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Comparative patient satisfaction: Physician assistants versus junior doctors in surgical wards at a Swiss hospital

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Abstract

Background: Physician assistants (PAs) are increasingly integrated into European healthcare systems, including Switzerland, where the profession remains relatively new. **Aim:** To compare patient-reported satisfaction with ward-based care provided by PAs and junior doctors (JDs) in a Swiss surgical department. **Methods:** This prospective, cross-sectional study surveyed patients from the Department of Visceral and Thoracic Surgery at Kantonsspital Winterthur, Switzerland, within two weeks after discharge. Satisfaction was assessed using a 13-item questionnaire comprising items derived from the 8-item German Patient Satisfaction Questionnaire (ZUF-8) and 5 ward-specific items. Internal consistency was assessed post hoc using Cronbach's alpha, and an exploratory adjusted linear regression was performed as a sensitivity analysis. **Results:** Among 192 respondents, no statistically significant difference was detected in total satisfaction scores (PA: median 51, range 34–52; JD: median 50.5, range 30–52; $p = 0.198$). Exploratory subgroup analyses showed higher ZUF-8-derived scores among patients with planned admissions in the PA group (nominal $p = 0.017$) and higher ward-specific scores among female patients in the PA group (nominal $p = 0.025$). After adjustment for age group, gender, and admission type, provider type was not significantly associated with total satisfaction (adjusted mean difference, PA vs. JD: 1.09 points, 95% CI, –0.18 to 2.37; $p = 0.093$). **Conclusion:** No statistically significant difference in overall patient satisfaction was detected between patients primarily cared for by PAs and those cared for by JDs. These single-center observational findings are preliminary and do not establish equivalence between provider groups. **Relevance for patients:** Patients reported high satisfaction with both provider groups, supporting further evaluation of PAs in surgical ward staffing models.

Keywords: Physician assistant; Surgical wards; Patient satisfaction

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1. Introduction

Healthcare systems worldwide are undergoing profound structural changes driven by demographic shifts, rising healthcare costs, and a growing shortage of physicians. These

challenges are particularly evident in hospital-based care, where the demand for high-quality, efficient, and patient-centered services continues to increase. Surgical wards in particular face unique pressures due to high patient turnover. In this context, alternative workforce models have gained increasing attention as a means of maintaining quality of care while ensuring sustainability of healthcare delivery.

Physician assistants (PAs) have emerged as an important component of such workforce models. Originally developed in the United States in the 1960s, the PA profession was designed to extend physician capacity by delegating selected medical tasks to highly trained non-physician clinicians working under physician supervision.[1-5] Over the past decades, PAs have become well established in many healthcare systems and have expanded into a wide range of specialties, including emergency medicine, internal medicine, and surgical disciplines.[6-8] PAs are equipped to perform physical examinations, make diagnoses, and prescribe treatments under the supervision of a supervising physician, akin to the responsibilities of junior doctors (JDs).[7,9,10]

In Europe, and particularly in Switzerland, the integration of PAs into hospital care is a comparatively recent development. Swiss hospitals are increasingly confronted with shortages of resident physicians, driven by reduced working hours, an aging medical workforce, and growing demands for work–life balance among younger physicians.[10-12] Swiss evidence on PA implementation remains limited, but a surgical ward study from another Swiss center reported improved continuity of rounds, interprofessional collaboration, and reduced administrative workload after PA implementation.[13,14] These emerging data suggest that the Swiss PA model is developing within ward-based team structures rather than simply reproducing long-established North American models.

