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Short-Term Improvement of Patients' Quality of Life After Coronary Artery Bypass Grafting – a Prospective Single-Center Study Based on the EQ-5D Assessment Tool

Poprawa jakości życia w perspektywie krótkoterminowej u pacjentów po pomostowaniu aortalno-wieńcowym – prospektywne, jednoośrodkowe badanie kliniczne oparte na kwestionariuszu EQ-5D

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Abstract

Background. Most cardiac patients believe that a heart operation will considerably improve their daily activities and quality of life (QoL). The question is how quickly it will happen. As the answer to this question is not strictly tied to medical outcomes, the authors decided to turn to the patients as a source.
Objectives. To determine the health-related QoL of heart surgery patients before surgery and to evaluate the change of QoL over the first month after operation.
Material and Methods. The study involved 86 coronary artery bypass grafting (CABG) patients (59 male; mean age = 63.3, SD = 8.93). Their QoL was measured by the EQ-5DVAS, which records the respondent's self-rated health status on a vertical visual analogue scale (VAS) of 0–100, in which 0 represents the worst imaginable state of health and 100 is the best imaginable. The patients' QoL was assessed at three points in time: on the day of admission (P1), 6 days after surgery (P2) and in the fourth week after the procedure (P3).
Results. The average QoL just before surgery (P1) was 61.9 (SD = 18.85). No major improvement in the QoL was achieved after 6 days (P2) (61.97, $p > 0.05$), but in the following 4 weeks the QoL increased dramatically (P3) (67.93, $p > 0.05$). It was observed that the QoL was associated with the patient age. In older patients there was a temporary drop at P2, whereas in younger patients there was a constant rise through the 4th post-operative week. Neither the type of procedure (on-pump *vs* off-pump) nor gender had any significant influence on the level of the QoL.
Conclusions. The quality of life significantly improves in the first 4 weeks after cardiac surgery. There is a relation between the patient's age and their reported QoL in the very early post-operative period. Further studies are needed to determine which areas of post-operative care of older patients require greater attention (**Adv Clin Exp Med 2011, 20, 4, 447–453**).

Key words: CABG, QoL, EQ-5D, EuroQol, EuroScore.

Streszczenie

Wprowadzenie. Pacjenci poddani pomostowaniu aortalno-wieńcowemu (CABG) oczekują poprawy jakości życia (QoL), nie mają jednak pewności, jak szybko mogą się jej spodziewać. Aby odpowiedzieć na to pytanie, przeprowadzono prospektywne, jednoośrodkowe badanie w Dolnośląskim Centrum Chorób Serca Medinet.
Cel pracy. Ocena jakości życia we wczesnym okresie pooperacyjnym u pacjentów poddanych zabiegowi CABG.
Materiał i metody. Do badania włączono 86 pacjentów poddanych CABG (59 mężczyzn; średni wiek [SD]: 63,3 [8,93]). Ocenę jakości życia przeprowadzono na podstawie kwestionariusza EQ-5D i skali VAS (*visual analogue scale*) o wartościach od 0 (najgorszy wyobrażalny stan zdrowia) do 100 (najlepszy wyobrażalny stan zdrowia). Jakość życia była mierzona w trzech punktach czasowych: dzień przed zabiegiem (P1), 6 dni po zabiegu (P2) i w 4. tygodniu po zabiegu (P3).
Wyniki. Średnia QoL w P1 wyniosła 61,9 (SD: 18,85), nie odnotowano istotnej poprawy w P2, QoL = 61,97 ($p > 0,05$), QoL istotnie poprawiła się natomiast w P3 – do poziomu 67,93 ($p > 0,05$). Czynnikiem wpływającym

na QoL był wiek, u osób starszych rejestrowano przejściowe pogorszenie QoL w P2. Na QoL nie wpływały: rodzaj zabiegu (z lub bez użycia krążenia pozaustrojowego) ani płeć.
Wnioski. QoL zmienia się w okresie okołooperacyjnym i istotnie poprawia się w pierwszych 4 tygodniach po zabiegu. Istnieje zależność między starszym wiekiem a postrzeganym poziomem QoL w 6. dniu po zabiegu. Być może przyszłe badania odpowiedzą na pytanie, czy starsi pacjenci wymagają odmiennej opieki w pierwszych tygodniach po zabiegu (**Adv Clin Exp Med 2011, 20, 4, 447–453**).

