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The Salomon Advisory System Supports a Depressive Episode Therapy

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"Salomon" system is Polish computer advisory system for diagnostics of affective disorders. The system makes it possible to assess the relative intensity of depression measured by the depressive episode characteristic symptoms set based on scientific criteria for ICD-10 classification, M. Hamilton's depression rating scale and fuzzy logic. After two following consultations the system is able to generate the therapeutic index. The index depends on clinical situation. Basing on new computer technologies and ICD-10 classification the creation of the rank of the most effective therapeutic methods for the specific disorders is possible. Applying of neural network simulator makes it possible to find the similar depressive episode clinical subtype with its characteristic clinical picture used by clinician making a therapeutic decision.

WHO has classified depression disturbances - due to widespread existence and serious medical consequences and resulting social and economic effects - as a priority health problem in all the developed countries. The significance of the depression disturbances is fully comparable to such illnesses as heart diseases, cancer and HIV infection.

The research made in the USA (NIMH programmer) shows that first contact doctors are not able to detect depression in relation to 50 - 70% of the people ill with it. Also the research made in other countries shows that a doctor properly identifies only one out of four persons with clear indications of depression. The wrong choice of the antidepressant drug may result in inefficient therapy and in growing risk of suicide.

It has been estimated that the Polish market of medicines is around 10 billion zl per year. Almost one fifth of the Polish medicine budget goes to refunding of the medicines. There is a growing insistence upon introduction of pharmacoeconomy connecting the elements of pharmacology, clinical medicine and economy. In 1993 the analysis of 50 best selling medicines in the EU made by two Italian pharmacologists showed that in France and Italy in over 45% of the cases the medicines with doubtful efficiency are applied.

Then we have created an expert system concerning depression disturbances. The expert systems have stopped to be just the domain of scientists dealing with artificial intelligence. For some years, mainly in the Western Europe, the USA and Japan we can see a growing application of these systems in medicine. The advisory systems may be described as the programmers whose main target is to simulate human expertise in the specified - usually narrow branch of knowledge. It is difficult to show the strict characteristics of the technology because it undergoes a process of intensive development. Nevertheless it is possible to specify several points differing it from conventional programmers:

- explicit representation of knowledge and separating it from the steering procedures,
- ability to explain the solutions of problems found by the system,
- transforming knowledge with the usage of mainly transforming symbols, in smaller degree numeric transforming, different methods of reasoning are mainly used to solve problems, rarely algorithms [2].

A computer advisory system called "Salomon" with a rapid access to the Internet data is aimed at providing the newest psychiatric knowledge for psychiatrists and doctors, who are treating most of the patients with depressive disorders. Psychiatrists may apply the system as a useful tool, shortening the time of patient's waiting for effective medical assistance. The system should never replace proper psychiatric examination and aggravate mutual relations between a doctor and a patient. The system cannot replace doctor in the difficult art of taking a therapeutic and diagnostic decision, will not replace his knowledge and experience.

The computer advisory system called "Salomon" was created as an application of the Polish expert system shell PC-SHELL, by AITECH firm. The classification ICD-10, research diagnostic criteria for the ICD-10, classic binary logic (0, 1 or "yes", "no") as well as "fuzzy" (multi-value) logic, HDRS (Hamilton Depression Rating Scale) are applied to define rules in knowledge bases [1, 6]. Classical research model, that is, classical binary logic and diagnostic criteria of ICD-10 classification as well as various psychometric scales were replaced with "fuzzy" logic model and one of well-recognized psychometric scales with

