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THE EFFECTIVENESS OF SURGEON DECISION ON PAIN SYNDROME OF PELVIC ORIGIN TREATMENT IN WOMEN ESTIMATED WITH THE MODEL OF DECISION TREE

Introduction. The problem of correct diagnostics with the decision on the consequent adequate treatment of diseases which are causative for pelvic pain syndrome in women is actual for 15–24% women of fertile age.

The purpose of the work is to investigate the effectiveness of different methods of treatment women with pain syndrome originated from pelvis and lower part of abdomen on the basis of retrospective analysis of 1092 histories of diseases during 2013–2017 p.p.,

Methods. Method of decision tree building up was used. The probability of different outcomes — restoration of health, recurrence of the disease along with the perioperative complications as well as duration of treatment in each case were taken into consideration as informative indices for decision tree composing. On the basis of mentioned data the index of effective period of treatment (EPT) was calculated. Period of observation was six months from the moment of disease diagnostics.

Results. It was established that the probability of complete health restoration was 0,83 after surgical treatment and 0,62 after drug treatment. In case of initial inefficiency of drug

treatment the probability of restoration of health as a result of surgical intervention was 0,40. The EPT in surgically treated patients was less than EPT in patients with therapeutic treatment by 3,29 times at the moment of making decision on the method of treatment.

Conclusions. It was concluded that early decision on surgical intervention as a method of diagnostics and treatment was more effective when compared with the drug method of treatment women with pelvic pain syndrome. Dependence of the treatment effects upon perioperative complications serve as forecasting data for individual medical care delivered during postoperative period.

Keywords: tree of decision, undertaking of decision in surgery, pain syndrome, the effectiveness of treatment estimation.

INTRODUCTION

Making decisions in surgical practice very often is performed under conditions of time shrinkage and uncertainty of symptoms. That is why correct chose of optimal decision on diagnostics and treatment is complicated [1–5]. From other side, looking for the identification of moments of surgeon's decision making and converting that process into autonomic informational support regime makes delivering surgical service more reliable and effective [1, 2]. Especially such an approach is of worth for syndromes with uncertain symptoms manifestations such as pain pelvic manifestations in women [6]. Taking into consideration that diagnostic and treatment mistakes are observed almost in one half of women with pain pelvic syndrome [4, 6], the working out the system aimed for support of surgeon decision is regarded as a great challenge with substantial practical consequences.

The building up of decision tree permits to estimate the effectiveness of treatment [7–9]. This method has not been used for the laparoscopic intervention effectiveness estimation in women with pelvic pain syndrome till the last time.

The purpose of the investigation is confined to perform retrospective comparative estimation of the effectiveness of surgical and conservative treatment of women with the pelvic pain and pain in the lower part of abdomen.

PROBLEM STATEMENT

The problem of heightening of diagnostics and treatment pelvic pain in women is especially actual taking into consideration that painful syndrome originated from pelvis and lower parts of abdomen is met in 15–24% of women of fertile age as well as both from 10 to 35% of diagnostic laparoscopies and up to 12% of hysterectomies are performed in women with chronic pelvic pain in developed countries [6]. Such aspect as differential diagnostics of appendicitis and inflammation of pelvic organs is also included as a separate and most contributive to the general problem on the effectiveness of diagnostics and treatment of pelvic pain per se [4, 6].

Hence, investigations aimed for comparative analysis of different methods of surgical and therapeutic treatment of women with pelvic pain is of outstanding practical significance. The creation of regression trees of decisions are among those methods which permit to perform such analysis. [10]. It is of worth to note that tree of regression is valid for the effect of treatment identification which is based on such argument as duration of patient's staying at hospital [10].

CHARACTERISTICS OF THE VOLUME AND METHODS OF INVESTIGATIONS

The volume of investigations. All results were gained in the course of retrospective analysis of histories of diseases of women, who were treated at Odessa Regional Clinical Hospital during 2013–2017 years with the pelvic pain and pain at lower part of abdomen as an indication for the treatment. Altogether 1092 histories of diseases of women from 18 up to 47 years old have been analyzed.

