



## Review Article

# A Novel Protocol for an Individually Tailored Stress Management Intervention before Surgery

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### Abstract

Surgery is perceived by most individuals as a highly stressful event. Stress responses and anxiety arise even before the surgery and may negatively influence psychological and physiological indices. Several studies have indicated that psychological stress management interventions can improve psychological, physiological, and immunological indices. However, research in this field is lacking standardized interventions, and has shown considerable heterogeneity regarding the specific intervention used, and the timing of the intervention. Here we propose a structured protocol that is initiated before surgery and is tailored for clusters of stress responses (emotional, cognitive, behavioral, and physiological). The protocol can be easily adapted to address various types of surgeries, potentially improving coping, psychological and physiological indices, as well as medical outcomes of disease progression.

**Keywords:** Pre-operative psychological intervention; Protocol; Stress management; Surgery

### Introduction

#### Stress

Psychological stress has been defined by several authors over the years. The most prominent is Lazarus and Folkman's (1984) [1] definition derived from their transactional model: "Psychological stress is a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p.19). Lazarus and Folkman contributed to the

understanding of psychological stress by adding to the physiological stress model (S-R) the cognitive process that humans undergo, appraising stressors and the person's ability to cope with them (primary and secondary appraisal) (S-O-R) [1]. This cognitive process may lead to stress, manifested by stress responses. Stress responses can be divided into two main tracks: psychological manifestation by emotional, cognitive, and behavioral responses and physiological manifestation through increased activity of: 1. the sympathetic branch of the autonomic nervous system [2]; and 2. the hypothalamus-pituitary-adrenal (HPA) axis. Both tracks of response may cause hormonal, immunological, and metabolic changes [2], and interact with each other. While evolutionary, stress responses in organisms were intended to enable short-term

adaptation to threats (fight or flight response), prolonged stress responses have the potential to cause damage to the organism, as described in the allostatic load model [3,4]. Thus, prolonged psychological responses, such as anxiety, helplessness, and confusion, may lead to depression, sleep disturbances, eating disorders, addiction, and other disorders, thus affecting health both directly and indirectly through changes in health behaviors [5]. Prolonged physiological responses to stress, such as hypertension, tachycardia, narrowing of peripheral blood vessels, elevated levels of blood glucose, and others [6,7], can cause chronic and life threatening medical conditions. Prolonged stress may also lead to shutting down the activation of some immune mechanisms [2]. Moreover, there is ample evidence linking psychological and physiological stress to dysregulation of the immune system [8,9].

Prolonged stress can also enhance chronic inflammatory processes, virally induced malignant processes, and defective DNA repair. These can promote-malignant transformation, cancer growth and metastasis [10-13]. It should be noted that psychological stress might begin even before a stressful event occurs since human beings can anticipate prospective stressors. Therefore, we can expect stress responses even before the stressful event itself: for example, preoperative stress responses.

### **Preoperative Stress**

Surgery is perceived as one of the most stressful events that most individuals will experience during their lives [14]. Stress responses arise even before the surgery, usually after being notified that surgery is needed and during the anticipation period [15]. Stress responses gradually decrease after surgery, partly dissipating within five to six days, with a return to baseline usually occurring within several weeks [16]. Low to moderate levels of preoperative stress responses have been found to often facilitate effective coping with the expected surgery [6], while prolonged elevated levels followed by dysregulation of response systems may cause negative consequences, as described below. Stress responses to surgery may be manifested in one or more of the aforementioned categories: emotional, cognitive behavioral, and physiological [17]. Common emotional responses include anxiety, fear, and worries. According to the results of an observational study of more than 15,000 patients undergoing a surgical procedure, anxiety was most frequently mentioned as the worst aspect of the preoperative period [18]. The overall prevalence of preoperative anxiety was reported to range between 12.6% and 76.7% in Western populations [19,20]. Preoperative anxiety includes concerns regarding hospitalization, the anesthetic procedure, and the surgery itself [21]. It also includes worries about suffering, pain, and the nature and duration of recovery [6,22,23]. It should be noted that stress levels before surgery vary depending on the disease, the severity of the surgery, and the expected follow-up

treatments. For example, studies among oncologic patients have shown that anxiety and stress arise even earlier, at the biopsy phase, and continue for an extended period alongside the various postoperative adjuvant therapies [24-25]. Likewise, Lang et al. [26] reported that women experience anxiety and elevated levels of cortisol before and during biopsy, weeks before surgery.