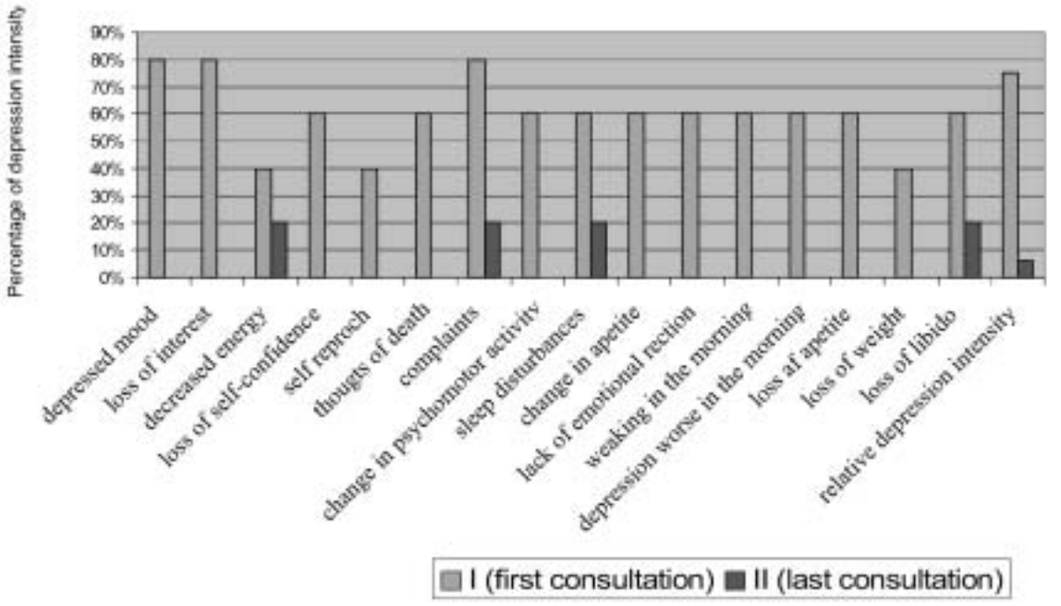

Fig. 1. Depression intensity scale according to RDC for ICD-10.

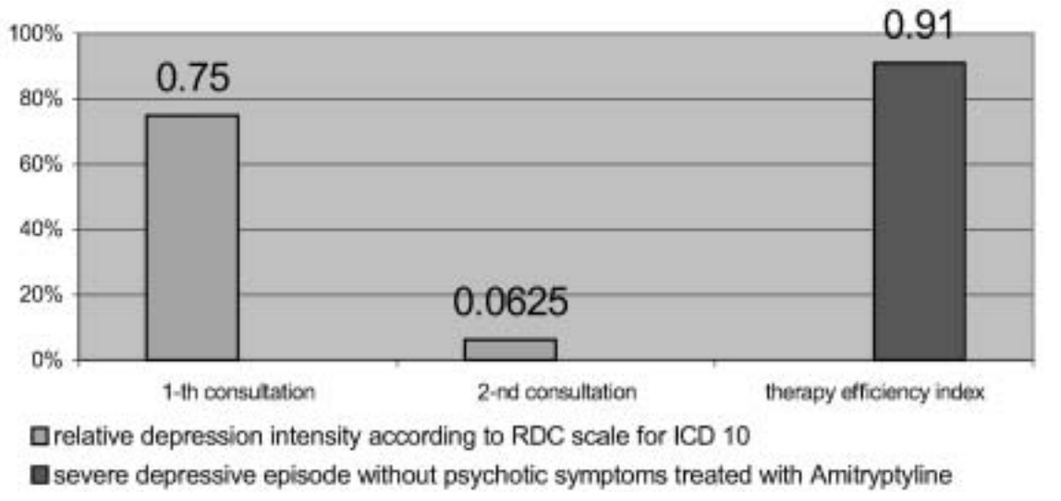

Fig. 2. Therapy efficiency index.

diagnostic criteria of ICD-10 classification remaining [7]. I hope I've reduced diagnostic errors by avoiding introducing symptoms in YES or NO system (i.e. 0,1) and we've achieved full compatibility with the knowledge accepted almost worldwide [6].

The "Salomon" system was created as a result of the author's previous experience gathered in the course of performing his D.Sc. thesis, entitled "Attempts to improve of diagnosis-therapy process of depressive syndromes by application of computer advisory system, based on different clinical classifications" [3, 4].

Bank of Depressive Disorders (Method)

An application of "Bank of depressive disorders" has an aim to gather practical data and create for the future a