Słowa kluczowe: CABG, jakość życia, EQ-5D, EuroScore, choroba wieńcowa.

A review of the literature evaluating the results of coronary artery bypass grafting (CABG) reveals that most of the studies focus on strictly clinical dimensions such as the mortality, morbidity and intensiveness of postoperative drug therapy, rather than on patient-reported outcomes such as the quality of life (QoL) [1–4]. The bottom line of reports on CABG is that the procedure prevents deaths and prolongs life [5–6], but there is still limited data on the quality of life after cardiothoracic surgery [7–8]. The emerging need for local studies combined with a shortage of such papers among Polish publications spurred the authors to conduct a prospective observatory study measuring the quality of life in patients after CABG.

Material and Methods

The study was performed at the Medinet Heart Center in Wroclaw, Poland – a tertiary cardiac surgery center. A total of 121 patients who underwent isolated coronary artery bypass grafting during the 5 consecutive months of the duration of the study were invited to participate. The main exclusion criterion was a lack of informed consent from the patient, but patients who missed more than one of the three QoL measurements were also excluded from the statistical analysis. As a result 86 patients were ultimately included in the study. Nearly 70% were male (n = 59). The age range extended from 42 to 81 years, with a mean of 63.3 (SD = 8.93). The age variations in relation to gender, procedure type and number of vessels grafted are provided in Table 1. The majority of patients were treated with a classic on-pump CABG, whereas 20.9% (n = 18) underwent off-pump coronary artery bypass grafting (OPCAB). The decision about whether or not to use the pump was made individually by the surgeon in charge and depended on the nature of the lesions and the skills of the surgeon. The patients were assigned to surgeons randomly; no physician could choose which patient to operate on.

The risk of operative mortality was estimated using the European System for Cardiac Operative Risk Evaluation (EuroSCORE) [9]. The EuroSCORE profiles is presented in Fig. 1.

Firstly, informed consent was obtained from each patient scheduled for the CABG. The self-administered questionnaire was completed by each patient at three points in time. The first questionnaire was given to the patient by the registering nurse on the day of admission to the hospital. In most cases this was one day before the scheduled treatment. The second one was given to the patient on day 6 after the surgery, which was 2 days before the patient was discharged from the surgical ward. The third time, the questionnaire was given to the patient at the rehabilitation ward during week 4 after the operation. Each time, the questionnaire was collected by the nursing staff, and if the patient had difficulties filling it out, assistance was provided on individual basis.

The five-dimensional three-level EQ-5D questionnaire with a visual analogue scale (referred to as VAS) was used to assess the health-related QoL [10]. The 5 domains in the EQ-5D tool are: physical status, based on assessment of mobility (I); independence, assessed in terms of the level of self-care (II); everyday functioning, in terms of the ability

Table 1. Age distribution in three subgroups (by gender, type of procedure and number of vessels grafted)

Tabela 1. Rozkład wieku w trzech podgrupach (według płci, rodzaju zabiegu, liczby pomostowanych naczyń)

Mean age in years (Średni wiek – lata)							
gender		type of procedure		number of vessels			
Male	Female	CABG	OPCAB	I	II	III	IV
62.2	65.7	64.1	60.1	62.6	61.5	65	65

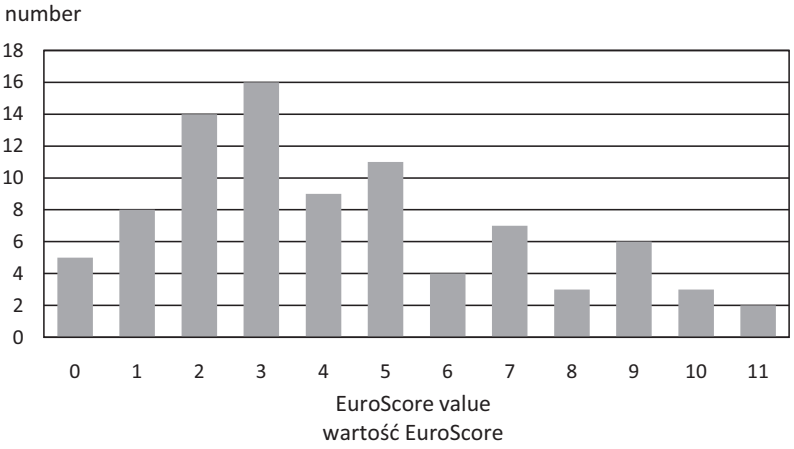

Fig. 1. Distribution of EuroSCORE values. EuroSCORE – European System for Cardiac Operative Risk Evaluation

