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Liebenhagen, Andreas; Forsberg, Anna; Kristensson, Jimmie

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LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00



# Development and Psychometric Exploration of the Anesthesia Surrendering Instrument

Andreas Liebenhagen, MSN, RNA, Anna Forsberg, PhD, RN,  
Jimmie Kristensson, PhD, RN

**Purpose:** *The aim of this study was to develop and test an instrument to measure surrendering at the time of anesthesia induction and to explore the construct validity.*

**Design:** *An instrumental cross-sectional design was used and construct validity was evaluated via psychometric testing.*

**Methods:** *The anesthesia surrendering instrument (ASI) comprised 36 items. A total of 202 adults (older than 18 years) answered the questionnaire. Principal component analysis was used for item reduction and identification of defining constructs.*

**Findings:** *Surrendering to anesthesia was defined by four constructs: preparation by avoidance, control, preparation by understanding, and acceptance, explaining 43.2% of the variance in the matrix.*

**Conclusions:** *The findings show that it is possible to measure the concept of surrendering by means of four dimensions as preparation by avoidance, control, preparation by understanding, and acceptance, although the dimensional variance of 43% could be considered weak. The ASI will constitute context-specific patient-reported experience measures for anesthesia, whereas further item refinement and testing of the ASI are necessary to achieve a better variance.*

**Keywords:** *anesthesia, instrument development, psychometric testing, construct validity.*

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Andreas Liebenhagen, MSN, RNA, Department of Anesthesia, Helsingborg General Hospital, Helsingborg, Sweden, and Department of Health Sciences, Lund University, Lund, Sweden; Anna Forsberg, PhD, RN, Department of Health Sciences, Lund University, Lund, Sweden, and Department of Thoracic Transplantation, Skåne University Hospital, Lund, Sweden; and Jimmie Kristensson, PhD, RN, Department of Health Sciences, Lund University, Lund, Sweden.

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*Address correspondence to* Andreas Liebenhagen, Department of Anesthesia, Helsingborg General Hospital, Södra Vallgatan 5, SE-251 87, Helsingborg, Sweden; e-mail address: [andreas.liebenhagen@skane.se](mailto:andreas.liebenhagen@skane.se) or [andreas.liebenhagen@med.lu.se](mailto:andreas.liebenhagen@med.lu.se).

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**THE CHALLENGE AND PROCESS** of surrendering to anesthesia care is characterized by an intensive technological focus that has a strong impact on the already vulnerable patient. According to Branscombe,<sup>1</sup> surrendering implies trusting in one's own safety and hence enables the genuine psychological and spiritual renewal necessary to go forward in life. The caregiver's professional role is to guide, accompany, and witness the patient's journey to surrendering. In such a situation, the patient is plunged into a threefold state of disadvantage consisting of existential disadvantage, that is, the vulnerability caused by being ill and requiring both anesthesia and a surgical intervention.<sup>2</sup> Second, institutional disadvantage, that is, the sense of being at the bottom of a hierarchical environment in which the patient is exposed and depersonalized on the operating table and at the mercy of unknown others.<sup>2</sup> Third, cognitive

disadvantage, is illustrated by unfamiliar procedures and terminology and the actual experience of being anesthetized.<sup>2</sup>

### *Literature Review*

The surrendering process in anesthesia was illustrated in an inductive study that resulted in a grounded theory of constructing a foundation for surrendering one's life into the hands of the other.<sup>3</sup> The study revealed that having to surrender one's body and consciousness into the hands of an unknown person incorporates building a foundation for so doing. This foundation is successively generated through a process of interaction with the anesthesia provider (AP) and involves preparing oneself to surrender, trying to retain control, accepting, and surrendering.<sup>3</sup> However, not all patients follow the process and instead refuse to accept and surrender.<sup>3</sup> Similarly, in a phenomenological study by Holmberg et al<sup>4</sup> the patients had a dual perspective on paramedical care. The main theme of the study, to "surrender in dependence of another," meant that there was no other alternative for the patient than to surrender into the hands of the paramedic.<sup>4</sup> However, this also involved adapting to the paramedic's perspectives on the patient's care needs, even if they were not shared by the patient.<sup>4</sup>