International studies have associated PA integration with continuity of ward presence, redistribution of routine clinical and administrative tasks, and potential workflow benefits. However, the magnitude and mechanisms of these benefits depend on local role definitions, supervision, provider experience, and team organization. Patient acceptance therefore remains an important outcome when PA roles are introduced into new healthcare systems.[15-21]

While these structural and economic considerations are important, the successful implementation of new professional roles ultimately depends on patient acceptance. Patient satisfaction is a central indicator of healthcare quality and has been linked to improved treatment adherence, better clinical outcomes, reduced complaint rates, and increased trust in healthcare institutions.[4,7-10] In surgical settings, where patients may experience anxiety, pain, and uncertainty related to operative interventions, effective communication, availability of healthcare providers, and perceived competence are particularly critical determinants of satisfaction.[22-27]

Several studies have investigated patient satisfaction with care provided by PAs compared to physicians, generally demonstrating no significant differences between provider types.[1,4,11,12] Much of this evidence originates from the United States, where PAs are well established, while European evidence is more limited and heterogeneous. Studies from England and the Netherlands have described PA contributions to inpatient continuity and patient care, but differences in healthcare organization, professional regulation, and patient familiarity limit direct transferability to Switzerland.[2,10,14,18,21]

In Switzerland, where the PA role is still evolving and patient familiarity with this profession may be limited, data on patient satisfaction are scarce. Existing Swiss work has primarily addressed organizational implementation and staff perspectives rather than direct patient comparisons.[13] Accordingly, a real-world assessment of patient-reported satisfaction may provide useful context-specific information, while recognizing that an observational comparison cannot isolate the causal effect of professional role from differences in provider characteristics or patient case mix.

Therefore, the objective of this exploratory study was to compare patient-reported satisfaction with ward-based care among patients primarily cared for by PAs versus JDs in a Swiss surgical department. The study was designed to describe real-world differences in satisfaction and generate hypotheses for future comparative research.

2. Methods

2.1. Study design and setting

This prospective, cross-sectional observational study was conducted in the Department of Visceral and Thoracic Surgery at the Cantonal Hospital Winterthur, Switzerland, a high-volume secondary and tertiary referral center. The department provides comprehensive surgical care, including elective and emergency procedures, and operates a team-based ward care model incorporating both PAs and JDs.

The study period extended from June 2023 to January 2024. Patient-reported outcome data were collected using a standardized questionnaire to assess satisfaction with ward-based medical care.

2.2. Patient selection and eligibility criteria

Patients were eligible for inclusion if they were aged 16 years or older and had been admitted to the visceral or thoracic surgical ward for a duration of three days or fewer, excluding weekends. This length-of-stay restriction was deliberately chosen to maximize the likelihood that patients would receive ward-based medical care predominantly from a single healthcare provider, either a PA or a JD, thereby reducing provider crossover as a potential confounding factor. Patients were excluded if they were transferred between wards, required prolonged hospitalization, or were unable to complete the questionnaire due to cognitive impairment or language barriers. No additional exclusions were made based on diagnosis, type of surgical procedure, or urgency of admission.

2.3. Organization of ward-based medical care

Ward-based medical care in the study department follows a structured team model in which either a PA or a JD serves as the primary provider responsible for daily ward rounds, postoperative monitoring, documentation, discharge planning, and communication with patients and relatives. Both provider groups perform these duties under the supervision of attending surgeons and consultants.

Patients were assigned to either a PA or a JD according to routine staffing schedules, without influence from the investigators. No randomization or matching was performed. This approach reflects real-world clinical practice. Efforts were made to maintain provider continuity throughout the hospital stay; however, occasional cross-coverage by the other provider type could not be excluded, and its frequency was not systematically recorded.

2.4. Description of healthcare providers

At the time of the study, the department employed four PAs, all female, aged between 30 and 50 years. All PAs had a professional background in either emergency medicine nursing or intensive care nursing and possessed between 10 and 30 years of clinical patient care experience prior to assuming the PA role. In addition to their nursing education, all PAs completed a structured postgraduate training program over the course of one year, focusing on medical knowledge, clinical decision-making, and ward-based patient management. These provider characteristics are important when interpreting comparisons with the JD group because professional role, age, prior clinical experience, continuity, and provider gender cannot be separated within the present design.

The JD group consisted of approximately 15 resident physicians, aged between 25 and 32 years, with clinical experience ranging from newly graduated physicians to residents with up to five years of postgraduate training. JDs rotated regularly between wards and the operating room as part of their surgical training curriculum. Individual provider-level characteristics, including exact postgraduate year, provider gender for each patient encounter, time spent with patients, and communication time, were not linked to the patient-level survey dataset.