Ryc. 1. Rozkład ilościowy według EuroSCORE. EuroSCORE – europejski system oceny ryzyka operacyjnego w kardiochirurgii

to perform listed commonplace activities (III); the level of pain and discomfort (IV); and mental condition, in terms of anxiety and depression (V). Each domain consists of three levels, level one representing the best possible outcome and level three the worst one. For example, in the mobility domain the levels are: 1) "I have no problems walking about", 2) "I have some problems walking about" and 3) "I am confined to bed". The answers were coded as 5 digit profiles in which each digit was equal to the level of answer given by the patient; for example 11121 meant a medium-level answer for domain IV and the highest level for domains I, II, III and V.

The Visual Analogue Scale consists of a vertical "thermometer" with a scale from 0 to 100. Each point of the scale represents the perceived level of quality of life at the given moment. The lowest score (0) represents the worst imaginable state of health, while the highest value (100) represents the best imaginable health. The patient's task was to draw a line intersecting the "thermometer" at the point describing his/her current perceived state of health.

The statistical analysis was performed using SPSS statistical software version 12.0. For the group characteristics exploratory data analysis was performed and descriptive statistics obtained. To test for the significance of a difference between two normally distributed averages the Student's t-test was used [11]. A linear regression analysis was used to establish the variables that influence the predefined QoL outcomes [12, 13].

Results

The mean baseline (pre-operative) level of quality of life was 61.9 (SD = 18.85) on the VAS. Regarding mobility, only one patient reported being bedridden; 41.4% of the patients had some difficulties walking around; and more than half (57.1%) had no problems with mobility. The vast majority of the patients (91.3%) reported no trouble with self-care. Everyday activity was impaired in 35.3% of the cases. Pain and discomfort were reported by 78% of the respondents. Depression or anxiety were noted by 67.6% of them. The complete baseline characteristics are presented in Table 2.

As shown in Fig. 2, the results collected in each domain of the EQ-5D have a diverse pattern in comparison to the VAS curve. The pre-operative outcomes were used as the baseline measurements against which to compare the data collected at later stages. The reported quality of life for all domains but depression and anxiety improved during the first post-operative week. The greatest increases between the pre-operative levels and the first post-operative outcomes were 45% for "self-care" and 24% for "everyday activity".

The deterioration in the levels of anxiety (–10%) continued, dropping by another 3% by the end of the fourth week – and the mean values in the remaining domains worsened as well. After 4 weeks only the "self-care" and "everyday activity" domains were assessed above the baseline, while the averages of the patients' reports for "mobility",

Table 2. Baseline quality of life characteristics

Tabela 2. Podstawowe cechy jakości życia

	Mobility %	Self-care %	Everyday activity %	Pain/Discomfort %	Anxiety/Depression %
1 (good)	57.1	91.3	64.6	22.1	32.4
2 (average)	41.4	8.7	33.8	70.6	64.7
3 (bad)	1.4	0	1.5	7.4	2.9

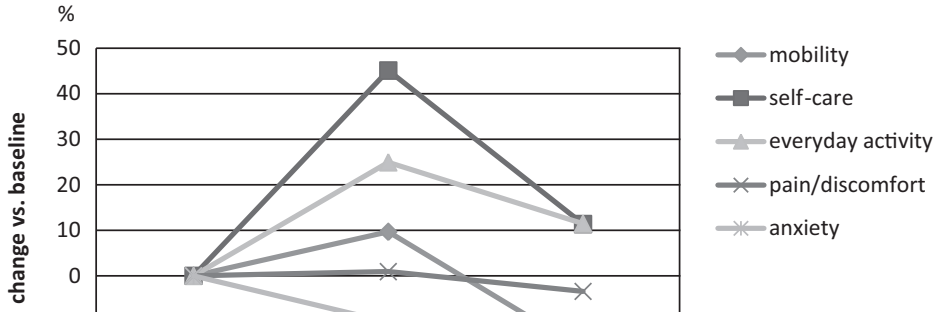

Fig. 2. Changes in the five Quality of Life domains over time. QoL – quality of life

Ryc. 2. Zmiana pięciu domen jakości życia w czasie. QoL – jakość życia.

