

Oncotherapy: A Decision Support System to Validate Oncological Treatments

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Abstract

Making therapy decisions in oncology is a challenging task in the medical precision era. Oncotherapy is a decision support system that provides oncologists with suitable therapies for the patient within the national guidelines. The system is capable, on the one hand, to help the oncologist to maximize fitting therapy to the patient and, on the other hand, to provide control tools for the country's sanitary authorities.

Keywords:

Clinical decision support system, Decision making, Medical oncology

Introduction

A clinical decision support system is a technological tool to help the physician to make decisions. Nowadays, choosing the best available therapy for a patient is a difficult task. We wanted to make an information system to help physicians to select the best option for each particular case, taking information from the accurate knowledge of the expert in the field enriched by the opinion of the oncologic community. It is a valuable assistance to reduce the occurrence of errors [1] in the physician's decision making process. This type of error is not the most frequent, but surely one of the most serious, because in most cases it does not allow the possibility of correction before any damage occurs. Oncotherapy also guarantees patients receive therapies in equal terms in the public health system. Besides, it allows the authorities to model the available therapies in the National Health System.

The objective of this study is to show a decision-making process in the prescription of oncological protocols assisted by a clinical decision support system called Oncotherapy, version 1.9.6.2.

Methods

Until June 2016, the National Cancer Institute collected, processed and sent by hand more than 2500 requests of series of therapy protocols every month. We have created an oncologic therapy engine with the guidelines of oncology therapies, based on the knowledge provided by the Guidelines Committee, guided by state-of-the-art oncology therapies. This engine will provide the available therapies according to the following three types of data: clinical diagnosis, clinical stage, and therapeutic criteria. The requests go through a designed workflow and may be automatically approved by the system if they match the criteria established by the engine. If the data do not match, the request is submitted to the consideration of a Therapy Committee and may be either approved or rejected. If it is rejected, the petitioner could resend this petition to the

Coordinator of the Therapy Committee, who could approve or reject it definitely (see Figure 1). The main reason for rejection is to have another similar therapy in progress. Patients could receive more than one treatment at the same time or at different times, requested by either the same doctor or a different one. The procedure is allowed and controlled by the system. Each request is processed, by computing drugs, presentations, doses by patient which are packaged and sent to the medical centers where the patients receive oncological medical treatment. The request comprises a complete treatment and not one treatment cycle as it used to be done before. Every treatment is modeled within a period of time and it is required to confirm the request at certain intervals. The doctor receives an alert signal to proceed. In this way we are certain to send therapies that are still needed by the patient. The request could be ordinary or express depending on the timing that the treatment is needed according to the clinical situation. To date, we have processed 2260 urgent requests. The treatment could be suspended if it has already begun or cancelled if it has not been sent yet. In case the treating oncologist should be unable to find the intended therapeutic protocol by using the engine, a request to the Guidelines Committee could be sent, which may then enter new knowledge into the engine to enable the new option. In this way, the system allows a dynamic interaction between the Guidelines Committee and the country's oncologic community, providing the engine with feedback. One messenger service is activated inside the system to facilitate the communication among the oncologic community members, as well as with the Guidelines Committee. The Administrator profile is allowed to model the engine, feeding it with permits and constraints depending on the existing therapies in the National Health System. The solution is presented in oncological language and is assisted by colors and images to help the physicians to reach the desired function promptly.

The sanitary authorities could control the procedure and indirectly they also control the expenses in medical oncology.

Oncotherapy is made in a distributed environment, using web-based technology, supported with Java development and uses the PostgreSQL® database engine. The application is supported and administered on a TomCat® server.

Results

The decision-making about oncology therapy is a very challenging aim to achieve. Physicians participate in Tumor Committees, but these are not always possible in places far from the oncology centers. This type of clinical decision support system brings the knowledge universally in the same conditions wherever the patient is.

From July, 2016 to August 2018, Oncotherapy processed 14905 requests for 9300 patient made by 78 medical oncologists

distributed throughout the country. The workflow of the requests is shown in Table 1. 80.5% of requests follow the automatic approval without human intervention. Therefore, the administrative manual work has been eliminated and the number of members in the Therapies Committee has been reduced. More than 2000 therapies are currently in progress in the whole country and the medical request error is nonexistent (see Table 2). The diagnostic area of therapeutic intervention was distributed as Table 3 shows. The Guidelines Committee has a continuous intervention in the update of the engine model. The administrator sets the model depending on the Guidelines Committee resolutions and the sanitary authorities criteria. Indirectly, the cost of therapies was reduced by almost 20%, in the same period of time the number of patients increased due to the possibility to request therapies across the whole country. The medical informatics solution will contribute to creating a robust procedure to request oncology therapies according to the national guidelines in the National Health System.

Table 1 - Summary of Requests

Status	Request
Request	14905
Automatically Approved	12020
Requesting	145
Under Evaluation	10
Approved by the Therapies Committee	2475
Rejected	130
Temporary Rejection	15
Request after temporary rejection	12
Rejoinder awaiting answer	19
Approved by the Coordinator of the Therapies Committee	60
Rejected by the Coordinator of the Therapies Committee	40
Guidelines Committee Request approved	100

Table 2 – Summary of Therapies

Status Therapies	Sum
Under therapy	2105
Awaiting confirmation	525
Finished	7060
Suspended	120
Cancelled	705
Confirmed	3670

Table 3 – Summary of Diagnostic Area

Area	Sum
Gynecological cancer	7312
Urological cancer	3923
Digestive cancer	1585
Lung cancer	350
Head and Neck cancer	239
Skin cancer	66
Brain cancer	49
Soft Tissue cancer	41
Primitive unknown	10

Discussion

It is not an easy goal to create an IT (Information Technology) tool that helps physicians to do part of their technical job. Finding the suitable windows where the information system could be part of the routine without interrupting the clinical

process is a very challenging work for medical informatics. It requires deep knowledge of the business and the technology to make it part of the clinical process. In order to reach this objective, it is very important to understand that technology is not the most important thing. It is better to focus on the involvement with the clinical situation with the doctor.

Until now we were working in terms of different dimensions such as patients, treatment, drugs, protocols of therapies and guidelines. However, our work has not finished yet. We are working on user profiles to use the physician's dimension as a new filter to expand the use of the software to other cancer specialities and to other medical specialities, because the engine is useful in some other diseases. This will be included in the new version before the end of 2019.

The next step is to create the interfaces of the software to talk with other IT solutions in the national information system.



Figure 1 – Workflow of Request

Conclusions

We have created a clinical support system, where the oncological therapies engine is the most important input to the systematization of the decision-making process. This has been working successfully for 2 years in the control area of the National Cancer Bank of antitumor therapies. At the same time it is beneficial for the oncologic community to eliminate prescription errors. We have created a tool for the authorities to control the cost of the therapies, controlling the model and the spread, avoiding the waste of drugs.

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