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PACE-CH: Paramedic Attrition, Career, and Employment in German-Speaking Switzerland: Perceived Leadership Quality, Job Satisfaction, and Turnover Intention

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Zusammenfassung

Hintergrund: Führungsqualität wird im Rettungsdienst konsistent mit Arbeitszufriedenheit und Turnover Intention (TI, Absicht, die Stelle zu wechseln oder den Beruf aufzugeben) in Verbindung gebracht. Für den deutschsprachigen Schweizer Rettungsdienst fehlte bislang ein validiertes Messinstrument. PACE-CH ist die erste systematische Querschnittsstudie, die diese Zusammenhänge in diesem Kontext untersucht.

Methodik: Im Januar und Februar 2024 wurden zwei parallele Befragungen durchgeführt: 338 Rettungssanitäterinnen und Rettungssanitäter im Einsatzdienst sowie 53 Führungspersonen aus deutschsprachigen Schweizer Rettungsdienstorganisationen nahmen teil. Es wurde ein Score mit sechs Items zur wahrgenommenen Führungsqualität (Perceived Leadership Quality Score, PLQS) entwickelt, der auf dem Empowering Leadership Questionnaire und Job-Demands-Resources-Modell aufbaut. Die Turnover Intention wurde als fünfstufige ordinale Variable operationalisiert. Zur Auswertung kamen ordinale logistische Regression, Spearman-Korrelationen sowie eine explorative Bootstrap-Mediationsanalyse mit 5'000 Simulationen zum Einsatz. Alle p-Werte wurden nach Benjamini-Hochberg adjustiert.

Ergebnisse: Der mittlere PLQS betrug 3,12 (SD 0,82; α = 0,881; CFI = 0,960, SRMR = 0,039). Der PLQS zeigte einen mittelstarken bis starken negativen Zusammenhang mit der TI (r = −0,448) sowie starke positive Zusammenhänge mit der Arbeitszufriedenheit (r = 0,640) und der Arbeitgeberempfehlung (r = 0,662). Jede Einheitszunahme des PLQS war mit einer geringeren Wahrscheinlichkeit für eine höhere TI assoziiert (OR = 0,21, 95%-KI [0,13; 0,33]; Nagelkerke R^2 = 0,235). Der PLQS allein erklärte 45,1% der Varianz in der Arbeitszufriedenheit. Die explorative Mediationsanalyse ergab, dass die Arbeitszufriedenheit 51,7% des Gesamtzusammenhangs zwischen PLQS und TI vermittelte (ACME = −0,189, 95%-KI [−0,306; −0,081], p = 0.002). Es wurden keine signifikanten Unterschiede nach Organisationstyp, Geschlecht oder Generation festgestellt.

Diskussion: Die wahrgenommene Führungsqualität zeigte im Querschnitt stärkere Zusammenhänge mit allen drei bindungsrelevanten Outcomes als die erhobenen demografischen und organisationalen Kovariaten. Die Mediationsbefunde sind exploratorischer Natur und bedürfen einer longitudinalen Replikation.

Schlussfolgerungen: Wahrgenommene Führungsqualität ist eine plausible und messbare Dimension im Arbeitsumfelds des deutschsprachigen Schweizer Rettungsdienstes. Dort werden bereits beträchtliche Mengen an Personaldaten erhoben; was derzeit fehlt, ist eine systematischere Auswertung dieser Daten sowie eine Rückmeldung an Mitarbeitende an der Front und an Vorgesetzte.

Abstract

Background: Leadership quality is consistently associated with job satisfaction and turnover intention (TI) in prehospital emergency medical services (EMS). No validated measurement instrument existed for German-speaking Swiss EMS. PACE-CH is the first systematic cross-sectional study to examine these associations in this context.

