: mid-back to lowest rib	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Back torso: lowest rib to iliac crest	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Back torso: buttocks (Iliac crest and below)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)
Right torso: base of neck to end of sternum	10% ENSD	ENSD	10% ENSD	10% ENSD
Right torso: end of sternum to lowest rib	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP cervical spine through 1970	LAT cervical spine through 1970	RPO cervical spine through 1970	LPO cervical spine through 1970
Right torso: lowest Rib to iliac crest	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Right torso: iliac crest to pubis (R hip)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)
Left torso: base of neck to end of sternum	10% ENSD	EXSD	10% ENSD	10% ENSD
Left torso: end of sternum to lowest rib	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Left torso: lowest rib to iliac crest	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)	RSD (0.30 m)
Left torso: iliac crest to pubis (L hip)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)	RSD (0.50 m)

a. EXSD2 is the EXSD calculated at 15 cm (thickness of the neck) as opposed to 24 or 34 cm (the thickness of the chest).

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-8. Skin dose guidance for chest projections for the good collimation period after 1970.

Area of skin	PA chest after 1970	LAT chest after 1970	AP lordotic chest after 1970	RAO chest after 1970	LAO chest after 1970
R front shoulder	EXSD	ENSD	ENSD	EXSD	EXSD
R back shoulder	ENSD	ENSD	EXSD	ENSD	ENSD
L front shoulder	EXSD	EXSD	ENSD	EXSD	EXSD
L back shoulder	ENSD	EXSD	EXSD	ENSD	ENSD
R upper arm to elbow	10% ENSD	ENSD	ENSD	10% ENSD	10% ENSD
L upper arm to elbow	10% ENSD	EXSD	ENSD	10% ENSD	10% ENSD
L hand	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD
R hand	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% ENSD
L elbow, forearm, wrist	10% ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
R elbow, forearm, wrist	10% ENSD	10% ENSD	ENSD	10% ENSD	10% ENSD
R side of head (including temple and ear)	10% ENSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD
L side of head (including temple and ear)	10% ENSD	10% ENSD	10% ENSD	10% ENSD	10% EXSD
Front left thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back left thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Front right thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
Back right thigh	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)	RSD (0.52 m)
L knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
R knee and below	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)	RSD (0.86 m)
L side of face	Eye/brain	10% ENSD	ENSD	10% ENSD	10% EXSD
R side of face	Eye/brain	10% ENSD	ENSD	10% EXSD	10% ENSD
L side of neck	10% ENSD	10% ENSD	ENSD	10% ENSD	10% EXSD
R side of neck	10% ENSD	10% ENSD	ENSD	10% EXSD	10% ENSD
Back of head	10% ENSD	10% ENSD	EXSD	10% ENSD	10% ENSD
Front of neck	Thyroid	10% ENSD	ENSD	Thyroid	Thyroid
Back of neck	10% ENSD	10% ENSD	EXSD	10% ENSD	10% ENSD
Front torso: base of neck to end of sternum	EXSD	Lung[a]	ENSD	EXSD	EXSD
Front torso: end of sternum to lowest rib	EXSD	Lung[a]	ENSD	EXSD	EXSD
Front torso: lowest rib to iliac crest	10% EXSD	10% lung[a]	ENSD	10% EXSD	10% EXSD
Front torso: iliac crest to pubis	10% EXSD	10% lung[a]	10% ENSD	10% EXSD	10% EXSD
Back torso: base of neck to mid-back	ENSD	Lung[a]	EXSD	ENSD	ENSD
Back torso: mid-back to lowest rib	ENSD	Lung[a]	EXSD	ENSD	ENSD
Back torso: lowest rib to iliac crest	10% ENSD	10% Lung[a]	EXSD	10% ENSD	10% ENSD
Back torso: buttocks (Iliac crest and below)	10% ENSD	10% Lung[a]	10% EXSD	10% ENSD	10% ENSD
Right torso: base of neck to end of sternum	ENSD	ENSD	ENSD	EXSD	ENSD
Right torso: end of sternum to lowest rib	ENSD	ENSD	ENSD	EXSD	ENSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	PA chest after 1970	LAT chest after 1970	AP lordotic chest after 1970	RAO chest after 1970	LAO chest after 1970
Right torso: lowest rib to iliac crest	10% ENSD	10% ENSD	ENSD	10% EXSD	10% ENSD
Right torso: iliac crest to pubis (R hip)	10% ENSD	10% ENSD	10% ENSD	10% EXSD	10% ENSD
Left torso: base of neck to end of sternum	ENSD	EXSD	ENSD	ENSD	EXSD
Left torso: end of sternum to lowest rib	ENSD	EXSD	ENSD	ENSD	EXSD
Left torso: lowest rib to iliac crest	10% ENSD	10% EXSD	ENSD	10% ENSD	10% EXSD
Left torso: iliac crest to pubis (L hip)	10% ENSD	10% EXSD	10% ENSD	10% ENSD	10% EXSD

a. The higher of the male or female lung dose value should be used for both genders.

Table B-9. Skin dose guidance for lumbar spine projections for the good collimation period after 1970.[a]

Area of skin	AP and AP spot lumbar spine after 1970	LAT and LAT spot lumbar spine after 1970	LPO lumbar spine after 1970	RPO lumbar spine after 1970
R front shoulder	10% ENSD	10% ENSD	10% ENSD	10% ENSD
R back shoulder	10% EXSD	10% ENSD	10% ENSD	10% EXSD
L front shoulder	10% ENSD	10% EXSD	10% EXSD	10% ENSD
L back shoulder	10% EXSD	10% EXSD	10% EXSD	10% EXSD
R upper arm to elbow	10% ENSD	10% ENSD	10% ENSD	10% EXSD
L upper arm to elbow	10% ENSD	10% EXSD	10% EXSD	10% ENSD
L hand	10% ENSD	10% EXSD	10% EXSD	10% ENSD
R hand	10% ENSD	10% ENSD	10% ENSD	10% EXSD
L elbow, forearm, wrist	10% ENSD	10% EXSD	10% EXSD	10% ENSD
R elbow, forearm, wrist	10% ENSD	10% ENSD	10% ENSD	10% EXSD
R side of head (including temple and ear)	Eye/brain	Eye/brain	Eye/brain	Eye/brain
L side of head (including temple and ear)	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front L thigh	10% ENSD	10% EXSD	10% ENSD	10% ENSD
Back L thigh	10% EXSD	10% EXSD	10% EXSD	10% EXSD
Front R thigh	10% ENSD	10% ENSD	10% ENSD	10% ENSD
Back R thigh	10% EXSD	10% ENSD	10% EXSD	10% EXSD
L knee and below	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)
R knee and below	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)	RSD (0.60 m)
L side of face	Eye/brain	Eye/brain	Eye/brain	Eye/brain
R side of face	Eye/brain	Eye/brain	Eye/brain	Eye/brain
L side of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain
R side of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Back of head	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Back of neck	Eye/brain	Eye/brain	Eye/brain	Eye/brain
Front torso: base of neck to end of sternum	10% ENSD	Lung[b]	10% ENSD	10% ENSD
Front torso: end of sternum to lowest rib	ENSD	Lung[b]	ENSD	ENSD
Front torso: lowest rib to iliac crest	ENSD	Lung[b]	ENSD	ENSD
Front torso: iliac crest to pubis	ENSD	Lung[b]	ENSD	ENSD
Back torso: base of neck to mid-back	10% EXSD	Lung[b]	10% EXSD	10% EXSD
Back torso: mid-back to lowest rib	EXSD	Lung[b]	EXSD	EXSD
Back torso: lowest rib to iliac crest	EXSD	Lung[b]	EXSD	EXSD

