



-A web-based CT dose calculator-

WAZA-ARI v2 USER MANUAL

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National Institutes for Quantum Science and Technology
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1. Preface

1.1. Preface

This manual is a user manual of WAZA-ARI v2, the web system for evaluating exposure dose from CT. The instruction, calculation algorithm and parameters for WAZA-ARI v2 are summarized in this manual. And it was edited by the following members who developed WAZA-ARI v2.

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1.2. Background of the development of WAZA-ARiv2

Recently, CT scan has been widely used in medical institutions while exposure dose from CT scan is much higher than that from radiography. Therefore, the International Atomic Energy Agency IAEA has called for more attention to exposure dose by radiography in early childhood and repeated radiography for the same patients. Japanese medical-related societies have also begun to manage exposure doses caused by medical behavior during the patient's life in order to prevent excessive exposure. Japan had a relatively large number of CT scanners per million population. According to the survey in 2005, more than 20.7 million scans per year was recorded. Nevertheless, the system for managing total medical exposure of patients has not been constructed in Japan.

To solve the above-mentioned problems, Japan's National Institutes for Quantum and Radiological Science and Technology (QST), Japan Atomic Energy Development Agency (JAEA), and the Oita University of Nursing and Health Sciences (Oita Pref. Nursing) renewed the WAZA-ARI system which was developed in 2012. The renewal system WAZA-ARI v2 can evaluate patient dose from CT scans and officially started to serve in January 2015 under the management of QST. [1][2]

1.3. Features of WAZA-ARiv2

WAZA-ARI is the second highest score a fighter can achieve in a Japanese martial arts ippon or waza-ari contest such as judo. The CT dose evaluation system WAZA-ARiv2 shares the same features with WAZA-ARI, which has served from Dec. 2012.

【Web-based system】

WAZA-ARiv2 was developed to be a web-based system so that installation and maintenance will never be a burden to users. After accessing the web site, users can calculate dose from CT by entering information such as the model of CT scanner, the scanning range, the age, body shape, and gender of the patient. The result will display immediately after the scanning conditions are set.

WAZA-ARiv2 has the following new functions

【Dose calculation for patients of various body shapes and ages】

The previous version of WAZA-ARI only calculates organ doses for the average Japanese adults. On the other hand, WAZA-ARiv2 calculates not only standard body shape but also fat and thin people so that most Japanese can be covered. Besides, dose calculation is supported for underage patients with the age of 0, 1, 5, 10, or 15. Dose calculation was mainly performed by simulation code developed by JAEA, and the phantoms used for calculation include the newly developed Japanese adult phantoms and the child phantoms developed by the University of Florida and the National Cancer Institute of the US.

【Construction of registered dose data statistically for CT scanning condition optimization】

After registration, users can calculate organ dose by entering required information and register the data on the QST server. WAZA-ARiv2 server, on the other hand, can collect dose data of each institution and estimate the distribution of dose from CT in Japan. Users can compare the dose level between their own institutions and the dose level of the registered data in WAZA-ARiv2 and use it to optimize CT scanning conditions to prevent overexposure of patients.

Calculation results are modified to display on the right side of the window for setting the scanning conditions in WAZA-ARiv2. In addition, the layout has been changed so that users can see the scanning conditions and the calculation results at the same time. Functions of registering calculation results and frequently used scanning conditions are also added for convenience.

2.Registration

ID registration is required to use WAZA-ARiv2 for dose calculation, dose registration, and dose distribution confirmation. The registration contents include name, email address, occupation, number of beds, number of annual CT tests, name of medical institution, etc.

2.1. User registration page

Press the "ID registration" button on the login page of WAZA-ARiv2 to go to ID registration page. After entering the required information, press the "Confirm" button for confirmation.

The screenshot shows a web form titled "ID registration" on a light green background. The form contains the following fields and labels:

| Field | Value | Label |
|------------------------------|----------------------|----------|
| Name | <input type="text"/> | Required |
| E-mail address | <input type="text"/> | Required |
| Occupation | Doctor | Required |
| Nation | Japan | Required |
| Fiscal year | 2019 | Required |
| Number of beds | <input type="text"/> | Required |
| Annual number of CT exams | <input type="text"/> | Required |
| Kind of facility | All | Required |
| Name of medical organization | <input type="text"/> | Required |

At the bottom center of the form is a green button labeled "Confirm".

Fig. 2-1. Page for user ID registration

2.2. Confirmation of registered content for user ID

Please check if the registered information is correct and read the terms of use for this site. Tick the checkbox and press "Register" button if you agree with the terms of us. Press "Revise" button to return to the input page and revise it if there is any mistake.

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Confirmation of user ID registration

Please click the "Register" button if you would like to register the data shown below. If you would like to revise your data to be registered, please click "Revise" button. If you would like to cancel the registration, please click "Cancel" button.

| | |
|------------------------------|---|
| Name | QST |
| E-mail address | qst@qst.go.jp |
| Occupation | Doctor |
| Nation | Japan |
| Fiscal year | 2019 |
| Number of beds | 100 |
| Annual number of CT exams | 1000 |
| Kind of facility | Hospital (Public) |
| Name of medical organization | National Institute of Radiological Sciences |

Privacy Policy

Conditions of use

The contents of the WAZA-ARIV2 website are provided by National Institute of Radiological Sciences (hereinafter "NIRS") with the following conditions of use. It is assumed that all the users visiting this website have agreed to the Site Policy.

Copyright

The copyright (or intellectual property rights) of all texts, graphical

☒ I have read and understand the sitepolicy described above and agree to all of its terms and conditions.

Register **Revise** **Cancel**

Fig. 2-2. Confirmation page for the registered content of user ID

2.3. Confirmation of the user ID registration

You will receive a registration completion email as shown below (Japanese only). The "User ID" and "Temporary Password" are included in this e-mail. Password can be changed after WAZA-ARI v2 login

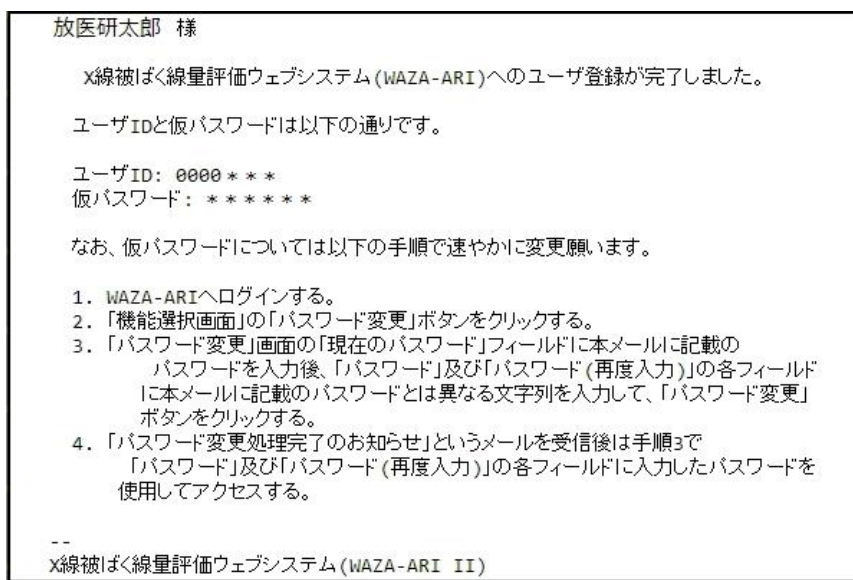


Fig. 2-3. Sample of the registration completion email

3. Dose calculation

3.1. Setting of the condition for dose calculation

After login, press "Calculation of the X-ray CT exposures" button on the Main menu page (Fig. 3.1) to go to dose calculation page (Fig. 3.2).

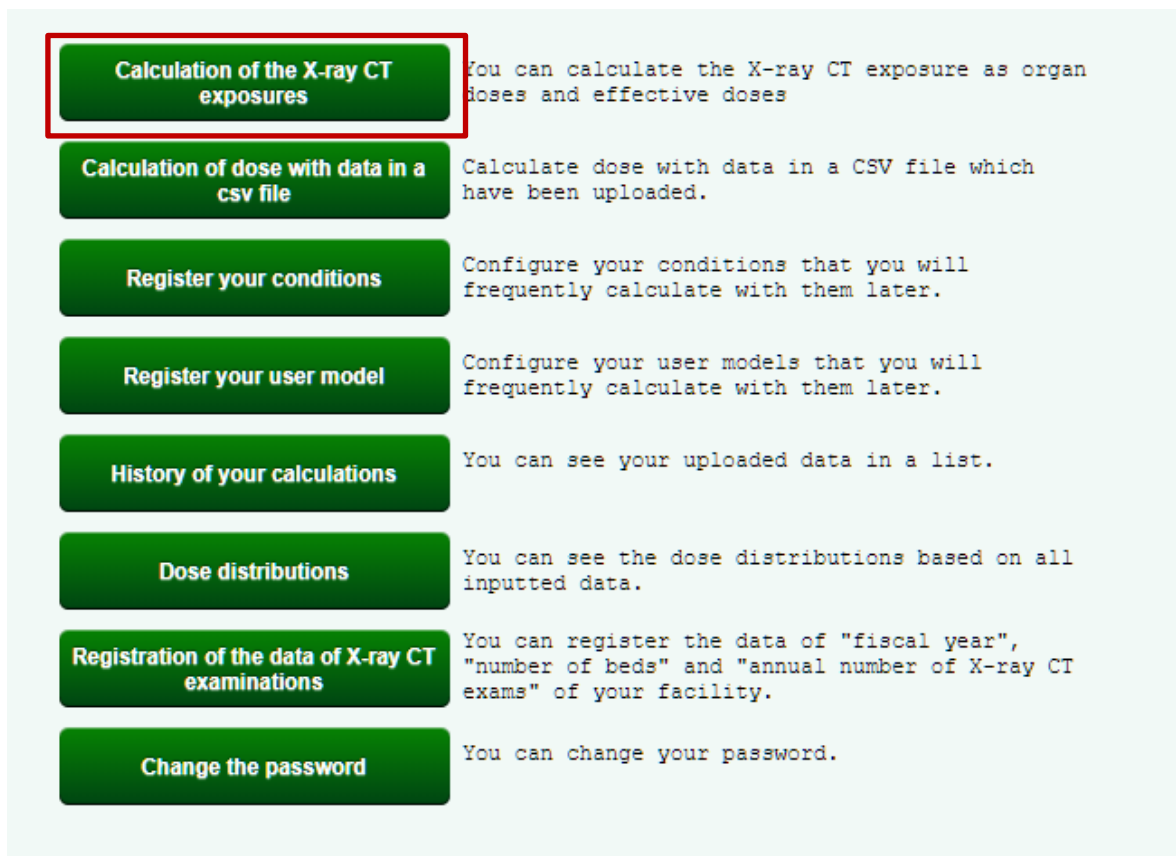


Fig. 3-1. Main menu (dose calculation)

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Condition name:

| Item name | Input value |
|------------------------------|---|
| Manufacturer / Scanner model | Manufacturer: <input type="text" value="-select-"/> Scanner model: <input type="text" value="-select-"/> |
| Filter | <input type="text" value="-select-"/> |
| Tube potential | <input type="text" value="-select-"/> kV |
| Rotation time | <input type="text" value="1.0"/> s |
| Pitch factor | <input type="text" value="1.0"/> (table feed per rotation / beam width) |
| Beam width | <input type="text" value="-select-"/> |
| Gender | <input checked="" type="radio"/> male <input type="radio"/> female |
| Phantom | <input type="text" value="standard"/> |
| Scan type | <input type="text" value="All"/> <input type="text" value="-select-"/> |
| Scan range | Begin position: <input type="text" value="1550"/> mm End position: <input type="text" value="920"/> mm |
| AEC | <input type="radio"/> ON <input checked="" type="radio"/> OFF |
| Tube current | <input type="text" value="100.0"/> mA |
| Optional Phantom | <input checked="" type="radio"/> Off |
| CTDI Phantom Size | <input checked="" type="radio"/> 16cm <input type="radio"/> 32cm |

Calculate Dose

Scan date & time:

Register

Results [Log-out](#)

| Organ / Tissue | Dose (mSv) |
|-------------------|------------|
| Gonad | |
| Prostate / uterus | |
| Urinary bladder | |
| Colon | |
| Small intestine | |
| Kidney | |
| Pancreas | |
| Gall bladder | |
| Stomach | |
| Spleen | |
| Adrenals | |
| Liver | |
| Heart | |
| Lungs | |
| Breast | |
| Esophagus | |
| Thymus | |
| Thyroid | |
| Salivary glands | |
| Oral cavity | |
| Out of Thorax | |
| Lens | |
| Brain | |
| Lymphaden | |
| Muscle | |
| Skin | |
| Bone | |
| Active marrow | |

ED100: mSv
ED50: mSv
DLF: mSv*cm
CTDIvol: mSv

export: [Print](#) [CSV](#)

Back to the menu page

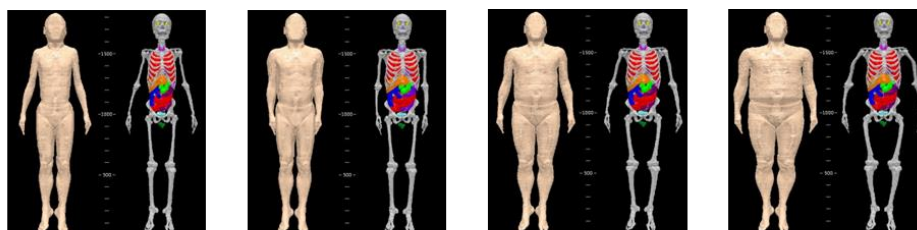
Fig. 3-2. Page for calculation of the X-ray CT exposures

Scanning conditions for dose calculation are set in the left column on dose calculation page. Detail of the scanning condition items are shown in Table 3-1 and detail of the available phantoms are shown in Table 3-2 and Fig. 3-3. Height, weight and BMI for each phantom are shown in Table 3-2.

