Measures of preoperative anxiety

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Abstract
The evaluation of treatment from the patient’s perspective (Patient Reported Outcomes, PROs) currently remains one of the most vibrant and dynamically developing fields of research. Among PROs, patient self-assessment of various symptoms, including one’s psychological state, is of great importance.

Anxiety is one of the most frequently observed psychological reactions among patients awaiting various surgeries, and may occur even in up to 80% of patients scheduled for high-risk surgical procedures. An increased level of preoperative anxiety has been proved to be related to negative consequences, both psychological and somatic, and affecting, in consequence, anaesthesia, postoperative care and treatment, along with the rehabilitation process. It is also considered as a risk factor for mortality in patients after surgeries.

Planning of necessary educational, pharmacological and psychological interventions should be preceded by the evaluation of anxiety level which should be considered a routine element of preoperative care. The assessment of anxiety intensity may be performed using psychometric scales. Various factors should be taken into consideration while choosing the scale, including its reliability and accuracy, the aim of the assessment, the patient’s age and clinical state, as well as the type of surgery being planned. In the current article, we present standardised and reliable methods which may be used in the evaluation of preoperative anxiety among patients scheduled for surgery, namely: the State-Trait Anxiety Inventory (STAI); the Hospital Anxiety and Depression Scale (HADS); the Amsterdam Preoperative Anxiety and Information Scale (APAIS); and the Visual Analogue Scale (VAS). A detailed description of the scales, including their main advantages and limitations, as well as their usefulness in both clinical evaluation of various patients’ groups and scientific research are presented.

Key words: preoperative anxiety, assessment methods

The issues concerning the incidence of preoperative anxiety, its predictors, and short- and long-term consequences, as well as attempts to find effective therapeutic interventions are of interest of many researchers, not only psychologists but also anaesthesiologists [1–4]. Anxiety is one of the most common psychological reactions among patients awaiting surgery. Study findings have demonstrated that severe preoperative anxiety can affect up to 80% of those awaiting surgeries [1]. In addition to the significant discomfort experienced by patients, increased levels of anxiety are often associated with adverse clinical sequel.

Anxiety is inextricably associated with stress and activates the neuroendocrine hypothalamic-pituitary-adrenal axis and the autonomic system. In response to endocrine regulatory mechanisms and excitation/stimulation of the adrenergic system, concentrations of „stress hormones”, such as adrenaline, vasopressin, cortisol or prolactin, increase. The activity of the above-mentioned substances causes a number of reactions, including acceleration of the heart rate, an increase in arterial pressure, the respiration rate and muscle tone, as well as dilation of the pupils, or hyperglycaemia [5–7]. Excessive excitation of the physiologi-
cal systems related to anxiety results in numerous adverse changes that are likely to unfavourably affect not only the anaesthesia itself or the early postoperative period but also remote behavioural and physiological adverse effects [5, 6, 8, 9].

A postoperative period preceded by increased anxiety is often associated with a higher level of experienced pain and, in consequence, higher demands for analgesics. Increased intensity of postoperative anxiety also leads to diminished susceptibility to anaesthetic drugs, prolonged wound healing, occurrence of chronic postoperative pain, and the reduced efficacy of postoperative rehabilitation and recovery [6, 7, 10–13]. Moreover, the symptoms of anxiety and depression present before surgery are predictors of worse satisfaction and patients’ subjective assessment of treatment efficacy, including long-term assessment [14, 15].

Of note is the fact that intensified preoperative anxiety is also a risk factor of death after surgical procedures [16–18].

An early and suitably planned preoperative intervention (educational, pharmacological, psychotherapeutic) can bring clear benefits in terms of the patient’s subjective status, improvement of care, but also objective clinical indicators, thus preventing long-term side effects of anxiety. Many researchers have stressed the importance of routine assessment of preoperative anxiety [1, 4, 16], which should precede planning of therapeutic interventions, including decisions concerning the assistance of a psychologist. The intensity of anxiety symptoms can be assessed during clinical interview, as well as through using psychometric methods.

The aim of the present study is to present in detail the scales assessing preoperative anxiety, their limitations and benefits in the context of their usefulness in everyday clinical practice and research. Detailed descriptions of the individual scales are presented in Table 1. The presentation of such tools seems to be part of the dynamic development of studies regarding the Patient Reported Outcomes (PROs) recently observed in the medical literature, among which patient mental status is essential [19, 20].