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP and AP spot lumbar spine after 1970	LAT and LAT spot lumbar spine after 1970	LPO lumbar spine after 1970	RPO lumbar spine after 1970
Back torso: buttocks (Iliac crest and below)	EXSD	Lung[b]	EXSD	EXSD
Right torso: base of neck to end of sternum	10% ENSD	10% ENSD	10% ENSD	10% EXSD
Right torso: end of sternum to lowest rib	ENSD	ENSD	ENSD	EXSD
Right torso: lowest rib to iliac crest	ENSD	ENSD	ENSD	EXSD
Right torso: iliac crest to pubis (R hip)	ENSD	ENSD	ENSD	EXSD
Left torso: base of neck to end of sternum	10% ENSD	10% EXSD	10% EXSD	10% ENSD
Left torso: end of sternum to lowest rib	ENSD	EXSD	EXSD	ENSD
Left torso: lowest rib to iliac crest	ENSD	EXSD	EXSD	ENSD
Left torso: iliac crest to pubis (L hip)	ENSD	EXSD	EXSD	ENSD

a. The pelvis, thoracic spine, and cervical spine would not have been performed for screening after 1970.
b. The higher of the male or female lung dose value should be used for both genders.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-10. Organ dose equivalents (rem) for chest projections for all periods.[a]

Organ	Projection	Through 1970	1971–1985	1986 and later
Thyroid	PFG[b]	3.94E−01	Not used	Not used
Thyroid	PA	3.48E−02	3.20E−03	3.90E−03
Thyroid	LAT/OBL	6.85E−02	2.88E−02	2.13E−02
Thyroid	AP lordotic	1.74E−01	3.17E−02	Not used
Thyroid	Fluoroscopy[c]	3.75E−01	Not used	Not used
Eye/brain	PFG[b]	7.25E−02	Not used	Not used
Eye/brain	PA	6.40E−03	3.20E−03	3.90E−03
Eye/brain	LAT/OBL	5.75E−02	2.88E−02	2.13E−02
Eye/brain	AP lordotic	1.74E−01	3.17E−02	Not used
Eye/brain	Fluoroscopy[c]	5.25E−02	Not used	Not used
Ovaries[b]	PFG[b]	2.50E−02[d]	Not used	Not used
Ovaries	PA	2.50E−02[d]	1.00E−04	2.60E−04
Ovaries	LAT/OBL	1.30E−02[d]	1.50E−04	3.25E−04
Ovaries	AP lordotic	4.66E−02	2.00E−04	Not used
Ovaries	Fluoroscopy[c]	1.50E−03	Not used	Not used
Urinary/bladder/prostate[b]	PFG[b]	2.50E−02[d]	Not used	Not used
Urinary/bladder/prostate	PA	2.50E−02[d]	1.00E−04	2.60E−04
Urinary/bladder/prostate	LAT/OBL	1.30E−02[d]	1.50E−04	3.25E−04
Urinary/bladder/prostate	AP lordotic	4.66E−02	2.00E−04	Not used
Urinary/bladder/prostate	Fluoroscopy[c]	1.50E−03	Not used	Not used
Colon/rectum[b]	PFG[b]	2.50E−02[d]	Not used	Not used
Colon/rectum	PA	2.50E−02[d]	1.00E−04	2.60E−04
Colon/rectum	LAT/OBL	1.30E−02[d]	1.50E−04	3.25E−04
Colon/rectum	AP lordotic	4.66E−02	2.00E−04	Not used
Colon/rectum	Fluoroscopy[c]	1.50E−03	Not used	Not used
Testes[b]	PFG[b]	5.00E−03[d]	Not used	Not used
Testes	PA	5.00E−03[d]	1.00E−06	5.00E−07
Testes	LAT/OBL	2.50E−03	2.50E−05	1.30E−05
Testes	AP lordotic	3.60E−03	1.00E−06	Not used
Testes	Fluoroscopy[c]	2.50E−05	Not used	Not used
Lungs (male)	PFG[b]	9.50E−01	Not used	Not used
Lungs (male)	PA	8.38E−02	4.19E−02	3.14E−02
Lungs (male)	LAT/OBL	9.65E−02	4.83E−02	4.07E−02
Lungs (male)	AP lordotic	9.46E−02	4.73E−02	Not used
Lungs (male)	Fluoroscopy[c]	8.38E−01	Not used	Not used

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Organ	Projection	Through 1970	1971–1985	1986 and later
Lungs (female)	PFG[b]	1.02E−00	Not used	Not used
Lungs (female)	PA	9.02E−02	4.51E−02	3.37E−02
Lungs (female)	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Lungs (female)	AP lordotic	7.06E−02	3.53E−02	Not used
Lungs (female)	Fluoroscopy[c]	8.88E−01	Not used	Not used
Thymus	PFG[b]	1.02E−00	Not used	Not used
Thymus	PA	9.02E−02	4.51E−02	3.37E−02
Thymus	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Thymus	AP lordotic	9.46E−02	4.73E−02	Not used
Thymus	Fluoroscopy[c]	8.88E−01	Not used	Not used
Esophagus	PFG[b]	1.02E−00	Not used	Not used
Esophagus	PA	9.02E−02	4.51E−02	3.37E−02
Esophagus	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Esophagus	AP lordotic	9.46E−02	4.73E−02	Not used
Esophagus	Fluoroscopy[c]	8.88E−01	Not used	Not used
Stomach	PFG[b]	1.02E−00	Not used	Not used
Stomach	PA	9.02E−02	4.51E−02	3.37E−02
Stomach	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Stomach	AP lordotic	9.46E−02	4.73E−02	Not used
Stomach	Fluoroscopy[c]	8.88E−01	Not used	Not used
Bone surface	PFG[b]	1.02E−00	Not used	Not used
Bone surface	PA	9.02E−02	4.51E−02	3.37E−02
Bone surface	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Bone surface	AP lordotic	9.46E−02	4.73E−02	Not used
Bone surface	Fluoroscopy[c]	8.88E−01	Not used	Not used
Liver/gallbladder/spleen	PFG[b]	1.02E−00	Not used	Not used
Liver/gallbladder/spleen	PA	9.02E−02	4.51E−02	3.37E−02
Liver/gallbladder/spleen	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Liver/gallbladder/spleen	AP lordotic	9.46E−02	4.73E−02	Not used
Liver/gallbladder/spleen	Fluoroscopy[c]	8.88E−01	Not used	Not used
Remainder organs	PFG[b]	1.02E−00	Not used	Not used
Remainder organs	PA	9.02E−02	4.51E−02	3.37E−02
Remainder organs	LAT/OBL	1.10E−01	5.50E−02	4.56E−02
Remainder organs	AP lordotic	9.46E−02	4.73E−02	Not used
Remainder organs	Fluoroscopy[c]	8.88E−01	Not used	Not used
Breast	PFG[b]	1.11E−01	Not used	Not used