Two new functions of (1) BMI-based organ dose calculation and (2) SSDE calculation are added in Feb 2021. If you select Adult optional phantom in the phantom item, body shape correction function (optional phantom) will be turned on and columns of height and weight display (Fig. 3-4). Using BMI estimated by the entered height and weight, it has potential to calculate the organ dose closer to the body shape of the subject. Phantom displayed on the calculation screen does not change with the entered height and weight. In WAZA-ARiv2, SSDE is calculated using CTDI_{vol} and the conversion factors proposed in AAPM TG 204, and the conversion factor is a function of effective diameter (AP: anterior-posterior dimension, LAT: lateral dimension). Fig. 3-5 shows the calculation screen when SSDE is turned on.

Table 3-1. Scanning condition item for dose calculation

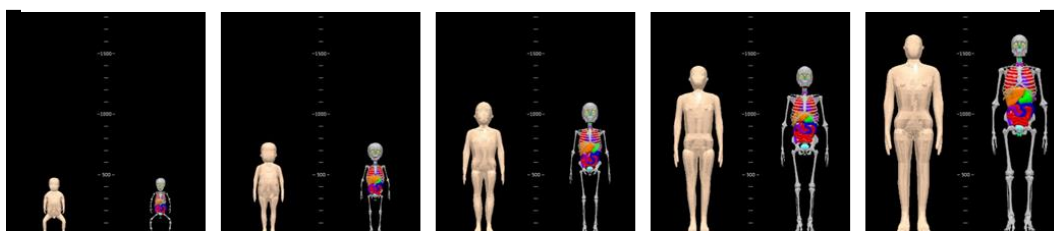
| Item | Description |
|--------------------------|---|
| Manufacturer | Vender of CT machine |
| Scanner model | Name of the CT scanner model |
| Filter | Name of the Bow-tie filter that depends on the of FOV |
| Tube potential | Tube Voltage [kV] |
| Rotation time | Time required for one rotation of the tube [s] |
| Pitch factor | Pitch for helical scan mode. (Movement of the table for one rotation of tube) / (beam width) |
| Beam width | Collimation range in the direction of body axis |
| Gender | Gender |
| Phantom | Select a phantom according to the body type and age. Adult: Standard, Fat(+2SD), Fat(+5SD) and Thin(-2SD) Child: age:0~15 Adult optional phantom |
| Scan type | Scan type (region of body) |
| Scan range | Enter the scanning range. The scanning range can also be set by dragging the <input type="checkbox"/> part on the center phantom image |
| AEC (Option) | "On" to enable dose calculation for the case of AEC (Auto Exposure Control) is applied. Setting the tube current for the specific slice is necessary. |
| Tube Current | Tube Current |
| Optional Phantom | The function of body shape correction is planned to be implemented in the future. |
| SSDE(Option) | "On" to enable calculation of SSDE (Size Specific Dose Estimates). P.S. Since SSDE is estimated using effective diameter, information of anterior-posterior dimension and lateral dimension are necessary. |
| CTDI phantom size | CTDI phantom size for calculating CTDI _{vol} and DLP |



Adult Male (from left to right): thin (-2σ), standard, fat ($+2\sigma$), obese ($+5\sigma$)



Adult Female (from left to right): thin (-2σ), standard, fat ($+2\sigma$), obese ($+5\sigma$)



Boy (from left to right): 0-yr-old, 1-yr-old, 5-yr-old, 10-yr-old, 15-yr-old



Girl (from left to right): 0-yr-old, 1-yr-old, 5-yr-old, 10-yr-old, 15-yr-old

Fig. 3-3. Available phantom types

| | |
|------------------|-------------------------------------|
| Optional Phantom | <input checked="" type="radio"/> ON |
| Height | <input type="text"/> cm |
| Weight | <input type="text"/> kg |

Fig. 3-4. Columns of Height and Weight display when Adult optional phantom is chosen.

| | |
|-------------------|--|
| Zd | 206.0 mA (z=1150.5mm) |
| Ze | 259.0 mA (z=987.5mm) |
| End position | 254.0 mA (z=920mm) |
| Optional Phantom | <input checked="" type="radio"/> OFF |
| CTDI Phantom Size | <input type="radio"/> 16cm <input checked="" type="radio"/> 32cm |
| SSDE | <input checked="" type="radio"/> ON <input type="radio"/> OFF |
| AP | <input type="text"/> cm |
| Lateral | <input type="text"/> cm |

Calculate Dose

Scan date & time:

Fig. 3-5. Columns of AP and Lateral display when SSDE is set "on".

Table 3-2. Height, weight and BMI for each phantom used in WAZA-ARI[3][4]

| | Male | | | Female | | |
|-------------------------|------------|------------|------|------------|------------|------|
| | height[cm] | weight[kg] | BMI* | height[cm] | weight[kg] | BMI* |
| Standard | 171 | 65.1 | 22.3 | 155 | 52 | 21.6 |
| +2σ : Fat(+2SD) | 171 | 82.2 | 28.1 | 155 | 66.9 | 27.8 |
| +5σ : Fat(+5SD) | 171 | 118.1 | 40.4 | 155 | 89.5 | 37.3 |
| -2σ : Thin(-2SD) | 171 | 54.1 | 18.5 | 155 | 43 | 17.9 |
| age:0 | 47.5 | 3.5 | 15.5 | 47.5 | 3.5 | 15.5 |
| age:1 | 76.4 | 10.2 | 17.5 | 76.4 | 10.3 | 17.6 |
| age:5 | 110.2 | 19.7 | 16.2 | 110.2 | 19.7 | 16.2 |
| age:10 | 139.8 | 34.3 | 17.6 | 139.8 | 34.3 | 17.6 |
| age:15 | 165.7 | 59.9 | 21.8 | 161.1 | 56.6 | 21.8 |

* BMI = (Weight[kg])/Height[m)]²

3.2. Confirmation of dose calculation results

After setting the appropriate conditions, press “Calculation dose” button to start dose calculation, and the dose calculation result will display. In addition to absorbed dose [mGy] to each organ, the effective dose (ED103, ED60) [mSv], DLP and CTDIvol are also displayed.

Absorbed dose • Equivalent dose • Effective dose

Equivalent dose H_T [mSv] of each organ is obtained by using the radiation weighting factor w_R and the absorbed dose D_{TR} [mGy] as follows.

$$H_T = w_R \times D_{TR}$$

Since w_R for X-ray is 1, D_{TR} [mGy] of each organ is equal to H_T [mSv]. Effective dose E is then calculated by summing the product of the tissue weighting factor w_T of each organ and [mSv] H_T for all organs.

$$E = \sum_T w_T H_T$$

Since the definition of w_T for each organ is different between ICRP103[5] and ICRP60[6], ED103 and ED60 are both displayed in the calculation result of WAZA-ARI.

It is worth to mention that WAZAARiv2 calculates E using Japanese phantom which is different from the phantom defined by ICRP. Therefore, strictly speaking, it is not proper to compare E calculated by WAZA-ARiv2 with that by other calculation software.

3.3. Registration of calculation results

You can browse statistical information of the registered data and compare with data registered in WAZA-ARiv2 with the statistical information of the radiation dose of your facility by registering the calculation results on the QST server. Press “Register” button to confirm your data for registration (Fig. 3-6).

Confirmation of your dose data to be registered

Please click the "Register" button if you would like to register your data shown below. If you would like to revise your data to be registered, please click "Revise" button. If you would like to cancel the registration, please click "Cancel" button.

| Condition | | Results | |
|------------------------------|---|-------------------|----------------|
| Item name | Input value | Organ / Tissue | Dose (mGy) |
| Date and Time | 2020/02/07 17:03 | Gonad | 20.05 |
| Scan type | Chest[Chest-Pelvis (1-phase)] | Prostate / uterus | 24.48 |
| Manufacturer / Scanner model | Manufacturer: Canon Scanner model: Alexion | Urinary bladder | 22.17 |
| Filter | Medium | Colon | 22.26 |
| Tube potential | 120 kV | Small intestine | 24.21 |
| Rotation time | 0.5 s | Kidney | 20.91 |
| Pitch factor | 1.0 | Pancreas | 22.07 |
| Beam width | 10mm(2x5mm) | Gall bladder | 21.06 |
| Gender | male | Stomach | 24.68 |
| Phantom | standard | Spleen | 21.09 |
| Scan range | Begin position: 1550 mm End position: 920 mm | Adrenals | 26.98 |
| AEC | OFF | Liver | 21.71 |
| Tube current | 200.0 mA | Heart | 22.18 |
| Optional Phantom | OFF | Lungs | 20.55 |
| CTDI Phantom Size | 22cm | Breast | 21.22 |
| | | Esophagus | 28.65 |
| | | Thymus | 22.02 |
| | | Thyroid | 49.73 |
| | | Salivary glands | 2.13 |
| | | Oral cavity | 1.30 |
| | | Out of Thorax | 0.35 |
| | | Lens | 0.19 |
| | | Brain | 0.24 |
| | | Lymphaden | 22.77 |
| | | Muscle | 14.32 |
| | | Skin | 12.34 |
| | | Bone | 20.69 |
| | | Active marrow | 17.69 |
| | | ED103: | 27.14 mSv |
| | | ED60: | 27.81 mSv |
| | | DLP: | 1293.10 mGy*cm |
| | | CTDIvol: | 19.59 mGy |

Register

Revise

Cancel

Fig. 3-6. Page for confirming the registered dose information

4. Dose calculation · registration using csv file

WAZA-ARiv2 can calculate and register multiple cases with different scanning condition by using a list file of csv format. Selecting "Calculation of dose with data in a csv file" on the Main menu (Fig. 4-1), the page for dose calculation and registration from csv file can will be shown as Fig. 4-2.

4.1. Dose calculation · registration using csv file

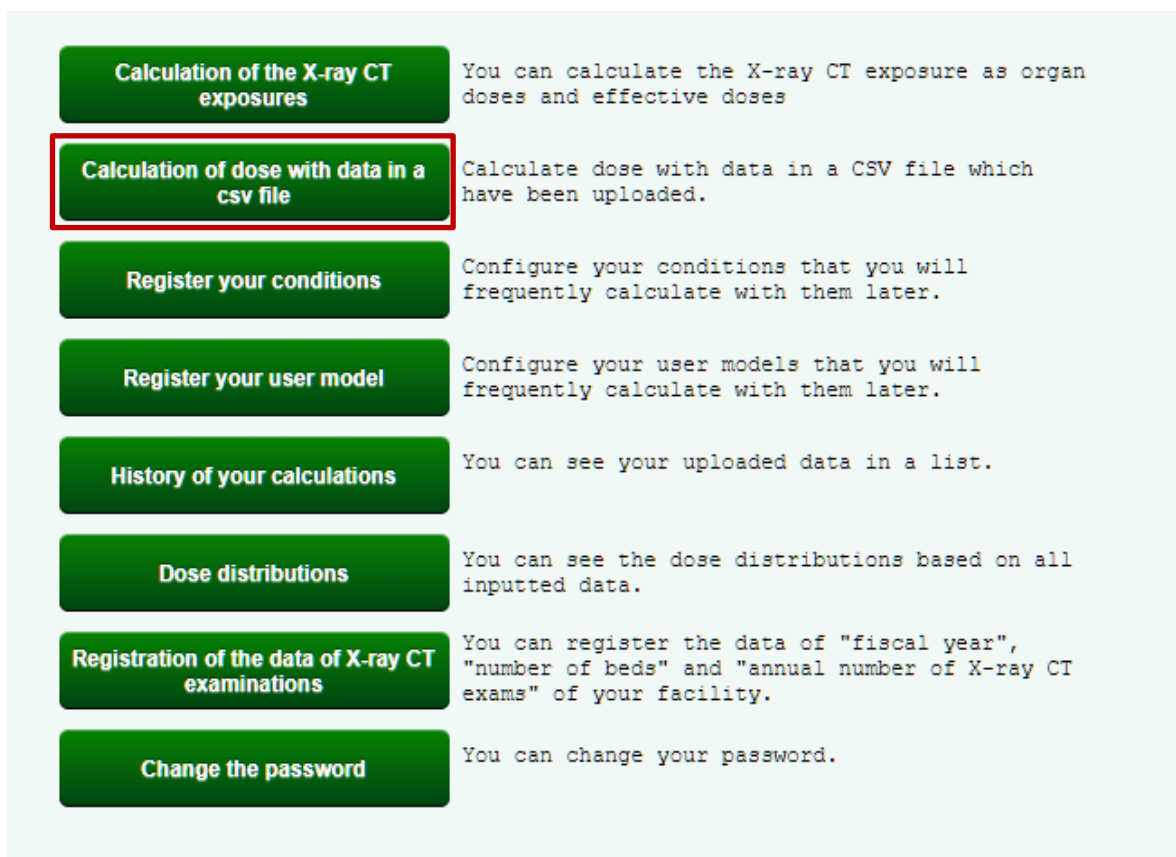


Fig. 4-1. Main menu (Calculation of dose with data in a csv file)

Calculation of dose with data in a csv file

Upload CSV file

選択されていません

Fig. 4-2. Page for calculation of dose with data in a csv file

Press to select the csv file and then press "Confirm data" button to check the content of upload data as it shown in Fig. 4-3. If any improper condition is included in the csv file, a warning message as shown in Fig. 4-4 will display and the upload process will stop.