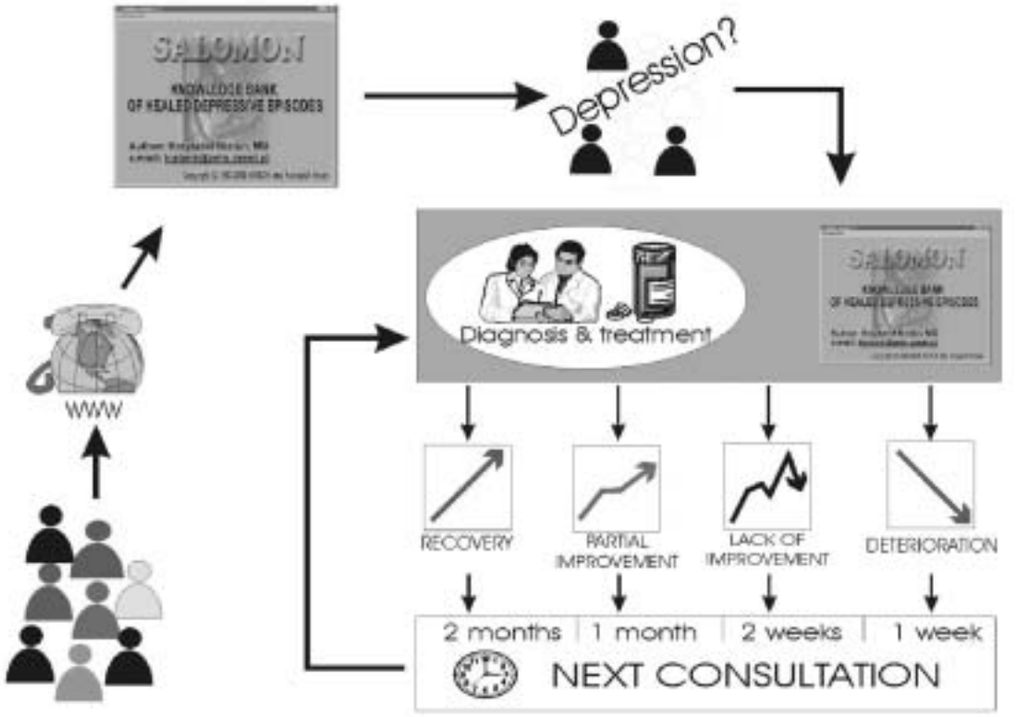

Fig. 3. Profits from knowledge bank about healed depressive episodes for patients.

Fig. 4. Profits from knowledge bank about healed depressive episodes - access to the network of excellence.

knowledge bank of patients and methods of their treatment. This bank includes therefore databases of patients and doctor, performing the treatment.

The advisory system gives a possibility to save effects of consultations of every patient and methods of a therapy prescribed by a doctor. The advisory system asks successive

TABLE 1
Clinical situations in depressive episodes treatment

1-th consultation	2-nd consultation	Clinical conditions comparison
Moderate depressive episode with somatic syndrome	Symptoms do not meet criteria for any depressive episode	"Recovery" - complete remission
Severe depressive episode without psychotic symptoms	Mild depressive episode without somatic syndrome	Partial improvement
Mild depressive episode without somatic syndrome	Mild depressive episode without somatic syndrome	Lack of improvement
Symptoms do not meet criteria for any depressive episode	Mild depressive episode with somatic syndrome	Deterioration

questions. A doctor has to select proper answers from displayed list. Accessible explanations "What is" may be used for elucidating of the asked questions. The conclusion - diagnosis generated by the system (one or more) will be displayed after answering all questions. Diagnostic conclusions of "Salomon" system are presented as:

- a set of symptoms for neural network simulator - when patient's symptoms don't meet criteria for depressive episode in any intensity (remission, cured episode, exclusion of depressive episode or depression disorder other than depressive episode);
- depressive episode with a statistic number from ICD-10 classification and a set of symptoms for neural network simulator - when patient's symptoms meet criteria for depressive episode.

After each consultation with the system it is possible to measure relative intensity of depression using a set of characteristic symptoms of depressive episode according to RDC for ICD-10 (Fig. 1).

In the course of depressive episode treatment the mentioned above clinical situations are possible. After consulting a patient with depressive episode a physician chooses a certain type of therapy. The interval between consultations depends on an initial diagnosis (i.e. severity of depressive episode) and on the dynamic of clinical picture. The interval should be shorter in the case of severe episodes or deterioration of a patient's psychic state. In the case of improvement in the patient's condition the interval can be longer (Table 1) [5].

After every second succeeding consultation it is also possible to estimate therapy effectiveness index. Its value depends on clinical situation:

- equals "0" if depression intensity values at the first and last consultation are the same (from clinical point of view: no improvement);
- equals "1" if a depression intensity value at the last consultation is equal to 0 (from clinical point of view: cured episode, full remission);
- is positive if a depression intensity value at the last consultation is lower than the one at the first consultation (from clinical point of view: partial improvement);
- is negative if a depression intensity value at the last consultation is higher than the one at the first consultation (from clinical point of view: deterioration, relapse) (Fig. 2).

The latest advances in information technology enable us to devise a ranking of the most effective therapeutic methods for a given disorder described in ICD-10 classification. Application of neural network allows finding similar sub clinical subdivisions of depressive episodes, i.e. clinical picture used daily to choose therapy (Fig. 3).

Due to application of universal format for data - therapy window, the use of ODBC as well as fast presentation of symptoms and therapy, i.e. essential information consolidating a physician's decision on diagnosis and therapy, may be exchanged in Internet and Intranet (Fig. 4).

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