Methods: Two parallel surveys were administered (January–February 2024) to 338 frontline paramedics and 53 managers across German-speaking Swiss EMS organisations. A six-item Perceived Leadership Quality Score (PLQS) was developed, anchored in the Empowering Leadership Questionnaire and the Job Demands-Resources framework. Turnover intention was operationalised as a five-level ordinal variable. Ordinal logistic regression, Spearman correlations, and exploratory bootstrapped mediation analysis (5,000 simulations) were used. All p-values were Benjamini-Hochberg adjusted.

Results: Mean PLQS was 3.12 (SD 0.82; α = 0.881; CFI = 0.960, SRMR = 0.039). PLQS showed a moderate-to-strong negative association with TI (r = −0.448) and strong positive associations with job satisfaction (r = 0.640) and employer recommendation (r = 0.662). Each one-unit increase in PLQS was associated with lower odds of higher TI (OR = 0.21, 95% CI [0.13, 0.33]; Nagelkerke R^2 = 0.235). PLQS alone accounted for 45.1% of variance in job satisfaction. Exploratory mediation analysis indicated that job satisfaction accounted for 51.7% of the total PLQS–TI association (ACME = −0.189, 95% CI [−0.306, −0.081], p = 0.002). No significant differences were found by organisation type, gender, or generation.

Discussion: Perceived leadership quality showed stronger cross-sectional associations with all three retention-relevant outcomes than the measured demographic and organisational covariates. Mediation findings were exploratory and require longitudinal replication.

Conclusions: Perceived leadership quality is a plausible and measurable dimension of the working environment in German-speaking Swiss EMS. Swiss EMS already generates considerable workforce data; what is currently missing is more systematic analysis of these data and feedback to frontline staff and supervisors.

Schlagwörter

Rettungswissenschaften, Rettungsdienst, Führungsqualität, Arbeitsplatzwechselbereitschaft, Arbeitszufriedenheit

Keywords

Paramedicine, Emergency medical services, Leadership quality, Turnover intention, Job satisfaction

Introduction

Emergency Medical Services (EMS) depend on the sustained availability of experienced paramedics. A global meta-analysis of 27 studies (n = 129,580) reported a pooled turnover intention (TI) prevalence of 23.5% among EMS professionals (Zarei et al., 2026). In German-speaking Switzerland, available evidence suggests an even greater workforce strain: 67.7% of EMS professionals have considered leaving and 43.4% show clinically relevant burnout (Stuby et al., 2026). A national retention study identified limited career opportunities and dissatisfaction with shift work as leading reasons for leaving, while also confirming a widening personnel gap despite increasing training output (Regener & Trede, 2024). Leadership quality and supervisory support rank consistently among the strongest modifiable predictors of job satisfaction and TI across healthcare professions (Thielmann et al., 2023; Wynendaele et al., 2025).

The Swiss paramedic qualification requires three years of higher professional education and is classified at level 6 of the European Qualification Framework (EQF), despite not constituting an academic bachelor's degree (State Secretariat for Education, Research and Innovation SERI, 2025). Swiss paramedicine operates within what Makrides et al. describes as a Directive System: scope of practice is delegated by medical directors, professional self-governance is limited, and no statutory self-regulation comparable to that of Professionally Autonomous systems exists (Makrides et al., 2022b, 2022a, 2023).

A systematic review of 10 EMS studies (n = 8,358) identified supervisor support as the strongest predictor of job satisfaction (Thielmann et al., 2023). Within the Job Demands-Resources framework (JD-R), leadership dimensions function as organisational resources that buffer demands and sustain engagement (Bakker et al., 2023; Bakker & Demerouti, 2007). Despite this evidence base, no validated instrument for measuring perceived leadership quality in the German-speaking Swiss EMS workforce existed at the time of data collection.

PACE-CH is the first systematic cross-sectional study of leadership quality, job satisfaction, and turnover intention in German-speaking Swiss EMS. The primary aim was to examine associations between a newly developed Perceived Leadership Quality Score (PLQS) and retention-related workforce outcomes. Secondary exploratory analyses examined potential indirect pathways via job satisfaction and organisational identification, subgroup variation, and gender-specific employment patterns.