STATE-TRAIT ANXIETY INVENTORY

The STAI contains two independent subscales consisting of 40 items. Twenty of these assess state anxiety (STAI-X1), i.e. situational anxiety experienced during the examination (“How are you feeling now?”); another 20 items measure trait anxiety (STAI-X2), understood as a relatively constant trait (“How do you usually feel?”). The subscales are assessed separately; preoperative anxiety is assessed using the state anxiety subscale. Patients address each statement by choosing one of four options. The 4-point Likert scale is applied for assessment (score 1–4). The minimum score is 20 while the maximum is 80. A higher score indicates higher anxiety. It is suggested that in case of assessing anxiety in pre-surgery patients a score of 44/45 should be interpreted as a clinically significant, while in general population a score of 39/40 is considered cut-off for alleviated anxiety level [21–24]. The above scale is considered to be the gold standard among the instruments assessing the level of anxiety [23], not only in clinical psychology and psychiatry but also in medicine. Moreover, the STAI is one of those most frequently used for assessing anxiety level, including preoperative anxiety [4, 7, 10, 16, 22, 25–30].

The state anxiety subscale allows one to follow the changes in anxiety symptoms, even in short intervals; hence its high usefulness for prospective studies as well as monitoring the patient mental status. In everyday clinical practice, the limitations of STAI include difficulty related to its duration, the number of statements included, as well as difficulties in filling in the questionnaire faced by the elderly. The authors’ experience shows that mistakes occur consisting of the automatic marking of extreme answers, which prevents reliable assessment of results. In such cases, it is recommended to verify the answers with the patient.

The Polish version of STAI can be purchased from the Psychological Test Laboratory of the Polish Psychological Association (www.practest.com.pl). A Master of Arts (MA) degree in psychology is required. Both the paper and electronic versions are available.

HOSPITAL ANXIETY AND DEPRESSION SCALE

The HADS consists of 14 items divided into two subscales assessed separately, namely: 7 statements related to anxiety – HADS-Anxiety (HADS-A) and another 7 statements related to depression — HADS-Depression (HADS-D). Preoperative anxiety is assessed with the HADS-Anxiety subtest. Respondents address each of the symptoms by choosing one of four available answers best describing their emotions. The answers are assessed according to the 4 point Likert scale (score 0–3). The range of scores is 0–21; a higher score denotes a higher intensity of anxiety symptoms. A score of 0–7 is considered normal, 8–10 borderline and 11 or more as pathological, clinically relevant anxiety [24, 31]. The major advantage of this scale is its reliability, ease of use, short time to complete and the possible immediate interpretation of results by a clinician. Since 1983, the scale has been widely used among patients with somatic diseases and, consistent with its name and purpose, among hospitalised patients. Moreover, the scale has been frequently used in surgery and anaesthesiology [11, 18, 29, 32–36], which confirms its clinical usefulness for assessing preoperative anxiety. The HADS test is available at www.gl-assessment.co.uk.
### Table 1. Characteristics of scales assessing anxiety

<table>
<thead>
<tr>
<th>STAI</th>
<th>HADS</th>
<th>APAIS</th>
<th>VAS</th>
</tr>
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<tbody>
<tr>
<td>Time to complete</td>
<td>State-anxiety subscale: about 10 min. Full scale: 15–20 min.</td>
<td>Anxiety subscale: about 3 min. Full scale: about 5–10 min.</td>
<td>About 2 min.</td>
</tr>
<tr>
<td>Characteristics</td>
<td>40 items, including 20 for state-anxiety assessment and 20 for trait-anxiety assessment</td>
<td>14 items, including 7 for assessing anxiety and 7 assessing depression</td>
<td>6 statements, including 4 for anxiety assessment and 2 for need-for-information assessment</td>
</tr>
<tr>
<td>Range of scores</td>
<td>20–80 Separate scores for state and trait anxiety subscales</td>
<td>0–21 Separate scores for each subscale</td>
<td>Anxiety subscale: 4–20. Need-for-information subscale: 2–10.</td>
</tr>
</tbody>
</table>