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Log-out

Confirmation of your dose data to be registered

Please click the "Register" button if you would like to register your data shown below. If you would like to revise your data to be registered, please click "Revise" button. If you would like to cancel the registration, please click "Cancel" button.

| Condition Number | Date and Time | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation time | Pitch factor | Beam width | Gender | Phantom | Scan Begin position | Scan End position | ABC current | Tube current | Begin Position | End Position |
|------------------|---------------|-------------------------------|--------------|----------------------|--------|----------------|---------------|--------------|-------------------|--------|------------|---------------------|-------------------|-------------|--------------|----------------|--------------|
| 1 | 2019/4/1 0:00 | Chest(Chest-Pelvis (1-phase)) | Siemens | Sensation 64 | [Body] | 120 kV | 1 s | 1 | 15mm | male | Thin(-2SD) | 1500mm | 920mm | ON | 198 mA | 149 mA | |
| 2 | 2019/4/1 0:00 | Head(Head-Neck (1-phase)) | GE | Revolution CT | [Head] | 120 kV | 1.5 s | 1.2 | 25x0.625mm | female | Fat(+2SD) | 1505mm | 1510mm | OFF | 200 mA | | |
| 3 | 2019/4/1 0:00 | Neck(Head-Neck (1-phase)) | Canon | Aquilion ONE GENESIS | [Body] | 120 kV | 1 s | 1.2 | 220x0.5mm(Volume) | male | age:15 | 1525mm | 790mm | OFF | 180 mA | | |

Fig. 4-3. Confirmation of the registered dose information

Calculation of dose with data in a csv file

Upload CSV file

The csv file contains invalid data.

Line 1:
CT Scan type is not correct.

Line 2:
No available data of Scanner model(Revolution CT).

Line 3:
CT Scan type is not correct.

選択されていません

Fig. 4-4. Screenshot for confirmation of improperly registered scanning condition

4.2. List file of scanning condition

You can download a sample list file (csv file and Excel file) on the lower part of the Description section on the homepage for reference and create a scanning condition list file by yourself. The scanning condition list file is a csv format file which is separated by commas in the following order. It is recommended to create a csv file using the example of the Excel file.

| (Order of the scanning condition items) | Description |
|---|---|
| <<Date and Time>> , | : scan time (Ex : 2015/7/6 14:03) |
| <<CT scan type>> , | : scan type |
| <<Manufacturer>> , | : Manufacturer of CT scanner |
| <<Scanner model>> , | : Name of the CTs scanner |
| <<Filter>> , | : Filter corresponding to the size of FOV |
| <<Tube potential>> , | : Tube Voltage[kV] |
| <<Rotation time>> , | : Tube rotation time[s] |
| <<Pitch factor>> , | : Pitch factor |
| <<Beam width>> , | : Beam width |
| <<Gender>> , | : Gender (male or female) |
| <<Phantom>> , | : Type of phantom |
| <<Scan range Begin position>> , | : Scan range Begin position [mm] |
| << Scan range Begin position >> , | : Scan range Begin position [mm] |
| <<AEC>> , | : ON or OFF |
| <<Tube current>> , | : Input when AEC OFF |
| <<Begin position>> , | : Input when AEC ON |
| <<Za>> ,<<Zb>> ,<<Zc'>> , | : Input when AEC ON (Not necessary for Zc') |
| <<Zc>> ,<<Zd>> ,<<Ze>> , | : Input when AEC ON |
| <<End position>> , | : Input when AEC ON |
| <<Optional Phantom>> , | : ON or OFF |
| <<Height>> ,<<Weight>> , | : N/A |
| <<AP>> ,<<Lateral>> , | : N/A |
| <<CTDI Phantom Size>> , | : Phantom Size used for calculating dose index (16 or 32) |
| <<SSDE>> , | : ON or OFF |

5.The setting of user scanning condition

Five frequently used scanning conditions are allowed to registered for each user in WAZA-ARI.

5.1. The setting of user scanning condition

After clicking "Register your conditions" button on the Main menu (Fig. 5-1), page for condition registration as shown in Fig. 5-2 will be displayed.

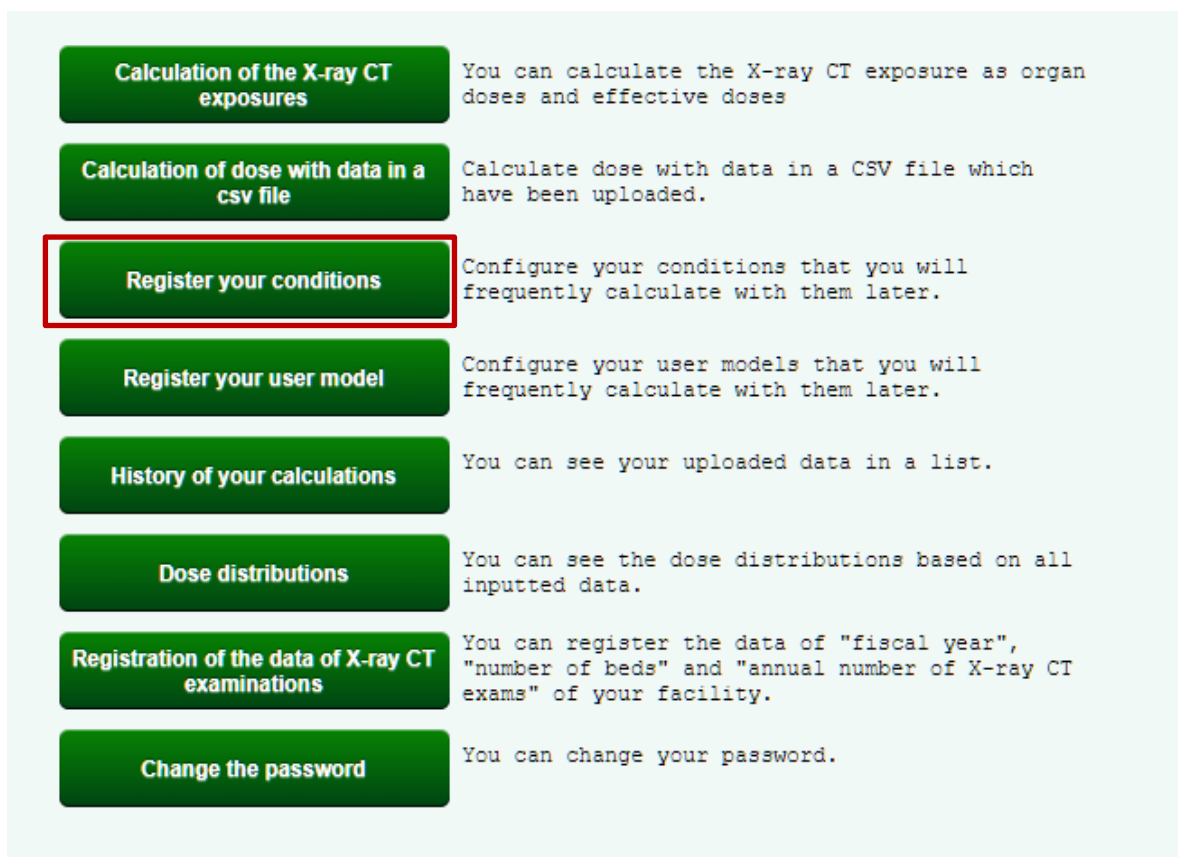


Fig. 5-1. Main menu (Register your conditions)

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User condition

①

②

Condition 1
Condition name
撮影条件1

Condition 2
Condition name
撮影条件2

Condition 3
Condition name

Condition 4
Condition name

Condition 5
Condition name

| Item name | Input value |
|-------------------|---|
| Manufacturer | Hitachi |
| / Scanner model | Supria Grande |
| Filter | Normal |
| Tube potential | 120 kV |
| Rotation time | 1.0 sec |
| Pitch factor | 1.0 (table feed per rotation / beam width) |
| Beam width | 10mm |
| Gender | male female |
| Phantom | standard |
| Scan type | すべて (すべて) |
| Scan range | Begin position: 1580 mm End position: 920 mm |
| AEC | on off |
| Tube current | 200.0 mA |
| Optional Phantom | off |
| CTDI Phantom Size | 16cm @ 32cm |

Register conditions

機能選択画面に戻る

Log-out

Fig. 5-2. Page for registering user scanning condition

Select the number of the scanning condition from the box ① shown in Fig. 5-2. Name of the scanning condition is required information. Fill the selected scanning condition shown in the box ②. All items are required item. After setting the scanning conditions, press "Register conditions" button and the window for confirmation will be displayed. Press the "Register" button to register if the conditions are correct.

5.2. Application of user scanning conditions

Choose the name of the scanning condition from the drop down list of "Condition name" in the upper left of Fig. 3-2 to apply the registered user scanning conditions for dose calculation.

6.Merge of dose calculation and calculation results

You can search, delete, merge, print, and export the dose calculation results in csv format in WAZA-ARiv2.

6.1. Search, print and delete of dose calculation history

6.1.1. Search of dose result from the history of your calculation

(1) Press "History of your calculation" button on the Main menu to go to the page of history of your calculations.

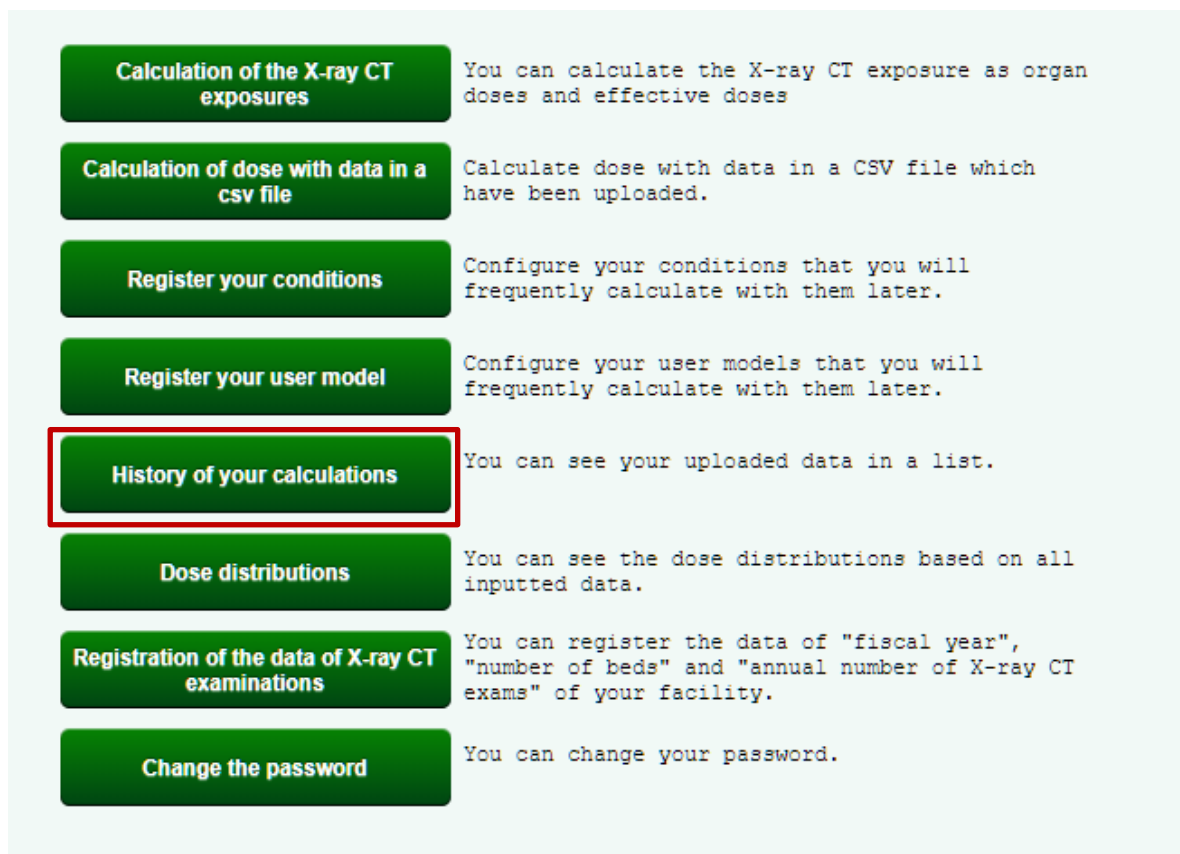


Fig. 6-1. Main menu (History of your calculation)

On the page of history of your calculation, ten cases of calculation results are displayed on each page. It is also possible to display the results for a limited period by specifying the date registered from "Period specified". You can delete, combine, and print only the selected result by ticking the check box on the left of each calculation result.

Waza-ari
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Log-out

History of your calculations

List to display
☒ by series ☐ by study

Search option: Period
☐ Whole period
☒ Specified period From To

Search **Back to the menu page**

<<First <Previous 10 cases **Next 10 cases** Last>> 1/2 pages

| Select for deletion | Date and Time | Study ID | Series ID | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation time | Pitch factor | Beam width | Gender | Phantom | Scan Begin position | Scan End position | ABC | Tube current Position |
|--------------------------|------------------|----------|-----------|-------------------------------|--------------|--------------------------|----------|----------------|---------------|--------------|----------------------|--------|------------|---------------------|-------------------|-----|-----------------------|
| <input type="checkbox"/> | 2015/12/06 15:12 | 00033160 | 00035251 | Pelvis[Pelvis] | GE | LightSpeed VCT | Small | 120.0 kV | 0.8 s | 1.0 | 20mm | male | age:5 | 640mm | 480mm | OFF | 440.0 mA |
| <input type="checkbox"/> | 2015/12/10 14:50 | 00033178 | 00035269 | Chest[Chest-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 0.8 s | 1.0 | 16x0.625mm | male | standard | 1449mm | 789mm | OFF | 200.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034218 | 00037144 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Standard | 80.0 kV | 1.0 s | 1.0 | 64x0.6mm(125x0.6) | male | standard | 1600mm | 1200mm | ON | 198.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034216 | 00037145 | Chest[Chest-Pelvis (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 120.0 kV | 1.5 s | 1.2 | 12x1.2mm | female | Thin(-2SD) | 1600mm | 1200mm | OFF | 200.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034217 | 00037146 | Neck[Neck-Pelvis (1-phase)] | GE | LightSpeed 16 | Large | 120.0 kV | 1.0 s | 1.2 | 20mm | male | age:10 | 1600mm | 1200mm | OFF | 201.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034227 | 00037170 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 100.0 kV | 1.0 s | 1.0 | 32x0.6mm(64x0.6) | male | standard | 1600mm | 1200mm | ON | 198.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034228 | 00037171 | Neck[Neck-Pelvis (1-phase)] | Canon | Aquilion ONE (TSK-901) | Large | 135.0 kV | 1.5 s | 1.2 | 2mmx4 (Conventional) | female | Thin(-2SD) | 1600mm | 1200mm | OFF | 200.0 mA |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034229 | 00037172 | Neck[Neck-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 1.0 s | 1.2 | 32x0.625mm | male | age:15 | 1600mm | 1200mm | OFF | 201.0 mA |
| <input type="checkbox"/> | 2015/04/01 00:00 | 00136271 | 00139823 | Chest[Chest-Pelvis (1-phase)] | Siemens | Sensation 64 | [Body] | 120.0 kV | 1.0 s | 1.0 | 18mm | male | Thin(-2SD) | 1580mm | 920mm | ON | 198.0 mA |
| <input type="checkbox"/> | 2015/04/01 00:00 | 00136272 | 00139824 | Head[Head-Neck (1-phase)] | GE | Revolution CT | [Head] | 120.0 kV | 1.5 s | 1.2 | 256x0.625mm | female | Fat(+2SD) | 1895mm | 1510mm | OFF | 200.0 mA |

export: [Print\(by selection\)](#) [Print](#) [CSV](#)

Fig. 6-2. Page of history of your calculation

6.1.2. Print

The registered dose information can be printed for preservation or distribution.

