

A Dose Database for Medical Patients in the Radiation Diagnosis / Therapy

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1. Introduction

Although for medical purpose, there are some rules for dose due to the radiation diagnosis and therapy.

Therefore, it can be said that patients dose by radiation diagnosis/therapy should be needed to estimate, before practices. As one of dose estimation methodology, IMED-PAT is developed.

2. Developments

2.1 Consideration for program

Several kinds of radiation diagnoses, radiopharmaceuticals and organs are considered for dose evaluation. In brief, we choose 27 kinds of diagnosis instruments and processes used most frequently. For radiation therapy, we select 130 kinds of radiopharmaceuticals including pharmaceuticals for research purpose. And, 27 kinds of organs are picked for the dose evaluation. It reflects the recommendation by the ICRP publication 60 in 1990.

We assume the establishment of generally accepted instruments, and construct dose data of medical patients, considering the dose due to one time practice. We consider 27 kinds of instruments investigating the data of many departments as well as the data of ICRP-34 and ICRP-62. We take into account radiopharmaceuticals for the research purpose as well as for the medical purpose. In ICRP-53 it was deliberated 120 kinds of radiopharmaceuticals, subsequently the International Commission on Radiological Protection recalculated about 9 kinds of radiopharmaceuticals in ICRP-62(1991) among the 120 kinds radiopharmaceuticals. The target organ composed of two groups is established for dose estimation. The particular assumptions for the evaluation are as following:

- Radioisotopes are distributed uniformly in organs, except the kidney. But, in this research, we assume that radioisotopes are distributed uniformly in the kidney for effect evaluation to other organs. (The change by the simplification of assumption is less than 10%.)
- The eye lens for risk evaluation because of obscurity included ICRP-26, but we exclude it because the used radiopharmaceutical is not accumulated the eye.
- The whole body dose is neglected, because this is less efficient than the effective dose.

And we keep in view functions of data addition, modification and deletion for program by additional researches.

2.2 Database Organization

We construct the database as stated above, and reorganize the database to be handled in the program easily. Through the process as shown Figure 1, it can be calculated the result dose of patients due to radiation diagnosis and therapy

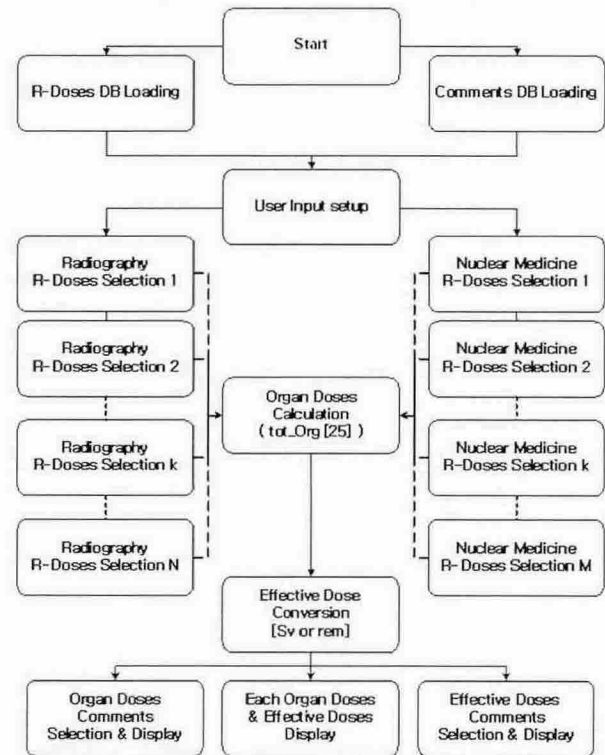


Figure 1. Algorithm for IMED-PAT.

The program begins with loading of R-Doses DB(radiography & radiopharmaceutical) and Comment DB(the advisory comment for dose effect by resulting dose level).

We construct the program IMED-PAT using the Visual C++ coding language, and organize the user-interface to access the program intuitively. The users choose the items among the pre-organized drop-down list through inputs by user, the number of diagnoses and radiopharmaceutical kinds, injected activities, times of diagnosis.

We compute the effective dose using the absorbed dose database and the organ weighting factors. IMED-PAT handles the DB by user input, and then it shows the computed results.

