Quality of life can be defined as “a person’s sense of well-being that stems from satisfaction or dissatisfaction with the areas of life that are important to them.”¹ Quality-of-life issues have been a major focus in modern academic circles, and virtually every medical discipline has developed tools to assess quality of life from the patient’s perspective.

We hypothesized that patient-defined, postanesthesia short-term quality-of-life issues are significant factors to consider when selecting anesthesia. This study developed and piloted a tool to assess the impact of specific anesthetic techniques on postanesthesia short-term quality-of-life issues.

In phase I, a panel of content experts developed a tool to measure postanesthesia short-term quality of life. In phase II, 50 same-day surgery subjects undergoing spinal or general anesthesia completed the tool on day 1 and on days 5, 6, or 7 postoperatively. The RAND 36-Item Health Survey was administered simultaneously to assess concurrent validity.

Phase I resulted in a 40-item tool covering 3 domains. The Phase II pilot supported internal consistency and construct validity for the majority of tool items, although the tool did not correlate strongly with the RAND questionnaire. To confirm the dimensions used in the tool, we recommend a multicenter study permitting the application of factor analysis.

Key words: General anesthesia, quality of life, spinal anesthesia, tool development.

Quality of life is a major focus for researchers conducting studies on patient satisfaction and anesthetic outcomes. Efficacy and safety drive anesthesia providers’ determination of the type of anesthesia administered, yet little consideration is given to postanesthesia quality of life from the patient’s perspective.

Several studies have addressed subjects’ attitudes, preferences, and satisfaction regarding anesthesia. A review of the literature revealed the majority of patients preferred general over spinal anesthesia.⁵,⁶ Given the potential side effects associated with general and spinal anesthetics, it is readily apparent that their administration could have a significant effect on postoperative quality of life.⁷,⁹

Some authors have attempted to indirectly obtain a quality-of-life value by measuring patients’ satisfaction with anesthesia.³ We believe it is possible to assess quality of life by asking direct questions that measure patients’ perceptions or views of their quality of life. Following a review of the available quality-of-life literature and through examination of common patient experiences with anesthesia in the postoperative period, 3 domains relevant to anesthesia were identified: physical, psychological, and role functioning.

The purpose of the present study was to develop and
pilot a tool to measure the effect of anesthesia on short-term quality of life. The postanesthesia short-term quality of life (PASQOL) tool was patterned after 3 existing tools that have demonstrated validity and reliability. These instruments also were chosen as models based on their concise wording, brevity, feasibility for administration, and shared components pertinent to anesthesia. 10-12 Global questions that capture a subjective assessment of overall quality of life and specific questions regarding role function and pain assessment also were incorporated into the PASQOL tool.

- Assumptions.
  1. The physical, psychological, and role-function aspects of life comprise the construct being measured: postanesthesia short-term quality of life.
  2. Patients can distinguish postoperative physical, psychological, and role-function effects related to the anesthetic from those related to the surgical procedure.

The development of the PASQOL tool was conducted in 2 phases.

Methods: Phase I

Phase I consisted of qualitative assessment of existing tools and the development of a preliminary questionnaire using information from these tools and case studies. Physical, psychological, and role function were the 3 healthcare domains chosen after consideration of patient quality-of-life areas most influenced by common side effects of general and spinal anesthesia. The questions were designed to elicit responses specifically related to postanesthesia short-term quality of life. Responses to questions in the physical, psychological, and role-function domains were made on a 10-cm horizontal visual analog scale (VAS). High scores on the VAS indicated a lower quality of life. Global questions were open-ended and required a narrative response.

The PASQOL and an instrument assessment sheet adapted from Grant and Davis13 were submitted to a panel of content experts: 2 anesthesiologists, 2 Certified Registered Nurse Anesthetists, 1 postanesthesia care unit nurse, 1 same-day surgery nurse, 3 persons who had undergone general anesthesia, and 3 persons who had undergone spinal anesthesia. The items on the PASQOL tool were reviewed by the members of the content panel for accurate representation of the concept of quality of life, appropriateness for use with the population in this military healthcare setting, and clarity of the questions. Content validity was assessed by calculating intrarater agreement and the content validity index. The content validity index is the standard error of the proportion of agreement among the content panel, and it takes into account chance agreement. 14 Revisions and submissions were repeated until at least 75% of the panelists agreed that the content of the tool was valid. The tool was revised according to the comments of the experts and resubmitted to the entire content panel.