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Organ	Projection	Through 1970	1971–1985	1986 and later
Breast	PA	9.80E−03	4.90E−03	5.80E−03
Breast	LAT/OBL	1.28E−01	6.38E−02	4.46E−02
Breast	AP lordotic	1.67E−01	8.36E−02	Not used
Breast	Fluoroscopy[c]	8.00E−02	Not used	Not used
Uterus	PFG[b]	2.50E−02[d]	Not used	Not used
Uterus	PA	2.50E−02[d]	1.30E−04	2.60E−04
Uterus	LAT/OBL	1.30E−02[d]	1.50E−04	2.73E−04
Uterus	AP lordotic	6.10E−02	1.50E−04	Not used
Uterus	Fluoroscopy[c]	1.75E−03	Not used	Not used
Bone marrow (male)	PFG[b]	2.09E−01	Not used	Not used
Bone marrow (male)	PA	1.84E−02	9.20E−03	8.90E−03
Bone marrow (male)	LAT/OBL	1.85E−02	9.25E−03	9.88E−03
Bone marrow (male)	AP lordotic	9.60E−03	4.80E−03	Not used
Bone marrow (male)	Fluoroscopy[c]	1.73E−01	Not used	Not used
Bone marrow (female)	PFG[b]	1.95E−01	Not used	Not used
Bone marrow (female)	PA	1.72E−02	8.60E−03	8.60E−03
Bone marrow (female)	LAT/OBL	1.45E−02	7.25E−03	7.67E−03
Bone marrow (female)	AP lordotic	9.60E−03	4.80E−03	Not used
Bone marrow (female)	Fluoroscopy[c]	1.58E−01	Not used	Not used
Entrance skin[e]	PFG[b]	3.06E+00	Not used	Not used
Entrance skin	PA	2.70E−01	1.35E−01	7.00E−02
Entrance skin	LAT/OBL	6.75E−01	3.38E−01	1.82E−01
Entrance skin	AP lordotic	2.70E−01	1.35E−01	Not used
Entrance skin	Fluoroscopy[c]	3.30E+00	Not used	Not used

a. Not used means projection not performed for screening in this period.
b. PFG dose equivalents are for stereo projections (two exposures). If only one projection was taken, these dose equivalents should be halved. See Section 7.2 for additional information.
c. Fluoroscopy dose equivalents based on 5 R/min for 30 seconds with an HVL of 2.0 mm Al eq.
d. Dose equivalents through 1970 are based on measured values (Rising and Soldat 1959; Webster and Merrill 1957) for testes, ovaries, uterus, and analogues.
e. ENSD equivalents determined by multiplying the incident air kerma by the backscatter factors of 1.32,1.35 and 1.42 for HVL of 2.0 mm Al, 2.5 mm Al and 4.0 mm Al, respectively, from NCRP Report 102 (NCRP 1989, Table B-8). Skin dose equivalents for all areas of skin are provided in Tables B-11 and B-12.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-11. Skin dose equivalents (rem) from chest projections through 1970.[a]

Area of skin	PFG[b] 1943–1970	Chest fluoroscopy through 1970	PA chest through 1970	LAT chest through 1970	AP lordotic chest through 1970	RAO chest through 1970	LAO chest through 1970
Right front shoulder	6.67E−02	6.32E−02	5.9E−03	6.75E−01	2.70E−01	3.0E−03	3.0E−03
Right back shoulder	3.06E+00	3.30E+00	2.70E−01	6.75E−01	5.9E−03	6.75E−01	6.75E−01
Left front shoulder	6.67E−02	6.32E−02	5.9E−03	3.0E−03	2.70E−01	3.0E−03	3.0E−03
Left back shoulder	3.06E+00	3.30E+00	2.70E−01	3.0E−03	5.9E−03	6.75E−01	6.75E−01
Right upper arm to elbow	3.06E−01	3.30E+00	2.70E−01	6.75E−01	2.70E−01	6.75E−01	6.75E−01
Left upper arm to elbow	3.06E−01	3.30E+00	2.70E−01	3.0E−03	2.70E−01	6.75E−01	6.75E−01
Left hand	3.06E+00	3.30E+00	2.70E−01	6.75E−02	2.70E−02	6.75E−02	6.75E−02
Right hand	3.06E+00	3.30E+00	2.70E−01	6.75E−02	2.70E−02	6.75E−02	6.75E−02
Left elbow, forearm, wrist	3.06E−01	3.30E+00	2.70E−01	6.75E−02	2.70E−01	6.75E−02	6.75E−02
Right elbow, forearm, wrist	3.06E−01	3.30E+00	2.70E−01	6.75E−02	2.70E−01	6.75E−02	6.75E−02
Right side of head including temple and ear	3.06E−01	3.30E−01	2.70E−02	5.75E−02	2.70E−02	3.E−04	6.75E−02
Left side of head including temple and ear	3.06E−01	3.30E−01	2.70E−02	5.75E−02	2.70E−02	6.75E−02	3.E−04
Front left thigh	9.E−04	8.E−04	8.E−05	1.E−04	8.E−05	1.E−04	1.E−04
Back left thigh	9.E−04	8.E−04	8.E−05	1.E−04	8.E−05	1.E−04	1.E−04
Front right thigh	9.E−04	8.E−04	8.E−05	1.E−04	8.E−05	1.E−04	1.E−04
Back right thigh	9.E−04	8.E−04	8.E−05	1.E−04	8.E−05	1.E−04	1.E−04
Left knee and below	3.E−04	3.E−04	3.E−05	4.E−05	3.E−05	4.E−05	4.E−05
Right knee and below	3.E−04	3.E−04	3.E−05	4.E−05	3.E−05	4.E−05	4.E−05
Left side of face	7.25E−02	5.25E−02	6.4E−03	5.75E−02	2.70E−01	6.75E−01	3.0E−03
Right side of face	7.25E−02	5.25E−02	6.4E−03	5.75E−02	2.70E−01	3.0E−03	6.75E−01
Left side of neck	3.06E−01	3.30E+00	2.70E−01	5.75E−02	2.70E−01	6.75E−01	3.0E−03
Right side of neck	3.06E−01	3.30E+00	2.70E−01	5.75E−02	2.70E−01	3.0E−03	6.75E−01
Back of head	3.06E−01	3.30E−01	2.70E−02	5.75E−02	5.9E−03	6.75E−02	6.75E−02
Front of neck	7.25E−02	5.25E−02	6.4E−03	5.75E−02	2.70E−01	5.75E−02	5.75E−02
Back of neck	3.06E−01	3.30E+00	2.70E−01	5.75E−02	5.9E−03	6.75E−01	6.75E−01
Front torso: base of neck to end of sternum	6.67E−02	6.32E−02	5.9E−03	1.10E−01	2.70E−01	3.0E−03	3.0E−03
Front torso: end of sternum to lowest rib	6.67E−02	6.32E−02	5.9E−03	1.10E−01	2.70E−01	3.0E−03	3.0E−03
Front torso: lowest rib to iliac crest	6.67E−02	6.32E−02	5.9E−03	1.10E−01	2.70E−01	3.0E−03	3.0E−03
Front torso: iliac crest to pubis	6.7E−03	6.3E−03	6.E−04	1.10E−02	2.70E−02	3.E−04	3.E−04
Back torso: base of neck to mid–back	3.06E+00	3.30E+00	2.70E−01	1.10E−01	5.9E−03	6.75E−01	6.75E−01
Back torso: mid–back to lowest rib	3.06E+00	3.30E+00	2.70E−01	1.10E−01	5.9E−03	6.75E−01	6.75E−01
Back torso: lowest rib to iliac crest	3.06E+00	3.30E+00	2.70E−01	1.10E−01	5.9E−03	6.75E−01	6.75E−01
Back torso: buttocks (Iliac crest and below)	3.06E−01	3.30E−01	2.70E−02	1.10E−02	6.E−04	6.75E−02	6.75E−02

