A computerized decision support system for head and neck cancer

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Abstract—Head and Neck Cancer (H&NC) is one of the most complex and difficult cancers in terms of treatment and prognosis. Decision Support Systems (DSS) are currently used in several aspects of the clinical practice, however in few cases they have been used to improve decision making process of H&NC. In this paper we propose a DSS conceptual architecture, which allow to use both traditional methods (e.g. clinical guidelines and survival analyses) and sophisticated techniques (e.g. computer models for prediction and knowledge discovery).

I. INTRODUCTION

The research work described in this paper presents a proposal for a computerized DSS for H&NC treatment, taking into account existing knowledge and literature in H&NC and analyzing existing types and features of DSS.

II. METHODS AND MATERIALS

First, a literature research has been made with the goal of 1) analyzing the H&NC problems and gaps, highlighting the options for treatment and prognosis and the solutions that medical professionals nowadays have to deal, and 2) studying current approaches of DSS, their influence in healthcare and H&NC treatment. Several keywords were used in search engines for scientific and academic research, and after a total of 5 literature researches over time a total of 50 articles were selected, taking into account the publication date, the main objective of this project and considering only systematic reviews and journal publications. The information extracted was analyzed to identify the elements that allow a DSS to address these gaps and needs. In the second phase, a conceptual architecture for DSS has been designed.

III. RESULTS

The results obtained in the H&NC literature [1], [2] research are: 1) Definition of the disease, symptoms, diagnosis, treatment and side effects are widely disseminated in the literature. 2) Guidelines used for treatment are based on the TNM classification. 3) The prognosis, recurrence and main risk factors can be estimated based on the epidemiologic studies published. 4) Although several treatment options have been identified, they remain complex and have deficiencies. Therefore, there is a variety of information that is used for H&NC, as well as improvements on prognosis and treatment that can be brought by different technological innovations and tools. We did not find any specific DSS focused in the treatment of H&NC although the use of DSS in the medical field has a clear advantage, improving the effects on clinical outcomes and supporting the clinicians during the decision process. Taking into account this, we have selected, as framework the one proposed by Frada et al [3], since this generic architecture allows to define a set of components to model the decision process workflow of H&NC and conceptualize the role of end-users, as well as the intermediate steps that occur when this information is processed from end-users to system components and datasets. Therefore, we have included the main elements and actions that take place in the diagnosis, treatment and prognosis of H&NC: the first is the Language System (LS), which consists of all messages the DSS can accept and interpret from user’s request. The results of message requests are represented through the Presentation System (PS). Both are interfaces with healthcare professionals and contain the representation of the main concepts and semantic data of H&NC. The Problem Processing System (PPS) is the main part of the system, responsible to recognize and solve problems through techniques and technologies that allow to correlate and implement rules, provided by the Knowledge System (KS), in charge of managing multivariate type of datasets due to the heterogeneity of H&NC. In this way, the PPS is able to retrieve and display information according to the requests done by healthcare users during the H&NC clinical process, through the PS and therefore closing the “decision loop”.

IV. CONCLUSION

After a bibliographic search, we found that there are no specific DSSs for H&NC, so we propose a conceptual architecture of a DSS for this disease. We have chosen a generic framework for rule-based DSS to define the conceptual steps that intervene in the decision making process. The presented architecture will allow to understand how new data can contribute to the generation of knowledge and improvements on the prognosis and treatment for H&NC.

ACKNOWLEDGMENT

The authors wish to acknowledge the BD2Decide consortium (www.bd2decide.eu), funded from the EU’s Horizon 2020 program, grant agreement No.689715.

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