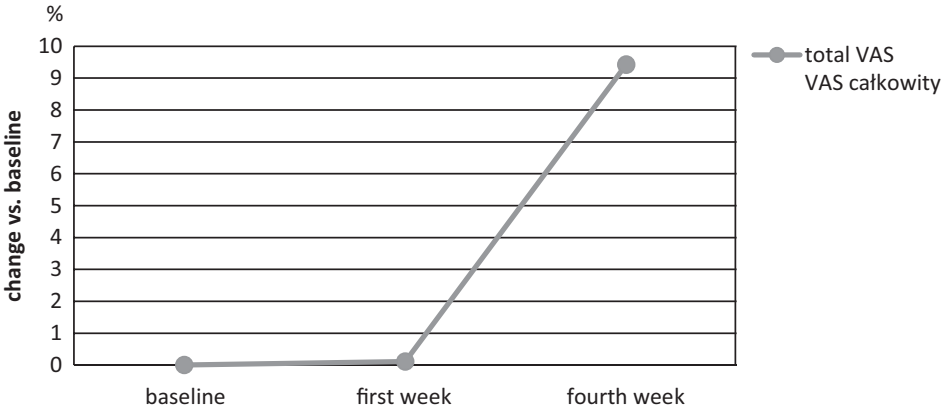

Fig. 3. Changes in Quality of Life over time as measured with the VAS tool. VAS – visual analog scale

Ryc. 3. Zmiana jakości życia mierzona narzędziem VAS w czasie. VAS – wizualna skala analogowa

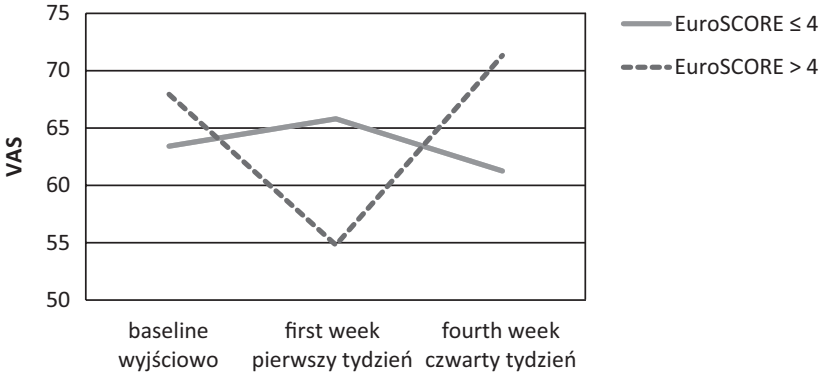

Fig. 4. Changes in Quality of Life over time in relation to the baseline perioperative risk.
VAS – visual analog scale.
EuroSCORE – European System for Cardiac Operative Risk Evaluation

Ryc. 4. Zmiana jakości życia w czasie w odniesieniu do wyjściowego ryzyka okołooperacyjnego.
VAS – wizualna skala analogowa.
EuroSCORE – europejski system oceny ryzyka operacyjnego w kardiochirurgii

"pain/discomfort" and "anxiety" all worsened. Full data are provided in Table 3.

During the first week after the procedure, the mean level of quality of life expressed as a VAS score did not show any significant change compared to the baseline level (61.97 vs. 61.90, $p > 0.05$). However, during the following four weeks the mean QoL level rose dramatically: an increase of 9.5%, reaching the level of 67.93 points (Fig. 3).