2.5. Data collection and questionnaire administration

Patient satisfaction was assessed using a written questionnaire distributed electronically within two weeks after hospital discharge. Patients received an email containing a brief explanation of the study purpose and a secure web-based link to the questionnaire. Participation was voluntary, and all responses were collected anonymously.

Two separate survey links were created: one for patients whose primary ward-based provider was a PA and one for patients cared for primarily by a JD. The content of both questionnaires was identical, ensuring comparability between groups. Assignment to the respective questionnaire was based on internal ward documentation of provider responsibility during the hospital stay.

The survey included five demographic/clinical variables (gender, age group, type of hospitalization, and type of surgical procedure), 13 satisfaction-related items, and one open-ended question for free-text comments. Each satisfaction item was rated on a four-point Likert scale ranging from 1 (very dissatisfied/very unlikely) to 4 (very satisfied/very likely). The absence of a neutral midpoint was retained from the structure of the underlying 8-item German Patient Satisfaction Questionnaire (ZUF-8) response format.

The satisfaction questionnaire was derived from the validated German-language ZUF-8, itself based on the 8-item Client Satisfaction Questionnaire,[28,29] but was adapted to the surgical ward context. Eight items were retained or contextually adapted to represent ZUF-8-related domains (overall satisfaction, perceived quality/competence, fit with expectations, perceived benefit, communication quality, needs met, willingness to return, and recommendation). Five additional ward-specific items assessed whether patients felt taken seriously regarding symptoms, perceived empathy, explanations about investigations and treatment, understanding of explanations, and clarity about post-discharge management. Because several item wordings were modified and five items were added, the 13-item instrument should

be regarded as a ZUF-8-derived instrument rather than a formally validated ZUF-8 scale. For comparability, the ZUF-8-derived eight-item subscore and the five-item ward-specific subscore were also analyzed separately.

For descriptive purposes, the total satisfaction scores (possible range, 13–52) were categorized as unsatisfied (13–28), neutral (29–42), or satisfied (43–52), as illustrated in **Figure 1**.

2.6. Outcome measures

The primary outcome was the total score across all 13 satisfaction items (possible range 13–52; higher scores indicate greater satisfaction). Secondary outcomes included the ZUF-8-derived eight-item subscore (range 8–32), the five-item ward-specific subscore (range 5–20), and exploratory subgroup analyses by patient gender, age group, and type of hospitalization. The subgroup analyses were hypothesis-generating and were not designed to establish treatment-effect heterogeneity.

2.7. Statistical analysis

Based on findings from a preceding, internal patient satisfaction study conducted in the emergency department of Cantonal Hospital Winterthur, an a priori power analysis was performed. The estimated effect size was 0.45. To achieve a statistical power of 0.8, at a significance level of 0.05 (two-tailed), the Wilcoxon–Mann–Whitney test for two independent groups was employed. The study utilized a questionnaire based on the ZUF-8 score, serving as a pertinent benchmark for our investigation.

Continuous variables were summarized as median and range, and categorical variables as counts and percentages. Satisfaction scores between provider groups were compared using the Wilcoxon–Mann–Whitney test. Chi-square or Fisher's exact tests were used for categorical variables as appropriate. Missing questionnaire items were handled using complete-case analysis for the relevant score; no imputation was performed. Because subgroup analyses were exploratory, nominal two-sided p-values are reported and interpreted cautiously rather than as confirmatory evidence. Internal consistency was assessed post hoc using Cronbach's alpha. To address measured confounding as a sensitivity analysis, an exploratory multivariable linear regression with heteroskedasticity-robust standard errors modeled the 13-item total score as a function of provider type, patient gender, age group, and hospitalization type. The adjusted model could not account for variables that were not collected, including comorbidities, objective illness severity, postoperative complications, provider-specific experience, or communication time. All analyses were conducted using R (version 4.4.0; R Foundation for Statistical Computing, Austria).