Cognitive responses, such as difficulty concentrating and an increase in negative thinking, may hinder the ability to understand and follow medical instructions [6,27], and consequently to reach decisions. Behavioral stress responses to surgery, such as irritability, and a low frustration threshold, may lead to aggressive behaviors toward relatives and medical staff [25,27,28]. Lastly, physiological stress responses, such as increased sensory sensitivity, decreased pain threshold, dizziness, and nausea [29] may result in higher doses of intraoperative anesthetics [30,31], higher consumption of postoperative pain killers [32], chronic postoperative pain [33,34], extended hospitalization period and slower recovery with more complications [35], and slower wound healing [36,37]. Coping with preoperative stress differs between people. However, since it is difficult to adapt a “problem focused mode” [1] in an uncontrollable situation such as the preoperative medical context, it is advisable to adapt an “emotion focused mode” [1] of coping, to reduce stress levels before surgery. Interventions that focus on managing stress responses may, therefore, be crucial during the preoperative period and should be initiated with the onset of stress responses or, in the case of life-threatening surgeries, immediately after receiving the diagnosis.

### **Preoperative Psychological Interventions**

The importance of psychological interventions before surgery has been widely acknowledged. A recent scoping review exemplified the effect of these interventions on psychological, physiological, and immunological indices [38]. However, research in this field is lacking standardized interventions and has shown considerable heterogeneity regarding the interventions used, and the timing of the intervention. Therefore, results cannot be compared, reliable conclusions regarding the interventions cannot be reached [39], and replication efforts are not warranted. Recent studies have found specific clusters of stress responses representing interpersonal variation [17]. More specifically, different stress response clusters were found to reflect the different aspects of the known emotional, cognitive, behavioral, and physiological stress responses, thus allowing the identification of individual patterns and subsequent tailoring of the appropriate intervention. Currently, the limited number of existing tailored interventions take into consideration anxiety levels, demographic characteristics, hospitalizations and surgical history, and the individual’s coping styles with stressful events and sense of control over the specific threat [40]. While these tailored approaches were found to increase

the effectiveness of the interventions [41], they have not addressed the characteristics of individuals' stress responses. We believe that an individually tailored psychological intervention would be more effective than "fit-all" interventions. When planning preoperative interventions, we recommend considering each person's stress response profile. We have thus developed a protocol that matches intervention to the specific preoperative stress responses of each individual.

### The Protocol

The protocol (see Appendix 1) was developed by the authors. THM, a licensed medical psychologist, as part of her PhD dissertation; IRB, a licensed clinical psychological and a psychoneuroimmunology researcher; SBE, a psychoneuroimmunology researcher with a focus on the perioperative period in cancer treatment; and RJ, a licensed medical and clinical psychologist with over 20 years of experience treating and studying stress management in the preoperative period. The protocol has been used to prepare women for breast cancer surgery. [38]. The protocol offers a structured frame of three components: 1. first meeting: an extended meeting of approximately 1.5 hours; 2. four follow-ups, before and after surgery, 30 minutes each (depending on type of surgery); and 3. phone calls between

sessions (20-30 minutes each). The first meeting includes:

1. Acquaintance and interviewing including mapping prominent stress response patterns according to the Stress Responses Questionnaire (SRQ) (see Appendix 2); Explaining of the intervention objectives.
2. Psychological intervention during which a stress management technique is offered according to stress response patterns. Each intervention includes the following steps: 1. mirroring; 2. clarification; 3. normalization; 4. coping; 5. tailored stress management technique (enhancing internal resources); 6. summary and instructions (includes referring to external resources).