The aforementioned aspects of surrendering are anchored in the feelings associated with having to place one's life in someone else's hands and are operationalized in the anesthesia surrendering instrument (ASI), the development and testing of which are reported in this article. Previous experiences, for example, of anesthesia, might influence ones future experiences, for example, the anesthesia induction.<sup>3,5</sup> Furthermore, it is well established that undergoing anesthesia and surgery is not without risk. For example, data from the Cleveland Clinic pertaining to noncardiac surgery showed that a mean arterial pressure less than 55 mm Hg was associated with acute kidney and myocardial injury.<sup>6</sup> A larger meta-analysis (N = 82,514) of the risk for acute kidney injury (AKI) also demonstrated a pooled incidence of AKI of 14.4% and a relative risk for mortality because of postoperative AKI of 12.6%.<sup>7</sup> Overall, perioperative complications have been found to reduce the survival rate by 69%, irrespective of the identified preoperative risks.<sup>8</sup> In summary, the aforementioned aspects are a source

of worry and anxiety for the patient who is about to surrender to anesthesia.

Previous research within the field of perianesthesia has mainly focused on the physiological and psychosomatic influence of general anesthesia,<sup>9</sup> perioperative communication and dialogue,<sup>10</sup> perioperative advocacy,<sup>11</sup> and professional conduct.<sup>12</sup> From the literature and recent scientific exploration,<sup>3</sup> we conclude that the core of the interaction between the vulnerable patient and the AP lies in the challenge of recognizing the patient's state of surrendering. The concept of surrendering rests firmly on, and is dependent on, knowledge of patients' previous experiences of anesthesia,<sup>3</sup> as well as perioperative advocacy,<sup>11</sup> perioperative communication, and interactions,<sup>10</sup> in addition to professional conduct<sup>12</sup> as these aspects might be related to the patient's ability to surrender and the AP's ability to recognize the patient's struggle to surrender.

To advance health care, it is important to use patient-reported experience measures (PREMs), which focus on aspects of the humanity of care, such as being treated with dignity and respect.<sup>13</sup> At present, there are no PREMs used for measuring patients' experiences of surrendering to anesthesia or being treated with dignity and respect. One reason might be a lack of inductively developed measures that address the inside perspective of the patient. However, there are several disease-specific and generic patient-reported outcome measures (PROMs) available, for example, measurement of pain, nausea, fatigue, distress, and so forth, where PROMs seek to ascertain patients' views of their symptoms, functional status, and health-related quality of life.<sup>13</sup> Thus, PROMs provide feedback on present individual care, whereas PREMs offer feedback on the current integration of care and enable patients to provide direct feedback on their care to drive improvement in services.<sup>13</sup> PREMs include involvement of patient participation and quality of communication, which are a part of the ASI. Consequently, patients' experiences of surrendering could be a potential PREM. However, we found no established measurement instrument for this clinical concept before the anesthesia induction process. Thus, the rational was to develop the ASI as a PREM<sup>13</sup> and to explore the psychometric properties of surrendering.

When the patient is in a process of constructing a foundation by which to surrender into the hands of the AP, the patient is dependent on aspects of her or his consciousness and responsiveness while confronting the unfamiliar,<sup>14</sup> in this case, inability to comprehend the consequences of anesthesia-induced unconsciousness. With regard to the patient's threefold state of disadvantage,<sup>2</sup> the interaction between the AP and the patient could be of importance for making the power balance in the encounter more even and creating safety in surrendering. An in-depth understanding of the core of surrendering to anesthesia is the foundation for this interaction and may be also for the patient's whole experience of the anesthesia process.

### **Purpose**

The aim of this study was to develop and test an instrument to measure surrendering at the time of anesthesia induction and to explore the construct validity.

## **Materials and Methods**

### **Study Design**

An instrumentation and cross-sectional study with psychometric exploration of construct validity.