Results: Phase I

Ten (83%) of 12 content panel members agreed that the questions from the physical and role-function domains were clear, represented the anesthesia experience, and were appropriate to the study population and setting. Ten (83%) of the panel members also agreed that the questions from the psychological domain were clear and appropriate to the population and setting of the study. However, only 9 (75%) of the panel members agreed that the questions from the psychological domain were clear and appropriate to the study population and setting. Howev er, only 9 (75%) of the panel members agreed that the questions from the psychological domain represented the anesthesia experience. Based on the panel's recommendations, changes in the wording used to describe the items regarding “emotional fatigue,” “difficulty remembering,” and “nightmares” were made to improve the anesthesia-specific representative quality of the psychological domain of the tool.

Quantitative and qualitative changes were made to the instrument items and domains of the second and final version of the PASQOL tool. For example, a “sample” question with an accompanying VAS was added to demonstrate to the respondent how to answer the questions on the instrument. The sample also demonstrated the direction of the VAS anchors, and all VAS anchors were changed from a random format to a consistent, right to left only, pattern. Some questions were deleted, added, or combined in the domains and global question sections to avoid redundancy and to increase clarity. Revisions and clarifications were made until the members of the content panel were satisfied and agreed on a final version of the PASQOL tool.

The final version of the tool consisted of 3 domains: physical, psychological experiences, and role function. The physical domain contained items named nausea/vomiting, headache, sore throat, sore back, sore muscles, altered sensation, unusually tired, and urination difficulty. Items in the psychological domain included sad/depressed, emotionally fatigued, nervous/tense/anxious, difficulty concentrating, difficulty remembering, difficulty with speech, nightmares, and recall of surgery. The role function domain items included daily activities, time lost, assistance with caring for family, and required help from another. In addition to the 20 VAS-scored questions on these topics, the tool requested subject demographics, asked 3 global questions, and offered 4 opportunities to provide perceptual and descriptive information in the 3 domains.
Methods: Phase II

- **Instruments.** The RAND 36-Item Health Survey is a brief, self-administered survey instrument that measures patient well-being and functioning without regard to specific disease conditions. The RAND survey is scored by ranking the number of limitations using word anchors and numeric ratings from 0 to 100. The numeric ratings are then recoded according to a protocol from the RAND Health Sciences Program so that a higher score reflects a more positive health state. The scaled scores represent the average for all items within the domains that the respondent answered.

The PASQOL instrument is a brief, self-administered 40-item survey with 27 questions structured to measure the physical, psychological, and role function aspects of quality of life specifically related to the anesthesia experience after surgery. The remaining 13 questions elicit information about demographics, military status, and experiences with anesthetics.

A horizontal VAS was used to rate 8 items in the physical experience domain, 8 items in the psychological experience domain, and 4 items in the role function domain. Each domain also contained 1 or 2 questions on additional symptoms, with space for a brief description by the respondent. Item scores were summed for a total domain score and domains added for a total experience score. Each VAS score could range from 0 to 10, with a maximum of 40 or 80 for each domain score and a maximum total experience score of 200. The higher the score, the more unpleasant the physical, psychological, or role limitation experience.

The Hospital Anxiety and Depression Scale (HAADS) is a 14-item self-administered questionnaire that assesses the anxiety and depression experienced by hospitalized subjects. Item scores range from 0 to 3, with higher scores indicating higher levels of anxiety and depression. Scores of individual items were summed with a possible maximum score of 21 for the anxiety scale and 21 for the depression scale.

Data analysis was performed using SPSS PC Plus (SPSS, Chicago, Ill). Demographic and anesthesia experience data are expressed as mean and SD. A P value of less than .05 was considered significant.

- **PASQOL tool pilot.** Phase II in the development of the PASQOL tool involved piloting the tool with patients undergoing surgery. After obtaining informed consent, a convenience sample of 25 men and 25 women undergoing same-day surgery procedures of less than 3 hours were enrolled in the study. The anesthesia technique was agreed upon by the anesthesia provider and the patient. Patients were excluded from the study if they had a history of cognitive or psychiatric impairment. To assure comparability between study groups, the HAADS was administered preoperatively.