Methods

This study follows the STROBE guidelines for cross-sectional observational studies. A completed STROBE checklist is provided as Appendix A1.

Design, Setting, and Participants

PACE-CH is a secondary analysis of cross-sectional survey data collected for a Master's thesis via the Findmind platform between 10 January and 7 February 2024 across German-speaking Switzerland (Brinkmann, 2024).

Two parallel questionnaires were administered: one for frontline EMS professionals, and one for managers and supervisors. The two samples were not matched at the service level and were treated as independent throughout. Items were derived from the theoretical framework of the

thesis, with each item linked to at least one theoretical chapter. Hofmann's empirical work on employer attractiveness in German EMS served as the primary EMS-specific reference for item generation (Hofmann, 2022). Both questionnaires underwent structured pretesting by independent reviewers, including two individuals with active leadership responsibilities in EMS. Based on this feedback, ten items were removed before final administration.

Participants were recruited via the Swiss Paramedic Association (SPA) email list (n = 890) and social media. Eligibility required active employment in a German-speaking Swiss EMS organisation and informed digital consent. Of 366 respondents, 338 met eligibility criteria and submitted questionnaires with fewer than 10% missing values. This corresponded to 37.9% of the SPA mailing list, although the overall response proportion could not be fully determined because recruitment also occurred via social media. The manager questionnaire was distributed by email to 58 EMS organisations. A total of 53 valid responses were received, corresponding to 45.7% of the estimated target of 116 respondents. The manager questionnaire also captured the highest formal qualification and whether it predated the leadership appointment. Full questionnaires and eligibility criteria are provided in Appendix A2. A participant flow diagram is provided in Appendix A4.

Perceived Leadership Quality Score

No validated instrument for assessing staff-perceived leadership quality in EMS existed at the time of the data collection. The Perceived Leadership Quality Score (PLQS) was developed for this study, with item selection guided by the validated dimensions of the Empowering Leadership Questionnaire (ELQ): Coaching, Informing, Participative Decision-Making, Showing Concern, and Leading by Example (Arnold et al., 2000). Four items mapped onto these domains: development support, internal communication, participatory decision-making, and performance recognition. Two further items were added based on dimensions identified as relevant to EMS retention in German-speaking Swiss EMS: perceived management competence and personnel policy (Brinkmann, 2024). Within the JD-R model, all six dimensions were conceptualized as organisational resources (Bakker et al., 2023; Bakker & Demerouti, 2007). Higher PLQS values indicate better perceived leadership quality.

Participatory decision-making used a five-point frequency scale (never to always), consistent with the original ELQ (Arnold et al., 2000). The remaining five items used five-point satisfaction or agreement scales. The PLQS was calculated as the unweighted mean across all six items (1 to 5), reflecting the intended interpretation of the scale as a parsimonious summary measure of a common underlying construct (Schneider et al., 2015).

Internal consistency was $\alpha = 0.881$ (range across subgroups: 0.855–0.930). Confirmatory Factor Analysis (CFA) with Yuan-Bentler robust corrections provided support for a unidimensional structure (CFI = 0.960, SRMR = 0.039). The robust RMSEA was 0.113 (df = 9, 90% CI [0.079–0.150]). Because RMSEA can be inflated in models with low degrees of freedom, CFI and SRMR were considered the primary fit indices in interpreting model adequacy (Kenny et al., 2015). To examine whether a unidimensional structure was the most appropriate representation of the data, two alternative models were estimated.