The study comprised two consecutive phases. The first phase comprised instrument development in two steps. First, defining the items and establishing face and content validity. Second, a cross-sectional study including a questionnaire for adult patients who had undergone general anesthesia in connection with a variety of outpatient surgical procedures. Lastly, psychometric properties of the instrument's construct validity were explored.

### **Phase 1: Instrument Development**

**STEP 1.** The initial item pool was determined by the research team and included 46 items generated from the results of previous research that resulted in a grounded theory of surrendering.<sup>5</sup> The items that were developed were based on the three categories identified in the grounded theory: preparing oneself to surrender, trying to retain control, accepting, and surrendering.<sup>5</sup> In accordance with the recommendation of Juniper et al<sup>15</sup> for

how to develop a questionnaire, the items were in the form of "I" statements, for example, "*Prior to being put to sleep, I felt defenseless*" or "*During the time of being put to sleep, I tried to maintain control.*"

**STEP 2.** Two independent groups tested face validity. The first comprised former patients (n = 7), selected through snowball sampling, who had experienced general anesthesia at some point in their life. The second group comprised nursing science researchers (n = 7). Independent of each other both groups evaluated the items in terms of their simplicity, relevance, and importance.<sup>16</sup> Face validity resulted in the exclusion of eight items because of their close resemblance to other items in the instrument or because of lack of clarity.

We followed the recommendations of Polit et al<sup>17</sup> on instrument development by means of content validity index (CVI), for which we consulted a second group of adults (n = 7) with previous experience of undergoing general anesthesia. Each item was reviewed in terms of relevance and clarity on a four-point scale: 1, *not relevant*; 2, *somewhat relevant*; 3, *quite relevant*; and 4, *highly relevant*.<sup>18</sup> Items rated as 3 or 4 were considered essential in terms of item-content validity (I-CVI), whereas scale-content validity (S-CVI) was computed by averaging the I-CVIs. In terms of relevance (range 0.71 to 1.0, S-CVI/Average 0.94), two items ended up on the cut-off score of 0.71 and were therefore removed from the instrument.<sup>17</sup> Clarity ranged from 0.86 to 1.0 (S-CVI/Average 0.98), with no items removed (cut-off score 0.71).

The final set of items comprised 36 statements. Each statement was individually scored on a four-point scale where the subjects stated their level of agreement from 1 to 4 (*completely agree, agree somewhat, disagree somewhat, and completely disagree*).<sup>16</sup> In accordance with Streiner et al,<sup>16</sup> to prevent imbalance in the analysis the scores of half of the positively worded item responses were mirrored, that is, positively worded items received the highest scores. The questionnaire took approximately 15 minutes to complete. It also contained questions about gender, age, surgical procedure, and the category of hospital where the participant was anesthetized.

### **Phase 2: Data Analysis**

The questionnaire was tested in Sweden, where approximately 825,000 elective and 2,110,000 outpatient operations are performed annually.<sup>19</sup> The SPSS version 23 was used for statistical analysis and categorical variables in the demographic data were analyzed using descriptive statistics. Because this instrument, or a similar one, has not been previously tested, principal component analysis (PCA) was considered suitable for exploration of the structure and identification of factors (hereafter constructs) that define items, statistically expressed with an eigenvalue ( $\lambda$ ) greater than 1.0.<sup>20</sup>

All 36 items were included in the PCA. As we assumed that the generated constructs were independent of each other and that there would be no correlation between the items, orthogonal Varimax rotation was used. This also helped to simplify the columns of the matrix.<sup>20</sup>

Bartlett's sphericity test was used to test the null hypothesis that there was no relationship between the items, which showed statistical significance ( $P = .000$ ), thus indicating that PCA was suitable for the data set and supports the constructs of the correlation matrix.<sup>20</sup> The Kaiser-Meyer-Olkin (KMO) test was used to measure sampling adequacy and test the strength of the relationship between the items. The KMO test value was 0.753, which is more than the recommended value of 0.7 and therefore considered appropriate as a correlation matrix.<sup>20</sup>