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	PFG[b] 1943–1970	Chest fluoroscopy through 1970	PA chest through 1970	LAT chest through 1970	AP lordotic chest through 1970	RAO chest through 1970	LAO chest through 1970
Right torso: base of neck to end of sternum	3.06E+00	3.30E+00	2.70E−01	6.75E−01	2.70E−01	3.0E−03	6.75E−01
Right torso: end of sternum to lowest rib	3.06E+00	3.30E+00	2.70E−01	6.75E−01	2.70E−01	3.0E−03	6.75E−01
Right torso: lowest rib to iliac crest	3.06E+00	3.30E+00	2.70E−01	6.75E−01	2.70E−01	3.0E−03	6.75E−01
Right torso: iliac crest to pubis (right hip)	3.06E−01	3.30E−01	2.70E−02	6.75E−02	2.70E−02	3.E−04	6.75E−02
Left torso: base of neck to end of sternum	3.06E+00	3.30E+00	2.70E−01	3.0E−03	2.70E−01	6.75E−01	3.0E−03
Left torso: end of sternum to lowest rib	3.06E+00	3.30E+00	2.70E−01	3.0E−03	2.70E−01	6.75E−01	3.0E−03
Left torso: lowest rib to iliac crest	3.06E+00	3.30E+00	2.70E−01	3.0E−03	2.70E−01	6.75E−01	3.0E−03
Left torso: iliac crest to pubis (Left hip)	3.06E−01	3.30E−01	2.70E−02	3.E−04	2.70E−02	6.75E−02	3.E−04

a. Values less than 0.1 mrem shown to one significant digit.
b. PFG dose equivalents are for stereo projections (two exposures). If only one projection was taken, these dose equivalents should be halved. See Section 7.2 for additional information.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-12. Skin dose equivalents (rem) from various chest projections after 1970.[a]

Area of skin	PA chest 1971–1985	LAT chest 1971–1985	AP lordotic chest 1971–1985	RAO chest 1971–1985	LAO chest 1971–1985	PA chest after 1985	LAT chest after 1985	RAO chest after 1985	LAO chest after 1985
Right front shoulder	2.9E−03	3.38E−01	1.35E−01	1.5E−03	1.5E−03	2.4E−03	1.82E−01	1.4E−03	1.4E−03
Right back shoulder	1.35E−01	3.38E−01	2.9E−03	3.38E−01	3.38E−01	7.00E−02	1.82E−01	1.82E−01	1.82E−01
Left front shoulder	2.9E−03	1.5E−03	1.35E−01	1.5E−03	1.5E−03	2.4E−03	1.4E−03	1.4E−03	1.4E−03
Left back shoulder	1.35E−01	1.5E−03	2.9E−03	3.38E−01	3.38E−01	7.00E−02	1.4E−03	1.82E−01	1.82E−01
Right upper arm to elbow	1.35E−02	3.38E−01	1.35E−01	3.38E−02	3.38E−02	7.0E−03	1.82E−01	1.82E−02	1.82E−02
Left upper arm to elbow	1.35E−02	1.5E−03	1.35E−01	3.38E−02	3.38E−02	7.0E−03	1.4E−03	1.82E−02	1.82E−02
Left hand	1.35E−02	3.38E−02	1.35E−02	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Right hand	1.35E−02	3.38E−02	1.35E−02	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Left elbow, forearm, wrist	1.35E−02	3.38E−02	1.35E−01	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Right elbow, forearm, wrist	1.35E−02	3.38E−02	1.35E−01	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Right side of head including temple and ear	1.35E−02	3.38E−02	1.35E−02	1.E−04	3.38E−02	7.0E−03	1.82E−02	1.E−04	1.82E−02
Left side of head including temple and ear	1.35E−02	3.38E−02	1.35E−02	3.38E−02	1.E−04	7.0E−03	1.82E−02	1.82E−02	1.E−04
Front left thigh	4.E−05	5.E−05	4.E−05	5.E−05	5.E−05	3.E−05	4.E−05	4.E−05	4.E−05
Back left thigh	4.E−05	5.E−05	4.E−05	5.E−05	5.E−05	3.E−05	4.E−05	4.E−05	4.E−05
Front right thigh	4.E−05	5.E−05	4.E−05	5.E−05	5.E−05	3.E−05	4.E−05	4.E−05	4.E−05
Back right thigh	4.E−05	5.E−05	4.E−05	5.E−05	5.E−05	3.E−05	4.E−05	4.E−05	4.E−05
Left knee and below	1.E−05	2.E−05	1.E−05	2.E−05	2.E−05	1.E−05	1.E−05	1.E−05	1.E−05
Right knee and below	1.E−05	2.E−05	1.E−05	2.E−05	2.E−05	1.E−05	1.E−05	1.E−05	1.E−05
Left side of face	3.2E−03	3.38E−02	1.35E−01	3.38E−02	1.E−04	3.9E−03	1.82E−02	1.82E−02	1.E−04
Right side of face	3.2E−03	3.38E−02	1.35E−01	1.E−04	3.38E−02	3.9E−03	1.82E−02	1.E−04	1.82E−02
Left side of neck	1.35E−02	3.38E−02	1.35E−01	3.38E−02	1.E−04	7.0E−03	1.82E−02	1.82E−02	1.E−04
Right side of neck	1.35E−02	3.38E−02	1.35E−01	1.E−04	3.38E−02	7.0E−03	1.82E−02	1.E−04	1.82E−02
Back of head	1.35E−02	3.38E−02	2.9E−03	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Front of neck	3.2E−03	3.38E−02	1.35E−01	2.88E−02	2.88E−02	3.9E−03	1.82E−02	2.13E−02	2.13E−02
Back of neck	1.35E−02	3.38E−02	2.9E−03	3.38E−02	3.38E−02	7.0E−03	1.82E−02	1.82E−02	1.82E−02
Front torso: base of neck to end of sternum	2.9E−03	5.50E−02	1.35E−01	1.5E−03	1.5E−03	2.4E−03	4.56E−02	1.4E−03	1.4E−03
Front torso: end of sternum to lowest rib	2.9E−03	5.50E−02	1.35E−01	1.5E−03	1.5E−03	2.4E−03	4.56E−02	1.4E−03	1.4E−03
Front torso: lowest rib to iliac crest	3.E−04	5.5E−03	1.35E−01	1.E−04	1.E−04	2.E−04	4.6E−03	1.E−04	1.E−04