### Tailored Techniques

While the intervention steps are similar for all, step 5 includes a tailored stress management technique according to the stress response pattern of each person derived from the SRQ. After discussing and consulting with experienced psychologists specializing in stress management, we adapted well established and scientifically proved stress management techniques which we match to each of the four response modes derived from the SRQ as presented in Table 1 and described below (for more detail, see

Appendix 1).

Response Mode	Tailored Intervention	Description	References
Emotional	Emotional Disclosure	A psychological method in which people are encouraged to disclose in front of another person (usually a therapist) or write about their emotions regarding a stressful, upsetting, or traumatic event.	Chaikin et al., 1975; Ignatius & Kokkonen, 2007; Sloan, 2010. [42-44]
Cognitive	Self-Talk	A cognitive-behavioral technique based on the idea that there is a relationship between perception and stress responses. This technique focuses on encouraging people to replace their negative and catastrophizing ideas with realistic and calming thoughts.	Babakhanloo et al., 2017; Hamilton et al., 2011; Kross et al., 2014; Meichenbaum, 1977, 1995. [45-49]
Behavioral	Behavioral Regulation	A method which uses CBT techniques to regulate adverse behaviors in response to stress.	Carver & Scheier, 2001; Chapman & Gratz, 2015; Mauss et al., 2007; Tang et al., 2020. [50-53]
Physiological	Diaphragmatic Breathing	A breathing exercise, also called "abdominal breathing" or "belly breathing," which fully engages the diaphragm and increases the efficiency of the lungs. It encourages full oxygen exchange, namely, the beneficial trade of incoming oxygen for outgoing carbon dioxide. This exercise reduces levels of the stress hormone cortisol and may help alleviate symptoms of stress and anxiety.	Brown et al., 2013; Chen et al., 2017; Garssen et al., 2010; Haase et al., 2005. [54-57]

	Progressive Muscle Relaxation	A deep relaxation technique which includes the gradual contraction and relaxation of groups of muscles in the body in an attempt to reduce muscle tension and promote a balanced physiological and psychological state.	Bernstein et al., 2000; Jacobsen, 1929; Loh et al., 2021; Metin et al., 2019; Ravindra & Patel, 2021.[58-62]
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**Table 1:** Tailored interventions to match response modes.

The first session includes: (1) a plan of future sessions before and after surgery; (2) Phone calls between sessions. During these meetings and phone calls, the psychologist assesses the patients' stress levels, checks whether they have exercised the techniques learnt, adjusts where necessary, confronts difficulties, and encourages them to continue.

### Expansion of External Resources

While the stress management techniques presented above focus on expanding inner coping resources, we are also aware of the advantages of external resources to cope with preoperative stress: specifically, psychoeducation and social support. Psychoeducation involves the provision of information regarding preoperative stress, the surgery, and postoperative sources of stress adapted to the specific procedures and/or disease (based on the patients' needs). Social support involves discussing with the patients their position and needs regarding social support and, if necessary, offering strategies for recruiting social support or overcoming obstacles. Although most studies have demonstrated that providing patients with information and social support before surgery is helpful, some have shown controversial outcomes [63-65]. We therefore suggest to carefully assess the needs of each patient and offer information and social support accordingly. Overall, our protocol offers each patient a tailored intervention aimed at managing and reducing the intensity of stress responses, clarifying medical uncertainties, and recruiting any necessary social support. Such an integrated and individualized approach may, we believe, help preventing further psychological or physiological negative outcomes.