In line with Comrey and Lee,<sup>21</sup> conceivably high communalities in the data set were compensated for by the Kaiser normalization procedure before rotation. The Catell scree test was used to explore distinct breaks between the slope of the descending size of the  $\lambda$ .<sup>22</sup> After examining the components in the constructs, we determined that the Kaiser criterion was the best screening option because it allows more items to be taken into account. Although a loading value of 0.3 among the items in the construct is considered salient,<sup>22</sup> we chose a cut-off value of 0.4 because of the sample size<sup>23</sup> and to ensure the quality of the results. Thus, condensation of items was achieved by retaining items with a loading value more than 0.4. In view of the num-

ber of items clustering in each loading, we tested the internal consistency of each construct. A Cronbach's  $\alpha$  between 0.7 and 0.9 was considered adequate for the whole orthogonal dimension matrix.<sup>24</sup>

### **Sample Selection**

The subjects were recruited from the anesthesia clinics at three different hospitals (university, regional, and local) in the south of Sweden and asked to complete the ASI to measure their anesthesia induction experience. Inclusion criteria were Swedish speaking adults (older than 18 years) who had to undergo general anesthesia as part of their outpatient surgery, who volunteered to participate, and gave both verbal and written consent, preoperatively, to the nurse at the surgical day-care unit. The sample size in this study was based on the assumption of Suhr<sup>25</sup> that for a reliable result the minimum number of subjects required in the survey should be a sample-to-item ratio of 5:1, with a minimum of 100 observations. Therefore, a sample of 180 subjects was set as a minimum requirement for PCA.

### **Data Collection**

In total, 225 questionnaires were distributed and 202 subjects included in the study between March and July 2016. Data were collected at outpatient recovery units when the treating surgeon and postoperative team considered the participant lucid and fit enough to be discharged to her or his home. The time frame for the patient to fill in the questionnaire was specified as, but not limited to, the time of discharge from the day-care recovery unit.

### **Ethical Considerations**

Recruitment and distribution of the questionnaire began after the Regional Ethical Review Board granted ethical approval (Dnr 2016/80), and permission to conduct the study was received from the operations manager at each participating anesthesia clinic. Potential subjects were given verbal and written information about the study and written consent was obtained from those who volunteered to participate.

## Results

### Demographics

Of the 225 questionnaires 16 were not returned, thus 209 responses were obtained, representing a response rate of 93%. Another seven responses were excluded because of incomplete responses in the questionnaires. Hence, the statistical analysis was based on 202 completed questionnaires.

Gender distribution among the subjects differed among the local, regional, and university hospitals, where a majority of subjects in the first two were women (68% and 65%). There were only minor variations in the mean age diversity among the subjects (52.59 to 48.40). The number of cohabiting subjects was slightly higher in the university hospital, whereas the number of noncohabiting subjects was higher in the local hospital (Table 1).

Hernia surgery procedures comprised inguinal, umbilical, and scrotal hernia in men. Orthopaedic procedures were dominated by arthroscopy, wrist, and ankle surgery. Other surgical procedures requiring general anesthesia were ear, nose, and throat surgery, extracorporeal shock wave lithotripsy, and endoscopic retrograde cholangiopancreatography (Table 1).

### Data Analysis

Of the 36 original items, only 29 were retained because of item loading. Initially, 11 constructs were extracted by PCA with only 1 to 4 items loading on each construct. We continued by testing a six-construct solution, where three of the six constructs contained more than three items. However, by reducing the number of predetermined constructs to a five-dimensional solution we obtained optimal variance with four to seven items loading on all five constructs. The PCA resulted in a 29-item matrix comprising four constructs. They were labeled as construct I (*preparation by avoidance*), construct II (*control*), construct III (*preparation by understanding*), and construct IV (*acceptance*). The fifth construct was inconclusive with two items' loading greater than 0.4, and it was therefore excluded from further abstraction. The remaining constructs had a  $\lambda$  value greater than 1.0, where construct I explained 16.6% of the variance, II explained 10.1%, III explained 6.3%, and IV explained 5.5%. Cumulatively, the solution explained 43.2% of the variance in the matrix. In constructs I, II, and III seven items were retained, whereas in construct IV the six items that clustered at greater than 0.4 were retained. Seven items were excluded from the instrument