Following the surgical procedure, subjects completed the PASQOL tool and RAND survey. Subjects were subsequently discharged with a mail-in PASQOL tool and RAND survey to complete between days 5 and 7 postoperatively. On approximately postoperative day 5, an investigator telephoned the subjects, asked the 3 global quality-of-life questions, and reminded subjects to return their questionnaires by mail.

Results: Phase II

All 50 subjects (100%) completed the PASQOL tools and RAND surveys and answered questions about their anesthetic experience on the day of surgery. Table 1 shows the sex, ethnicity, and military status of 46 subjects. Data for 4 of the 50 subjects (8%) were not included in the analysis, since unanticipated changes to their anesthetics were required. Of the remaining subjects, 26 (57%) received a general anesthetic, and 20 (43%) received a spinal anesthetic. In the general anesthesia group, 22 (85%) of 26 subjects returned the mail-in PASQOL tool, and 21 (81%) returned the mail-in RAND survey. Of subjects who received spinal anesthesia, the respective return rates were only 60% (12/20) and 55% (11/20). The percentage of subjects who responded by telephone to the global questions was higher in the spinal anesthesia group (16/20 [80%]) than that in the general anesthesia group (17/26 [65%]). The Figure shows the percentage of subjects in each primary surgical category.

The HAADS was administered to all subjects to determine the comparability of the 2 groups in terms of anxiety and depression as a product of the planned anesthetic (spinal or general). No significant differences in anxiety and depression levels were found between the general and spinal anesthesia groups. In addition, mean age, height, weight, and number of past anesthetic experiences were compared between groups (Table 2). Age and number of past anesthetics were significantly higher in the spinal anesthesia group.

- **Assessment of reliability of the PASQOL tool.** The internal consistency of the PASQOL physical and psychological experience domain scores on the day of surgery and the mail-in PASQOL physical, psychological, and role function experience domain scores on day 5, 6, or 7 after surgery were assessed by using the Cronbach α. Internal consistency was well supported by this measure, particularly for the first use of a new instrument.

- **Construct validity.** The construct validity of the PASQOL tool was supported by significantly different scores on the PASQOL tool between the 2 anesthetic
The significant difference in the role function domain between the general and spinal anesthesia groups supports the discriminant validity by comparing groups known to be different in terms of the anesthesia received.

The significant correlation noted of items in the physical experience domain, assessed on the day of surgery in all 50 subjects, reveals an estimate of convergent validity for the items nausea/vomiting, headache, sore throat, altered sensation, unusually tired, and difficult urination ($r = 0.3$ to $0.81; P < .05$). The lack of a significant correlation between the sore back and sore muscles items with other items in the physical domain needs to be verified with a larger sample of subjects. Correlations of items within each domain at the 1-week postoperative period were not as strong or as consistent as correlations on the day of surgery.

The psychological experience items on the day of surgery converged well with each other (Pearson $r = 0.300$ to $0.945; P < .05$) with the exception of nightmares ($r = -0.020$ to $0.058$).

Role function items measured within 1 week of surgery correlated strongly with each other within the role function domain ($r = 0.569$ to $0.996; P < .01$).

In an effort to demonstrate that the domains of the PASQOL tool measure different dimensions of the postanesthesia experience, correlation of the items in the PASQOL physical domain with the items in the PASQOL psychological domain was performed. Weak but significant correlations existed for the item altered sensation from the physical domain with the item emotionally fatigued from the psychological domain ($r = 0.338$) and within the same domains, respectively, for the items sore back and difficulty remembering ($r = 0.409$). The physical items headache and unusually tired correlated more strongly with items in the psychological domain. Headache correlated modestly with difficulty concentrating, nightmares, and difficulty remembering ($r = 0.453$ to $0.644; P < .01$). Unusually

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**Table 1. Demographics: Gender, ethnicity, military status**