Criteria on the inclusion into investigation were the next:
- fertile age of women;
- the presence of painful syndrome of pelvic or / and lower abdomen origin;
- the performance of laparoscopic diagnostics along with the performing of laparoscopic treatment in the anamnesis;
- clear and reliable chance for the expert estimation of the effectiveness of diagnostics and treatment as well as possibility to estimate such informative parameters as complications incidence, duration of staying at hospital after first and repeated women's advertising for medical help.

Methods of the analysis. The calculation of the effectiveness of treatment was performed on the basis of probability of restoration of patient's health, and duration of the period of hospital treatment, which was measured in days. Besides, the probability of the recurrence of the disease (syndrome) as well as the duration of repeated hospital period of treatment was taken into account. The recurrence of disease was identified as repeated advertising of the patient with the same symptoms on the painful syndrome originated from pelvis and lower part of abdomen. The period between the moment of discharging from previous treatment and repeated advertising for medical help was estimated in days and was taken as an informative parameter for the effectiveness of treatment estimation. All histories of diseases were analyzed for the period of half of a year from the moment of the first women observation at hospital.

Taking into consideration of the possibility of quantitative estimation performing using tree decisions method [3, 8] the quantification of the effectiveness of treatment was performed with the index "effective period of treatment" (EPT). Such an index was calculated in accordance to the equation:

$$EPT = \frac{1}{n}\sum_{i=1}^{n} x_i\, P(A), \tag{1}$$

where x_i — an average length of treatment period; P — probability of successful result of treatment (health restoration); n — number of patients.

Similarly, in case of recurrence of disease and repeated treatment, EPT was calculated as an averaged number of days after the first discharging from the hospital multiplied by the probability of the recurrence of disease. Taking into consideration the well-known fact on the reversed dependence between the length of period before recurrence of the disease and the effectiveness of treatment [5, 6], the EPT for repeated medical care was calculated as reversed value of average length of period free from pain syndrome after the first treatment multiplied by 100 and by weight coefficient (Q=10). That was necessary for correct comparison of EPT calculated for the first period of treatment with the

EPT of treatment performed after recurrence of disease:

$$EPT = \frac{1}{\frac{1}{n}\sum_{i=1}^{n} x_i} \times 100 \times Q \times P(A).$$

(2)

THE GENERAL CHARACTERISTICS OF TREATMENT RESULTS

Surgical treatment results. In the accordance with retrospective analysis, it was established that 828 patients (75,8%) have been treated surgically while the rest 234 patients (24,2%) were treated therapeutically.

Intraoperative complications were registered in 84 patients (10,1%), and in 48 out of them complications were also revealed during postoperative period (Fig. 1). The mean duration of the treatment of intraoperative complications was 11,84 ± 1,13 days, while postoperative ones were treated during — 17,52 ± 1,22 days. It is worth to note that recurrence of disease was observed in 32 out of 48 patients in the subgroup of patients with both intra- and postoperative complications, while the rest of them (16 patients, 33,3%) successfully discharged from hospital. The recurrence of disease was registered in 16 out of 36 patients, who had only postoperative complications, while the rest 20 patients were successfully discharged from hospital (Fig.1). Those patients who were surgically treated and free from intraoperative complications (744 patients) demonstrated postoperative complications in 76 cases (10,2%), while the majority of them (668 patients) have been discharged from the hospital after 4,57 ± 0,81 days of treatment. Later on 68 patients out from those 668 have advertised for medical help again after 97,50 ± 6,42 days free from pain syndrome period.

Therapeutic treatment results. 264 patients (24,2%) have started with drug-based conservative treatment (Fig. 1). The successful results of 23,41 ± 2,51 days of treatment was observed in 108 patients (40,9%). The recurrence of the disease was registered in the rest 156 (59,0%) patients after 33,92 + 2,85 days of treatment. The corrected drug-based treatment was restarted in 56 out of those 156 patients with the success ful result in 27,22 ± 3,35 days of treatment. The rest 100 patients were decided to treat surgically, and in 44 (44,0%) of them the intraoperative complications have been registered, which have been successfully therapeutically treated in 16,03 ± 1,52 days. Besides, in 28 out of 44 patients postoperative complications have been precipitated as well. The majority of patients with both intra- and postoperative complications (71,4%) suffered from the recurrent pain syndrome, which renovated in average of 50,83 ± 6,74 days, while successful treatment, which was registered in eight patients, finished in 37,32 ± 4,59 days of treatment. Those patients who had intraoperative complications without postoperative ones the renovated pain symptoms was seen in 74,51 ± 7,45 days (eight patients), while successful treatment was observed in 16,33 ± 2,92 days of treatment (eight patients).