A two-factor solution separating participatory and relational items yielded a factor correlation of r = 0.893, indicating near-collinearity and offering no meaningful differentiation beyond the single-factor model. A bifactor model was also estimated; specific factor variance was negligible across items, further supporting a unidimensional interpretation. Modification indices identified two item pairs with residual covariance (MI = 23.0 for the competence cluster; MI = 13.2 for the recognition cluster). These covariances were not freed, in order to avoid capitalising on sample-specific variation without strong theoretical justification (Marsh et al., 2004). Factor loadings ranged from λ = 0.683–0.830. Scalar measurement invariance across gender was supported (ΔCFI ≤ 0.004). External validation against established instruments has not yet been conducted and remains a priority for future work, a note on scale comparability is provided in Appendix A3.

Outcomes and Covariates

Turnover intention (TI) was operationalized as a five-level ordinal variable based on survey responses to Q16 (n=337): (1) no current plan, (2) opportunistic (defined as willingness to change if a suitable opportunity arose), (3) within 12 months, (4) within 6 months, and (5) notice already given. An additional binary variable for imminent TI was derived by collapsing levels 3 – 5 (n = 37) versus levels 1 – 2 (n = 300) and was used exclusively for the exploratory Youden threshold analysis. A binary sensitivity variable (any active TI vs. none) was retained for comparability with prior literature. Job satisfaction was measured on a five-point scale (Q14). Additional outcomes include pension intention (Q11), an Employee Net Promoter Score (eNPS) proxy (Q19), and perceived mission statement authenticity as an organisational identification marker (Q20). Educational level followed the Swiss qualification framework: Tertiary A for academic qualifications and Tertiary B for professional education.

Statistical Analysis

All analyses were conducted in R 4.3. Primary packages included lavaan, mediation, pROC, segmented, lme4, and MASS. Group comparisons used Kruskal-Wallis tests with rank epsilon-squared. P-values were Benjamini-Hochberg (BH) adjusted across the 13 planned subgroup comparisons (See Appendix A3). Two ordinal logistic regression models (proportional odds) examined TI as a five-level outcome: a PLQS-only model (A1) and a full model (A2) adding five prespecified covariates: salary satisfaction, work-life balance, gender, organisation type, and generational cohort. These covariates were selected a priori based on prior literature identifying them as relevant structural and demographic predictors of TI in prehospital workforces (Thielmann et al., 2023; Wynendaele et al., 2025). Their inclusion allowed the association between PLQS and TI to be assessed while accounting for these measured factors. Model fit was assessed using Nagelkerke R^2 and multiclass AUC (Hand-Till method). A binary logistic sensitivity analysis retained the collapsed binary TI variable for comparability with prior literature. DeLong's test was used for ROC-based comparison of the binary models. Job satisfaction was modelled with Ordinary Least Squares (OLS) regression and tenfold cross-validation, and pension intention was analysed using ordinal logistic regression. OLS was used for interpretabilty and because the five-point job satisfaction scale was treated as approximately continuous.

Listwise deletion was applied throughout and complete-case sample sizes are reported for each model. Primary analyses addressed associations between PLQS and TI. Mediation, segmentation, and high-risk subgroup analyses were treated as exploratory. Exploratory mediation analyses used nonparametric bootstrapping with 5,000 simulations to examine whether associations between PLQS and TI were statistically consistent with indirect pathways via job satisfaction and organisational identification (Efron & Hastie, 2016; Imai et al., 2010). Moderation was tested with likelihood ratio tests. Exploratory analyses including a Youden-based threshold for imminent turnover intention, a segmented regression for the PLQS–job satisfaction association, and proportional-odds diagnostics with a partial proportional odds sensitivity analysis are reported in Appendix A3.

Intraclass correlations estimated clustering by canton and organisation type. An exploratory high-risk subgroup was defined as respondents with PLQS ≤ 2.5, active TI (levels 2-5), and job satisfaction ≤ 2. The PLQS threshold of ≤ 2.5 was chosen as a conservative cutoff half a point below the scale midpoint of 3.0. This definition was not prespecified. To assess potential common-method bias, Harman's single-factor test was conducted on all principal study variables (PLQS, job satisfaction, TI, eNPS, organisational identification, salary satisfaction, work-life balance; n = 316). The first unrotated factor accounted for 46.9% of total variance, below the 50% threshold commonly used to indicate dominant method variance (Podsakoff et al., 2003). This result should be interpreted cautiously, as Harman's test provides only a limited diagnostic of common-method bias. Extended statistical results, including full correlation tables, model fit summaries, and mediation details, are provided in Appendix A3.