(1) To print only the selected calculation results, check the check box and select "Print (by selection)". Select "Print" to print all the search results displayed.

(2) The "scanning conditions", "Phantom simulation range", "Absorbed dose to organ" and "Effective dose" input to WAZA-ARI are printed as shown below.

Waza-ari

Input value

| | |
|-------------------|--|
| Manufacturer | GE |
| Scanner model | LightSpeed VCT |
| Filter | Small |
| Tube potential | 120.0 kV |
| Rotation time | 0.5 s |
| Pitch factor | 1.0 |
| Beam width | 20mm |
| Gender | male |
| Phantom age | 5 |
| Scan type | Head[Routine Head(non- helical)] |
| Scan range | 957 mm - 1098 mm |
| AEC | OFF |
| Tube current | 440.0 mA |
| Optional Phantom | OFF |
| CTDI Phantom Size | 16.0cm |

Results

| Organ/Tissue | Dose (mGy) | Organ/Tissue | Dose (mGy) | Organ/Tissue | Dose (mGy) | Organ/Tissue | Dose (mGy) |
|-----------------|------------|--------------|------------|-----------------|------------|---------------|------------|
| Gonad | 0.0 | Gall bladder | 0.04 | Breast | 0.18 | Lens | 37.37 |
| Prostate/uterus | 0.0 | Stomach | 0.06 | Esophagus | 0.66 | Brain | 36.34 |
| Urinary bladder | 0.0 | Spleen | 0.06 | Thymus | 0.5 | Lymphaden | 1.98 |
| Colon | 0.01 | Adrenals | 0.06 | Thyroid | 1.58 | Muscle | 2.35 |
| Small intestine | 0.01 | Liver | 0.08 | Salivary glands | 6.59 | Skin | 3.73 |
| Kidney | 0.03 | Heart | 0.22 | Oral cavity | 5.27 | Bone | 9.95 |
| Pancreas | 0.03 | Lungs | 0.46 | Out of Thorax | 18.35 | Active marrow | 11.35 |

ED103: 2.4 mSv

ED60: 1.91 mSv


DLP: 640.42 mGy*cm

CTDIvol: 45.42 mGy

Fig. 6-3. Preview of the print of dose calculation result

(3) After confirming the printed page, click  " for printing.

6.1.3. Export data in CSV format

The registered dose information can be used for detailed analysis with spreadsheet software such as excel. 

Press on the page of History of your calculation and specify the save destination for saving.

6.1.4. Delete dose calculation results

"Delete the marked data" button is not activated in the beginning.

(1) Tick the box "☑" on the left edge of the table and press "Delete the marked data" button to forward to the confirmation page.

Waza-ari

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History of your calculations

List to display
by series by study

Search option: Period
Whole period
Specified period From To

Search Back to the menu page

<<First <Previous 10 cases Next 10 cases Last>> 1/2 pages

| Select for deletion | Date and Time | Study ID | Series ID | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation P. time | fa |
|-------------------------------------|------------------|----------|-----------|-------------------------------|--------------|--------------------------|----------|----------------|------------------|----|
| <input type="checkbox"/> | 2018/12/06 15:12 | 00083160 | 00083261 | Pelvis(Pelvis) | GE | LightSpeed VCT | Small | 120.0 kV | 0.8 s | 1. |
| <input type="checkbox"/> | 2018/12/10 14:50 | 00083178 | 00083269 | Chest(Chest-Pelvis (1-phase)) | Phillips | Brilliance iCT | Large | 120.0 kV | 0.8 s | 1. |
| <input type="checkbox"/> | 2014/10/30 18:46 | 00083178 | 00087146 | Head(Head-Neck (1-phase)) | Siemens | Definition Flash(tube A) | Standard | 80.0 kV | 1.0 s | 1. |
| <input type="checkbox"/> | 2014/10/30 18:46 | 00083178 | 00087148 | Chest(Chest-Pelvis (1-phase)) | Siemens | Definition Flash(tube A) | Wide | 120.0 kV | 1.8 s | 1. |
| <input type="checkbox"/> | 2014/10/30 18:46 | 00084217 | 00087146 | Neck(Head-Neck (1-phase)) | GE | LightSpeed 16 | Large | 120.0 kV | 1.0 s | 1. |
| <input checked="" type="checkbox"/> | 2014/10/30 18:46 | 00083178 | 00087170 | Head(Head-Neck (1-phase)) | Siemens | Definition Flash(tube A) | Wide | 100.0 kV | 1.0 s | 1. |
| <input type="checkbox"/> | 2014/10/30 18:46 | 00084228 | 00087171 | Neck(Head-Neck (1-phase)) | Canon | Aquilion ONE(TSX-501) | Large | 138.0 kV | 1.8 s | 1. |
| <input type="checkbox"/> | 2014/10/30 18:46 | 00084229 | 00087172 | Neck(Head-Neck (1-phase)) | Phillips | Brilliance iCT | Large | 120.0 kV | 1.0 s | 1. |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00196271 | 00199823 | Chest(Chest-Pelvis (1-phase)) | Siemens | Sensation 64 | [Body] | 120.0 kV | 1.0 s | 1. |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00196272 | 00199824 | Head(Head-Neck (1-phase)) | GE | Revolution CT | [Head] | 120.0 kV | 1.8 s | 1. |

Delete the marked data Merge selected data

Confirmation of the data for the deletion

Please click the "Delete" button if you would like to delete your data shown below. If you would like to revise your data to be deleted, please click "Revise" button. If you would like to cancel the deletion, please click "Cancel" button.

Data to delete 1

| Item name | Condition | Input value |
|------------------------------|-----------|--|
| Date and Time | | 2014/10/30 18:46 |
| Scan type | | Chest(Chest-Pelvis (1-phase)) |
| Manufacturer / Scanner model | | Siemens Definition Flash(tube A) |
| Filter | | Wide |
| Tube potential | | 120.0 kV |
| Rotation time | | 1.8 s |
| Pitch factor | | 1.2 |
| Beam width | | 12x1.2mm |
| Gender | | female |
| Phantom | | Thin(+2SD) |
| Scan range | | Begin position 1600 mm End position 1200 mm |
| ABC | | OFF |
| Tube current | | 200.0 mA |
| Optional Phantom | | OFF |
| CTDI Phantom Size | | 32.0cm |

| Organ / Tissue | Dose(mGy) |
|-----------------|---------------|
| Head | 0.02 |
| Prostate/uterus | 0.01 |
| Urinary bladder | 0.02 |
| Colon | 0.12 |
| Small intestine | 0.10 |
| Esophagus | 1.46 |
| Pancreas | 0.88 |
| Gall bladder | 0.88 |
| Stomach | 1.69 |
| Spleen | 2.77 |
| Adrenals | 2.24 |
| Liver | 4.32 |
| Heart | 35.25 |
| Lungs | 35.55 |
| Breast | 24.01 |
| Esophagus | 37.28 |
| Thymus | 40.82 |
| Thyroid | 59.47 |
| Salivary glands | 35.74 |
| Oral cavity | 29.62 |
| Out of Thorax | 25.44 |
| Lens | 50.04 |
| Brain | 21.51 |
| Lymphaden | 9.18 |
| Heart | 9.88 |
| Spine | 9.16 |
| Bone | 29.19 |
| Active marrow | 14.07 |
| ED103 | 16.54 mSv |
| ED60 | 13.25 mSv |
| DLP | 984.14 mGy*cm |
| CTDIvol | 23.35 mGy |

Delete Revise Cancel

Fig. 6-4. Page of "History of your calculations" and "Confirmation of the data for deletion"

- (2) Press "Delete" button to delete the data after confirmation.
- (3) Press "Revise" to return to "History of your calculation".
- (4) Press "Cancel" button to return to Main menu.

*** Note: Deleted data cannot be recovered.**

6.2. Merge of the dose calculation result and dose evaluation for the same protocol

Study ID and Series ID are automatically assigned to the registered dose calculation results. Data for the same patient can be merged to the same Study ID and evaluated in WAZA-ARiv2.

6.2.1. Merge of the calculation results

Tick the box of the dose calculation result that you want to merge as shown in Fig. 6-5. The "Merge selected data" button will be active when more than one box was ticked. Press "Merge selected data" button to go to the confirmation page as shown in Fig. 6.6. Press "Merge" button and the Study ID of the selected dose calculation results will be unified as shown in Fig. 6-7.

| Select for deletion | Date and Time | Study ID | Series ID | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation time | Pitch factor | B |
|-------------------------------------|------------------|----------|-----------|-------------------------------|--------------|--------------------------|----------|----------------|---------------|--------------|--------|
| <input type="checkbox"/> | 2018/12/06 15:12 | 00033160 | 00035251 | Pelvis[Pelvis] | GE | LightSpeed VCT | Small | 120.0 kV | 0.5 s | 1.0 | 20mm |
| <input type="checkbox"/> | 2018/12/10 14:50 | 00033178 | 00035269 | Chest[Chest-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 0.5 s | 1.0 | 16x0.6 |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034215 | 00037144 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Standard | 80.0 kV | 1.0 s | 1.0 | 64x0.6 |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034216 | 00037145 | Chest[Chest-Pelvis (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 120.0 kV | 1.5 s | 1.2 | 12x1.2 |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034217 | 00037146 | Neck[Neck-Pelvis (1-phase)] | GE | LightSpeed 16 | Large | 120.0 kV | 1.0 s | 1.2 | 20mm |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034227 | 00037170 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 100.0 kV | 1.0 s | 1.0 | 32x0.6 |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034228 | 00037171 | Neck[Neck-Pelvis (1-phase)] | Canon | Aquilion ONE (TSX-301) | Large | 135.0 kV | 1.5 s | 1.2 | 2mmx4 |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034229 | 00037172 | Neck[Neck-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 1.0 s | 1.2 | 32x0.6 |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136271 | 00139823 | Chest[Chest-Pelvis (1-phase)] | Siemens | Sensation 64 | [Body] | 120.0 kV | 1.0 s | 1.0 | 18mm |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136272 | 00139824 | Head[Head-Neck (1-phase)] | GE | Revolution CT | [Head] | 120.0 kV | 1.5 s | 1.2 | 256x0. |

Delete the marked data
Merge selected data

Fig. 6-5. Page of history of your calculation (merge of the calculation results)


- A web-based CT dose calculator -
Log-out

Confirmation of the data for the merge

Please click the "Merge" button if you would like to merge your data shown below. If you would like to revise your data to be merged, please click "Revise" button. If you would like to cancel the merge, please click "Cancel" button.

Data to merge 1

| Item name | Input value |
|------------------------------|--|
| Date and Time | 2014/10/20 18:46 |
| Scan type | Head/Head-Neck (1-phase) |
| Manufacturer / Scanner model | Manufacturer: Siemens Scanner model: Definition Flash/tube A1 |
| Filter | Standard |
| Tube potential | 80.0 kV |
| Rotation time | 1.0 s |
| Pitch factor | 1.0 |
| Beam width | 64x0.6mm(128x0.6) |
| Gender | Male |
| Phantom | standard |
| Scan range | Begin position: 1600 mm End position: 1200 mm |
| AEC | OFF |
| Optional Phantom | OFF |
| CTDI Phantom Size | 32.0cm |

| Organ / Tissue/Dose(mSv) | Results |
|--------------------------|---------------|
| Skull | 0.0 |
| Frontal / Orbit | 0.01 |
| Orbitary | 0.02 |
| Chin | 1.29 |
| Small Intestine | 0.9 |
| Kidney | 3.23 |
| Pancreas | 4.73 |
| Gall bladder | 4.83 |
| Stomach | 4.93 |
| Spleen | 9.38 |
| Adrenals | 4.37 |
| Liver | 9.29 |
| Heart | 8.65 |
| Lungs | 9.18 |
| Esophagus | 5.47 |
| Thyroid | 4.64 |
| Thymus | 5.3 |
| Thyroid | 9.63 |
| Salivary glands | 0.88 |
| Oral cavity | 0.3 |
| Out of Thorax | 0.04 |
| Lens | 0.03 |
| Brain | 0.04 |
| Lymphaden | 1.81 |
| Muscle | 1.33 |
| Skin | 1.28 |
| Bone | 3.37 |
| Active marrow | 1.63 |
| ED103 | 3.11 mSv |
| ED60 | 2.61 mSv |
| ILP | 153.48 mSv*cm |
| CTDIvol | 3.64 mSv |