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	PA chest 1971–1985	LAT chest 1971–1985	AP lordotic chest 1971–1985	RAO chest 1971–1985	LAO chest 1971–1985	PA chest after 1985	LAT chest after 1985	RAO chest after 1985	LAO chest after 1985
Front torso: iliac crest to pubis	3.E−04	5.5E−03	1.35E−02	1.E−04	1.E−04	2.E−04	4.6E−03	1.E−04	1.E−04
Back torso: base of neck to mid–back	1.35E−01	5.50E−02	2.9E−03	3.38E−01	3.38E−01	7.00E−02	4.56E−02	1.82E−01	1.82E−01
Back torso: mid–back to lowest rib	1.35E−01	5.50E−02	2.9E−03	3.38E−01	3.38E−01	7.00E−02	4.56E−02	1.82E−01	1.82E−01
Back torso: lowest rib to iliac crest	1.35E−02	5.5E−03	2.9E−03	3.38E−02	3.38E−02	7.0E−03	4.6E−03	1.82E−02	1.82E−02
Back torso: buttocks (Iliac crest and below)	1.35E−02	5.5E−03	3.E−04	3.38E−02	3.38E−02	7.0E−03	4.6E−03	1.82E−02	1.82E−02
Right torso: base of neck to end of sternum	1.35E−01	3.38E−01	1.35E−01	1.5E−03	3.38E−01	7.00E−02	1.82E−01	1.4E−03	1.82E−01
Right torso: end of sternum to lowest rib	1.35E−01	3.38E−01	1.35E−01	1.5E−03	3.38E−01	7.00E−02	1.82E−01	1.4E−03	1.82E−01
Right torso: lowest rib to iliac crest	1.35E−02	3.38E−02	1.35E−01	1.E−04	3.38E−02	7.0E−03	1.82E−02	1.E−04	1.82E−02
Right torso: iliac crest to pubis (right hip)	1.35E−02	3.38E−02	1.35E−02	1.E−04	3.38E−02	7.0E−03	1.82E−02	1.E−04	1.82E−02
Left torso: base of neck to end of sternum	1.35E−01	1.5E−03	1.35E−01	3.38E−01	1.5E−03	7.00E−02	1.4E−03	1.82E−01	1.4E−03
Left torso: end of sternum to lowest rib	1.35E−01	1.5E−03	1.35E−01	3.38E−01	1.5E−03	7.00E−02	1.4E−03	1.82E−01	1.4E−03
Left torso: lowest rib to iliac crest	1.35E−02	1.E−04	1.35E−01	3.38E−02	1.E−04	7.0E−03	1.E−04	1.82E−02	1.E−04
Left torso: iliac crest to pubis (Left hip)	1.35E−02	1.E−04	1.35E−02	3.38E−02	1.E−04	7.0E−03	1.E−04	1.82E−02	1.E−04

a. Values less than 0.1 mrem shown to one significant digit.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-13. Organ dose equivalents (rem) for lumbar spine and pelvis projections for all periods.[a,b]

Organ	Projection	Through 1970	1971−1985
Thyroid	AP or AP spot lumbar spine[c]	2.88E−04	2.33E−04
Thyroid	LAT or LAT spot lumbar spine[d]	3.79E−05	2.80E−05
Thyroid	AP pelvis	1.52E−05	Not used
Eye/brain	AP or AP spot lumbar spine[c]	2.88E−04	2.33E−04
Eye/brain	LAT or LAT spot lumbar spine[d]	3.79E−05	2.80E−05
Eye/brain	AP pelvis	1.52E−05	Not used
Ovaries[b]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Ovaries	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Ovaries	AP pelvis	6.50E−01	Not used
Urinary bladder/prostate[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Urinary bladder/prostate	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Urinary bladder/prostate	AP pelvis	6.50E−01	Not used
Colon/rectum[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Colon/rectum	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Colon/rectum	AP pelvis	6.50E−01	Not used
Testes[b]	AP or AP spot lumbar spine[c]	2.70E−02	3.26E−03
Testes	LAT or LAT spot lumbar spine[d]	5.60E−02	2.24E−03
Testes	AP pelvis	6.40E−01	Not used
Lungs (male)	AP or AP spot lumbar spine[c]	8.93E−02	6.13E−02
Lungs (male)	LAT or LAT spot lumbar spine[d]	3.79E−02	3.92E−02
Lungs (male)	AP pelvis	1.52E−03	Not used
Lungs (female)	AP or AP spot lumbar spine[c]	8.93E−02	6.13E−02
Lungs (female)	LAT or LAT spot lumbar spine[d]	3.79E−02	3.92E−02
Lungs (female)	AP pelvis	1.52E−03	Not used
Thymus	AP or AP spot lumbar spine[c]	8.93E−02	6.13E−02
Thymus	LAT or LAT spot lumbar spine[d]	3.79E−02	3.92E−02
Thymus	AP pelvis	1.52E−03	Not used
Esophagus	AP or AP spot lumbar spine[c]	8.93E−02	6.13E−02
Esophagus	LAT or LAT spot lumbar spine[d]	3.79E−02	3.92E−02
Esophagus	AP pelvis	1.52E−03	Not used
Stomach[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Stomach	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Stomach	AP pelvis	6.50E−01	Not used