The influence of various factors on the reported quality of life was assessed. The patients were divided into 2 groups depending on their Euro-SCORE values. The first group included patients with 4 points and below on the EuroSCORE scale

Table 3. VAS (visual analog scale) characteristics over time

Tabela 3. Cechy VAS (wizualnej skali analogowej) w czasie

	Mobility %	Self-care %	Usual activities %	Pain/Discomfort %	Anxiety %	Total VAS %
Baseline	–	–	–	–	–	–
First week	9.66	45.08	24.93	0.93	–10.17	0.11
Fourth week	–16.10	11.37	11.47	–3.43	–13.61	9.42

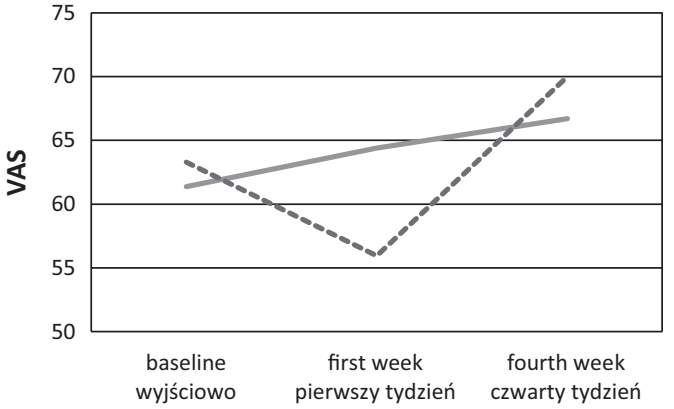

Fig. 5. Changes in Quality of Life over time in relation to gender. VAS – visual analog scale

Ryc. 5. Zmiana jakości życia w czasie w odniesieniu do płci. VAS – wizualna skala analogowa

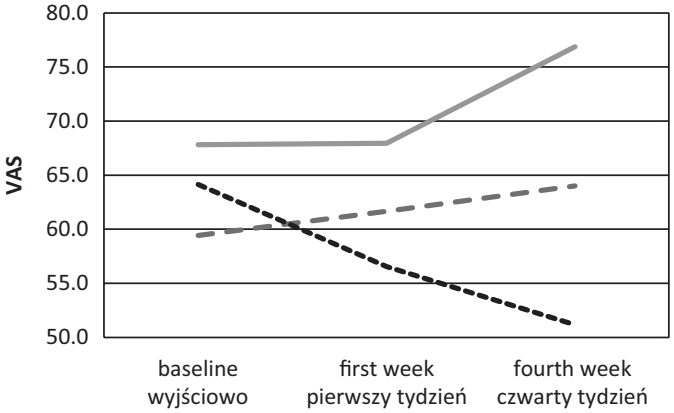

Fig. 6. Changes in Quality of Life over time in relation to age (in years). VAS – visual analog scale

Ryc. 6. Zmiana jakości życia w czasie w odniesieniu do wieku (lata). VAS – wizualna skala analogowa

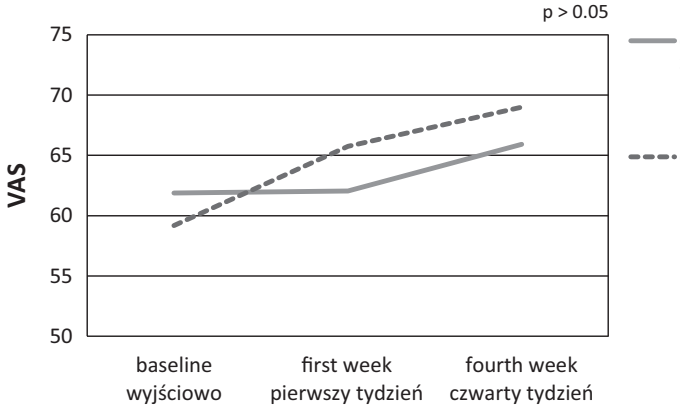

Fig. 7. Changes in Quality of Life over time in relation to the type of procedure (on-pump, off-pump). VAS – visual analog scale

Ryc. 7. Zmiana jakości życia w czasie w zależności od rodzaju zabiegu. VAS – wizualna skala analogowa

and was considered a low perioperative risk group. The patients with 5 points or more constituted the high perioperative risk group [14]. The baseline VAS for both groups were comparable; no statistically significant differences were found (Fig. 4). In general the low-risk group demonstrated less fluctuation in the VAS values for the duration of the study. In contrast, the high-risk group presented a sharp decrease in their reported quality of life in the first week. This was followed by a clear improvement by the end of the fourth week after surgery, when their VAS level was 10 points higher than the low-risk group.

The pattern of the VAS curves was different for males and for females (Fig. 5). In both groups the baseline level of the perceived quality of life was similar, but in the female group it went down in the first week after the procedure and then picked up in the fourth week, reaching a relatively high level of 70 points. In contrast, the male patients reported no drop in the quality of life during the entire postoperative period; constant improvement was reported. However, this tendency was more subdued, leading to a level of 66.7 points by the fourth week.