3. Results

3.1. Study population and response rate

During the study period, a total of 401 eligible patients were invited to participate in the survey. Of these, 192 patients completed the questionnaire, corresponding to an overall response rate of 48%. Among respondents, 110 patients (57.3%) had a JD as their primary ward-based healthcare provider, whereas 82 patients (42.7%) were primarily cared for by a PA. Baseline demographic and clinical characteristics of the study population are summarized in Table 1. Gender and admission type were similarly distributed between groups, whereas differences in age distribution and procedure mix indicate that case mix was not fully balanced.

3.2. Overall patient satisfaction

Analysis of the 13-item total satisfaction score revealed no statistically significant difference between patients primarily treated by PAs and those treated by JDs (p = 0.198). Both groups showed high satisfaction, with substantial clustering near the upper end of the scale, indicating a ceiling effect.

The median overall satisfaction score for the entire cohort was 51 (range: 30–52). Patients in the PA group achieved a median score of 51 (range: 34–52), whereas patients in the JD group achieved a median score of 50.5 (range: 30–52). The distribution of satisfaction scores is illustrated in Figure 1.

3.3. Analysis of core ZUF-8 satisfaction items

The ZUF-8-derived eight-item subscore also showed no statistically significant difference between provider groups (p = 0.112). The median was 32 (range 20–32) in the PA group and 31 (range 18–32) in the JD group (Table 2), indicating consistently positive patient perceptions of ward-based medical care irrespective of provider type. Internal consistency was high for this eight-item subscore (Cronbach's alpha = 0.898 in the combined sample; n = 181 complete cases).

3.4. Subgroup analyses by clinical context

Further subgroup analyses were conducted to explore whether patient satisfaction differed according to the clinical context of hospitalization. These analyses were not prespecified to demonstrate effect modification and are reported as hypothesis-generating findings. Among planned admissions, the ZUF-8-derived eight-item score was higher in the PA group than in the JD group (nominal p = 0.017). No corresponding provider-group difference was detected among emergency admissions (nominal p = 0.383).

Table 1. Patient characteristics

Characteristics	Physician assistant	Junior doctor	*p*-value
Patients (%)	82 (43)	110 (57)	
Gender, female (%)	29 (35)	37 (34)	0.924
Age group (%)			0.006
16–40	15 (18)	20 (18)	
41–60	36 (44)	35 (32)	
61–80	22 (27)	50 (46)	
>80	6 (7)	4 (4)	
NA	3 (4)	1 (1)	
Type of hospitalization (%)			1.000
Emergency	22 (27)	30 (27)	
Planned	57 (70)	78 (71)	
NA	3 (3)	2 (2)	
Procedure/treatment (%)			
Appendectomy	6 (7)	11 (10)	0.234
Cholecystectomy	3 (4)	19 (17)	0.002
Hernia repair	34 (41)	32 (29)	0.150
Conservative treatment	4 (5)	4 (4)	1.000
Thyroid	13 (16)	9 (8)	0.045
Proctology	4 (5)	5 (5)	0.920
Ileus	3 (4)	2 (2)	0.500
Thorax	1 (1)	1 (1)	1.000
Other (laparoscopy, pressurized intraperitoneal aerosol chemotherapy, rectopexy, colon surgery, lymph node excision	4 (5)	9 (8)	0.300
NA	10 (12)	18 (16)	

Note: Procedure-specific *p*-values represent comparisons of the proportion of patients in each procedure or treatment category between the physician assistant and junior doctor groups, rather than comparisons among procedure categories. These analyses were exploratory and intended to describe potential differences in case mix between the groups, not to test confirmatory hypotheses.
Abbreviation: NA: Not available.

3.5. Analysis of ward-specific satisfaction items

An additional subscore was calculated using questionnaire items that had been added to the original ZUF-8 instrument to better reflect the specific context of surgical ward care, including aspects related to postoperative information, and discharge planning. The resulting five-item subscore showed no statistically significant overall difference between provider groups (p = 0.194; Table 2), further supporting comparable performance of both provider groups across ward-based responsibilities. Internal consistency was acceptable in the combined sample (Cronbach's alpha = 0.708; n = 184 complete cases).