<table>
<thead>
<tr>
<th>Anesthesia type</th>
<th>General (n = 26)</th>
<th>Spinal (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>M, 20; F, 6</td>
<td>M, 17; F, 3</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>Black</td>
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<td>2</td>
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<tr>
<td>Hispanic</td>
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<td>1</td>
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<tr>
<td>Asian</td>
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<td>0</td>
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<tr>
<td>White</td>
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<tr>
<td>Native American</td>
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<td><strong>Military status</strong></td>
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<td></td>
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<td>Active duty</td>
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<td>14</td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Family member</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2. Demographics: Age, height, weight, and anesthesia experience**

<table>
<thead>
<tr>
<th>Anesthesia type</th>
<th>General (n = 26)</th>
<th>Spinal (n = 20)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (y)</strong></td>
<td>33 ± 9.63</td>
<td>43 ± 14.30</td>
<td>.018†</td>
</tr>
<tr>
<td><strong>Height (in)</strong></td>
<td>68 ± 4.35</td>
<td>69 ± 3.79</td>
<td>.602</td>
</tr>
<tr>
<td><strong>Weight (lb)</strong></td>
<td>182 ± 34.12</td>
<td>203 ± 37.78</td>
<td>.055</td>
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<tr>
<td><strong>Prior anesthetics</strong></td>
<td>1.69 ± 1.16</td>
<td>3.25 ± 2.77</td>
<td>.003†</td>
</tr>
</tbody>
</table>

* Prior anesthetics exclude local anesthetics for dental procedures.
† P < .05.

Values are expressed as mean ± SD.
tired also correlated modestly with difficulty concentrating, sad/depressed, emotionally fatigued, and nervous/tense/anxious ($r = 0.497$ to $0.588; P < .01$). These modest correlations of items in domains expected to diverge are logically correlated, given that both physical and psychological changes can result in these same symptoms. When correlating the physical items with role function items, headache and sore throat correlated with required help from another ($r = 0.490; P < .01$). Unusually tired correlated with all items of the role function domain ($r = 0.361$ to $0.578; P < .05$), which logically, is expected.

The correlation of items from the psychological domain with role function items shows the majority of items correlated moderately to strongly ($r = 0.340$ to $0.985; P < .05$). Recall of surgery and difficulty with speech did not correlate well, which indicates a need to examine specific items from each of the domains of the tool.

The characteristic responses to the 3 global quality-of-life questions at the end of the PASQOL tool indicated no change in quality of life 5 to 7 days postoperatively compared with immediately postoperatively in 25 (76%) of 33 subjects who were surveyed by telephone. A change was reported by 8 subjects (24%). One patient whose anesthetic was converted from spinal to general stated that quality of life was not affected but that severe backache was experienced postoperatively. We believe that this patient's response was important to report, but the data were not included in the reliability testing of the PASQOL tool and in comparisons between anesthetic groups. Of 34 subjects surveyed by telephone, 27 (82%) reported that the anesthetic they received had no effect on their quality of life, while 5 (15%) reported that the anesthetic had some role in their quality of life between days 5 and 7 postoperatively. One patient (3%) thought the change in quality of life “could have been due to surgeons pulling on my back or making me move from table to table.” The majority of subjects surveyed by telephone (30/33 [91%]) reported they would subsequently undergo the same anesthetic as received, while 2 (6%) said they would not elect to receive the same anesthetic in the future. One patient (3%) needed additional information before deciding on the type of anesthetic for the future.

When the differences in age and weight were controlled, a significant difference in role function was found between the spinal and general anesthesia groups.

Finally, correlation matrices were prepared to determine item retention in the tool. The matrices revealed that certain items from the 3 domains may not contribute to the measurement of the core aspects of short-term quality of life after an anesthetic. However, since these matrices are based on data from a limited sample (34 subjects), all items will be retained on the instrument in a subsequent test with a larger sample.

**Discussion**

Of the 46 subjects who participated in the study, 34 (74%) returned the questionnaire after the 5- to 7-day postoperative period. We were able to contact 33 (72%) of the 46 subjects by telephone for their responses to the global questions. The rate of return may have been improved by asking subjects to bring their questionnaires to the postoperative surgical follow-up appointment.