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Organ	Projection	Through 1970	1971−1985
Bone surface[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Bone surface	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Bone surface	AP pelvis	6.50E−01	Not used
Liver/gallbladder/spleen[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Liver/gallbladder/spleen	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Liver/gallbladder/spleen	AP pelvis	6.50E−01	Not used
Remainder organs[e,f]	AP or AP spot lumbar spine[c]	5.60E−01	1.68E−01
Remainder organs	LAT or LAT spot lumbar spine[d]	7.10E−01	1.32E−01
Remainder organs	AP pelvis	6.50E−01	Not used
Breast	AP or AP spot lumbar spine[c]	8.93E−02	6.13E−02
Breast	LAT or LAT spot lumbar spine[d]	3.79E−02	3.92E−02
Breast	AP pelvis	1.52E−03	Not used
Uterus[e]	AP or AP spot lumbar spine[c]	5.60E−01	2.23E−01
Uterus	LAT or LAT spot lumbar spine[d]	7.10E−01	8.68E−02
Uterus	AP pelvis	6.50E−01	Not used
Bone marrow (male)	AP or AP spot lumbar spine[c]	3.46E−02	2.87E−02
Bone marrow (male)	LAT or LAT spot lumbar spine[d]	5.69E−02	6.16E−02
Bone marrow (male)	AP pelvis	3.50E−02	Not used
Bone marrow (female)	AP or AP spot lumbar spine[c]	3.46E−02	2.87E−02
Bone marrow (female)	LAT or LAT spot lumbar spine[d]	5.69E−02	6.16E−02
Bone marrow (female)	AP pelvis	3.50E−02	Not used
Entrance skin[g]	AP or AP spot lumbar spine[c]	1.900E+00	1.05E+00
Entrance skin	LAT or LAT spot lumbar spine[d]	5.00E+00	3.79E+00
Entrance skin	AP pelvis	2.000E+00	Not used

a. Not used means projection not performed for screening in this period.
b. Doses through 1970 are based on measured values (Lincoln and Gupton 1958) for skin, testes, and ovaries.
c. Dose equivalents are for one projection. If both AP and AP spot are being included as the default frequency, the listed dose equivalents should be doubled.
d. Dose equivalents are for one projection. If both LAT and LAT spot are being included as the default frequency, the listed dose equivalents should be doubled.
e. The ovary measured dose is used to determine organ dose equivalents for the Remainder organs and other organs in the primary beam for projections of the lumbar spine and pelvis through 1970.
f. The ovary DCF is used to determine organ dose equivalents for the Remainder organs and other organs in the primary beam for projections of the lumbar spine and pelvis for 1971−1985.
g. Skin dose equivalents for all areas of skin are provided in Tables B-14.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-14. Skin dose equivalent (rem) from lumbar spine and pelvis projections for all periods.[a]

Area of skin	AP or AP spot lumbar spine through 1970	LAT or LAT spot lumbar spine through 1970	Pelvis through 1970	AP or AP spot lumbar spine 1971−1985	LAT or LAT spot lumbar spine 1971−1985
Right front shoulder	1.90E−01	5.00E−01	2.00E−01	1.05E−01	3.79E−01
Right back shoulder	3.6E−03	5.00E−01	3.8E−03	2.62E−03	3.79E−01
Left front shoulder	1.90E−01	1.90E−03	2.00E−01	1.05E−01	1.66E−03
Left back shoulder	3.6E−03	1.90E−03	3.8E−03	2.62E−03	1.66E−03
Right upper arm to elbow	1.90E−01	5.00E−01	2.00E−01	1.05E−01	3.79E−01
Left upper arm to elbow	1.90E−01	1.90E−03	2.00E−01	1.05E−01	1.66E−03
Left hand	1.90E+00	1.90E−03	2.00E+00	1.05E−01	1.66E−03
Right hand	1.90E+00	5.00E−01	2.00E+00	1.05E−01	3.79E−01
Left elbow, forearm, wrist	1.90E+00	1.90E−03	2.00E+00	1.05E−01	1.66E−03
Right elbow, forearm, wrist	1.90E+00	5.00E−01	2.00E+00	1.05E−01	3.79E−01
Right side of head including temple and ear	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Left side of head including temple and ear	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Front left thigh	1.90E−01	1.90E−03	2.00E−01	1.05E−01	1.66E−03
Back left thigh	3.6E−03	1.90E−03	3.8E−03	2.62E−03	1.66E−03
Front right thigh	1.90E−01	5.00E−01	2.00E−01	1.05E−01	3.79E−01
Back right thigh	3.6E−03	5.00E−01	3.8E−03	2.62E−03	3.79E−01
Left knee and below	4.E−04	5.E−04	4.E−04	2.47E−04	3.83E−04
Right knee and below	4.E−04	5.E−04	4.E−04	2.47E−04	3.83E−04
Left side of face	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Right side of face	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Left side of neck	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Right side of neck	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Back of head	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Front of neck	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Back of neck	3.E−04	3.E−05	1.E−05	2.33E−04	2.80E−05
Front torso: base of neck to end of sternum	1.90E−01	3.32E−02	2.00E−01	1.05E−01	3.92E−02
Front torso: end of sternum to lowest rib	1.90E+00	3.32E−02	2.00E+00	1.05E+00	3.92E−02
Front torso: lowest rib to iliac crest	1.90E+00	3.32E−02	2.00E+00	1.05E+00	3.92E−02
Front torso: iliac crest to pubis	1.90E+00	3.32E−02	2.00E+00	1.05E+00	3.92E−02
Back torso: base of neck to mid–back	3.6E−03	3.32E−02	3.8E−03	2.62E−03	3.92E−02
Back torso: mid–back to lowest rib	3.64E−02	3.32E−02	3.83E−02	2.62E−02	3.92E−02
Back torso: lowest rib to iliac crest	3.64E−02	3.32E−02	3.83E−02	2.62E−02	3.92E−02
Back torso: buttocks (Iliac crest and below)	3.64E−02	3.32E−02	3.83E−02	2.62E−02	3.92E−02
Right torso: base of neck to end of sternum	1.90E−01	5.00E−01	2.00E−01	1.05E−01	3.79E−01

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP or AP spot lumbar spine through 1970	LAT or LAT spot lumbar spine through 1970	Pelvis through 1970	AP or AP spot lumbar spine 1971−1985	LAT or LAT spot lumbar spine 1971−1985
Right torso: end of sternum to lowest rib	1.90E+00	5.00E+00	2.00E+00	1.05E+00	3.79E+00
Right torso: lowest rib to iliac crest	1.90E+00	5.00E+00	2.00E+00	1.05E+00	3.79E+00
Right torso: iliac crest to pubis (right hip)	1.90E+00	5.00E+00	2.00E+00	1.05E+00	3.79E+00
Left torso: base of neck to end of sternum	1.90E−01	1.90E−03	2.00E−01	1.05E−01	1.66E−03
Left torso: end of sternum to lowest rib	1.90E+00	1.90E−02	2.00E+00	1.05E+00	1.66E−02
Left torso: lowest rib to iliac crest	1.90E+00	1.90E−02	2.00E+00	1.05E+00	1.66E−02
Left torso: iliac crest to pubis (left hip)	1.90E+00	1.90E−02	2.00E+00	1.05E+00	1.66E−02

a. Values less than 0.1 mrem shown to one significant digit.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-15. Organ dose equivalents (rem) for thoracic and cervical spine projections through 1970.

