

Pengembangan In-House Software untuk Perhitungan Time Integrated Activity Coefficient Berbasis Efficacy pada Dosimetri Tiroid = Developing In-House Software for Time Integrated Activity Coefficient's Calculation with Efficacy Based on Thyroid Dosimetry

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Abstrak

Treatment Planning menggunakan metode Dosimetri dengan pendekatan biokinetik pasien terbukti memberikan optimisasi dosis yang lebih baik dibandingkan metode fixed dose terutama dalam menjamin efikasi dan safety pada proses Radioiodine Therapy. Sayangnya, Metode Dosimetri pada Radioiodine Therapy untuk kanker tiroid masih belum diimplementasikan secara klinis di Indonesia dikarenakan terdapat keterbatasan kesediaan perangkat lunak untuk perhitungan. Oleh karena itu, penelitian ini dilakukan untuk mengembangkan perangkat lunak berbasis GUI (General Use Interface) yang dapat memberikan perhitungan Dosimetri tiroid. Algoritma perhitungan pada GUI dikembangkan dengan menerapkan metode perhitungan Dosimetri seperti MIRD full time point, serta implementasi metode one dan two time points. Pada pengembangan metode MIRD full time point, Goodness of Fit pada serangkaian model Sum of Exponential (SOE) dilakukan untuk mendapatkan fitting yang optimal. Parameter untuk Goodness of Fit meliputi visualisasi grafik yang baik, nilai Coefficient of Variation (CV) < 50%, dan Correlation Matrix memiliki off-diagonal sebesar -0,8 CM 0,8. Hasilnya, didapatkan bahwa fungsi f2d merupakan fungsi terbaik untuk fitting pada GUI. Ditambahkan pula fitur evaluasi GoF serta model selection pada software GUI yang dapat digunakan oleh pengguna secara mandiri. Tahapan selanjutnya yaitu validasi hasil perhitungan GUI terhadap hasil referensi yang dilakukan pada ketiga metode perhitungan. Didapatkan hasil relatif deviasi <10% sehingga GUI dianggap dapat digunakan untuk perhitungan. Selain metode perhitungan, terdapat informasi tambahan berupa estimasi error pada Two times points dan One time point yang dilakukan pada tahapan implementasi yaitu dengan mengevaluasi hasil perhitungan Two times points dan One time point pada GUI dengan menilai parameter relatif standard deviation (RSD) menggunakan nilai AUC (Area Under the Curve). Dari tahapan ini, didapatkan bahwa banyak pengambilan data (uptake points) akan mempengaruhi nilai AUC. Estimasi mean dan SD (standar deviasi) error perhitungan oleh Two times points, one time late point, dan One time early point terhadap Full times points secara berturut-turut adalah $2.56 \pm 1.2\%$, $11.94 \pm 2.2\%$, dan $26.87 \pm 1.78\%$.

.....Treatment planning using dosimetry calculation with biokinetic-based has known to provide an optimization dose better than the fixed-dose method regarding the efficacy and safety of radioiodine therapy. Nonetheless, there have not been numerous implementations of the dosimetry for radioiodine therapy in Indonesia because of limited data and inadequate technologies. Therefore, this study aimed to develop a software GUI that can calculate with dosimetry method in the thyroid organ. The algorithm's equation has elaborated by using various dosimetry calculation methods such as MIRD's full times points calculation and implementation from one time and two times points calculation. The MIRD's full times points calculation was developed using Goodness of Fit on some SOE functions to achieve the best fitting. The parameters for goodness of fit (GoF) are visual evaluation of graph, coefficient of variations (CV) <50%, and correlation matrix' off-diagonal around -0,8 CM 0,8. After that, it was obtained that f2d is the best fit function for this

software. It was added to the software features like GoF evaluation and model selection for users to use it by themselves. More, a validation to references has done for all three methods' calculations in this GUI. The relative deviation between the GUI results and the references were <10% for all three methods, it means that the GUI was already capable of both calculation and fitting. Besides providing calculations, there were additional notes that tell users about the estimated error for both Two times points and One time point that has already been done by the implementation method. This method evaluates each method's calculation results within GUI by determining the relative standard deviation (RSD) from AUCs. From this study, it is known that the AUC result is dependent on number of uptake measurement. Mean and SD error for two times points, one time late point, and one time early point were $2.56 \pm 1.2\%$, $11.94 \pm 2.2\%$, dan $26.87 \pm 1.78\%$ respectively.