The significant difference found in age and military status between the 2 groups was expected, as the older, retired population tends to receive spinal anesthesia more often because of coexisting disease. After controlling for age and weight, a significant difference was found in role function between the 2 groups, with the spinal anesthesia group having higher scores for this domain. The higher scores indicate more interference with postoperative role function in the spinal anesthesia group compared with the general anesthesia group. Active-duty subjects may return to work despite a diminished quality of life. Although subjects in this group had significant changes in fatigue levels postoperatively, they nevertheless had no significant change in role function.

The findings of a recent study by Gilbert et al support the finding of a lower level of role function after spinal anesthesia. These investigators examined outcome variables in a large population of elderly patients undergoing repair of hip fracture. They found no significant differences between general and spinal anesthesia groups in early, in-hospital complications. Conversely, they found general anesthesia was significantly associated with independent ambulation and with some improvement in 2 other walking-associated activities of daily living through 2 years of follow-up. These findings support those of the present pilot study and further augment the validity of the PASQOL tool. However, as Gilbert et al noted, their study was observational and open to potential selection bias. Confirmation of the validity and reliability of the PASQOL tool will require expanded use in a large, more heterogeneous sample.

The PASQOL tool did not correlate closely with any
of the RAND survey domains as determined by the Pearson r statistic. However, the physical domain of the PASQOL tool correlated with the RAND energy/fatigue scale in the expected direction. The higher physical interruption scores of the PASQOL tool were associated with lower energy levels measured by the RAND survey. This lack of correlation between the PASQOL and the RAND physical scales may be explained by the fact that the RAND tool was developed originally in a population obtained from a variety of clinics and physicians’ offices. The subjects in this PASQOL pilot study were a more homogeneous group of surgical outpatients, classified as ASA physical status I or II.

The overall scores on the PASQOL tool were not distributed evenly. The skewed distribution was the result of the majority of subjects scoring the VAS as “zero.” This may have resulted in a reduced correlation between the PASQOL and RAND tools. In addition, the majority of the RAND survey questions were not applicable on the day of surgery when the number of subjects assessed was the largest.

The strong correlations of the PASQOL tool domain items with themselves support the internal consistency of the 3 domains that can be measured in surgical subjects: physical experience, psychological experience, and role function. The paucity of significant correlations between the physical and psychological domains supports the divergent nature of these dimensions, except for headache and fatigue. Because these particular symptoms can have both physical and psychological origins, it is understandable that these 2 items tended to converge.

The correlation of the role function items with many items of the psychological domain and with the headache and fatigue items of the physical domain indicates a need for further testing of the tool with numbers of subjects sufficient for factor analysis. A minimum of 200 subjects heterogeneous with respect to ASA physical status ratings and surgical types would clarify or confirm the dimensionality of the PASQOL tool. This could be accomplished by a multicenter administration of the PASQOL tool. In addition, more quantitative data could be obtained on the global quality-of-life questions by converting them from open-ended questions to VAS scales.

After an extensive search of the literature, we believe the number of items selected for each of the 3 domains on the PASQOL tool was sufficient to cover all aspects of short-term quality of life. The experts on the content panel agreed that the total number of items represented the universe of what the tool attempted to measure.

The tool may be limited in its ability to specifically differentiate surgical effects from anesthesia-related effects. However, we attempted to minimize this potential limitation by clearly asking that each question on the tool be answered with regard to the anesthetic experience. Ultimately, patients will answer each question based on their perception of the anesthesia experience. If patients believed a postoperative problem was anesthesia-related, they would use this experience to assess future anesthetics. Therefore, we believe these questions remain fundamental to understanding patients’ fears and concerns regarding anesthesia and that their responses indicate the factors they perceive as affecting their quality of life after an anesthetic.

As with any new instrument designed to measure an abstract construct such as quality of life, the validity and reliability of the PASQOL tool must be established before its widespread use can be recommended. Validity and reliability can be tested and confirmed only by administration of the tool to large groups of subjects, followed by careful analysis and examination of the results. To this end, a multicenter study with the intent to enroll 400 subjects is under development. The study is designed primarily to compare quality of life following general versus regional anesthesia and secondarily to continue to assess validity, reliability, and instrument design. We encourage use of the instrument and concurrent evaluation of its validity and reliability by other investigators in diverse populations and environments.

REFERENCES

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