The results of absorbed dose and effective dose are displayed as a table form. Also, when the absorbed dose and effective dose are above certain level, as known deterministic effects were revealed, even considering the medical purpose of diagnosis and therapy, the

program will refer the pre-organized comment DB. Hence, it can be said that IMED-PAT compute the patient dose by radiography & radiopharmaceuticals, and serve decision making advises by present comments sentences following level of estimated dose values for each target organs or effective value.

2.3 User's Guide

The order of dose evaluation for radiation diagnosis by this program is as following: ① Choose the number of kinds for radiation diagnosis. Fundamentally eight disable drop-down lists are arranged. Input the number of kinds for radiation diagnosis and click the "Updatelist", and then the same number of practice drop-down lists will be able. ② Choose the kind of operating radiation diagnosis among active lists. ③ Input the number of times for the diagnosis practice in "Time" boxes.

The order of dose evaluation for radiopharmaceuticals by this program is as following: ① Input the number of injected radiopharmaceutical kinds, and then relevant drop-down menus will be able among the prepared eight drop-down lists. ② Because 130 kinds of radiopharmaceuticals are used, it is constructed the two-dimensional drop-down lists. So, first, choose a chemical category, and then second drop-down lists are changed by the first chemical selection. ③ Select the injected radiopharmaceutical. And then, input the activities of the radiopharmaceuticals in MBq.

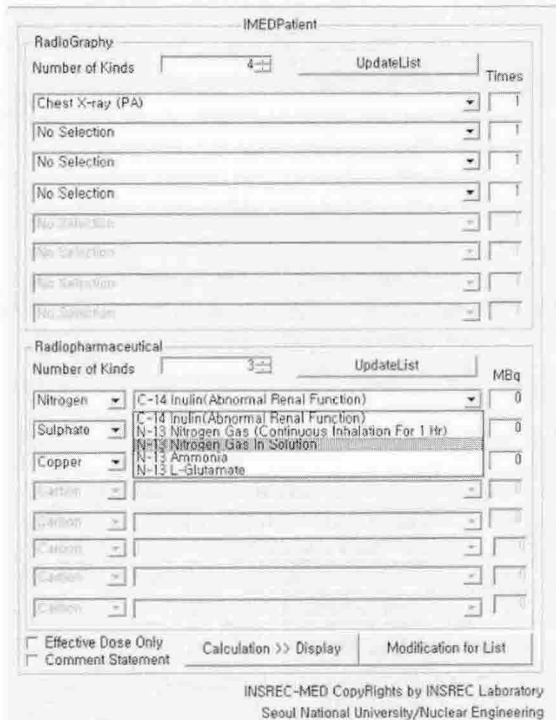


Figure 2. Selection for radiopharmaceuticals in IMED-PAT.

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After input the data for the dose evaluation of the radiation diagnosis/therapy, click the "Calculation>>Display" button. And then the new window for the calculation results will be pop-up as shown in Figure 3.

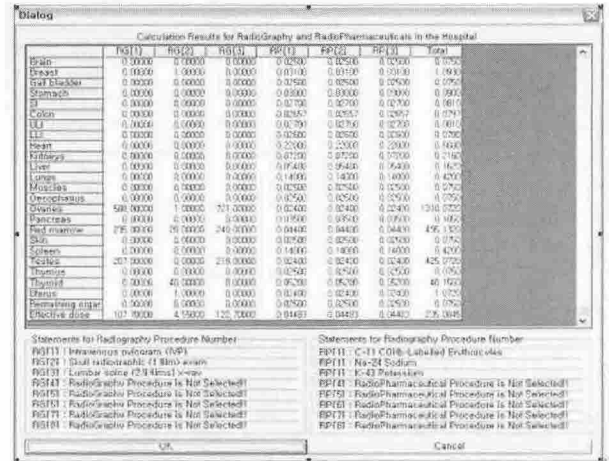


Figure 3. Database display dialogue box.
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3. Conclusion

The purpose of IMED-PAT is to analyze dose composition factors and main causes of radiation dose for patients in radiation diagnosis and therapy. Also, IMED-PAT have the functions that user can modify, delete and add data to both radiation dose DB by updating timely. And we can help users manage the dose for patients and plan the medical treatment by offering the dose estimation and dose level information before radiation diagnosis and therapy.

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