Results

Sample and Reliability

The workforce sample was 55.3% male, 38.8% female, and 5.9% did not report gender or identified as non-binary or other. Hospital-based EMS was the largest organisation type (39.6%), followed by cantonal (19.2%) and urban (18.3%) services. Mean PLQS was 3.12 (SD 0.82). Internal consistency was similar across all reported subgroups (Table 1).

Table 1

Cronbach's Alpha of the PLQS by Subgroup

Subgroup	n	α
Total sample	319	0.881
Male	187	0.882
Female	131	0.879
Hospital-based EMS	134	0.886
Cantonal EMS	65	0.855
Urban EMS	62	0.866
Private EMS	36	0.930

Figure 1

Distribution of Perceived Leadership Quality Scores

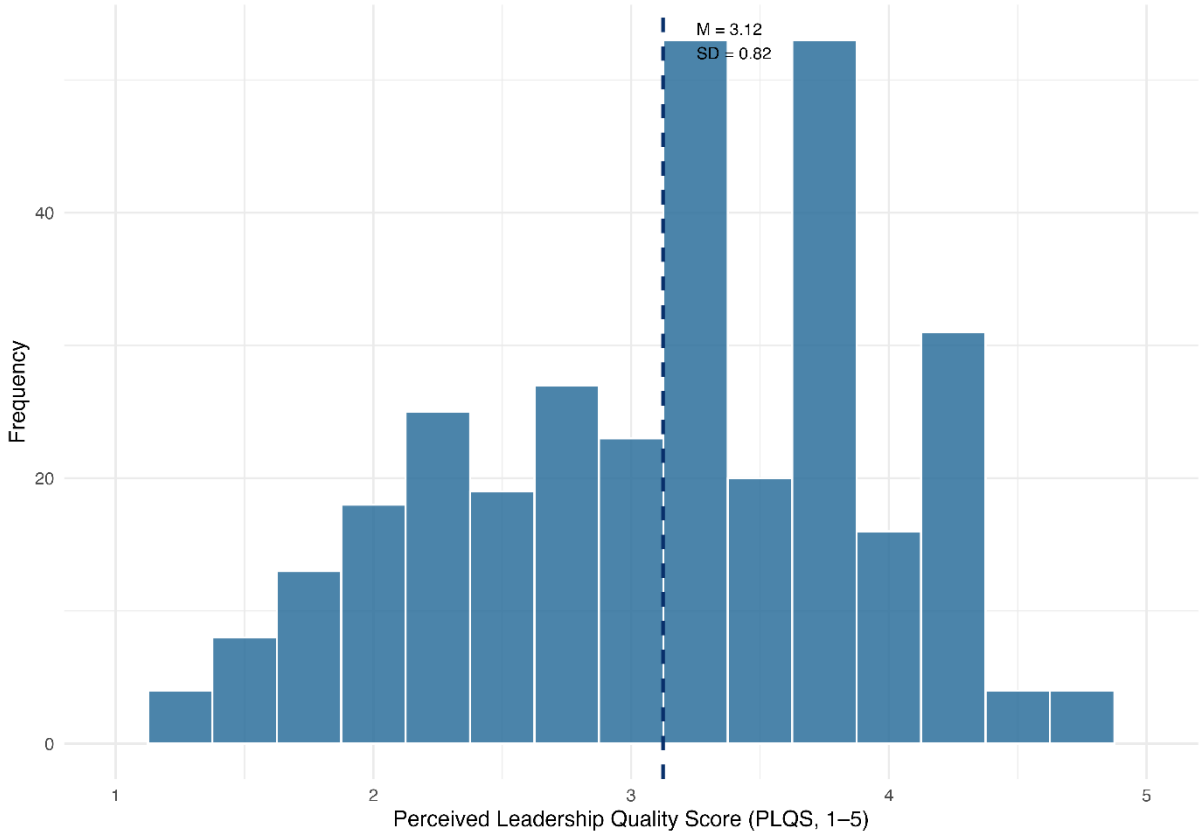


Table 2

Key Spearman Correlations (n = 319–338)