Data to merge 2

| Item name | Input value |
|------------------------------|--|
| Date and Time | 2014/10/20 18:46 |
| Scan type | Chest/Chest-Neck (1-phase) |
| Manufacturer / Scanner model | Manufacturer: Siemens Scanner model: Definition Flash/tube A1 |
| Filter | Wide |
| Tube potential | 120.0 kV |
| Rotation time | 1.5 s |
| Pitch factor | 1.2 |
| Beam width | 12x1.2mm |
| Gender | female |
| Phantom | Thin-25D |
| Scan range | Begin position: 1600 mm End position: 1200 mm |
| AEC | OFF |
| Tube currents | 200.0 mA |
| Optional Phantom | OFF |
| CTDI Phantom Size | 32.0cm |

| Organ / Tissue/Dose(mSv) | Results |
|--------------------------|---------------|
| Skull | 0.0 |
| Frontal / Orbit | 0.01 |
| Orbitary | 0.02 |
| Chin | 0.12 |
| Small Intestine | 0.13 |
| Kidney | 1.44 |
| Pancreas | 0.88 |
| Gall bladder | 0.83 |
| Stomach | 1.68 |
| Spleen | 2.77 |
| Adrenals | 2.24 |
| Liver | 4.32 |
| Heart | 18.29 |
| Lungs | 10.58 |
| Esophagus | 24.01 |
| Thyroid | 37.29 |
| Thymus | 40.62 |
| Thyroid | 33.47 |
| Salivary glands | 16.74 |
| Oral cavity | 23.62 |
| Out of Thorax | 18.64 |
| Lens | 10.04 |
| Brain | 11.81 |
| Lymphaden | 9.12 |
| Muscle | 8.93 |
| Skin | 9.14 |
| Bone | 23.13 |
| Active marrow | 14.07 |
| ED103 | 13.66 mSv |
| ED60 | 13.25 mSv |
| ILP | 934.14 mSv*cm |
| CTDIvol | 23.35 mSv |

Data to merge 3

| Item name | Input value |
|------------------------------|--|
| Date and Time | 2014/10/20 18:46 |
| Scan type | Head/Head-Neck (1-phase) |
| Manufacturer / Scanner model | Manufacturer: Siemens Scanner model: Definition Flash/tube A1 |
| Filter | Wide |
| Tube potential | 100.0 kV |
| Rotation time | 1.0 s |
| Pitch factor | 1.0 |
| Beam width | 32x0.6mm(64x0.6) |
| Gender | Male |
| Phantom | standard |
| Scan range | Begin position: 1600 mm End position: 1200 mm |
| AEC | OFF |
| Optional Phantom | OFF |
| CTDI Phantom Size | 32.0cm |

| Organ / Tissue/Dose(mSv) | Results |
|--------------------------|---------------|
| Skull | 0.0 |
| Frontal / Orbit | 0.06 |
| Orbitary | 0.1 |
| Chin | 0.72 |
| Small Intestine | 2.47 |
| Kidney | 9.68 |
| Pancreas | 14.04 |
| Gall bladder | 14.04 |
| Stomach | 15.93 |
| Spleen | 14.83 |
| Adrenals | 13.68 |
| Liver | 16.16 |
| Heart | 14.73 |
| Lungs | 14.78 |
| Esophagus | 9.88 |
| Thyroid | 14.24 |
| Thymus | 18.66 |
| Thyroid | 21.14 |
| Salivary glands | 1.7 |
| Oral cavity | 0.96 |
| Out of Thorax | 0.23 |
| Lens | 0.11 |
| Brain | 0.14 |
| Lymphaden | 4.33 |
| Muscle | 9.62 |
| Skin | 9.18 |
| Bone | 9.13 |
| Active marrow | 5.02 |
| ED103 | 8.88 mSv |
| ED60 | 8.07 mSv |
| ILP | 451.46 mSv*cm |
| CTDIvol | 11.29 mSv |

Merge
Revise
Cancel

Fig. 6-6. Page for confirming the merged data

| Select for deletion | Date and Time | Study ID | Series ID | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation time | Pitch factor | |
|-------------------------------------|------------------|----------|-----------|-------------------------------|--------------|--------------------------|----------|----------------|---------------|--------------|------|
| <input type="checkbox"/> | 2018/12/06 15:12 | 00033160 | 00035251 | Pelvis[Pelvis] | GE | LightSpeed VCT | Small | 120.0 kV | 0.5 s | 1.0 | 20mm |
| <input type="checkbox"/> | 2018/12/10 14:50 | 00033178 | 00035269 | Chest[Chest-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 0.5 s | 1.0 | 16x |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034215 | 00037144 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Standard | 80.0 kV | 1.0 s | 1.0 | 64x |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034216 | 00037145 | Chest[Chest-Pelvis (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 120.0 kV | 1.5 s | 1.2 | 12x |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034217 | 00037146 | Neck[Neck-Pelvis (1-phase)] | GE | LightSpeed 16 | Large | 120.0 kV | 1.0 s | 1.2 | 20mm |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00034227 | 00037170 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 100.0 kV | 1.0 s | 1.0 | 32x |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034228 | 00037171 | Neck[Neck-Pelvis (1-phase)] | Canon | Aquilion ONE (TSX-301) | Large | 135.0 kV | 1.5 s | 1.2 | 2mm |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034229 | 00037172 | Neck[Neck-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 1.0 s | 1.2 | 32x |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136271 | 00139823 | Chest[Chest-Pelvis (1-phase)] | Siemens | Sensation 64 | [Body] | 120.0 kV | 1.0 s | 1.0 | 18mm |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136272 | 00139824 | Head[Head-Neck (1-phase)] | GE | Revolution CT | [Head] | 120.0 kV | 1.5 s | 1.2 | 256x |



| Select for deletion | Date and Time | Study ID | Series ID | Scan type | Manufacturer | Scanner model | Filter | Tube potential | Rotation time | Pitch factor | |
|-------------------------------------|------------------|----------|-----------|-------------------------------|--------------|--------------------------|----------|----------------|---------------|--------------|------|
| <input type="checkbox"/> | 2018/12/06 15:12 | 00033160 | 00035251 | Pelvis[Pelvis] | GE | LightSpeed VCT | Small | 120.0 kV | 0.5 s | 1.0 | 20mm |
| <input type="checkbox"/> | 2018/12/10 14:50 | 00033178 | 00035269 | Chest[Chest-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 0.5 s | 1.0 | 16x |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00033178 | 00037144 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Standard | 80.0 kV | 1.0 s | 1.0 | 64x |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00033178 | 00037145 | Chest[Chest-Pelvis (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 120.0 kV | 1.5 s | 1.2 | 12x |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034217 | 00037146 | Neck[Neck-Pelvis (1-phase)] | GE | LightSpeed 16 | Large | 120.0 kV | 1.0 s | 1.2 | 20mm |
| <input checked="" type="checkbox"/> | 2014/10/30 15:46 | 00033178 | 00037170 | Head[Head-Neck (1-phase)] | Siemens | Definition Flash(tube A) | Wide | 100.0 kV | 1.0 s | 1.0 | 32x |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034228 | 00037171 | Neck[Neck-Pelvis (1-phase)] | Canon | Aquilion ONE (TSX-301) | Large | 135.0 kV | 1.5 s | 1.2 | 2mm |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00034229 | 00037172 | Neck[Neck-Pelvis (1-phase)] | Philips | Brilliance iCT | Large | 120.0 kV | 1.0 s | 1.2 | 32x |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136271 | 00139823 | Chest[Chest-Pelvis (1-phase)] | Siemens | Sensation 64 | [Body] | 120.0 kV | 1.0 s | 1.0 | 18mm |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136272 | 00139824 | Head[Head-Neck (1-phase)] | GE | Revolution CT | [Head] | 120.0 kV | 1.5 s | 1.2 | 256x |

Fig. 6-7. Change of the Study ID after merging data

6.2.2. Dose evaluation for the same study (patient)

You can search dose data in the history of your calculations and have the results displayed with the unit of Study ID by choosing list to display "by study" as it shown in Fig. 6-8. In that case, the organ dose for the same ID will be summed automatically for evaluation and the column of the scanning conditions will not be displayed.

Waza-ari

- A web-based CT dose calculator -

Log-out

History of your calculations

List to display
☒ by series ☐ by study

Search option: Period
☐ Whole period
☒ Specified period From 2014/05/08 To 2020/02/11

Search

Back to the menu page

<<First

<Previous 10 cases

Next 10 cases>

Last>>

1/2 pages

| Select for deletion | Date and Time | Study ID | Series ID | Gonad | Prostate/uterus/bladder | Colon | Small intestine | Kidney | Pancreas | Gall bladder | Stomach | Spleen | Adrenals | Liver | Heart | Lungs | Breast | Esophagus | Thymus | Thyroid | Salivary glands | Other | |
|--------------------------|------------------|----------|--|-------|-------------------------|-------|-----------------|--------|----------|--------------|---------|--------|----------|-------|-------|-------|--------|-----------|--------|---------|-----------------|-------|------|
| <input type="checkbox"/> | 2018/12/06 15:12 | 00039160 | 00035251 | 45.13 | 42.2 | 42.3 | 28.27 | 30.18 | 4.39 | 3.68 | 3.45 | 1.78 | 1.11 | 1.05 | 1.45 | 0.34 | 0.19 | 0.15 | 0.22 | 0.1 | 0.04 | 0.01 | 0.01 |
| <input type="checkbox"/> | 2014/10/30 15:46 | 00039178 | 00032629; 00037144; 00037145; 00037170; 00149284; 00149285; 00149286 | 29.87 | 19.82 | 23.5 | 29.6 | 28.06 | 37.49 | 43.01 | 42.79 | 45.55 | 46.78 | 39.87 | 48.2 | 79.59 | 72.66 | 53.66 | 68.99 | 72.27 | 89.71 | 38.29 | 31.0 |
| <input type="checkbox"/> | 2014/10/15:46 | 00034217 | 00037146 | 0.0 | 0.0 | 0.0 | 0.01 | 0.01 | 0.03 | 0.04 | 0.06 | 0.06 | 0.08 | 0.06 | 0.1 | 0.34 | 0.66 | 0.19 | 1.61 | 1.21 | 5.41 | 35.19 | 30.0 |
| <input type="checkbox"/> | 2014/10/15:46 | 00034228 | 00037171 | 0.05 | 0.04 | 0.05 | 0.27 | 0.3 | 3.25 | 2.23 | 1.93 | 3.82 | 6.22 | 5.07 | 9.77 | 85.55 | 82.47 | 64.39 | 81.02 | 91.41 | 133.02 | 85.28 | 69.6 |
| <input type="checkbox"/> | 2014/10/15:46 | 00034229 | 00037172 | 0.0 | 0.0 | 0.01 | 0.15 | 0.21 | 0.71 | 0.92 | 1.49 | 2.22 | 1.89 | 2.14 | 2.79 | 19.09 | 18.21 | 15.69 | 17.06 | 21.28 | 33.6 | 27.89 | 27.8 |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136271 | 00139923 | 13.01 | 19.22 | 23.94 | 28.94 | 28.98 | 29.99 | 30.42 | 29.83 | 31.65 | 31.92 | 26.87 | 30.16 | 28.01 | 27.06 | 19.88 | 28.88 | 25.93 | 27.9 | 1.97 | 0.89 |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136272 | 00139924 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.01 | 0.01 | 0.0 | 0.01 | 0.02 | 0.01 | 0.02 | 0.08 | 0.12 | 0.03 | 0.17 | 0.11 | 0.8 | 17.04 | 8.7 |
| <input type="checkbox"/> | 2019/04/01 00:00 | 00136278 | 00139925 | 12.01 | 10.17 | 10.99 | 12.63 | 11.93 | 11.97 | 11.14 | 11.56 | 12.18 | 11.42 | 11.1 | 12.06 | 12.4 | 11.65 | 9.89 | 11.59 | 12.38 | 18.89 | 14.53 | 15.1 |
| <input type="checkbox"/> | 2019/10/04 07:00 | 00137100 | 00140652 | 6.94 | 9.55 | 11.89 | 11.17 | 11.34 | 9.75 | 9.66 | 9.55 | 10.29 | 9.7 | 8.04 | 9.94 | 8.72 | 8.41 | 6.1 | 7.59 | 8.2 | 11.3 | 0.6 | 0.38 |
| <input type="checkbox"/> | 2019/10/04 07:03 | 00137101 | 00140653 | 6.63 | 9.67 | 12.06 | 14.26 | 14.71 | 14.61 | 14.56 | 14.21 | 15.2 | 14.8 | 12.7 | 14.47 | 14.46 | 14.04 | 10.18 | 12.67 | 13.45 | 17.14 | 0.79 | 0.5 |

Delete the marked data

Merge selected data

export: [Print\(by selection\)](#) [Print](#) [CSV](#)

Fig. 6-8. Page for history of your calculation (displayed with history for the same study ID)

7. User model

Under construction

8. Confirmation of dose distribution

You can review all registered calculation results using this function. Accordingly, print, delete and exportation of the registered data are also available. Pressing "Dose distributions" button on the Main menu (Fig. 8-1) to go to the page of "Register the number of X-ray CT examination".