### Discussion

For most people the preoperative phase is a distressing period characterized by psychological and physiological stress responses. These might influence various indices, such as pain threshold [29], wound healing [36,37], and may lead to slower and more complicated recovery [35]. This period can therefore be seen as a window of opportunity for reducing stress responses and improving patients' well-being [66]. Although providing medications is often more feasible in the surgical context than conducting psychological interventions, the effects of the drug treatment are limited to the timeframe they are prescribed, not commonly overlapping with the entire medical journey. Additionally, stress-reducing medications are often contraindicated in 50% of surgical patients, do not affect all stress responses, and may also have adverse effects

[13,38]. Therefore, we believe that it is crucial to include stress management psychological interventions during the preoperative period to reduce stress and enable patients to acquire techniques that will also serve them throughout their medical treatments. Although ample research has provided evidence of the importance of preoperative psychological interventions, based on our clinical experience and literature, such approaches are not routine in most medical institutions and current interventions are not standardized [67].

Our protocol was developed based on the results of two previous studies we conducted in order to map the various clusters of stress responses based on our SRQ questionnaire [17]. The protocol enables the provision of a tailored intervention which matches the dominant preoperative stress responses of each person in an attempt to improve their coping, and consequently psychological and physiological indices. The protocol focuses on enhancing the individual's internal resources for coping with preoperative stress by using tailored stress management techniques. These techniques are easy to adapt, and recording the first sessions enables patients to practice them both before and after surgery. Our protocol also offers the expansion of external resources if needed. While we believe that acquiring stress management techniques strengthens the sense of control in an uncontrolled situation, there are some people for whom external resources might increase their stress levels and whose needs should therefore be mapped before referring them to external resources. The development of an individually-tailored protocol enables the flexibility of accommodating patients' specific needs, personal characteristics, and unique stress response patterns. There is thus a need for a standardized tailored protocol which can be adapted for various surgeries and may improve coping before and after surgery. The use of this protocol as a guide for clinical interventions should be carried out by medical/health psychologists with expertise in stress management. Regarding research, an intervention study which adapts a protocol enables standardized research employing numerous therapists and comparing studies. Preliminary results of a recent study using a version of this protocol indicate that this psychological tailored interventions before breast surgery (n = 40) were effective in reducing stress 30-days following surgery [39], as well as improving molecular indices of cancer progression in the excised tumor [68,69]. The use of the preliminary protocol we have presented should be replicated in additional studies regarding various surgeries to test its efficiency.

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(\* equal contribution)

## Appendix 1: A Protocol for an Individually Tailored Stress Management Intervention Before Surgery

### First Meeting

#### a) Acquaintance

Nice to meet you...my name is... my profession is... during our meeting I would like to offer you a technique which might help you to cope better with the upcoming surgery. But first I want to ask you some questions:

- Your name is...how old are you?
- What do you know about your upcoming surgery?
- Mapping main stressors: All people who are about to undergo surgery experience stress. I will now present a list of stressors that usually cause stress responses before surgery. Please relate to each of them and indicate whether they cause you stress and to what extent (0–100).

The psychologist fills in the following table:

Factor	Intensity
Anesthesia	
Surgery itself	
Complications	
Pain	
Body appearance after surgery	
Other	

- Mapping stress responses: Now I will ask you to fill out a questionnaire from which we can learn about your stress responses.
- The psychologist presents the SRQ.
- After they fill in the SRQ:

Now we will go over the questionnaire to learn about your main stress response pattern.

#### b) Intervention

After mapping each patient's stress response pattern, as it appears in the SRQ, the psychologist tailors an intervention according to the following four categories: E-emotional, C-cognitive, B-behavioral, and P-physiological.

**Mirroring:** From the questionnaire you filled out, I have learnt that in stressful situations you tend to respond with (according to their responses to the SRQ):

**E:** anxiety/ depression/ loneliness... or

**C:** focus on negative thoughts /confusion/difficulty concentrating... or

**B:** nervousness/ outbursts...or

**P:** headaches/insomnia/tight muscles...

I believe that by focusing on your **E** (emotional responses) or **C** (disturbing thoughts) or **B** (behavioral responses) or **P** (physiological responses), we can improve your readiness for surgery.

**Clarification:** Can you tell me more about your: **E** (emotional responses) or **C** (disturbing thoughts) or **B** (behavioral responses) or **P** (physiological responses)?