| In all scales higher score represents higher level of anxiety |
|---------------------------------|----------------|-----------------|-----------------|
| Cut-off points for clinically significant anxiety | 44–45 | 8 | 10–11 for anxiety-related items | Population-dependent |
| Major advantage | „Gold standard” for anxiety assessment — measures state and trait anxiety. | Short time of completion; also enables one to assess symptoms of depression. | Dedicated for preoperative anxiety assessment; Additionally, assesses need-for-information; Free of charge with authors’ consent. | The shortest time of completion, easy to complete for elderly and patients in poor clinical state. Widely available. |
| Major limitations | Number of items; Time to complete; Difficult for the elderly — those with poor clinical state; cognitive impairment; | Possible errors during completion | None | None |
| Application in research in anaesthesiology and surgery | +++ | +++ | +++ | +++ |
| Main applications | Clinical psychology and psychiatry; patients with somatic diseases. | Patients with somatic diseases; hospitalised patients; clinical psychology | Surgery; Anaesthesiology | The widest use, hospital wards, including intensive care units, anaesthesiology and surgery departments |
| Prospective assessment, monitoring the level of anxiety | +++ Only state-anxiety scale | +++ | +++ At various stages of the preoperative period | +++ |

STAI: State Trait Anxiety Inventory; HADS: Hospital Anxiety and Depression Scale; APAIS: Amsterdam Preoperative Anxiety and Information Scale; VAS: Visual Analogue Scale; +++ Extremely useful; ++ Moderately useful

### AMSTERDAM PREOPERATIVE ANXIETY AND INFORMATION SCALE

The APAIS test was developed specifically to assess preoperative anxiety. It comprises six items, four of which relate to the general measurement of preoperative anxiety (two concern anaesthesia-related anxiety while the other two concern surgery-related anxiety). The remaining two items assess the patient’s need for anaesthesia-related and surgery-related information. Patients address each of the items by choosing one of the available answers rated from 1 — „not at all” to 5 — „extremely”. The maximum score on the anxiety subscale is 20, and 10 on the need-for-information subscale [37]. The higher the scores, the more intense the preoperative anxiety and need for information are.

The APAIS is available free of charge. The reliability and internal consistency of its Polish version presented in Table 2 was confirmed using the HADS and Visual Analogue Scale in a group of cardiac surgery patients. The cut-off point in the Polish version of APAIS was set at 10 [38]. The reliability of APAIS has also been confirmed in many other studies among patients awaiting various types of surgeries, both under local and general anaesthesia [2, 27, 30, 37–40]. Due to possible differences in the internal consistency of APAIS in different groups of patients (high/low risk procedures, general or local anaesthesia) and the fact that the cut-off values of clinically relevant anxiety may differ for women and men [27, 41], it is recommended to assess the psychometric properties of APAIS for particular populations of patients.
An important advantage of APAIS worth-stressing, one distinguishing it from the remaining scales, is the fact that it assesses not only the level of anxiety but also the need for information concerning anaesthesia and surgery. For health professionals dealing with surgical patients, this kind of information is extremely important. The study findings have demonstrated that higher levels of anxiety are accompanied by higher needs for information [2, 23, 38]; moreover, education and information provided to patients awaiting surgery favours a reduction in the level of anxiety [2, 3, 42]. Nevertheless, it should be remembered that the provision of too many pieces of information, when burdened with the emotional component, can lead to the increase of anxiety level. Therefore, the kind of information health professionals provide and the way they provide it, rather than the amount of information, are crucial [43].

### Visual Analogue Scale

The VAS comprises a 100-mm line with the ends denoting 0 and 10. The scale is both simple and the most commonly used method for studies in psychology, medicine and interdisciplinary research. The VAS test is most frequently applied to assess pain but is also a recognised method for assessment of other somatic and psychological symptoms, as well as one’s general health condition and quality of life. The most frequently used form of VAS-anxiety is the line where 0 indicates „no anxiety” while 10 represents „highest anxiety that can be imagined” or „most intensive anxiety”. The major advantage of this scale is that it is both easy and patient-friendly; additionally, its shortness and short time needed for interpretation are beneficial. Thanks to the above features, the scale can be successfully used to assess and monitor the intensity of fear/anxiety in elderly and severely ill patients. In the latter situations the usefulness of extended questionnaires is limited due to their difficulty for patients and the higher probability of mistakes associated with difficulties in focusing attention or e.g. concomitant severe pain. Moreover, another unquestionable advantage of the VAS test is its reliability for assessing the level of preoperative anxiety confirmed in the studies using the STAI and HADS tests among surgical and intensive care unit patients [2, 23, 38, 44].

