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Diagnosis of urinary tract infection based on artificial intelligence methods

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Abstract

Background and Objective: Urinary tract infection (UTI) is a common disease affecting the vast majority of people. UTI involves a simple infection caused by urinary tract inflammation as well as a complicated infection that may be caused by an inflammation of other urinary tract organs. Since all of these infections have similar symptoms, it is difficult to identify the cause of primary infection. Therefore, it is not easy to diagnose a UTI with routine examination procedures. Invasive methods that require surgery could be necessary. This study aims to develop an artificial intelligence model to support the diagnosis of UTI with complex symptoms.

Methods: Firstly, routine examination data and definitive diagnosis results for 59 UTI patients gathered and composed as a UTI dataset. Three classification models namely; decision tree (DT), support vector machine (SVM), random forest (RF) and artificial neural network (ANN), which are widely used in medical diagnosis systems, were created to model the definitive diagnosis results using the composed UTI dataset. Accuracy, specificity and sensitivity statistical measurements were used to determine the performance of created models.

Results: DT, SVM, RF and ANN models have 93.22%, 96.61%, 96.61%, 98.30% accuracy, 95.55%, 97.77%, 95.55%, 97.77% sensitivity and 85.71%, 92.85%, 100%, 100% specificy results, respectively.

Conclusions: ANN has the highest accuracy result of 98.3% for UTI diagnosis within the proposed models. Although several symptoms, laboratory findings, and ultrasound results are needed for clinical UTI diagnosis, this ANN model only needs pollacuria, suprapubic pain symptoms and erythrocyte to get the same diagnosis with such accuracy. This proposed model is a successful medical decision support system for UTI with complex symptoms. Usage of this artificial intelligence method has its advantages of lower diagnosis cost, lower diagnosis time and there is no need for invasive methods. (C) 2018 Elsevier B.V. All rights reserved.

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Author Keywords: Artificial intelligence methods; Medical decision support systems; Urinary tract infection; Artificial neural networks; Decision tree;

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