Interactive Demographic Visualization of Multiple Facilities across Time

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Abstract

We present an interactive demographic visualization of multiple facilities across time that can be generalized. It provides not only users with an overview of patient demographic information of multiple facilities across time, but also offers detailed breakdowns of patient demographics such as age, gender, language, and race of a selected facility by allowing users to choose their view preference. When users mouse over a specific area of the bar graph of summary statistics on the facilities, four charts corresponding to the breakdown of demographic information (i.e., age, gender, language, and race) are updated dynamically. Furthermore, the visualization displays summary statistics of the selected facility that users are viewing.

Introduction

The electronic health record (EHR) data are complicated, reflecting a variety of patient health information, such as patient demographics, progress notes, medications, vital signs, laboratory data, etc. Studies have evaluated visual analytic tools for navigating and analyzing such health data, targeting ease of use of these complicated datasets. In one study, Wang and colleagues focused on navigating multiple records of categorical temporal data from the EHR [1]. The prototype of their visualization tool enabled users to align, rank, and filter the results of queries [1]. In another study, Zhang and colleagues focused on analyzing patient cohort data, building an interactive visualization application that enabled clinicians to explore patient cohort data by visualizing and refining cohorts [2].

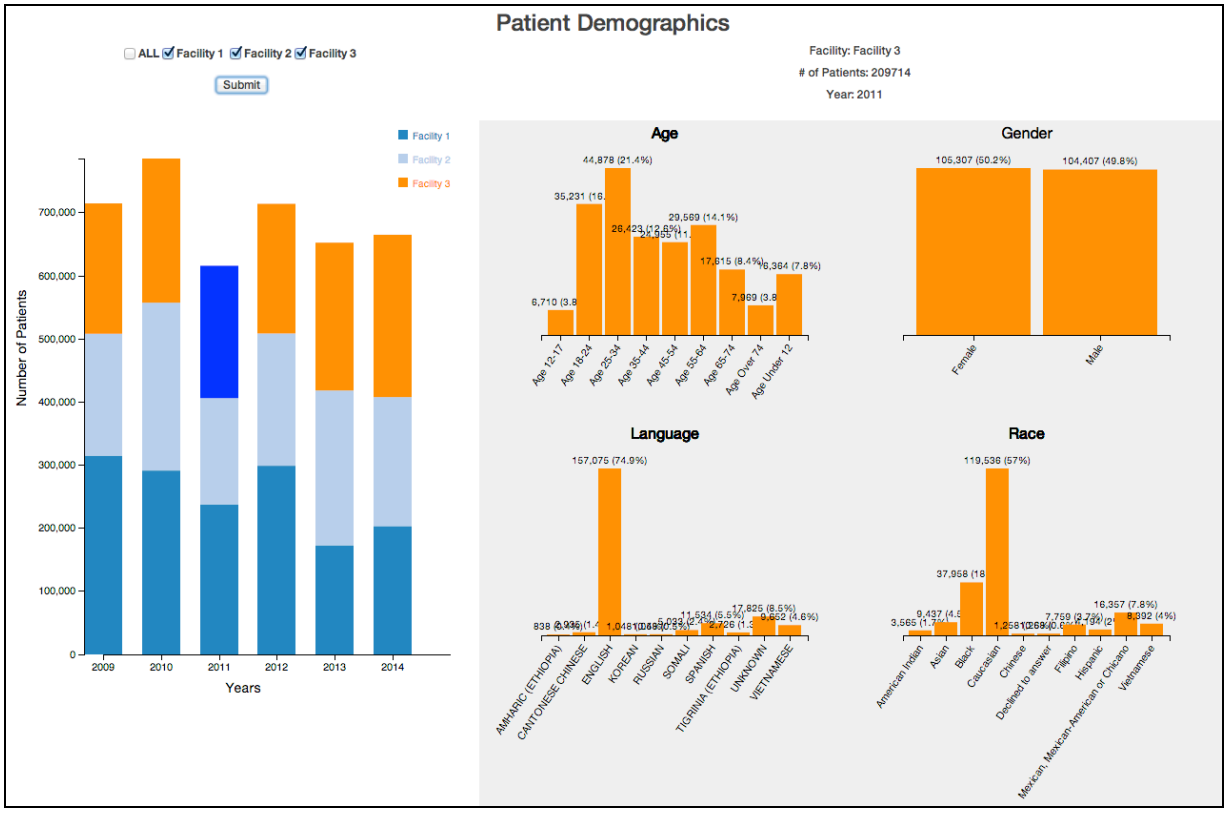

Figure 1. Interactive demographic visualization with four components: a set of check boxes for allowing users to determine any combinations of facilities based on their interest, a dashboard displaying the summary of the selected data with the name of the facility, the number of patients, and the year of the selected data, and four charts representing the patient demographic information (i.e. age, gender, language, and race).

In this paper, we introduce an interactive demographic visualization of multiple facilities across time with temporal patient demographics data to support users whose aim is to explore the existing clinical data to later conduct research. Based on the golden rule of data visualization such as overview, zoom and filter, and detail-on-demand [3, 4], we applied the technique of "Level of Detail (LOD)" in creating our visualization. For LOD, in addition to the summary view of a cohort of the specific population [2], our visualization provides users with an additional four charts to represent detailed information of patient demographics by age, gender, language, and race.

Target Users

Our visualization is targeted to individuals who use data for generated through clinical care for research. The potential target users can be any biomedical researcher, such as faculty, residents, fellows, graduate students, or research staff. For such users, it is crucial to explore the information available about the data in order to generate questions, test feasibility, and conduct biomedical research on specific populations. For example, some clinical studies have age restrictions, others have gender restrictions, and some require information about the spoken language as they can only recruit English speakers.

Visualization

We generated visualizations with D3 Javascript library (http://d3js.org/). The visualization demonstrates patient demographic information of multiple facilities across time as illustrated in Figure 1. Users can choose any combination of facilities to explore the overview of patient demographic information. When users mouse over on the specific area of the bar graph, four charts corresponding to breakdowns of demographic information (i.e. age, gender, language, and race) are updated dynamically. For consistency, the four charts were colored with the same color of the selected area of the bar graph. On the top of each bar on the charts, the number of patients and the percentage of all the number of patients are displayed.

Conclusion

We have presented an interactive demographic visualization of EHR data from multiple facilities across time. Our visualization provided users with two main features to express "Level of Detail": 1) allowing users to choose their view preference by filtering the source of data, and 2) displaying the detailed information based on their interest by hovering a mouse on the bar chart. These features allow users to navigate patient demographics such as age, gender, language, and race via four charts updated dynamically. While this prototype offers users dynamic access to basic demographic EHR data, validating its features would confirm potential for dissemination of use. This prototype provides a useful starting point to evaluate and iterate visualizations for broader dissemination [5, 6]. The dynamic nature of the web-based visualization method provides promise for researchers to interact with complex EHR data efficiently and easily and speed use of EHR data for discovery.

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