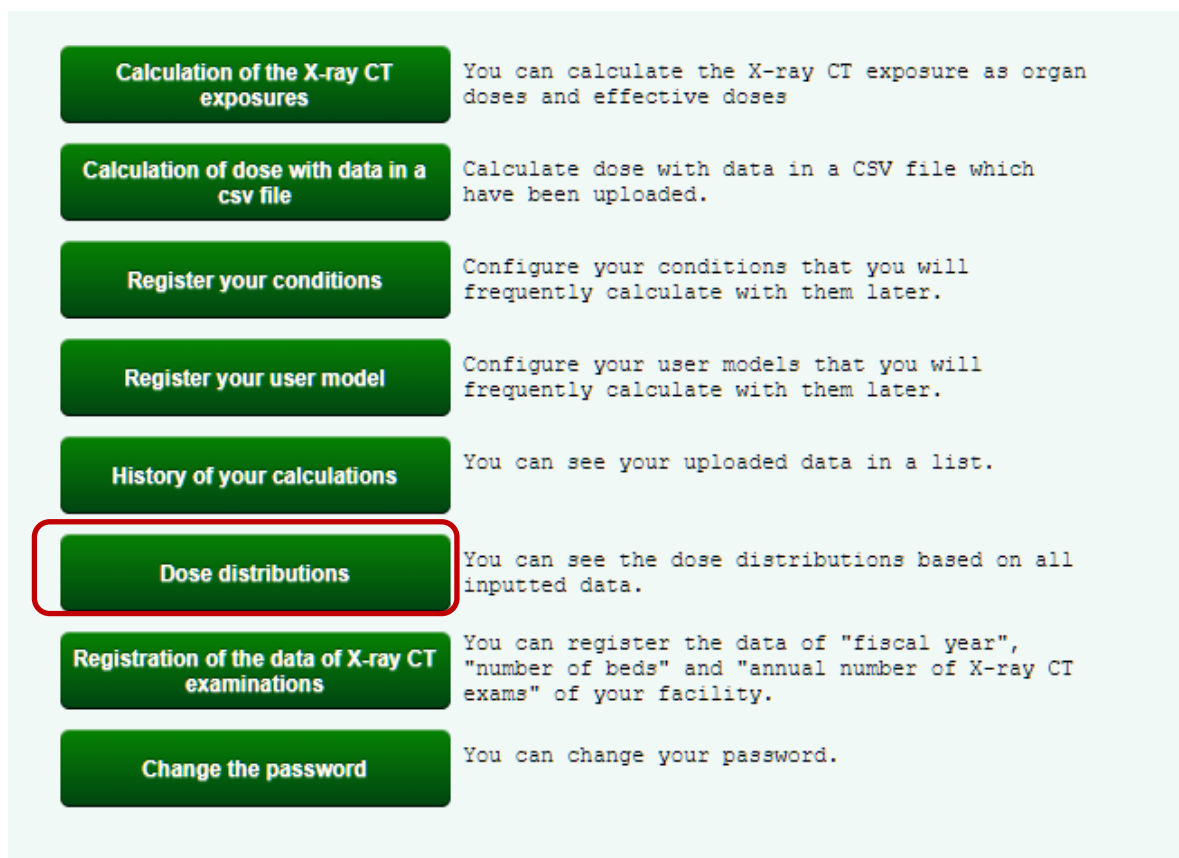


Fig. 8-1 Main menu (Dose distributions)

Specify each condition on the page for displaying in dose distribution (Fig. 8-2) and press "Show the graph" button to check browse dose distribution of registered data as a histogram. (Fig. 8-3 and Fig. 8-4).

If you choose "All facilities" for the data for the search you will see light green and dark green in your graph and the meaning is as follows,

Light green: All the dose data in the WAZA-ARiv2

Dark green: Dose data registered by your institution

Accordingly, median of each data is displayed as the statistical level value of the histogram.

You can specify the tissue types and CT examination type of dose information to display. If you want to specify more than one type, press "Ctrl" on the keyboard while you select.

The screenshot shows the 'Dose distributions' page of the Waza-ari web-based CT dose calculator. The page has a light green background and a 'Log-out' button in the top right corner. The main heading is 'Dose distributions'. Below it, the section 'Specify range of display?' contains several form fields:

- List to display:** Two radio buttons, 'by series' (selected) and 'by study'.
- Fiscal year:** A dropdown menu showing '2019'.
- Nation:** A dropdown menu showing 'Japan'.
- Data for the search:**
 - Radio button 'All facilities' (selected).
 - Radio button 'Specify the name of medical facility'.
 - Kind of facility:** A dropdown menu with options: 'All', 'Hospital(National)', and 'Hospital(Public)'.
- Phantom:**
 - Radio button 'All facilities' (selected).
 - Radio button 'Limit type to:'.
 - Type:** A dropdown menu showing '-select-'.
- Item name of dose data:** A dropdown menu showing 'ED103'.
- Type of CT exams:** A dropdown menu with options: 'All[All]', 'Head[Face/Orbits/Sinus]', and 'Head[Head-Neck CTA]'.
- Search option:**
 - Radio button 'No' (selected).
 - Radio button 'Yes'.
 - Fields for 'Minimum:', 'Maximum:', and 'Step:'.
 - Radio buttons 'Absolute' (selected) and 'Relative'.

At the bottom of the form, there are two green buttons: 'Show the graph' and 'Back to the menu page'.

Fig. 8-2 Page for specifying the information of dose distribution

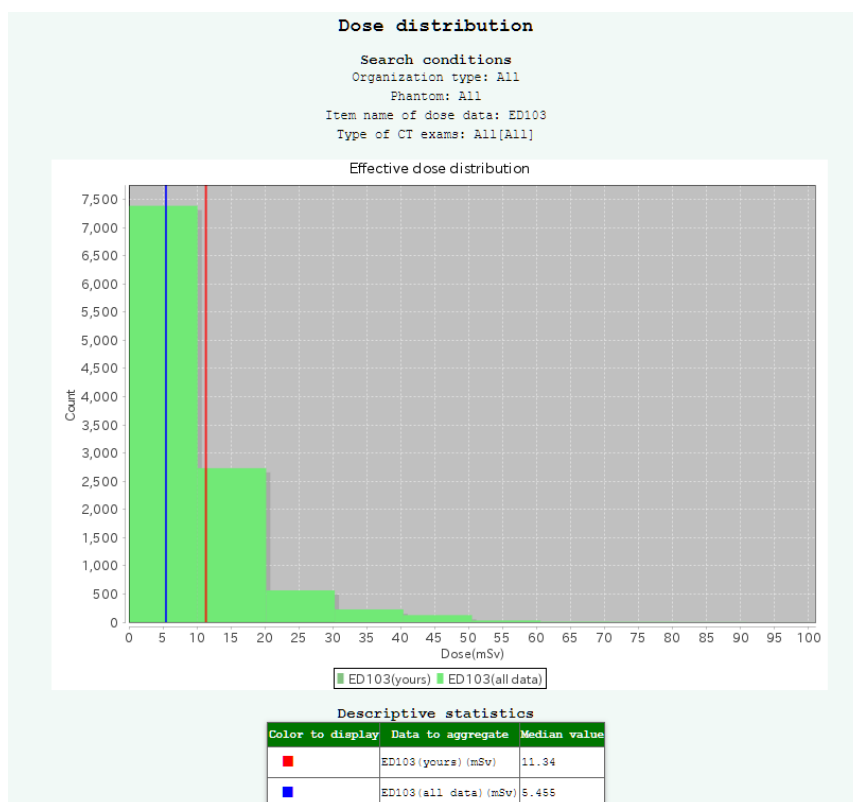


Fig. 8-3 Histogram of dose distribution (Absolute)

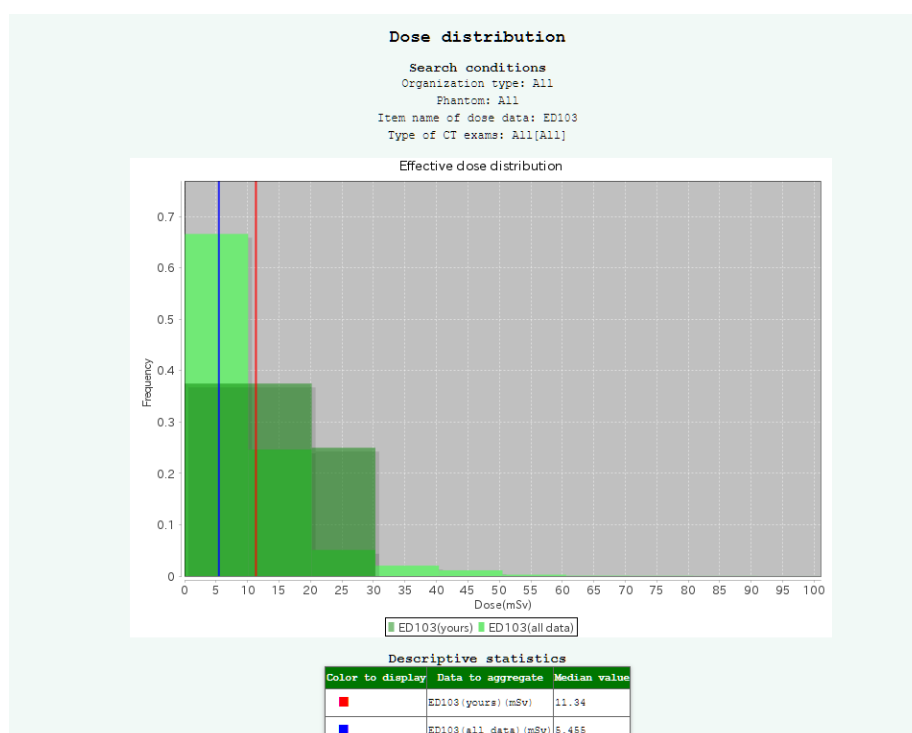


Fig. 8-4 Histogram of dose distribution (Relative)

9. Dose calculation method

9.1. Construction of organ dose database for each CT source data

WAZA-ARI calculates exposure dose using organ dose database for each CT model, tube voltage, Bow-tie filter, and phantom. This organ dose database is constructed using general-purpose particle / heavy ion transport calculation codes PHITS developed by the JAEA and various human Voxel phantoms.

After measuring source data (such as HVL and dose distribution) for each CT model, tube voltage, Bow-tie filter and collimation X-ray energy spectrum and generation distribution are modeled based on the measurement, and the model is implemented into PHITS as an X-ray source. Accordingly, using PHITS and the human body voxel phantom to calculate dose to each organ for each slice of phantom. [1,2]

In PHITS, absorbed dose to organ T per generated photon at slice k $qD(T, k)$ [mGy / photon] and air kerma at the center of rotation per generated photon qK_{air} [mGy / photon] ($=CTDI_{free\ air}$ per generated photon) are calculated for each CT model, tube voltage, Bow-tie filter, and phantom and implemented in WAZA-ARI system as described above. Absorbed dose to organ T at k -th slice $_nD(T, k)$ [mGy / mGy] per $CTDI_{free\ air}$ is then calculated by

$$_nD(T, k) = \frac{qD(T, k)}{qK_{air}}.$$

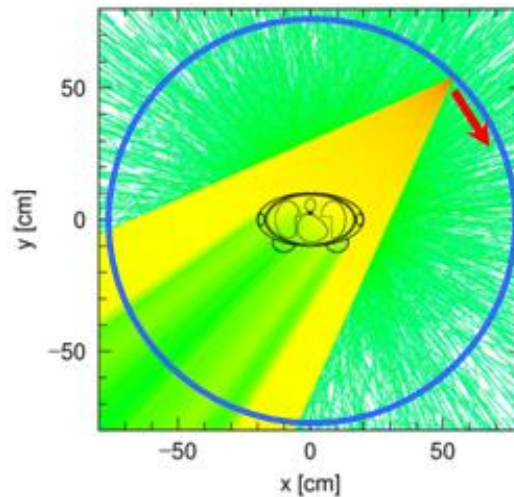


Fig. 9-1. Example of how X-ray emitted from CT device using PHITS

In WAZA-ARI, CT models with similar beam quality and dose distribution are calculated using the same source data while dose information such as $CTDI_w$ and $CTDI_{free\ air}$ are referring the nominal values of each model.

9.2. Organ dose database and the computable range

Organ dose database is the calculated radiation dose data for each organ within an interval of 5 mm (= 1 slice). Table 9-1 shows the content of organ dose database.

Table 9-1 Content of organ dose database

| Phantom | Male | Female |
|-------------------|-------------------------|-------------------------|
| standard | | |
| Fat(+2SD) | 0 – 1835 (367 slice) | 0 – 1666 (334 slice) |
| Fat(+5SD) | | |
| Thin(-2SD) | | |
| age:0 | 0 - 475 mm (95 slice) | 0 - 475 mm (95 slice) |
| age:1 | 0 - 765 mm (153 slice) | 0 - 765 mm (153 slice) |
| age:5 | 0 - 1105 mm (221 slice) | 0 - 1105 mm (221 slice) |
| age:10 | 0 – 1400 mm (280 slice) | 0 – 1400 mm (280 slice) |
| age:15 | 0 – 1660 mm (332 slice) | 0 – 1615 mm (323 slice) |

9.3. Parameter and data for dose calculation

Organ dose calculation for each scanning condition needs the following parameter.

Beginning position z_{start} [mm] and the end position z_{end} [mm] of scan

Tube current I [mA]

Rotation time t [s]

Beam pitch pit [-]

normalized CTDI free air ${}_nCTDI_{free\ air}$ [mGy/mAs]

${}_nCTDI_{free\ air}$ means CTDI free air per mAs which varies with tube current, Bow-tie filter and beam width.

normalized Weighted CTDI ${}_nCTDI_w$ [mGy/mAs]

$CTDI_w$ is the summation of weighted central dose in CTDI phantom (16 cm ϕ for head and 32 cm ϕ for body) $CTDI_{center}$ and the peripheral dose in CTDI phantom $CTDI_{peripheral}$.

$$CTDI_w = \frac{1}{3}CTDI_{center} + \frac{2}{3}CTDI_{peripheral} \quad (1)$$

${}_nCTDI_w$ is $CTDI_w$ per mAs and it varies with tube voltage and beam width.

9.4. Calculation of organ dose

AEC (Auto Exposure Control) : off

Couch movement during one rotation of the beam is $w \cdot pit$, and irradiated area is equal to the beam width w during one rotation. Therefore, percentage of the body surface with incident of primary X-rays can be expressed as follows.

$$\frac{w}{w \cdot pit} = \frac{1}{pit}$$

$\frac{1}{pit} > 1$ means that this part is multiple irradiations.

Irradiation of k th slice results in dose for the organ $TD(T, k)$ [mGy] is as follows

$$D(T, k)[\text{mGy}] = {}_nD(T, k)[\text{mGy/mGy}] \cdot {}_nCTDI_{free\ air}[\text{mGy/mAs}] \cdot \frac{I \cdot t}{pit}[\text{mAs}] \quad (2)$$

${}_nD(T, k)$ is pre-calculated for different CT scanner, tube voltage, Bow-tie filter and phantom with an interval $\Delta s = 5 \text{ mm}$.