Variable pair	r	τ
PLQS ↔ Job satisfaction	0.640	0.534
PLQS ↔ Employer recommendation (eNPS)	0.662	0.554
PLQS ↔ Organisational identification	0.657	0.536
PLQS ↔ Turnover intention	−0.448	−0.363
PLQS ↔ Pension intention	0.231	0.177

The manager sample (n = 53) was predominantly male (83.0%), Generation X (62.3%), and hospital-based (58.5%); 79.2% remained active in frontline operations. Higher vocational education (Tertiary B) predominated for 43.4% (HF diploma 28.3%, post-graduate HF 15.1%). Continuing education at university level was held by 37.7% (CAS 18.9%, DAS 1.9%, MAS 17.0%), and consecutive academic degrees by 18.9% (Bachelor 3.8%, Master 11.3%, PhD 3.8%). For 69.8% the highest qualification predated the leadership appointment; the remaining 30.2% acquired it after taking up the role.

Correlations and Regression

Leadership quality correlated strongly with employer recommendation (r = 0.662), organisational identification (r = 0.657), and job satisfaction (r = 0.640). The association with TI was moderate and negative (r = -0.448). After controlling for job satisfaction, the partial Spearman correlation between PLQS and TI attenuated from -0.448 to -0.170, a reduction of 62%. All correlations remained statistically significant after Benjamini-Hochberg correction (all p < 0.001). Kendall's tau values are also shown in Table 2.

In ordinal logistic regression (proportional odds), PLQS was negatively associated with TI in the single-predictor model (A1: OR = 0.21, 95% CI [0.13 – 0.33], p < 0.001), with Nagelkerke R^2 = 0.235 and multiclass AUC (Hand-Till) = 0.665. Nagelkerke R^2 is reported as a descriptive in-sample fit measure; it does not estimate explained variance in a broader population given the convenience sample design. The full model (A2) reached R^2 = 0.300 (LRT vs. A1: p = 0.022). Adding the remaining covariates increased Nagelkerke R^2 by 0.06 beyond the PLQS-only model. A binary sensitivity analysis yielded consistent results (OR = 0.24, 95% CI [0.15-0.38]). Detailed results of the partial proportional odds sensitivity analysis, segmented regression, and exploratory Youden-based threshold for imminent TI are reported in Appendix A3. For job satisfaction, PLQS alone accounted for 45.1% of the variance, and the full model reached R^2 = 0.542 (tenfold CV R^2 = 0.525).

Mediation Analysis

Table 3 provides the full numerical results. Because the cross-sectional design does not permit causal inference, the following findings are reported as descriptively consistent, hypothesis-generating patterns only. Job satisfaction accounted for 51.7% of the total association between PLQS and TI (ACME = -0.189, 95% CI [-0.306, -0.081], p = 0.002). A significant direct effect remained after controlling for this pathway (ADE = -0.177, 95% CI [-0.342, -0.018], p = 0.030). The organisational identification pathway did not reach statistical significance (ACME = -0.040, 95% CI [-0.163 - +0.084], p = 0.531), suggesting that perceived mission statement authenticity did not show an independent indirect association with TI in this model. The eNPS pathway showed a significant positive indirect effect of PLQS on employer recommendation via job satisfaction (ACME = 0.258, 95% CI [0.152, 0.378], p < 0.001; Prop. Mediated = 35.4%).