**Table 1. Demographic Details and the Six Most Common Surgical Procedures**

Demographic Details of the Sample (N = 202)				
Variable	Local Hospital	Regional Hospital	University Hospital	Cumulative
N = 202	n = 67	n = 63	n = 72	
Men % (n)	64.2 (43)	31.7 (20)	34.7 (25)	43.6 (88)
Women % (n)	35.8 (24)	68.3 (43)	65.3 (47)	56.4 (114)
Age				
Min.	21	18	18	18-80 (Range)
Max.	80	79	78	
Mean	52.59	50.49	48.40	50.44
SD	15.34	16.10	16.41	15.98
Type of surgery* % (n)				
1. Breast	5.7 (3)	44.2 (23)	29.4 (20)	22.7 (46)
2. Hernia	57.6 (30)	0	0	14.9 (30)
3. ENT	0	3.8 (2)	38.2 (26)	13.8 (28)
4. Urology	5.7 (3)	1.9 (1)	32.3 (22)	12.8 (26)
5. Orthopaedics	0	48 (25)	0	12.4 (25)
6. ERCP/cholecystectomy	30.7 (16)	1.9 (1)	0	8.4 (17)

ENT, ear, nose, and throat; ERCP, endoscopic retrograde cholangiopancreatography.

\*Relates to the six most frequent types of surgery among the participants in this study.

**Table 2. Presentation of the Rotated Component Matrix: A Five-Dimensional Principal Component Analysis (With the Fifth Construct Excluded [Excl.]) of Items in the Anesthesia Surrendering Instrument**

**Orthogonal-Varimax Component Matrix With Cronbach's  $\alpha$  Values, Keiser-Myer-Olkin, and Bartlett's Test of Sphericity**

<b>Constructs</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>C5<sup>Excl.</sup></b>
<b>C1. Preparation by Avoidance</b>					
I tried to avoid thoughts about the anesthesia induction	0.765				
I tried to avoid thoughts about the intraoperative environment	0.760				
I tried to ignore my emotions	0.674				
I tried to avoid thoughts about what was happening to me	0.665				
I tried to control my emotions	0.656				
I tried to avoid thoughts about what I sensed inside my body	0.557				
I prepared for postoperative discomfort	0.411				
<b>C2. Control</b>					
I tried to stay awake		0.825			
I tried to keep my eyes open		0.785			
I tried to maintain control		0.695			
I felt I was being suffocated		0.556			
I was afraid of waking up during surgery		0.476			
I felt defenseless (before induction)		0.427			
I was afraid of not regaining consciousness		0.410			
<b>C3. Preparation by understanding</b>					
I tried to pose as many questions as possible to the AP			0.703		
I tried to understand the technical objects			0.674		
I looked around the operating theatre			0.633		
I tried to understand what was taking place around me			0.549		
I tried to envision the anesthesia			0.544		
I observed the work of the AP			0.526		
I tried to joke			0.522		
<b>C4. Acceptance</b>					
I felt that I could surrender				0.661	
I made eye contact with the AP				0.588	
I followed the AP's instructions				0.553	
I experienced being personally received by the AP				0.528	
I breathed deeply into the anesthesia mask				0.512	
I felt defenseless (at induction)				0.425	
<b>C5. Construct excluded</b>					
I tried to relax					0.547
I tried to understand the course of events I sensed inside my body					0.444
Eigenvalue $\lambda$ after rotation	5.95	3.63	2.27	1.98	1.70
% of total $\lambda$ ( $\Sigma$ )	16.54	10.1	6.31	5.51	4.75 (43.2)
Cronbach $\alpha$	.81	.8	.74	.57	.24

AP, anesthesia provider.