As shown in Fig 9-2, absorbed dose D to tissue T $D(T)$ that located in scanning range of $z_{start} \sim z_{end}$ ($z_{start} < z_{end}$) [mm] is calculated as follows.

$$D(T) = \int_{z_{start}}^{z_{end}} \frac{D(T, k)}{\Delta s} dz = \frac{z_{i+1} - z_{start}}{\Delta s} D(T, i) + \sum_{k=i+1}^{j-1} D(T, k) + \frac{z_{end} - z_j}{\Delta s} D(T, j) \quad (3)$$

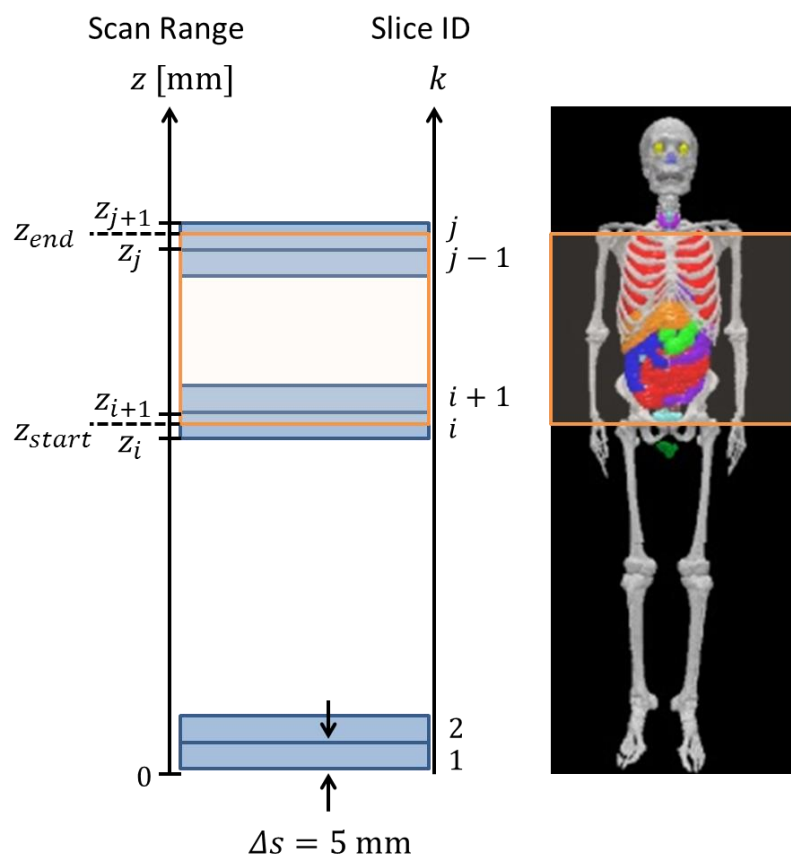


Fig 9-2. Relationship between the scanning range of $z_{start} \sim z_{end}$ and organ dose data for k th slice

AEC (Auto Exposure Control) : on

When AEC function is on, it is assumed that tube current I [mA] changes according to z-coordinate of the irradiation position as shown in Fig. 9-3. Tube current values $I_{start}, I_{end}, I_a, I_b, I_{c'} (= I_b), I_c, I_d, I_e$ corresponding to the beginning/end position of scanning z_{start}, z_{end} and boundary position $z_a, z_b, z_{c'}, z_c, z_d, z_e$ can be specified by the user. Tube current at the center of each slice I_k ($\Delta s = 5$ mm) within the scanning range is calculated based on the tube voltage. Boundary positions are shown in Table 9-2 and Table 9-3.

When the coordinates $z_k + \frac{\Delta s}{2}$ of the center of the k-th slice are between adjacent boundary positions z_l, z_m , tube current I_k is expressed by linear interpolation as shown in the following formula.

$$I_k = I_l + \frac{I_m - I_l}{z_m - z_l} \left(z_k + \frac{\Delta s}{2} - z_l \right) \quad \left(z_l < z_k + \frac{\Delta s}{2} < z_m \right) \quad (4)$$

On the assumption that I_k is constant within each slice, absorbed dose D to organ T from the irradiation of the kth slice $D(T, k)$ is calculated as follows.

$$D(T, k)[\text{mGy}] = {}_nD(T, k)[\text{mGy/mGy}] \cdot {}_nCTDI_{free\ air}[\text{mGy/mAs}] \cdot \frac{I_k \cdot t}{pit} [\text{mAs}] \quad (5)$$

Absorbed dose to tissue T $D(T)$ within the scan area is calculated by Eq. (6).

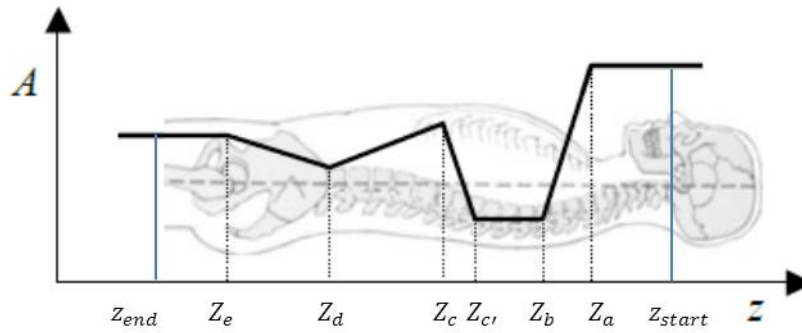


Fig. 9-3. Change of tube current when AEC is on

Table 9-2 Boundary for male phantom when using AEC calculation

| z | Anatomical definition | Adult male [mm] | 0-year-old boy [mm] | 1-year-old boy [mm] | 5-year-old boy [mm] | 10-year-old boy [mm] | 15-year-old boy [mm] |
|------------------|----------------------------------|--------------------|------------------------|------------------------|------------------------|-------------------------|-------------------------|
| Z_a | First slice of lung apex | 1542.5 | 337.5 | 575.5 | 885.5 | 1156.5 | 1394.5 |
| Z_b | Trachea | 1452.5 | 319.5 | 550.5 | 843.5 | 1100.5 | 1324.5 |
| $Z_{c'}$ | | 1322.5 | 297.5 | 493.5 | 774.5 | 1019.5 | 1190.5 |
| $(Z_{c'} - Z_c)$ | | (50) | (20) | (20) | (20) | (20) | (20) |
| | Hepatic portal section | | | | | | |
| Z_c | (Last slice for left lung field) | 1272.5 | 277.5 | 473.5 | 754.5 | 999.5 | 1170.5 |
| Z_d | Upper margin of iliac | 1150.5 | 200.5 | 377.5 | 614.5 | 823.5 | 1010.5 |
| Z_e | Upper margin of pubis | 987.5 | 164.5 | 306.5 | 517.5 | 686.5 | 849.5 |

Table 9-3 Boundary for male phantom when using AEC calculation

| z | Anatomical definition | Adult female [mm] | 0-year-old girl [mm] | 1-year-old girl [mm] | 5-year-old girl [mm] | 10-year-old girl [mm] | 15-year-old girl [mm] |
|------------------|----------------------------------|----------------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|
| Z_a | First slice of lung apex | 1404.5 | 337.5 | 575.5 | 885.5 | 1156.5 | 1345.5 |
| Z_b | Trachea | 1311.5 | 319.5 | 550.5 | 843.5 | 1100.5 | 1269.5 |
| $Z_{c'}$ | | 1181.5 | 297.5 | 493.5 | 774.5 | 1019.5 | 1164.5 |
| $(Z_{c'} - Z_c)$ | | (50) | (20) | (20) | (20) | (20) | (20) |
| | Hepatic portal section | | | | | | |
| Z_c | (Last slice for left lung field) | 1131.5 | 277.5 | 473.5 | 754.5 | 999.5 | 1144.5 |
| Z_d | Upper margin of iliac | 1028.5 | 200.5 | 377.5 | 614.5 | 823.5 | 975.5 |
| Z_e | Upper margin of pubis | 861.5 | 164.5 | 306.5 | 517.5 | 686.5 | 818.5 |

9.5. Calculation of dose index

WAZA-ARI calculates DLP (Dose Length Product) and averaged $CTDI_{vol}$ for the scanning area as dose indexes.

AEC (Auto Exposure Control) : off

$$CTDI_{vol}[\text{mGy}] = {}_nCTDI_w \cdot \frac{I \cdot t}{pit}$$

$$DLP[\text{mGy} \cdot \text{cm}] = CTDI_{vol}[\text{mGy}] \cdot (z_{end} - z_{start}) [\text{mm}] \cdot \frac{1}{10} \left[\frac{\text{cm}}{\text{mm}} \right]$$

AEC (Auto Exposure Control) : on

$CTDI_{vol}$ for k th slice $CTDI_{vol}(k)$ is expressed as:

$$CTDI_{vol}(k)[\text{mGy}] = Rel_CTDI \cdot {}_nCTDI_w \cdot \frac{I_k \cdot t}{pit}$$

When the scanning range is between $z_{start} \sim z_{end}$ ($z_{start} < z_{end}$) shown in Fig 9-2, DLP [$\text{mGy} \cdot \text{cm}$] can be expressed as

$$DLP[\text{mGy} \cdot \text{cm}] = \left\{ (z_{i+1} - z_{start}) \cdot CTDI_{vol}(i) + \Delta s \cdot \sum_{k=i+1}^{j-1} CTDI_{vol}(k) + (z_{end} - z_j) \cdot CTDI_{vol}(j) \right\} [\text{mGy} \cdot \text{mm}] \cdot \frac{1}{10} [\text{cm/mm}]$$

Averaged $CTDI_{vol}$ [mGy] can be expressed as:

$$CTDI_{vol}[\text{mGy}] = \frac{DLP[\text{mGy} \cdot \text{cm}]}{(z_{end} - z_{start})[\text{mm}]} \cdot 10[\text{mm/cm}]$$

SSDE (Size-specific Dose Estimates) : on

SSDE is a dose index proposed to correct the uncertainty of $CTDI_{vol}$. WAZA-ARiv2 calculates SSDE by using the conversion factors, i.e. f_{size}^{16} or f_{size}^{32} , and the following formula proposed in AAPM report TG204 [7].

If $CTDI_{vol}$ was calculated based on a 32 cm CTDI phantom:

$$SSDE = f_{size}^{32} \times CTDI_{vol}^{32} [\text{mGy}]$$

If $CTDI_{vol}$ was calculated based on a 16 cm CTDI phantom:

$$SSDE = f_{size}^{16} \times CTDI_{vol}^{16} [\text{mGy}]$$

Table 9-4 Conversion factor f_{size}^{32} as a function of effective diameter

| Effective diameter | Conversion factor | Effective diameter | Conversion factor | Effective diameter | Conversion factor |
|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| 8 | 2.76 | 21 | 1.71 | 34 | 1.06 |
| 9 | 2.66 | 22 | 1.65 | 35 | 1.02 |
| 10 | 2.57 | 23 | 1.59 | 36 | 0.99 |
| 11 | 2.47 | 24 | 1.53 | 37 | 0.95 |
| 12 | 2.38 | 25 | 1.48 | 38 | 0.92 |
| 13 | 2.30 | 26 | 1.43 | 39 | 0.88 |
| 14 | 2.22 | 27 | 1.37 | 40 | 0.85 |
| 15 | 2.14 | 28 | 1.32 | 41 | 0.82 |
| 16 | 2.06 | 29 | 1.28 | 42 | 0.79 |
| 17 | 1.98 | 30 | 1.23 | 43 | 0.76 |
| 18 | 1.91 | 31 | 1.19 | 44 | 0.74 |
| 19 | 1.84 | 32 | 1.14 | 45 | 0.71 |
| 20 | 1.78 | 33 | 1.10 | | |

Table 9-5 Conversion factor f_{size}^{16} as a function of effective diameter

| Effective diameter [cm] | Conversion factor | Effective diameter [cm] | Conversion factor | Effective diameter [cm] | Conversion factor |
|-------------------------|-------------------|-------------------------|-------------------|-------------------------|-------------------|
| 6 | 1.49 | 23 | 0.77 | 40 | 0.40 |
| 7 | 1.43 | 24 | 0.74 | 41 | 0.38 |
| 8 | 1.38 | 25 | 0.71 | 42 | 0.37 |
| 9 | 1.32 | 26 | 0.69 | 43 | 0.35 |
| 10 | 1.27 | 27 | 0.66 | 44 | 0.34 |
| 11 | 1.22 | 28 | 0.63 | 45 | 0.33 |
| 12 | 1.18 | 29 | 0.61 | 46 | 0.32 |
| 13 | 1.13 | 30 | 0.59 | 47 | 0.30 |
| 14 | 1.09 | 31 | 0.56 | 48 | 0.29 |
| 15 | 1.05 | 32 | 0.54 | 49 | 0.28 |
| 16 | 1.01 | 33 | 0.52 | 50 | 0.27 |
| 17 | 0.97 | 34 | 0.50 | 51 | 0.26 |
| 18 | 0.93 | 35 | 0.48 | 52 | 0.25 |
| 19 | 0.90 | 36 | 0.47 | 53 | 0.24 |
| 20 | 0.86 | 37 | 0.45 | 54 | 0.23 |
| 21 | 0.83 | 38 | 0.43 | 55 | 0.22 |
| 22 | 0.80 | 39 | 0.41 | | |