The perceived quality of life also varied in different age groups. The patients were divided into three subgroups based on age: young (40–54 years), middle-aged (55–69 years) and old (70–84 years) (Figure 6). The older patients' reported level

of quality of life decreased throughout the study period. The opposite was true the middle-aged and young groups, who reported improvements in both the first and the fourth post-operative weeks.

The health-related quality of life scores after CABG surgery improved for both on-pump and off-pump patients; no statistically significant difference between the groups was found (Fig. 7).

Discussion

The authors came to 4 conclusions on the basis of this study. Firstly, perceptions of the QoL in the first week after the operation correlate with the patients' gender. In male patients the improvement in quality of life appears immediately after the procedure, whereas women need up to 4 weeks to recover. This phenomenon has been observed in other studies, but the underlying cause has not yet been established [15]. The divergence might, however, be explained by the fact that the male patients were more anxious before the procedure, which improved immediately following it. On the other hand the women's quality of life was influenced more by pain and by everyday activities, which need more time to improve.

Secondly, although the patients are in pain and have limited mobility throughout the first post-operative week, their perceived quality of life, measured with the VAS, is not lower than before the procedure (Fig. 3), even though before the procedure they were more mobile and had no surgery-related pain. This observation suggests that psychological factors play an important role in the pre-operative perception of the quality of life, and may be even of greater importance than physical ones. This observation has been reported in some papers [16], but larger studies that assessed short-term quality of life post-CABG did not report this phenomenon [8].

Thirdly, there is a relationship between age and perceived quality of life after the operation. The younger patients not only had a higher baseline QoL, but their perceived QoL also tended to improve more quickly. This was clearly visible after the first week after the procedure. In contrast, the older patients tended to report lower VAS values, and their score on day 6 was 20% lower than the pre-operative one. The cause of this observation remains uncertain, but has also been reported in the literature [8]. The younger age groups suffer from less comorbidity, which might explain the higher pre-surgical VAS scores [17]. Also, heart disease – often the main medical issue in the younger age groups – is a relatively serious burden to these age groups' perceived quality of life. Perhaps the operation is regarded as a release and this is proportionally reflected in the improvement in their reported QoL.

Lastly, when the authors looked at the relationship between quality of life and perioperative risk, in the high-risk group (above 4 EuroSCORE points) a decrease in QoL was noted in the first week after the procedure. This was, however, followed by a much larger increase during the next weeks, and in this group the VAS value in the fourth week was greater than before operation. A high EuroSCORE rank is usually a sign of multiple comorbidities, a significant medical history, poor cardiac status and older age. This might explain why the reported quality of life was lower than in the low-risk group (with EuroSCOREs equal to or below 4 points).

It is not really clear why there was such a large dip in the low-risk group's VAS in the first week after the procedure. The authors speculate that people in this group, who have fewer comorbidities and less experience with diseases and hospitalizations than those in the high-risk group, may be more sensitive to any changes in their health and may therefore report them as having greater impact.

The autors concluded that this study highlighted some issues that might require review and further investigation as a follow-up. Although the number of individuals included in the statistical analysis was nearly 90, the established significance level of $p < 0.05$ was not obtained. This may be due to poor inclusion criteria, as well as too small a sample. It might be relevant to take this fact into consideration when designing future studies, making sure that the study group is big enough.

One other interesting observation emerged from this study. The changes in the VAS values indicate that patients perceived their quality of life to be better after the procedure than on the day before it. One might conclude that the procedure helped them, except that not all of the QoL domains were rated higher in the fourth week – in fact, three out of five deteriorated as compared to the pre-operative levels. The only domains that improved were self-care and everyday activity. Surprisingly, anxiety was also among the domains that got worse. This finding was not analyzed any further in the present study, but it seems noteworthy. The mechanisms responsible for short-term improvements in quality of life seem to be extremely interesting and worthy of further investigation.

A better understanding of the factors that impact the quality of life of cardiothoracic patients would be of great value not only from the medical point of view, but also from the patients' perspective. If physicians and surgeons could identify the factors that severely decrease the perioperative quality of life, they could probably take action to modify them and thus improve the patients' post-operative quality of life.

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