The postoperative complications were observed in 36 out of 56 patients who had not intraoperative ones. In 24 out of these 36 patients suffered from the recurrence of disease in average of 70,3 ± 5,8 days. Successful treatment was performed in 12 out of those 24 patients in 27,0 ± 3,4 days. The successful discharging from hospital after 6,33 ± 0,62 days of treatment was registered in
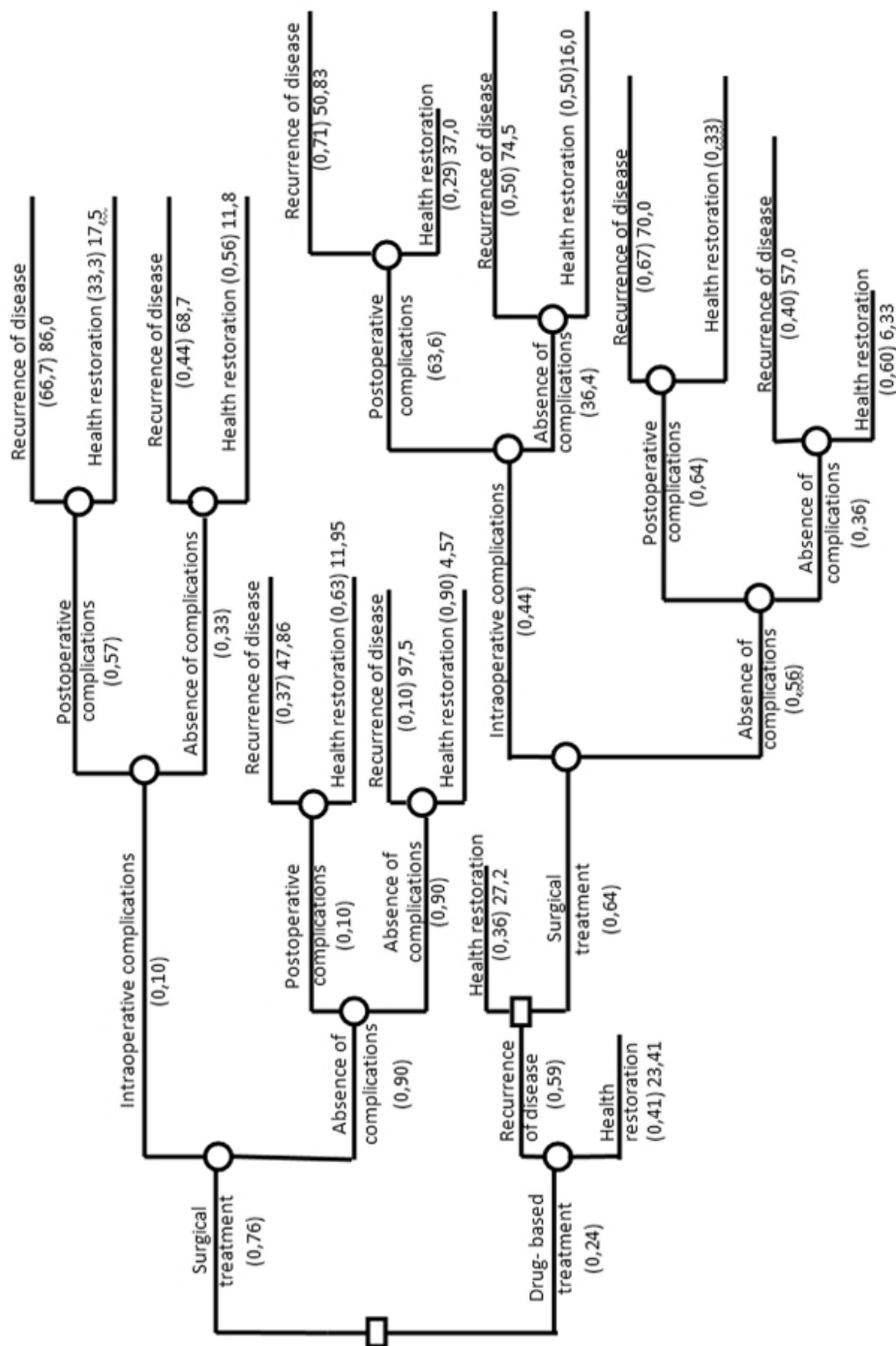
Fig. 1. Graph on the effectiveness of medical service delivering to patients with chronic pelvic pain. Notes: at this and next figure — the probability of correspondent patient's state (in brackets), and duration of treatment (days) — nearby brackets.