3.6. Subgroup analyses by patient demographics

Satisfaction scores were further analyzed according to patient demographics. No significant differences in overall satisfaction were observed when stratifying by age groups.

When stratified by patient gender, a statistically significant difference emerged. In the exploratory gender-stratified analysis, female patients reported a higher ward-specific five-item score in the PA group than in the JD group (nominal p = 0.025). In contrast, satisfaction among male patients did not differ significantly according to provider type.

4. Discussion

The present study found high levels of patient satisfaction with ward-based surgical care in both provider groups, with no statistically significant difference in the 13-item total satisfaction score between patients primarily cared

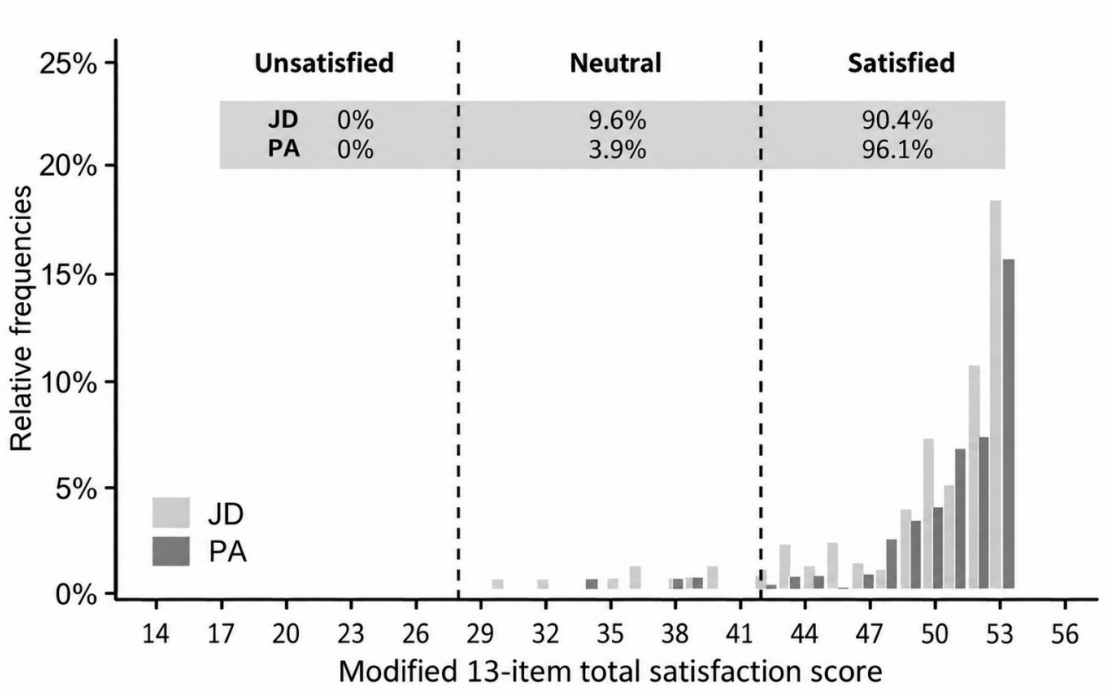


Figure 1. Modified 13-item overall satisfaction score by provider group. $p = 0.198$.
Abbreviations: JD: Junior doctor; PA: Physician assistant; ZUF-8: 8-item German Patient Satisfaction Questionnaire.

Table 2. Patient satisfaction scores by provider group

Score	Physician assistant	Junior doctor	*p*-value
Modified 13-item overall score	51 (34–52)	50.5 (30–52)	0.198
ZUF-8-derived 8-item score	32 (20–32)	31 (18–32)	0.112
Ward-specific 5-item score	19 (12–20)	19 (12–20)	0.194

Note: Values are presented as median (range).

for by PAs and those cared for by JDs. Likewise, no statistically significant differences were detected in the ZUF-8-derived eight-item and ward-specific five-item subscores. In the context of a Swiss surgical department in which PAs are an emerging professional group, these findings are encouraging and support the feasibility and patient acceptance of integrating experienced PAs into ward-based care. At the same time, the observational design does not establish equivalence, non-inferiority, or a causal effect of professional role.