The constructs are in bold type and numbered 1 to 5 with associated items.

Cronbach  $\alpha$ : overall instrument = .76.

Kaiser-Meyer-Olkin test = 0.75.

Bartlett's test of sphericity =  $P < .000$ .

because of a construct loading value less than 0.4. Construct validity, internal consistency, KMO test, and Bartlett's test of sphericity values are presented in Table 2.

### **Constructs I to IV**

I: *Preparation by avoidance* contains seven items that describe various ways in which the subjects tried to cope with the situation.

II: *Control* describes the different ways in which the subjects attempted to remain in control at anesthesia induction. Control was expressed as a struggle to deal with feelings and comprises seven items.

III: *Preparation by understanding* contains seven items that reflect how the subjects used their cognitive capacity to help them relate to and deal with the different aspects of the intraoperative context.

IV: *Acceptance* is the fourth construct and contains six items describing how the subjects adhered to the AP's instructions.

### **Discussion**

The key findings in this study indicate that an initial version of the ASI consists of 29 items and that it is possible to operationalize anesthesia surrendering into four constructs: preparation by avoidance, control, preparation by understanding, and acceptance. The constructs explained 43% of the variance. With a total variance of 43% among items and an overall  $\alpha$  value of .76, the structure of the ASI appears suitable for further testing and development of its ability to measure the concept of surrendering to anesthesia.

It could be argued that instead of choosing patients with previous experience of anesthesia, we could have chosen experts (health care professionals) with in-depth knowledge on the concept to provide a sufficient level of control. In view of the fact that a future aim is to develop the ASI into a PREM, it was important to use patient expertise from an early stage, which explains our strategy of ensuring good readability. The item construction process involved several basic steps. First, a grounded theory study was conducted that constituted the theoretical framework for the ASI. One weakness in the results was the total scale variance

of 43%, which indicates that the instrument may not cover some unknown important areas. The concept is complex, novel, and involves many aspects of the patient's thoughts and emotions, implying the need for further exploration of content validity. Given the early stage of this research, the overall reliability of the condensed component matrix is acceptable. In line with Nunnally,<sup>26</sup> we believe that the degree of consistency is dependent on the use of the instrument. Hence, a cut-off  $\alpha$  value of .7 is not deemed an absolute threshold for valid consistency but rather a rule erring on the side of caution to guide the researcher in developing the instrument.<sup>26</sup> The findings in this study constitute a reasonable foundation for further development of the ASI.

In agreement with the previously generated grounded theory,<sup>3</sup> surrendering is apparent among patients who are confronted with placing their life in the hands of the AP. The reason for this is the similar structure, where the three categories of the grounded theory (*preparing oneself to surrender; trying to retain control, and accepting and surrendering*)<sup>3</sup> match the constructs in the present study.

*Surrendering to anesthesia* is suggested as an abstraction of the matrix, comprising the subjects' process of maintaining their dignity until anesthesia induced loss of consciousness. The four underpinning constructs in this study therefore represent fundamental aspects in which the subjects maintain their identity and sense of existence. This agrees with the personal construct theory of Kelly<sup>5</sup> where the constructs outline the foundation of human existence and may well be seen as reflections of the subjects' inner processes during the anesthesia experience.

In essence, the constructs in this study are understood by means of how the subjects construe the items.<sup>5</sup> The constructs are interpretations of a situation—the anesthesia experience at the time of induction—thus do not constitute the situation itself. It could be suggested that constructs I to IV are abstract properties that can be attributed to the numerous events coinciding with general anesthesia procedures. This not only corresponds to the personal construct theory on how subjects interpret events, but also constitutes a framework for how to predict future events based on previous experiences.<sup>5</sup> The subjects' inner processes of

how they think, feel, and understand events during the conscious phase of the anesthesia experience are expressions of anticipation.<sup>5</sup> More concretely, the subjects' expressions exist in the form of constructs, here generated by psychometric testing.