12 out of 20 patients, who did not demonstrate both intra- and postoperative complications (Fig. 1). The rest eight patients have been advertised for medical help with renovated pain syndrome in 57,3 ± 6,7 days.

THE COMPARATIVE EFFECTIVENESS OF SURGICAL AND CONSERVATIVE TREATMENT

The clear rising of EPT was evident when it was compared with such one measured in patients treated surgically in patients resistant to drug-based treatment with such one in patients who were treated surgically from the very beginning (Table 1).

The EPT in surgically treated patients, who did not suffer from complications, was two times less when compared with EPT in patients with perioperative complications (Fig. 2). It should be stressed that EPT in patients with successful initial surgical treatment was less by 2,68 times when compared with such one registered in patients whom surgical intervention was performed after therapeutic treatment (Fig. 2, B). EPT in patients with recurrent disease, which was registered after initial therapeutic treatment was higher when compared with such one in patients with primarily surgical treatment by 3,17 times (Fig. 2, C). Finally, the EPT in surgically treated patients was less than EPT in patients with therapeutic treatment by 3,29 times at the moment of making decision on the method of treatment (Fig. 2, D).

Hence, gained data as a result of retrospective analysis are in favor for different type of treatment as an initial decision for women with pelvic pain syndrome. Surgical or drug treatment has been chosen on the basis of both actual medical protocol and patients desire to be involved in surgical or drug-based treatment. Also it was established that surgical and therapeutic treatment has had different consequences with respect to complications precipitance and patient's repeated advertisement for medical help. Thus, in case of drugs prescription recovery was observed with the probability of 0,62 including recovery after repeated medical help delivering. Similar probability after surgical treatment was 0,83. But surgical treatment which has been delivered after therapeutic treatment was followed by recovery with a probability of 0,40. Such low value is in favor for reduced effectiveness of surgical treatment under conditions of ineffectiveness of drug treatment of pelvic pain syndrome. The lowering of surgery effectiveness might be explained by both resistance of the disease to treatment and increasing of disease severity [4, 6]. It should be emphasized that this fact points on importance of earlier diagnostics and surgery intervention in women with pelvic pain syndrome.

Table 1. **EPT values depending upon the type of complications and the type of primarily treatment**