**Normalization:** For many people expecting surgery these are typical reactions.

**Coping:** How do you usually cope with these: **E** (emotional responses) or **C** (disturbing thoughts) or **B** (behavioral responses) or **P** (physiological responses)?

The psychologist summarizes and reflects.

### **Introducing the stress management tailored technique:**

I want to offer you a technique that will allow you to cope effectively with your **E** (emotional responses) or **C** (disturbing thoughts) or **B** (behavioral responses) or **P** (physiological responses) before surgery. I will record our session as we practice and then send it to you so you can continue practicing at home.

### **Offered techniques:**

**E-** Emotional disclosure

**C-** Self-talk

**B-** Behavioral regulation

**P-** Breathing, muscle relaxation

### **In detail:**

#### **Emotional disclosure**

The psychologist talks with the patients, explains the importance of emotional disclosure, and encourages them to identify and express their emotions:

- Emotional disclosure refers to a therapeutic method whereby people express their emotions by talking or writing about their worries and concerns. Emotional disclosure has been widely recognized as having beneficial effects on physical and psychological health.

- Do you share your feelings regarding the surgery with anyone?

If yes:

The psychologist asks if it is helpful. If so, the psychologist reinforces the patients and offers them additional methods of emotional disclosure, such as writing.

If not:

The psychologist inquires about barriers/difficulties in relation to emotional disclosure and suggests some effective methods of emotional disclosure, such as talking with a close person, writing about their worries and concerns about the surgery, etc.

The psychologist checks with the patients to see which of the techniques suits them best.

#### **Self-Talk**

The psychologist provides the patients with a blank page divided into two and asks them to write on one side of the page up to 10 thoughts disturbing them regarding the upcoming surgery, ranging from the least to the most stressful. The psychologist then asks them to read the list aloud and says:

- Disturbing thoughts do not necessarily reflect reality. As you know, they make coping difficult. So now, I suggest that you try to counter each of the thoughts written on the page with calming thoughts that will help you to cope better. For example, in response to the thought, “I am worried that I will suffer from pain after surgery,” you can tell yourself, “I can use painkillers to reduce my pain.”

- Now I will ask you to go over each negative thought you wrote on the page and write on the opposite side of the page a calming thought to confront the disturbing thought.

The psychologist asks the patient to read in a sequence several times a disturbing thought and immediately afterward the relevant calming one.

#### **Behavioral Regulation**

The psychologist talks with the patients and helps them to identify their maladaptive behavioral responses. Together they look for effective ways of regulating their behavior.

Examples:

- 1) Try to train yourself not to react immediately. When you feel an outburst approaching, try to remind yourself that an outburst of rage may make you feel good in the short term but is not worth the damage that it will cause in the long term.

- 2) Pay attention to time and environment. For example, if you tend to be more nervous in the evening, it may be due to fatigue. Learn the schedule of your nervousness. Awareness of the times when you tend to be nervous can help you avoid discussions or conversations about sensitive issues during these times and thus help to reduce outbursts of anger.

- 3) Try to calm yourself down. Take a few moments for yourself, preferably in a quiet room, listen to music that you like or, alternatively, do some physical exercise, such as walking.

#### **Diaphragmatic Breathing**

The psychologist explains the importance of breathing.

- Usually, we are not aware of how we breathe. However, we can control the way we breathe and its rhythm. We can use this ability to regulate the tension in our body and breathe intentionally in a way that will activate our body’s relaxation response. In stressful situations, breathing is usually flat and fast; calm breathing is deep and slow and is performed via the diaphragm and not the chest muscles. Diaphragmatic breathing allows for an increased supply of oxygen to the brain and muscles and activates the feeling of relaxation.

- Now I will teach you how to practice diaphragmatic breathing.



The psychologist instructs and practices diaphragmatic breathing with the patient.

### **Progressive Muscle Relaxation (PMR)**

○ Before starting to practice, the psychologist checks whether the patient has ever practiced any kind of relaxation technique, what they know about relaxation (including concerns), and contraindications that should be taken into consideration, such as low blood pressure, diabetes, etc.