### ***Preparation by Avoidance***

The subjects did not want to be part of what was taking place and therefore avoided thoughts about external aspects such as the anesthesia itself and the anesthesia environment. Internally, they struggled to avoid emotions, while at the same time trying to monitor their emotions. Boulanger et al.<sup>27</sup> define avoidance as an emotional regulation strategy to reduce discomfort in the short term. Furthermore, avoidance not only serves as a strategy for the subject but is also a function that mediates stressful events, such as the anesthesia experience.<sup>27</sup> Avoidance is a response that emphasizes the context and in the long term can have a negative impact on quality of life and functioning.<sup>27</sup> This might influence treatment in that communication between the AP and the patient could be hampered, thus affecting medical and nursing interventions.

### ***Control***

Expressions of control were illustrated by the subjects' ambivalence toward their emotions and physical feelings, that is, feeling suffocated or struggling to stay awake despite experiencing the direct influence of the anesthesia drugs. Anesthesia induction involves either a struggle for control or just letting go and surrendering to the AP. According to Kelly,<sup>5</sup> either way control is analogous to making a choice between different alternatives in the given context because the patient cannot do all simultaneously, which explains their ambivalence toward inner emotions and feelings. To make this choice the subjects tried to control themselves and the situation to which they were subjected. Trying to keep their eyes open with a clear emphasis on maintaining control seemed to be a way of coping with the fear of waking up during surgery while at the same time feeling defenseless. In summary, control is a viewpoint from which patients or significant others attempt to understand and explain actions and events.<sup>5</sup>

### ***Preparation by Understanding***

Preparation by understanding means that the subjects noticed different features in a series of elements and interpreted their perceptions.<sup>5</sup> These elements come to characterize the event, that is, the anesthesia induction, in which the subjects tried to discern differences or similarities to previous anesthesia experiences. This requires an intact cognitive capacity as it necessitates an ability to try to relate to features in the context and/or messages in the communication between the AP and the participant. The subjects did not only look around, observe the AP's work, and joke in an effort to ease their anxiety and fear of the unknown, but also posed questions in an attempt to understand their impressions and the technology. This is an expression of how to create structure and meaning in an event filled with unknown elements and encounters. It is also an endeavor to envision the anesthesia and anticipate events.

### ***Acceptance***

Accepting a situation requires imagination, skill, and may be most importantly, courage.<sup>5</sup>

Kelly<sup>5</sup> describes how fear of being taken over by something else or somebody else hinders the subject from reaching acceptance and letting go, for example, as is the case with anesthesia induction. Therefore, one needs sufficient imagination to envision being in a safe environment and in safe hands despite fearing the unknown. It requires skill to retain one's integrity when confronted by technical devices and unfamiliar terminology used by the operating theater staff. One argument is that the subjects reached this acceptance by a willingness to see the world through the eyes of the AP.

For the patient, the AP represents a guarantee for safety and that the patient is in a protected environment, which facilitates participation in the preparations for anesthesia. Acceptance is not restricted to a specific situation but also applies to the relevant other,<sup>5</sup> that is, the AP. Consequently, the subjects did not only accept the situation per se, but also accepted the AP as a person. Despite the fact that we are able to distinguish between different constructs within the matrix of *surrendering to anesthesia*, the

necessity of strengthening *acceptance* as an isolated construct within the process remains. Nevertheless, when seen in its entirety the construct touches on important aspects related to the grounded theory of surrendering.<sup>3</sup>

### ***Surrendering to Anesthesia***

The Catell scree test was used to explore distinct breaks between the slope of the descending size of the  $\lambda$  on the scree plot. Because we used the minimum requirement in the sample-to-item ratio of 5:1, with a potential risk of covariation instability among the items, the scree test was considered less reliable for retention of constructs. The initial theoretical construction<sup>3</sup> suggested three dimensions that, in this study, ended up in four final constructs starting with a five-dimensional solution. This illustrates the complexity when trying to convert complex inductively developed concepts into psychometrically sound structures that enable sound measurement. We argue that a sound measurement is mandatory in further item development to capture the extent of the concept to a higher degree. However, there is a slight similarity to a study by Ternstedt et al<sup>28</sup> in which the final stage of a good death contained the concept of surrender. Ternstedt et al<sup>28</sup> reported that although the patients wished to remain alive, they nevertheless recognized that life was at an end. This is analogous to item 36 in our questionnaire, *I felt that I could surrender*, because refusing surgery and remaining ill was not an option for the subjects.