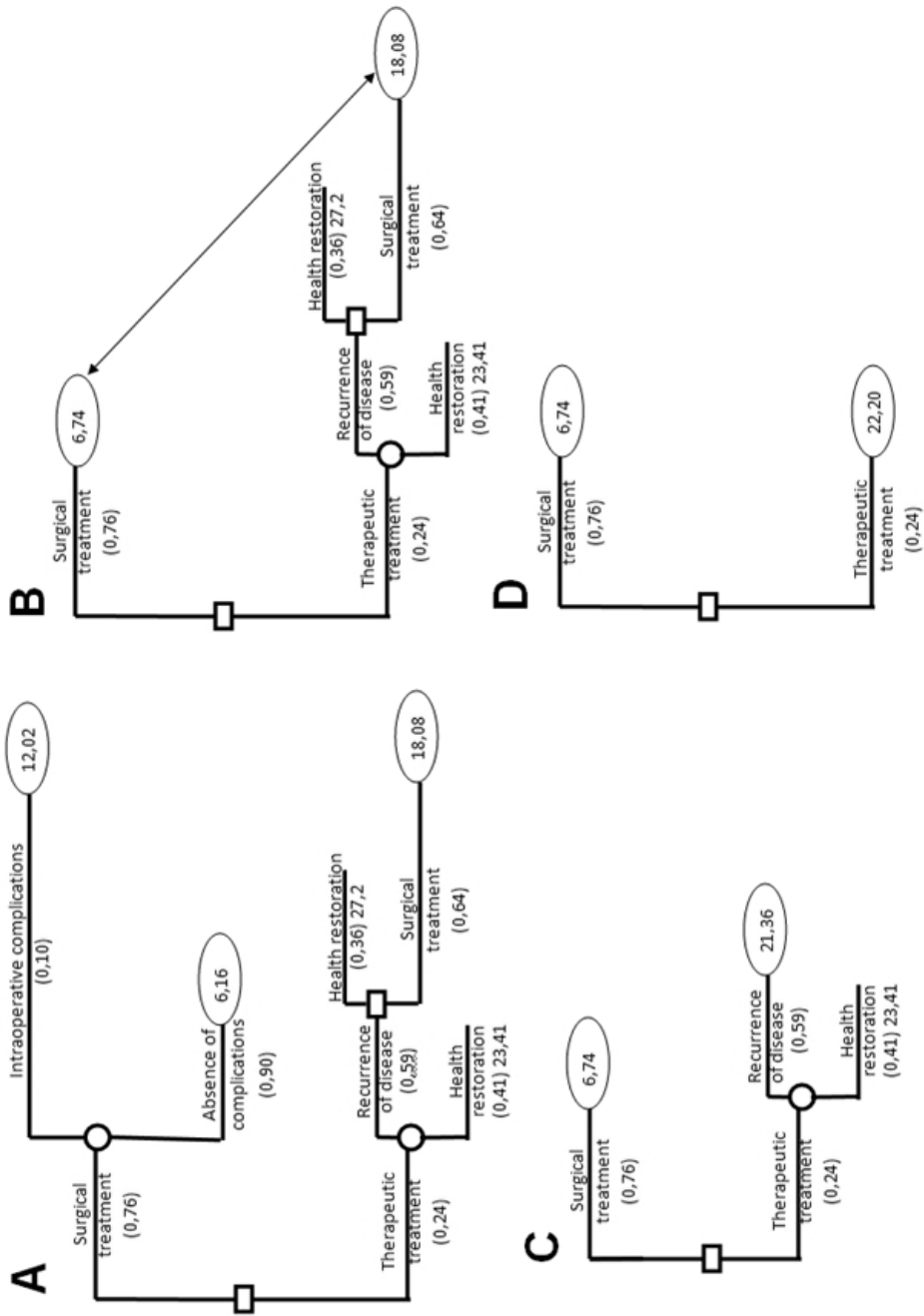| Type of the initial treatment	Type of complications		
	Intraoperative	Postoperative	Perioperative (Both)
Surgical	12,99	15,30	13,56
Conservative (therapeutical or drug-based)	14,70	18,48	24,73

Fig. 2. Stages on EPT (inside ellipses) calculations in the course of clarifying the effect of intraoperative complications (A), comparison of the effectiveness of surgical treatment after the first advertisement for medical help and after recurrence of pain syndrome as a result of the resistance to therapeutic treatment — marked with arrows (B), as well as comparison of the effectiveness of surgical and therapeutic treatment (C and D).

EPT-index proved to be effective in the course of evaluation of effectiveness of treatment methods as far as it includes probability of possible results of treatment, duration of treatment and similar characteristics for cases of disease recurrence. Thus, gained data revealed that EPT of those patients who have suffered from postoperative complications with the absence of intraoperative ones was 2,98 times fold greater when compared with the EPT of patients who were successfully treated and avoided preoperative complications. Similar ratio of ETP (1,71 times) was observed in patients who were treated therapeutically from the very beginning pertained to patients whom surgical intervention was performed secondarily to the initial drug-based treatment. It is also worth to note that ETP was higher in all groups of patients who were treated initially therapeutically when compared with data gained in groups of patients who began with surgical treatment.

Gained data are in favor for the recommendation to concentrate resources of the system of surgeon decision support on the crucial decision — the chose method of treatment of women who suffered from pelvic pain and pain at lower part of abdomen with uncertain origin at the moment of their entrance to hospital. Also it is important to pay proper attention to chose method of diagnostics and treatment of those women who were resistant to the initial therapeutical treatment.