Organ	Thoracic spine projection	Organ dose equivalents (rem)	Cervical spine projection	Organ dose equivalents (rem)
Thyroid	AP	9.26E−02	AP	3.25E−01
Thyroid	LAT	1.23E−01	LAT	1.46E−02
Thyroid	RPO	1.23E−01	RPO	3.25E−01
Thyroid	LPO	1.23E−01	LPO	3.25E−01
Eye/brain	AP	9.26E−03	AP	3.25E−01
Eye/brain	LAT	8.80E−03	LAT	1.46E−02
Eye/brain	RPO	8.80E−03	RPO	3.25E−01
Eye/brain	LPO	8.80E−03	LPO	3.25E−01
Ovaries	AP	2.80E−02[a]	AP	6.00E−05[a]
Ovaries	LAT	4.60E−02[a]	LAT	2.00E−04[a]
Ovaries	RPO	4.60E−02	RPO	6.00E−05
Ovaries	LPO	4.60E−02	LPO	6.00E−05
Urinary/bladder/prostate	AP	2.80E−02[a]	AP	6.00E−05
Urinary/bladder/prostate	LAT	4.60E−02[a]	LAT	2.00E−04
Urinary/bladder/prostate	RPO	4.60E−02	RPO	6.00E−05
Urinary/bladder/prostate	LPO	4.60E−02	LPO	6.00E−05
Colon/rectum	AP	2.80E−02[a]	AP	6.00E−05
Colon/rectum	LAT	4.60E−02[a]	LAT	2.00E−04
Colon/rectum	RPO	4.60E−02	RPO	6.00E−05
Colon/rectum	LPO	4.60E−02	LPO	6.00E−05
Testes	AP	1.00E−03[a]	AP	2.70E−04[a]
Testes	LAT	2.00E−03[a]	LAT	9.20E−04[a]
Testes	RPO	2.00E−03	RPO	2.70E−04
Testes	LPO	2.00E−03	LPO	2.70E−04
Lungs (male)	AP	3.27E−01[b]	AP	6.48E−03
Lungs (male)	LAT	2.35E−01[b]	LAT	5.98E−03
Lungs (male)	RPO	2.35E−01	RPO	6.48E−03
Lungs (male)	LPO	2.35E−01	LPO	6.48E−03
Lungs (female)	AP	2.33E−01[b]	AP	6.48E−03
Lungs (female)	LAT	2.82E−01[b]	LAT	5.98E−03
Lungs (female)	RPO	2.82E−01	RPO	6.48E−03
Lungs (female)	LPO	2.82E−01	LPO	6.48E−03

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Organ	Thoracic spine projection	Organ dose equivalents (rem)	Cervical spine projection	Organ dose equivalents (rem)
Thymus	AP	3.27E−01[b]	AP	6.48E−03
Thymus	LAT	2.82E−01[b]	LAT	5.98E−03
Thymus	RPO	2.82E−01	RPO	6.48E−03
Thymus	LPO	2.82E−01	LPO	6.48E−03
Esophagus	AP	3.27E−01[b]	AP	6.48E−03
Esophagus	LAT	2.82E−01[b]	LAT	5.98E−03
Esophagus	RPO	2.82E−01	RPO	6.48E−03
Esophagus	LPO	2.82E−01	LPO	6.48E−03
Stomach	AP	3.27E−01[b]	AP	6.48E−03
Stomach	LAT	2.82E−01[b]	LAT	5.98E−03
Stomach	RPO	2.82E−01	RPO	6.48E−03
Stomach	LPO	2.82E−01	LPO	6.48E−03
Bone surface	AP	3.27E−01[b]	AP	6.48E−03
Bone surface	LAT	2.82E−01[b]	LAT	5.98E−03
Bone surface	RPO	2.82E−01	RPO	6.48E−03
Bone surface	LPO	2.82E−01	LPO	6.48E−03
Liver/gallbladder/spleen	AP	3.27E−01[b]	AP	6.48E−03
Liver/gallbladder/spleen	LAT	2.82E−01[b]	LAT	5.98E−03
Liver/gallbladder/spleen	RPO	2.82E−01	RPO	6.48E−03
Liver/gallbladder/spleen	LPO	2.82E−01	LPO	6.48E−03
Remainder organs	AP	3.27E−01[b]	AP	6.48E−03
Remainder organs	LAT	2.82E−01[b]	LAT	5.98E−03
Remainder organs	RPO	2.82E−01	RPO	6.48E−03
Remainder organs	LPO	2.82E−01	LPO	6.48E−03
Breast	AP	3.61E−01	AP	6.48E−03
Breast	LAT	1.23E−02	LAT	5.98E−03
Breast	RPO	1.23E−02	RPO	6.48E−03
Breast	LPO	1.23E−02	LPO	6.48E−03
Uterus	AP	2.80E−02[a]	AP	6.00E−05[a]
Uterus	LAT	4.60E−02[a]	LAT	2.00E−04[a]
Uterus	RPO	4.60E−02	RPO	6.00E−05
Uterus	LPO	4.60E−02	LPO	6.00E−05

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Organ	Thoracic spine projection	Organ dose equivalents (rem)	Cervical spine projection	Organ dose equivalents (rem)
Bone marrow (male)	AP	2.86E−02	AP	4.75E−03
Bone marrow (male)	LAT	3.96E−02	LAT	4.42E−03
Bone marrow (male)	RPO	3.96E−02	RPO	4.75E−03
Bone marrow (male)	LPO	3.96E−02	LPO	4.75E−03
Bone marrow (female)	AP	2.27E−02	AP	4.75E−03
Bone marrow (female)	LAT	3.08E−02	LAT	4.42E−03
Bone marrow (female)	RPO	3.08E−02	RPO	4.75E−03
Bone marrow (female)	LPO	3.08E−02	LPO	4.75E−03
Entrance skin[c]	AP	1.30E+00[a]	AP	5.70E−01
Entrance skin	LAT	2.90E+00[a]	LAT	3.43E−01
Entrance skin	RPO	2.90E+00	RPO	5.70E−01
Entrance skin	LPO	2.90E+00	LPO	5.70E−01

a. Dose equivalents through 1970 are based on measured values (Lincoln and Gupton 1958) for skin, testes, ovaries, and uterus for the thoracic spine, and measured values (Braestrup and Wycoff 1958, p.81, Table VII) for testes, ovaries, and uterus for the cervical spine.
b. The higher of the two lung DCFs is used to determine organ dose equivalents for the remainder organs and other organs in the primary beam for projections of the thoracic spine.
c. Skin dose equivalents for all areas of skin are provided in Tables B-16.