### ***Limitations***

There are limitations in relation to the sample size and cultural context. Another limitation is the ability of the subjects to remember and describe their feelings postoperatively. To guarantee face and content validity the items were formulated in a way that did not require extremely high health literacy skills to understand their content and meaning. Following the establishment of face and content validity, ten items were removed because of their close resemblance to other items or because their configuration made them difficult to interpret. The purposive sample consisting exclusively of outpatients is also a limitation, as is the ability of the subjects to remember their experiences of anesthesia. Because of the lack of research on the concept of surrendering at the

time of anesthesia induction, we considered it valuable that patients with previous experience of general anesthesia reviewed the content validity. Use of a sample-to-item ratio of 5:1 must be seen as an absolute minimum requirement and thus less optimal for avoiding covariation instability among the items.<sup>25</sup> Because the items originate from a grounded theory of surrendering during anesthesia induction, there is a risk that they could be interpreted as sample specific, making the instrument less generalizable to other health care contexts. The high response frequency among some items, with 80% or more completely and/or somewhat agreeing/disagreeing, might be an indication of low item specific variance. For example, the item, "I hoped that the AP would notice me as a person" had a score of 97% (agree completely/somewhat) and likewise the item, "I tried to stay awake" scored 84% (disagree completely/somewhat). Hence, a dichotomously designed scale (four-point scale) leaves little room for variance.

Because this research was conducted in a Swedish context the influence of different cultural prerequisites should be considered in further development and if adopted elsewhere. Another limitation is that the subjects' history of previous general anesthesia was not included in the demographics. It is likely that such experience would influence the anesthesia surrendering variables. In addition, the purposive sampling technique and small sample size lead to a risk of bias, thus generalization of the findings can be expected to be limited and should therefore be made with caution.

### ***Implications for Future Research***

The next step in this research is to proceed with confirmatory factor analysis to confirm the findings of this hypothesized measurement model. It would also be appropriate to repeat this study using a larger sample and within cultural contexts that differ from Swedish conditions. Finally, because this study only takes surrendering experiences of adult patients into consideration, it would be of great value to qualitatively explore, psychometrically evaluate, and confirm how children and teenagers aged less than 18 years experience the concept of surrendering at the time of anesthesia induction.

### **Clinical Implications**

According to Black,<sup>13</sup> the potential of questionnaires that provide accurate evidence of outcomes from the patient perspective could help to increase public accountability of health services and health care professionals. In addition, these measurement instruments must be well developed to be useful and enable standardization. After further testing, the ASI will constitute a context-specific PREM for anesthesia. As there are no context-specific PREMs available, the ASI will fill a gap and enable standardized measurements among different surgical patient groups regarding their experiences of dignified care when surrendering to anesthesia. A start has been made in considering the important impact of patients' experience of the humanity of care, but it requires far more investigation. It may be that judgments about the effectiveness of an AP will need to be adjusted to take account of patients' experiences

and not only focus on safety and logistical effectiveness. In its present form, the ASI could be used as a tool when professionals discuss and focus on such an adjustment, as it highlights important indicators of the patient's own experience of anesthesia induced unconsciousness.

### **Conclusions**

This study has shown that it is possible to measure the concept of surrendering by means of four dimensions. Despite the fact that a dimensional variance of 43% could be considered weak, the explained variance does not suggest an optimal number of components to be retained. For this reason, further item refinement and testing are necessary to achieve a better variance. At this early stage of research and testing of the ASI, surrendering to anesthesia has been found to be underpinned by the four constructs: *preparation by avoidance, control, preparation by understanding, and acceptance*.

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