Table 3

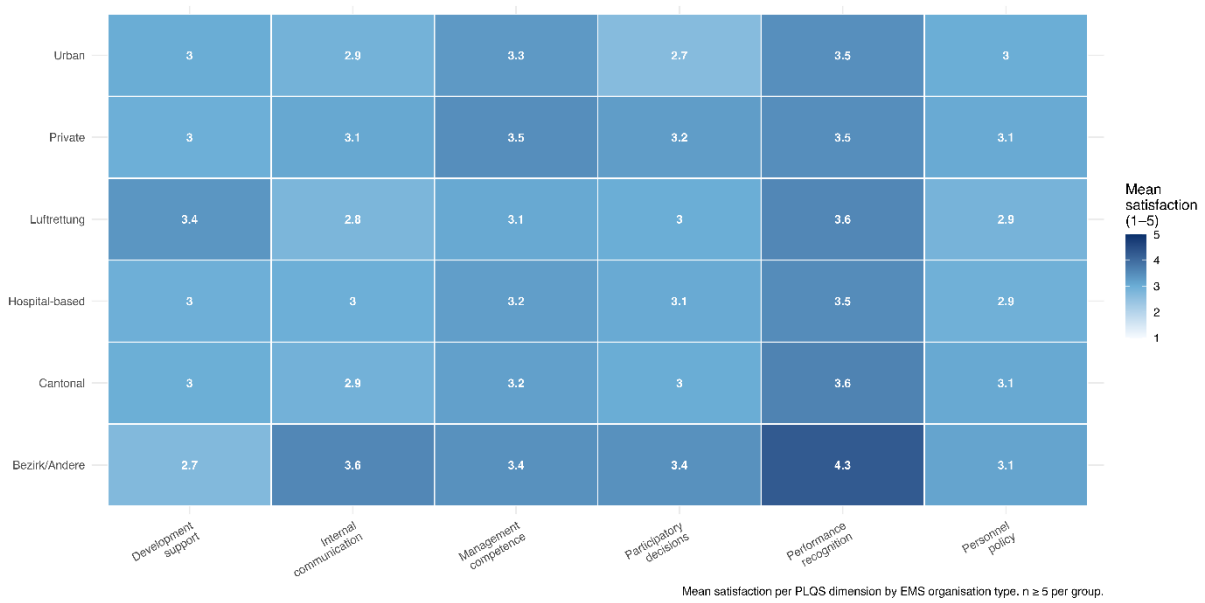
Exploratory Indirect Effects: PLQS and Turnover Intention

Pathway	ACME	95% CI	Prop. mediated	p
PLQS → Job satisfaction → TI	−0.189	[−0.306, −0.081]	51.7%	0.002
PLQS → Org. identification → TI	−0.040	[−0.163, +0.084]	10.9%	0.531
PLQS → Job satisfaction → eNPS	0.258	[0.152, 0.378]	35.4%	< 0.001

Nonparametric bootstrap, 5,000 simulations, percentile CI. Org. identification = perceived mission statement authenticity (Q20). eNPS = employer Net Promoter Score proxy; TI = turnover intention.

Figure 2

Dimension-Level Satisfaction by Organisation Type



Group Comparisons and High-Risk Segmentation

After global BH correction across 13 tests, no significant differences in PLQS, job satisfaction, or TI were observed by organisation type, gender, or generational cohort (all $p > 0.40$). Cantonal intraclass correlation coefficient (ICC) was 0.076 for PLQS and 0.039 for TI. These results suggest no clear concentration of PLQS deficits across the examined subgroups.

The exploratory high-risk subgroup comprised 25 respondents (7.4%) with mean PLQS 1.77, mean job satisfaction 1.76, and a frustration composite of 11.1 versus 4.74 in the remainder. Mean professional experience was 13.6 years.

Hospital-based personnel accounted for 64% of this group versus 40.5% in the remainder (χ^2(sim.) $p = 0.038$, Cramér's $V = 0.116$). Given the small subgroup size and modest effect size, this pattern should be treated as hypothesis-generating rather than as a robust institutional finding. Figure 2 provides a descriptive overview of dimension-level satisfaction patterns across EMS organisation types.