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Table B-16. Skin dose equivalent (rem) from thoracic and cervical spine projections through 1970.[a]

Area of skin	AP thoracic spine	LAT thoracic spine	RPO thoracic spine	LPO thoracic spine	AP cervical spine	LAT cervical spine	RPO cervical spine	LPO cervical spine
Right front shoulder	1.30E+00	2.90E+00	2.90E+00	2.90E+00	5.70E−02	3.43E−01	5.70E−02	5.70E−02
Right back shoulder	2.49E−02	2.90E+00	1.10E−02	1.10E−02	1.1E−03	3.43E−01	1.1E−03	1.1E−03
Left front shoulder	1.30E+00	1.10E−02	2.90E+00	2.90E+00	5.70E−02	1.3E−03	5.70E−02	5.70E−02
Left back shoulder	2.49E−02	1.10E−02	1.10E−02	1.10E−02	1.1E−03	1.3E−03	1.1E−03	1.1E−03
Right upper arm to elbow	1.30E+00	2.90E+00	2.90E+00	2.90E+00	5.70E−02	3.43E−02	1.1E−03	5.70E−02
Left upper arm to elbow	1.30E+00	1.10E−02	2.90E+00	2.90E+00	5.70E−02	1.E−04	5.70E−02	5.70E−02
Left hand	1.30E−01	2.90E−01	2.90E−01	2.90E−01	4.E−04	3.E−04	4.E−04	4.E−04
Right hand	1.30E−01	2.90E−01	2.90E−01	2.90E−01	4.E−04	3.E−04	4.E−04	4.E−04
Left elbow, forearm, wrist	1.30E+00	2.90E−01	2.90E−01	2.90E−01	4.E−04	3.E−04	4.E−04	4.E−04
Right elbow, forearm, wrist	1.30E+00	2.90E−01	2.90E−01	2.90E−01	4.E−04	3.E−04	4.E−04	4.E−04
Right side of head including temple and ear	1.30E−01	2.90E−01	1.1E−03	2.90E−01	5.70E−01	3.43E−01	4.76E−02	5.70E−01
Left side of head including temple and ear	1.30E−01	2.90E−01	2.90E−01	1.1E−03	5.70E−01	2.87E−02	5.70E−01	4.76E−02
Front left thigh	3.E−04	4.E−04	4.E−04	4.E−04	1.E−04	9.E−05	1.E−04	1.E−04
Back left thigh	3.E−04	4.E−04	4.E−04	4.E−04	1.E−04	9.E−05	1.E−04	1.E−04
Front right thigh	3.E−04	4.E−04	4.E−04	4.E−04	1.E−04	9.E−05	1.E−04	1.E−04
Back right thigh	3.E−04	4.E−04	4.E−04	4.E−04	1.E−04	9.E−05	1.E−04	1.E−04
Left knee and below	1.E−04	1.E−04	1.E−04	1.E−04	7.E−05	4.E−05	7.E−05	7.E−05
Right knee and below	1.E−04	1.E−04	1.E−04	1.E−04	7.E−05	4.E−05	7.E−05	7.E−05
Left side of face	1.30E−01	7.7E−03	2.90E−01	1.1E−03	5.70E−01	2.87E−02	5.70E−01	4.76E−02
Right side of face	1.30E−01	7.7E−03	1.1E−03	2.90E−01	5.70E−01	3.43E−01	4.76E−02	5.70E−01
Left side of neck	1.30E+00	7.7E−03	2.90E+00	1.10E−02	5.70E−01	2.87E−02	5.70E−01	4.76E−02
Right side of neck	1.30E+00	7.7E−03	1.10E−02	2.90E+00	5.70E−01	3.43E−01	4.76E−02	5.70E−01
Back of head	2.5E−03	7.7E−03	2.90E−01	2.90E−01	1.09E−02	3.43E−01	5.70E−01	5.70E−01
Front of neck	1.30E+00	7.7E−03	1.08E−01	1.08E−01	5.70E−01	3.43E−01	5.70E−01	5.70E−01
Back of neck	2.49E−02	7.7E−03	1.10E−02	1.10E−02	4.76E−02	2.87E−02	4.76E−02	4.76E−02
Front torso: base of neck to end of sternum	1.30E+00	2.46E−01	2.90E+00	2.90E+00	5.70E−01	3.43E−02	5.70E−01	5.70E−01
Front torso: end of sternum to lowest rib	1.30E+00	2.46E−01	2.90E+00	2.90E+00	8.E−04	5.E−04	8.E−04	8.E−04
Front torso: lowest rib to iliac crest	1.30E+00	2.46E−01	2.90E+00	2.90E+00	8.E−04	5.E−04	8.E−04	8.E−04
Front torso: iliac crest to pubis	1.30E−01	2.46E−02	2.90E−01	2.90E−01	3.E−04	2.E−04	3.E−04	3.E−04
Back torso: base of neck to mid–back	2.49E−02	2.46E−01	1.10E−02	1.10E−02	1.09E−02	3.43E−02	1.09E−02	1.09E−02
Back torso: mid–back to lowest rib	2.49E−02	2.46E−01	1.10E−02	1.10E−02	8.E−04	5.E−04	8.E−04	8.E−04
Back torso: lowest rib to iliac crest	2.49E−02	2.46E−01	1.10E−02	1.10E−02	8.E−04	5.E−04	8.E−04	8.E−04
Back torso: buttocks (Iliac crest and below)	2.5E−03	2.46E−02	1.1E−03	1.1E−03	3.E−04	2.E−04	3.E−04	3.E−04
Right torso: base of neck to end of sternum	1.30E+00	2.90E+00	1.10E−02	2.90E+00	5.70E−02	3.43E−01	5.70E−02	5.70E−02

ATTACHMENT B
ORGAN DOSE EQUIVALENT TABLES (continued)

Area of skin	AP thoracic spine	LAT thoracic spine	RPO thoracic spine	LPO thoracic spine	AP cervical spine	LAT cervical spine	RPO cervical spine	LPO cervical spine
Right torso: end of sternum to lowest rib	1.30E+00	2.90E+00	1.10E−02	2.90E+00	8.E−04	5.E−04	8.E−04	8.E−04
Right torso: lowest rib to iliac crest	1.30E+00	2.90E+00	1.10E−02	2.90E+00	8.E−04	5.E−04	8.E−04	8.E−04
Right torso: iliac crest to pubis (right hip)	1.30E−01	2.90E−01	1.1E−03	2.90E−01	3.E−04	2.E−04	3.E−04	3.E−04
Left torso: base of neck to end of sternum	1.30E+00	1.10E−02	2.90E+00	1.10E−02	5.70E−02	1.3E−03	5.70E−02	5.70E−02
Left torso: end of sternum to lowest rib	1.30E+00	1.10E−02	2.90E+00	1.10E−02	8.E−04	5.E−04	8.E−04	8.E−04
Left torso: lowest rib to iliac crest	1.30E+00	1.10E−02	2.90E+00	1.10E−02	8.E−04	5.E−04	8.E−04	8.E−04
Left torso: iliac crest to pubis (Left hip)	1.30E−01	1.1E−03	2.90E−01	1.1E−03	3.E−04	2.E−04	3.E−04	3.E−04

a. Values less than 0.1 mrem shown to one significant digit.