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Longitudinal Electronic Dental Data and Periodontal Disease

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Introduction

Nearly 42% of adults in the United States (US) suffer from periodontal disease (PD) despite advances in research and treatment. PD can result in tooth loss and reduced quality of life if left untreated. If the associated risk factors are controlled, PD can be avoided, according to research. For instance, some studies have examined the long-term effects of smoking, diabetes, age, and calculus on the onset and progression of Parkinson's disease. The majority of these studies' cohorts were from 1969 to 1988, so they may not accurately represent the current patient population. Additionally, these studies were conducted on non-US patients and lacked information regarding longer follow-up visits. Keeping track of how a disease changes over time is important, especially for PD, which is a disease that progresses slowly. However, such studies are difficult to carry out because they are costly, time-consuming, and difficult to keep patients for an extended period of time.

The widespread use of electronic dental record (EDR) systems to record patient care information presents a significant opportunity for research into PD's clinical course and the impact of risk factors. For conducting longitudinal studies, the EDR offers numerous advantages. The EDR, for instance, can offer a longer period of follow-up, current clinical information for patients, and evidence from the real world. EDR data face difficulties, including questionable quality, information that is scattered across various sections of the EDR, and information that is missing, despite this promising potential. As a consequence of this, it is not known whether or not EDR data have the capacity to supply patients with significant information. Additionally, these datasets can be used to predict the likelihood of disease onset and progression using AI and machine learning techniques. However, in order to avoid flawed outcomes, applying these methods necessitates evaluating the quality of the data.

Description

In medicine, longitudinal electronic health record (EHR) data have been used in a number of studies to predict hospitalization rates and the risk of cardiovascular disease. In a similar vein, researchers in dentistry have made use of automated methods to compare the accuracy of periodontal charting information in the EDR data of four large dental academic institutes in the United States with automated diagnosis. Using EDR data from three of these institutions, the authors also identified new cases of periodontitis and tooth loss. A deep-learning model that automated the staging and grading of periodontitis was reported in another study. Finally, a few studies have reported methods for extracting information about PD risk factors from the EDR, including information about cardiovascular diseases, diabetes, and smoking. However, to the best of our knowledge, no study has examined PD change and its clinical course over time using longitudinal EDR data [1-3].

As a result, our long-term objective is to evaluate the long-term treatment outcomes of both surgical and non-surgical periodontal treatments by utilizing longitudinal EDR data and applying AI and ML techniques to study the clinical course of PD. This study aimed to develop two automated algorithms for assessing the longitudinal EDR data's quality and tracking patients' PD over time. We created three patient populations: the progress of the disease; Curbing the illness; the disease has not changed. We created three patient cohorts and provided detailed steps and computer algorithms for cleaning and pre-processing the messy EDR data. Other researchers can use these open-source resources for their PD-related research. The number of periodontal charting and clinician-recorded diagnoses documented between 1 June 2005 and 1 August 2019 for patients who received at least one COE between 1 January 2009 and 31 December 2014 was analyzed using descriptive statistics with confidential intervals of 95 percent. The purpose of including information from the periodontal chart alongside the clinician-documented diagnosis is for comparison. We wanted to contrast clinician-documented diagnoses with periodontal charting documentation. The typical number of days, months, and years between the first and second patients'; third and first; as well as the sums for the first and fourth visits. This test assisted us with distinguishing how as often as possible patients' clinician-recorded analyze were accessible to decide their infection change over the long haul [4,5].

Conclusion

Two automated computer algorithms were developed in this study to classify patients with 99 percent accuracy into three categories: disease progression, disease improvement, and no change in disease. In addition, we demonstrated a method for cleaning and processing messy EDR data step by step in order to extract information from free text, which is necessary prior to utilizing AI and ML techniques. In addition, we demonstrated that longitudinal EDR data could be used to track the progression of the disease over 15 years. To study the clinical course of PD, we successfully generated three distinct cohorts of PD patients: no disease change, disease progression, and disease improvement. Longitudinal EDR data can be used to examine PD response to various treatments using this method.

Acknowledgement

None

Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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