Our results are consistent with a substantial body of international literature demonstrating comparable patient satisfaction between PAs and physicians across various healthcare settings.[6,10,30-34] Although the overall finding is confirmatory, its demonstration in a Swiss inpatient surgical setting is relevant because most available evidence originates from healthcare systems in which the PA profession is more established. The present study therefore adds real-world patient-level evidence from a European healthcare system where the PA role is still developing.

European inpatient evidence remains more limited than North American evidence. Studies from England and the Netherlands have described PA contributions to continuity and ward-based care,[35-38] while a Swiss surgical ward implementation study reported improvements in continuity of rounds and interprofessional collaboration after PA introduction.[13] Our patient-reported findings complement these organizational observations by showing that high satisfaction can be maintained when experienced PAs assume substantial responsibility for routine surgical

ward care. The present data cannot determine which specific mechanisms—such as continuity, communication style, time spent with patients, or provider experience—account for this observation, but these factors provide plausible directions for future research.

An important consideration is that the two provider groups represented different real-world professional profiles. The PAs were experienced clinicians with 10-30 years of prior nursing experience, whereas the JDs were early-career physicians with up to five years of postgraduate training. This difference limits causal attribution to professional role alone, but it also reflects the workforce model as it was implemented in clinical practice. The findings therefore describe patient experience with these two existing care configurations rather than an isolated effect of professional title.

4.1. Surgical ward context and continuity of care

Surgical wards place particular demands on communication, availability, and coordination across perioperative transitions.[23,26,39-43] A stable ward presence is one plausible advantage of the PA model because JDs rotate between wards and the operating room. This structural difference may enhance continuity of care, which has repeatedly been identified as a key contributor to patient satisfaction and trust.[38] However, continuity and time spent with patients were not quantitatively measured in this study; therefore, they should be considered potential explanatory mechanisms rather than demonstrated mediators of satisfaction.

This potential advantage was reflected in our subgroup analysis of elective admissions. Patients undergoing planned surgical procedures reported significantly higher satisfaction when cared for by PAs compared with JDs. The stable ward presence of PAs may facilitate more efficient communication and responsiveness to patient concerns, thereby enhancing satisfaction. Similar observations have been reported in previous studies linking continuity of care with improved patient experience in hospital settings.[6,22,23,38,41] No provider-group difference was detected among emergency admissions. This finding should not be interpreted as evidence of equivalent performance in acute or complex care, because illness severity and clinical complexity were not measured and may have differed between groups.

In contrast, no difference in satisfaction was observed between provider groups among emergency admissions. In such cases, patient satisfaction may be more strongly influenced by illness severity, clinical outcomes, and time-critical decision-making than by provider type alone.

4.2. Gender-related differences in patient satisfaction

An interesting finding of this study is the significantly higher satisfaction reported by female patients when cared for by PAs. This observation is consistent with prior research suggesting that provider gender and communication style may influence patient perceptions of care.[44-47] Female healthcare providers have been shown, on average, to engage more frequently in patient-centered communication, shared decision-making, and emotional support, all of which are factors associated with increased satisfaction, particularly among female patients.

In particular, all PAs in this study were female, whereas the JD group included both male and female physicians. Provider gender at the individual patient level was not available for JDs. Consequently, professional role, provider gender, age, clinical experience, continuity, and communication characteristics are intertwined and cannot be separated statistically in this dataset. Accordingly, the gender-related subgroup finding should not be interpreted as a patient preference for PAs or for female providers. It is best viewed as a signal for future studies that can link patient and provider characteristics and formally test interaction effects.

4.3. Implications for workforce planning and surgical training

From a healthcare-system perspective, the findings provide limited but relevant information for workforce planning. They suggest that care primarily provided by experienced PAs in this established single-center PA model was not associated with a statistically detectable difference in satisfaction scores. Switzerland, like many European countries, faces increasing shortages of resident physicians due to demographic changes, reduced working hours, and evolving expectations regarding work–life balance.[10-12] Simultaneously, surgical training programs require protected operating room exposure for JDs, limiting their availability for ward-based care.