○ Before using PMR, it is recommended beginning with breathing exercises, such as abdominal breathing.

○ Instructions: I want to teach you a technique that will allow you to better manage your physiological responses and help you cope with the forthcoming surgery. The technique focuses on muscle relaxation exercises. To be continued according to the instructions in E. Jacobsen, *Progressive Relaxation* (University of Chicago Press, 1929).

**Summary and instructions:** How do you feel about this technique? (Discussion). I recommend you continue practicing what we have practiced today while listening to the recording of our meeting. Try to practice at least once a day. Choose a quiet place without interruptions.

Please document your experiences daily and assess if and how it influences your ECBP responses. We will keep on following your ECBP responses during our next meetings.

Finally, the first session includes a plan of: (1) **Future sessions:** Two sessions before surgery, while one of them the day before, and two more sessions, the first, on the day after surgery, and the second before hospital discharge (depending on surgery's type); (2) **Phone calls between sessions:** bi-weekly phone calls are scheduled to provide ongoing guidance, training, and support and to address potential difficulties related to each of the techniques trained during the first session.

If the protocol is being used for research purposes, we recommend continuing with two more follow-up sessions.

### **c) Utilization of external resources (tailored to the patient's needs)**

#### **1. Psychoeducation**

The psychologist checks whether the patient feels that they lack information.

○ Some people need information before dealing with a stressful situation and some do not. What about you?

- If the patient feels that they lack information, map the topics and the extent to which they need additional information (write them down).

- Explore with the patient which information sources suits them best:

○ If they prefer written information, provide them with booklets, pamphlets, refer to certified medical websites, etc.

○ If they prefer face-to-face information, refer them to the nurse or surgeon.

- General recommendations before medical appointments: 1) Think about the questions you would like to ask and write them down. 2) Since people tend not to perceive or remember all the information provided in stressful situations, we recommend being accompanied by a family member or a friend. 3) We recommend that you or your companion write down the key points of the meeting or record it.

#### **2. Social Support**

○ Now I would like to discuss social support with you. Most people usually benefit from social support. However, there are some people who feel that social support might disturb them, or that they need social support of a certain type or from a certain person.

○ What is your position on social support?

○ If answers are positive – Do you feel that the social support you receive matches your needs? If not: what are your other available sources of support? Are there any obstacles to recruiting social support?

○ If possible, encourage the patient to overcome these obstacles and to expand their sources of support.

○ If the answers are negative – Would you like to discuss it? (avoid any pressure).

### **Appendix 2: Stress Responses Questionnaire**

Various stressful events or situations in life may trigger stress responses in each of us. However, different people may react in different ways to the same event. We would like to learn about your responses during the period before the expected surgery.

Please go through the list of responses people experience in stressful situations and mark which of them and to what extent they describe your responses from 1 (never) to 5 (always).

	<b>Stress Responses</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	Anxiety					
2	Difficulty concentrating					
3	Physical unrest					
4	Confusion					
5	Backaches					
6	Attention dispersion					
7	Nervousness					
8	Emotional stress distress					
9	Digestive upsets (constipation or diarrhea)					
10	Emotional flooding					
11	Tight muscles					
12	Insomnia					
13	Temper flare-ups					
14	Jaw tension					
15	Fatigue, lack of energy					
16	Depression					
17	Teeth grinding					
18	Irritability					
19	Crying spells					
20	Neck and shoulder pain					
21	Feeling of helplessness					
22	Stomach pain					
23	Decrease in enjoyment and / or desire to act					
24	Low frustration threshold					
25	Loneliness					
26	Appetite change (Over / under eating)					
27	Tendency to introversion					
28	Headaches					
29	Increase in negative thoughts					
30	Nausea					

Jacoby, R., Greenfeld-Barsky, K., Porat, T., Harel, S., Hanalis-Miller, T. & Goldzweig, G. (2021). Individual stress response patterns: Preliminary findings and possible implications. *PLOS ONE* 16(8): e0255889.