CONCLUSIONS

The process of the delivering of medical care to patients with pelvic pain syndrome is possible to model at satisfactory level with the method of decision tree creation. Using such an approach the critical points — decisions which are followed by different level of effectiveness of treatment is possible to identify

In accordance to gained data on the effectiveness of patients treatment who were successfully discharged from hospital, but advertised again after recurrence of pain syndrome it was established that in-time performed surgical treatment permitted to get better results when compared with drug-based treatment.

Surgical treatment performed after primarily delivered drug- based treatment is followed by greater number of both intra — and postoperative complications as well as by prolonged hospital period of treatment when compared with patients who were started in-time with surgery.

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ОЦІНЮВАННЯ ЕФЕКТИВНОСТІ ПРИЙНЯТТЯ РІШЕНЬ ХІРУРГОМ У РАЗІ БОЛЬОВОГО СИНДРОМУ МИСКОВОГО ПОХОДЖЕННЯ ЗА ДОПОМОГИ МОДЕЛІ ДЕРЕВА РІШЕНЬ

Вступ. Проблема коректної діагностики і прийняття рішення щодо адекватного лікування захворювань, які є причиною больового синдрому мискового походження, є важливою, оскільки синдром трапляється у 15–24% жінок репродуктивного віку.

Мета роботи полягає у порівнянні ефективності різних методів лікування жінок з больовим синдромом мискового походження на основі ретроспективного аналізу 1092 історій хвороб пацієнтів, яким лікування було надано в період 2013–2017 р.р.

Методи дослідження. Використано метод побудови моделі дерева рішень. В якості інформаційних критеріїв побудови моделі було використано імовірність одужання, час відновлення проявів захворювання після лікування, імовірність виникнення периопераційних ускладнень, а також тривалість лікування. На основі вказаних критеріїв розраховано показник ефективного періоду лікування. Період спостереження пацієнтів складав півроку з моменту виникнення больового синдрому.

Результати дослідження. Встановлено, що імовірність повного відновлення здоров'я склала 0,83 після хірургічного і 0,62 після консервативного лікування. У випадку, коли первинне консервативне лікування не приводило до одужання, імовірність одужання після проведення хірургічного втручання дорівнювала 0,40. Ефективність періоду лікування, розрахована для пацієнтів з первинним хірургічним лікуванням, була менша в 3,29 разу у порівнянні з ефективністю, розрахованої для пацієнтів з первинним консервативним лікуванням.

Висновки. Своєчасне прийняття рішення щодо хірургічного лікування захворювань, які є причиною больового синдрому мискового походження, є ефективнішим у порівнянні із застосуванням медикаментозного лікування. Визначена залежність ефективності лікування від периопераційних ускладнень може слугувати в якості прогностичних критеріїв стану пацієнта в післяопераційному періоді.

Ключові слова: дерево рішень, прийняття рішення в хірургії, больовий синдром, оцінка ефективності лікування.

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ОЦЕНКА ЭФФЕКТИВНОСТИ ПРИНЯТИЯ РЕШЕНИЙ ХИРУРГОМ
ПРИ БОЛЕВОМ СИНДРОМЕ ТАЗОВОГО ПРОИСХОЖДЕНИЯ
С ПОМОЩЬЮ МОДЕЛИ ДЕРЕВА РЕШЕНИЙ

Проведены ретроспективные исследования эффективности принятия решений при диагностике и лечении пациентов хирургического профиля — женщин, страдаючих хроническим болевым синдромом. Результаты анализа историй болезни 1092 пациенток, которым была оказана врачебная помощь в период 2013–2017 г.г., проведенного на основе построения дерева решений, показали, что вероятность выздоровления при проведении хирургического вмешательства составила 0,83, в то время как при проведении медикаментозного лечения — 0,62. В случае неэффективности медикаментозного лечения вероятность выздоровления уменьшалась до 0,40. Определены ключевые моменты применения системы поддержки решений хирурга, позволяющие повысить эффективность лечения данной категории пациентов.

Ключевые слова: *дерево решений, принятие решений хирургом, болевой синдром,оценка эффективности лечения.*