10. Registered parameters

Table 10-1 Scan position and range for each scan type: Age-0 M/F

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|-----|------------|
| Head | Routine Head (non-helical) | 475 | 390 | 85 |
| | Routine Head (helical) | 475 | 390 | 85 |
| | Head-Neck (1-phase) | 475 | 330 | 145 |
| | Head CTA | 475 | 355 | 120 |
| | Head-Neck CTA | 475 | 330 | 145 |
| | Face/Orbits/Sinus | 440 | 355 | 85 |
| Neck | Routine Neck (1-phase) | 390 | 345 | 45 |
| | Neck-Chest (1-phase) | 390 | 260 | 130 |
| | Neck-Abdomen (1-phase) | 390 | 220 | 170 |
| | Neck-Pelvis (1-phase) | 390 | 140 | 250 |
| Chest | Routine Chest (1-Phase) | 370 | 260 | 110 |
| | HRCT | 370 | 260 | 110 |
| | Chest-upper Abdomen (1-phase) | 370 | 220 | 150 |
| | Chest-Pelvis (1-phase) | 370 | 140 | 230 |
| | Lung nodule (1-phase) | 370 | 260 | 110 |
| Abdomen | Upper Abdomen (1-phase) | 300 | 220 | 80 |
| | Abdomen-Pelvis (1-phase) | 300 | 140 | 160 |
| | Multi-phase Liver | 300 | 215 | 85 |
| Pelvis | Pelvis | 240 | 140 | 100 |
| | Lower Abdomen | 240 | 140 | 100 |
| | Hip | 195 | 145 | 50 |
| Spine | C-spine | 395 | 345 | 50 |
| | T-spine | 370 | 240 | 130 |
| | L-spine | 280 | 190 | 90 |
| Cardiac | Coronary CTA | 330 | 280 | 50 |

Table 10-2 Scan position and range for each scan type: Age-1 M/F

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|-----|------------|
| Head | Routine Head (non-helical) | 765 | 650 | 115 |
| | Routine Head (helical) | 765 | 650 | 115 |
| | Head-Neck (1-phase) | 765 | 555 | 210 |
| | Head CTA | 765 | 600 | 165 |
| | Head-Neck CTA | 765 | 555 | 210 |
| | Face/Orbits/Sinus | 720 | 600 | 120 |
| Neck | Routine Neck (1-phase) | 650 | 565 | 85 |
| | Neck-Chest (1-phase) | 650 | 425 | 225 |
| | Neck-Abdomen (1-phase) | 650 | 380 | 270 |
| | Neck-Pelvis (1-phase) | 650 | 280 | 370 |
| Chest | Routine Chest (1-Phase) | 600 | 425 | 175 |
| | HRCT | 600 | 425 | 175 |
| | Chest-upper Abdomen (1-phase) | 600 | 380 | 220 |
| | Chest-Pelvis (1-phase) | 600 | 280 | 320 |
| | Lung nodule (1-phase) | 600 | 425 | 175 |
| Abdomen | Upper Abdomen (1-phase) | 495 | 380 | 115 |
| | Abdomen-Pelvis (1-phase) | 495 | 280 | 215 |
| | Multi-phase Liver | 495 | 375 | 120 |
| Pelvis | Pelvis | 405 | 280 | 125 |
| | Lower Abdomen | 405 | 280 | 125 |
| | Hip | 345 | 285 | 60 |
| Spine | C-spine | 655 | 565 | 90 |
| | T-spine | 600 | 410 | 190 |
| | L-spine | 470 | 350 | 120 |
| Cardiac | Coronary CTA | 550 | 470 | 80 |

Table 10-3 Scan position and range for each scan type: Age-5 M/F

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1100 | 975 | 125 |
| | Routine Head (helical) | 1400 | 1270 | 130 |
| | Head-Neck (1-phase) | 1400 | 1135 | 265 |
| | Head CTA | 1400 | 1200 | 200 |
| | Head-Neck CTA | 1400 | 1135 | 265 |
| | Face/Orbits/Sinus | 1350 | 1200 | 150 |
| Neck | Routine Neck (1-phase) | 1270 | 1140 | 130 |
| | Neck-Chest (1-phase) | 1270 | 920 | 350 |
| | Neck-Abdomen (1-phase) | 1270 | 860 | 410 |
| | Neck-Pelvis (1-phase) | 1270 | 635 | 635 |
| Chest | Routine Chest (1-Phase) | 1180 | 920 | 260 |
| | HRCT | 1180 | 920 | 260 |
| | Chest-upper Abdomen (1-phase) | 1180 | 860 | 320 |
| | Chest-Pelvis (1-phase) | 1180 | 635 | 545 |
| | Lung nodule (1-phase) | 1180 | 920 | 260 |
| Abdomen | Upper Abdomen (1-phase) | 1020 | 860 | 160 |
| | Abdomen-Pelvis (1-phase) | 1020 | 635 | 385 |
| | Multi-phase Liver | 1020 | 865 | 155 |
| Pelvis | Pelvis | 860 | 635 | 225 |
| | Lower Abdomen | 860 | 635 | 225 |
| | Hip | 740 | 650 | 90 |
| Spine | C-spine | 1280 | 1140 | 140 |
| | T-spine | 1180 | 900 | 280 |
| | L-spine | 950 | 745 | 205 |
| Cardiac | Coronary CTA | 1120 | 990 | 130 |

Table 10-4 Scan position and range for each scan type: Age-10 M/F

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1400 | 1270 | 130 |
| | Routine Head (helical) | 1400 | 1270 | 130 |
| | Head-Neck (1-phase) | 1400 | 1135 | 265 |
| | Head CTA | 1400 | 1200 | 200 |
| | Head-Neck CTA | 1400 | 1135 | 265 |
| | Face/Orbits/Sinus | 1350 | 1200 | 150 |
| Neck | Routine Neck (1-phase) | 1270 | 1140 | 130 |
| | Neck-Chest (1-phase) | 1270 | 920 | 350 |
| | Neck-Abdomen (1-phase) | 1270 | 860 | 410 |
| | Neck-Pelvis (1-phase) | 1270 | 635 | 635 |
| Chest | Routine Chest (1-Phase) | 1180 | 920 | 260 |
| | HRCT | 1180 | 920 | 260 |
| | Chest-upper Abdomen (1-phase) | 1180 | 860 | 320 |
| | Chest-Pelvis (1-phase) | 1180 | 635 | 545 |
| | Lung nodule (1-phase) | 1180 | 920 | 260 |
| Abdomen | Upper Abdomen (1-phase) | 1020 | 860 | 160 |
| | Abdomen-Pelvis (1-phase) | 1020 | 635 | 385 |
| | Multi-phase Liver | 1020 | 865 | 155 |
| Pelvis | Pelvis | 860 | 635 | 225 |
| | Lower Abdomen | 860 | 635 | 225 |
| | Hip | 740 | 650 | 90 |
| Spine | C-spine | 1280 | 1140 | 140 |
| | T-spine | 1180 | 900 | 280 |
| | L-spine | 950 | 745 | 205 |
| Cardiac | Coronary CTA | 1120 | 990 | 130 |

Table 10-5 Scan position and range for each scan type: Age-15 Male

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1660 | 1530 | 130 |
| | Routine Head (helical) | 1660 | 1530 | 130 |
| | Head-Neck (1-phase) | 1660 | 1370 | 290 |
| | Head CTA | 1660 | 1445 | 215 |
| | Head-Neck CTA | 1660 | 1370 | 290 |
| | Face/Orbits/Sinus | 1620 | 1445 | 175 |
| Neck | Routine Neck (1-phase) | 1525 | 1365 | 160 |
| | Neck-Chest (1-phase) | 1525 | 1140 | 385 |
| | Neck-Abdomen (1-phase) | 1525 | 1010 | 515 |
| | Neck-Pelvis (1-phase) | 1525 | 790 | 735 |
| Chest | Routine Chest (1-Phase) | 1420 | 1140 | 280 |
| | HRCT | 1420 | 1140 | 280 |
| | Chest-upper Abdomen (1-phase) | 1420 | 1010 | 410 |
| | Chest-Pelvis (1-phase) | 1420 | 790 | 630 |
| | Lung nodule (1-phase) | 1420 | 1140 | 280 |
| Abdomen | Upper Abdomen (1-phase) | 1215 | 1010 | 205 |
| | Abdomen-Pelvis (1-phase) | 1215 | 790 | 425 |
| | Multi-phase Liver | 1215 | 1015 | 200 |
| Pelvis | Pelvis | 1050 | 790 | 260 |
| | Lower Abdomen | 1050 | 790 | 260 |
| | Hip | 910 | 790 | 120 |
| Spine | C-spine | 1540 | 1365 | 175 |
| | T-spine | 1420 | 1100 | 320 |
| | L-spine | 1200 | 920 | 280 |
| Cardiac | Coronary CTA | 1360 | 1185 | 175 |

Table 10-6 Scan position and range for each scan type: Age-15 Female

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1600 | 1485 | 115 |
| | Routine Head (helical) | 1600 | 1485 | 115 |
| | Head-Neck (1-phase) | 1600 | 1320 | 280 |
| | Head CTA | 1600 | 1405 | 195 |
| | Head-Neck CTA | 1600 | 1320 | 280 |
| | Face/Orbits/Sinus | 1550 | 1405 | 145 |
| Neck | Routine Neck (1-phase) | 1480 | 1325 | 155 |
| | Neck-Chest (1-phase) | 1480 | 1080 | 400 |
| | Neck-Abdomen (1-phase) | 1480 | 1015 | 465 |
| | Neck-Pelvis (1-phase) | 1480 | 770 | 710 |
| Chest | Routine Chest (1-Phase) | 1370 | 1080 | 290 |
| | HRCT | 1370 | 1080 | 290 |
| | Chest-upper Abdomen (1-phase) | 1370 | 1015 | 355 |
| | Chest-Pelvis (1-phase) | 1370 | 770 | 600 |
| | Lung nodule (1-phase) | 1370 | 1080 | 290 |
| Abdomen | Upper Abdomen (1-phase) | 1190 | 1015 | 175 |
| | Abdomen-Pelvis (1-phase) | 1190 | 770 | 420 |
| | Multi-phase Liver | 1190 | 800 | 390 |
| Pelvis | Pelvis | 1000 | 770 | 230 |
| | Lower Abdomen | 1000 | 770 | 230 |
| | Hip | 880 | 770 | 110 |
| Spine | C-spine | 1490 | 1325 | 165 |
| | T-spine | 1370 | 1050 | 320 |
| | L-spine | 1160 | 900 | 260 |
| Cardiac | Coronary CTA | 1310 | 1145 | 165 |

Table 10-7 Scan position and range for each scan type: Adult Male

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1835 | 1700 | 135 |
| | Routine Head (helical) | 1835 | 1700 | 135 |
| | Head-Neck (1-phase) | 1835 | 1510 | 325 |
| | Head CTA | 1835 | 1600 | 235 |
| | Head-Neck CTA | 1835 | 1510 | 325 |
| | Face/Orbits/Sinus | 1785 | 1600 | 185 |
| Neck | Routine Neck (1-phase) | 1700 | 1525 | 175 |
| | Neck-Chest (1-phase) | 1700 | 1230 | 470 |
| | Neck-Abdomen (1-phase) | 1700 | 1150 | 550 |
| | Neck-Pelvis (1-phase) | 1700 | 920 | 780 |
| Chest | Routine Chest (1-Phase) | 1580 | 1230 | 350 |
| | HRCT | 1580 | 1230 | 350 |
| | Chest-upper Abdomen (1-phase) | 1580 | 1150 | 430 |
| | Chest-Pelvis (1-phase) | 1580 | 920 | 660 |
| | Lung nodule (1-phase) | 1580 | 1230 | 350 |
| Abdomen | Upper Abdomen (1-phase) | 1350 | 1150 | 200 |
| | Abdomen-Pelvis (1-phase) | 1350 | 920 | 430 |
| | Multi-phase Liver | 1350 | 1165 | 185 |
| Pelvis | Pelvis | 1180 | 920 | 260 |
| | Lower Abdomen | 1180 | 920 | 260 |
| | Hip | 1080 | 910 | 170 |
| Spine | C-spine | 1700 | 1525 | 175 |
| | T-spine | 1580 | 1190 | 390 |
| | L-spine | 1340 | 1060 | 280 |
| Cardiac | Coronary CTA | 1450 | 1265 | 185 |

Table 10-8 Scan position and range for each scan type: Adult Female

| Body region | Scan parameter | Begin | End | Range (mm) |
|-------------|-------------------------------|-------|------|------------|
| Head | Routine Head (non-helical) | 1665 | 1550 | 115 |
| | Routine Head (helical) | 1665 | 1550 | 115 |
| | Head-Neck (1-phase) | 1665 | 1380 | 285 |
| | Head CTA | 1665 | 1445 | 220 |
| | Head-Neck CTA | 1665 | 1380 | 285 |
| | Face/Orbits/Sinus | 1625 | 1455 | 170 |
| Neck | Routine Neck (1-phase) | 1540 | 1370 | 170 |
| | Neck-Chest (1-phase) | 1540 | 1110 | 430 |
| | Neck-Abdomen (1-phase) | 1540 | 1010 | 530 |
| | Neck-Pelvis (1-phase) | 1540 | 820 | 720 |
| Chest | Routine Chest (1-Phase) | 1435 | 1110 | 325 |
| | HRCT | 1435 | 1110 | 325 |
| | Chest-upper Abdomen (1-phase) | 1435 | 1010 | 425 |
| | Chest-Pelvis (1-phase) | 1435 | 820 | 615 |
| | Lung nodule (1-phase) | 1435 | 1110 | 325 |
| Abdomen | Upper Abdomen (1-phase) | 1200 | 1010 | 190 |
| | Abdomen-Pelvis (1-phase) | 1200 | 820 | 380 |
| | Multi-phase Liver | 1200 | 1015 | 185 |
| Pelvis | Pelvis | 1050 | 820 | 230 |
| | Lower Abdomen | 1050 | 820 | 230 |
| | Hip | 930 | 810 | 120 |
| Spine | C-spine | 1545 | 1370 | 175 |
| | T-spine | 1435 | 1090 | 345 |
| | L-spine | 1200 | 930 | 270 |
| Cardiac | Coronary CTA | 1300 | 1140 | 160 |

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