Task redistribution to PAs may support ward continuity and create additional operative or educational time for JDs, as reported in prior implementation studies.[13,15-20] The present study did not directly measure workload, training time, length of stay, costs, clinical outcomes, or safety; therefore, these potential organizational benefits should not be inferred from the satisfaction data alone.

Patient acceptance remains an important prerequisite for new workforce models. The high satisfaction scores in both groups are reassuring at a descriptive level, but decisions about PA integration should also consider

clinical outcomes, team functioning, scope of practice, supervision, costs, training requirements, and patient case mix.

4.4. Limitations

Several limitations must be considered. First, allocation to PAs or JDs followed routine staffing schedules rather than randomization or matching. This creates a substantial risk of selection and case-mix bias. The groups may have differed in clinical complexity, surgical complexity, comorbidities, postoperative complications, illness severity, or team dynamics. Only a limited set of patient characteristics was available, and the post hoc adjusted sensitivity analysis could account for age group, gender, and admission type but not for these unmeasured severity indicators. The adjusted association between provider type and the 13-item total score remained non-significant (adjusted mean difference 1.09 points, 95% CI, −0.18 to 2.37; $p = 0.093$), but residual confounding remains likely. Second, provider characteristics were strongly confounded with professional role: all PAs were female and had 10–30 years of prior clinical experience, whereas JDs were younger early-career physicians. The study therefore cannot isolate the effect of provider profession from experience, gender, continuity, or communication skills. Third, occasional provider crossover could not be excluded and was not systematically quantified; exposure to both provider types could attenuate between-group differences. Fourth, some patients may not have clearly distinguished PA, JD, and nursing roles, as suggested by free-text comments.

Fifth, the questionnaire was derived from ZUF-8 but included contextually modified wording and five additional ward-specific items. Post hoc internal consistency was high for the 13-item instrument (Cronbach's alpha = 0.907) and the ZUF-8-derived eight-item subscore (alpha = 0.898), and acceptable for the ward-specific subscore (alpha = 0.708); however, internal consistency alone does not establish construct validity or direct comparability with the validated ZUF-8. The marked ceiling effect may also reduce sensitivity to small differences. Sixth, the response rate was 48%, creating potential non-response bias. Seventh, this was a single-center study in a department with an established PA model, limiting generalizability. Finally, the cross-sectional assessment captures satisfaction at one time point, and the subgroup findings were exploratory and require independent confirmation in larger multicenter studies with prospectively measured case mix and provider-level characteristics.

5. Conclusion

In this prospective observational study of surgical ward care at a Swiss hospital, patient satisfaction was high among patients primarily cared for by both PAs and JDs, and no statistically significant difference in overall satisfaction was detected between the two groups. In a healthcare system where the PA role is still emerging, these findings provide encouraging real-world evidence of patient acceptance of experienced PAs as members of surgical ward teams. Further multicenter studies are needed to assess generalizability and longer-term outcomes.

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Conflict of interest

The authors declare they have no competing interests.

Author contributions

Conceptualization: Stefan Breitenstein, Barbara Fiedel, Aline Laurence Meier
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Methodology: Aline Laurence Meier, Stefan Breitenstein
Writing–original draft: Aline Laurence Meier
Writing–review & editing: Aline Laurence Meier, Stefan Breitenstein

Ethics approval and consent to participate

The study was conducted at Kantonsspital Winterthur, Switzerland. The study team consulted the hospital's study committee/ethics committee regarding the ethical requirements for this study. Based on this consultation, separate ethical approval was considered not necessary, and no formal ethics approval ID was issued. Participation was voluntary. Patients provided consent for the use of their questionnaire responses for research purposes by returning the completed questionnaire. All questionnaire responses were collected anonymously.

Consent for publication

No identifiable patient data were collected through the questionnaires; therefore, consent for publication of identifiable patient data was not applicable.

Availability of data

The data analyzed in this study are available from the corresponding author upon reasonable request.

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