PAPER

Technology for Health

N. SAKIB, X. SUN, C. MENG, N. KONG, C. MASTERSON, H. MENG, K. HYER, M. LI. A data-driven staffing decision platform for improving nursing care operational excellence. Gerontechnology 2018;17(Suppl):135s; https://doi.org/10.4017/gt.2018.17.s.131.00 **Purpose** Skilled Nursing Facilities (SNF) are responsible for caring for the increasingly frail and vulnerable elderly population with 24/7 formal care and assistance. To ensure the quality of care for the SNF residents, adequate staffing level is of great importance. Many studies have shown that an inadequate staffing level will negatively affect various SNF care outcomes[1,2]; e.g., increased re-hospitalization incidence and mortality risk, as well as service quality indicators; e.g., increased facility deficiency citations. Existing industry staffing practice tends to be experienced-based and often in a reactive mode[3]. Thus, there is a need to develop a staffing decision support platform, which can help SNF administrators make evidence-based and proactive decisions. **Method** We developed a computer-based data-enabled decision support platform for a SNF in the Tampa Bay area. The platform aims to forecast future service demands of SNF residents based on the anecdotal electronic health records and further proactively determine the adequate level of nursing staff of each type (e.g., RN, CNA, LPN, etc.) for the upcoming scheduling epoch. We employed an agent-based simulation modeling framework to ensure the necessary granularity on modelling various sources of heterogeneity over time as well as among residents and nursing staff. Such a framework will also have more potential to reveal emerging system outcomes due to staffing decisions under the heterogeneity[4]. In particular, we modeled agents to capture individual resident's demographics, physical/psychological functioning conditions, service utilization (e.g., staff time), and service flow (e.g., admission, discharge). The overall simulation model can emulate the changes in daily service demands and evaluate different provision scenarios in response to the changes. To improve the computer visualization and promote user-friendliness of the platform, we enrich visualization functionalities with Java programming. **Results & Discussion** The developed decision-support platform consists of four modules, namely, system inputs configuration, staffing strategy specification, performance & process evaluation and visualization & animation. The system inputs configuration module allows the user to import historical SNF demand data, e.g., those available from the SNF Minimum Data Set (MDS), specify staff scheduling restrictions, and adjust simulation settings, such as simulation run length, nursing staff wages, and resident arrival rates. The staffing strategy specification module allows the user to construct the nursing care schedules based on some prespecified staffing strategy (e.g., minimum staffing ratio) together with scheduling restrictions (e.g., nobody scheduled over three consecutive shifts). The performance & process evaluation module can output various facility-level performance metrics, such as service utilization and cost, over the simulation run. They will allow users to compare various staffing strategies. The visualization & animation module can render both 2D and 3D animations to mimic daily operations for real SNF layout and service system configuration. Overall, the developed simulation platform will aid SNF administrators in developing optimal staffing levels for different scenarios of resident census and service needs.

References
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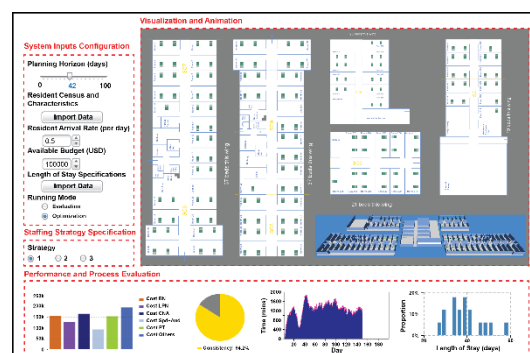
Figure 1. User Interface of Simulation Platform