### SUMMARY AND PRACTICAL COMMENTS

The literature review presented above demonstrates that there are several methods available to evaluate the intensity of preoperative anxiety and preliminary diagnosis of clinically significant anxiety. The aim of the review was to discuss the selected scales to facilitate the choice of the method most appropriately corresponding to the study aim or to the clinical situation. The essential criterion of choice is the type of clinical situation (the type and extent of surgery; its mode, namely, emergent/elective), patient’s age and clinical state (including e.g. severity of pain, dyspnoea, cognitive impairment, consciousness disorders). The somatic condition of a patient is likely to cause difficulties in completing the questionnaire, to increase tension and anxiety being experienced, and to reduce the reliability of assessment.

As for research and decision-making regarding further therapeutic management based on the assessment of anxiety with the VAS and APAIS, it is recommended to adjust the cut-off values to the population tested. The studies evaluating the psychometric properties of these scales have shown that the scores indicating the pathological level of anxiety may differ according to population and gender. This can be associated with a tendency to mask the symptoms of anxiety among men and higher anxiety level observed among women [26, 30, 38, 44] as well as some other factors. Therefore, in these two methods, the determination of cut-off points using the receiver operating characteristic (ROC) curve and evaluation of specificity and sensitivity seem fully justifiable. Furthermore, the acceptance of cut-off points with a higher coefficient of false positive results (lower specificity and higher sensitivity) appears to be more beneficial from the point of view of clinical care. In such cases, the likelihood of abandonment of interventions in patients requiring deeper psychological evaluation or therapeutic interventions is lower, even though the odds to undertake actions in patients not requiring such assessments and interventions are higher.

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**Table 2. Amsterdam Preoperative Anxiety and Information Scale (APAIS)***

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very</th>
<th>Extremely</th>
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<tbody>
<tr>
<td>I am worried about anaesthesia</td>
<td>Not at all</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Very</td>
<td>Extremely</td>
</tr>
<tr>
<td>I am constantly thinking about anaesthesia</td>
<td>Not at all</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Very</td>
<td>Extremely</td>
</tr>
<tr>
<td>I would like to know as much as possible about anaesthesia</td>
<td>Not at all</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Very</td>
<td>Extremely</td>
</tr>
<tr>
<td>I am worried about surgery</td>
<td>Not at all</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Very</td>
<td>Extremely</td>
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</tbody>
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In some cases, especially in the elderly, the assistance of medical personnel is necessary. The help of the patient’s family or other accompanying individuals should be prevented as in such cases the questionnaire is not completed by the patient but “on his/her behalf”, which excludes its usefulness and reliability.

Although it should be emphasised that all the tools presented are self-report scales of symptoms, this does not diminish their usefulness. The subjective assessment of mood seems to be most accurate as patients are, in a sense, experts in evaluating their own state, particularly psychological reactions. Indeed, in some cases the clinician may assess the patient’s condition inadequately, exaggerating or neglecting the extent of the problem [30, 44].

All the methods assessing anxiety presented here (in the case of STAI — the state anxiety subscale) can be used to monitor the mental status of patients, thus a prospective assessment, as they are sensitive to even subtle variations in the level of anxiety. The APAIS, designed specifically to evaluate preoperative anxiety, can be applied at various stages of preparation for surgery (e.g. qualification, ambulatory anaesthetic consultation, assessment on the day prior to surgery). Some authors suggest the high burden related to the use of psychometric tests [8]. However, the studies findings and experience of the authors of the present review have demonstrated that indeed the STAI test can be troublesome due to its duration, hence the time needed to complete it, and difficulties that the elderly face, the use of HADS, APAIS or VAS tests takes only several minutes and the information obtained is extremely important for implementing therapeutic interventions, including psychological assistance, as well as for planning such interventions in the postoperative period.

It should be noted that the tests discussed here (except for the STAI test, the purchase of which requires an AM in psychology, as mentioned before) may be used by all health professionals (physicians, psychologists, nurses, physiotherapists) taking care of patients scheduled for surgical procedures. It should be emphasised that clinical interview and contact with patients are essential for preoperative assessment, especially that related to psychological aspects, while psychometric methods provide a valuable supplement. A good patient-clinician relationship favours frankness, effective communication and a feeling of security and good care.

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References:


