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CONFERENCE ABSTRACT

Modeling approach to managing the deployment of integrated organizational models for multi-morbid patients in the CareWell study. The Basque Country case.

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Introduction: An integrated care approach supported by information and communication technologies (ICT) is being deployed in the Basque Country within the European CareWell project, to best respond to the complex needs of multi-morbid patients. Our statistical analysis carried out in Donostialdea County has demonstrated that the profile of resource consumption has not shown the expected changes. The fact that no significant differences were found indicates that the aim of maintaining stability in multi-morbid patients has not been achieved. However, this is just a static view of the situation two years after the initial deployment. Although necessary, this information is not enough to assess the efficacy of the intervention since the way in which health care is organized is considered as a unitary actor, either adapting to the environment or remaining inert. Integration of health care requires the alteration of delivery processes that change over time in predictable and unpredictable ways. Some processes may be altered more quickly than others, depending on how long it takes for the health-care staff to achieve the necessary behavioural changes. The objective of this work was to apply predictive modeling adapted to the local context to develop a tool within the Deming's plan-do-check-act (PDCA) cycle to manage continuous improvement in integrated interventions over the long term in the CareWell project.

Methods: Simulation modeling techniques – Discrete Event Simulation (DES) – were used to forecast the budget impact of a new integrated intervention – which included use of electronic prescriptions and new provider roles, including reference internist, hospital liasion nurse, and advanced skills nurse – from 2012 to 2020. Predictive modeling helped us delimit the impact of the integrated health-care intervention according to the organizationally defined goals by comparing both scenarios. Resource consumption data used to populate the model –traditional health care – was obtained from administrative databases. A Delphi study was performed to determine the extent to which integrated health-care systems could avoid patient decompensation, which was measured as Accident and Emergency (A&E) service uses and

hospitalizations avoided. This economic analysis assumed a reduction in emergencies by 10% during 5 years.

With the simulation model, the resource-consumption rates were provided as a result. Multiplying this by the unit costs, we determined the cost of illness of multi-morbid patients with traditional health care and with a hypothetical integrated health-care organization that would achieve a reduction in emergencies by 2% annually. Combining the cost of illness allowed us to estimate the Budget Impact Analysis (BIA).

Results: Predictive modeling showed that, by considering ageing of the general population, the multi-morbid patient population in Donostialdea will increase by 8% by 2020. As the target population is both larger and older, conventional health-care costs will have increased by 21%. If interventions could successfully reduce emergency costs annually by 2%, this budget would decrease 18%, with cumulative savings of over 500,000 euros in the study period.

Discussion: Deming's PDCA cycle, together with statistical analysis, is a well-known tool for management, but to our knowledge, our work is the first to demonstrate the capacity of predictive modeling as a complementary tool in managing integrated health-care models. Using DES to represent the care process and natural history of multi-morbid patients, we can forecast the economic burden associated with this population. This was possible by use of data and tools with very different origins. We combined clinical evolution, resource consumption, demographic trends, epidemiological data obtained with the Dismod II software, parametric survival analysis, economic evaluation, and simulation to inform the planning stage with a tool from the world of engineering. Integrating simulation modeling and statistical analysis within the Deming's PDCA cycle has helped the continuous improvement of the challenging task of changing the organizational model to achieve deployment of complex interventions within integrated health-care organizations. The four stages described in the PDCA cycle mirror the scientific experimental method of formulating a hypothesis, collecting data to test the hypothesis, analysing and interpreting the results, and making inferences to iterate the hypothesis. We used modeling to formulate the hypothesis (planning) by defining two key elements derived from extrapolation of resource consumption to 2020: foreseeing the situation and setting objectives. First, modeling anticipated the increase of care cost for multi-morbid patients due to ageing in Donostialdea County. Second, it showed the cost savings if the program achieved the objective of reducing unstable conditions in patients by an annual 2%. We aimed to replicate the integrated health care by a functioning or interactive representation of the system, as opposed to purely conceptual models such as mathematical functions. This model was developed as a prototype for a certain county in the Basque. Currently we are carrying out the analysis for the whole Basque Country considering the twelve Integrated Health Care Organizations which deployed different integrated solutions. This will let us do benchmarking and apply the best solutions.

Keywords: integrated health care; deming's cycle; planning; discrete event simulation