Manager-Staff Rating Differences

Manager ratings of overall staff satisfaction were lower than staff self-ratings (M 3.36 vs. 3.85, $\Delta = -0.49$, $p < 0.001$), as were ratings of global satisfaction ($\Delta = -0.55$, $p < 0.001$). Managers rated developmental support and task compensation more positively than staff did ($\Delta = +0.44$, $p = 0.004$; $\Delta = +0.51$, $p = 0.004$). Career opportunities showed no significant difference between groups ($\Delta = +0.19$, $p = 0.210$) (Figure 3; Table 4).

Figure 3

Manager-Staff Rating Differences

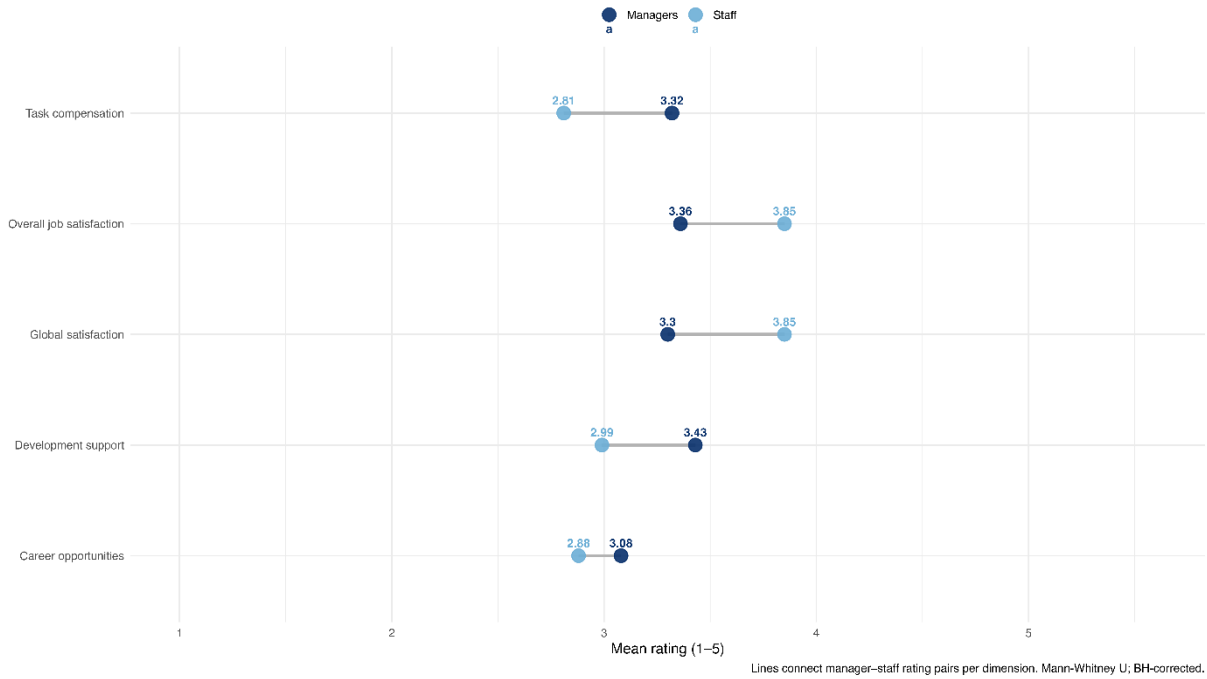


Table 4

Cross-Perspective Analysis: Manager vs. Staff Ratings

Dimension	M (managers)	M (staff)	Δ	p (BH)
Overall job satisfaction	3.36	3.85	−0.49	< 0.001 ***
Development support	3.43	2.99	+0.44	0.004 **
Global satisfaction	3.30	3.85	−0.55	< 0.001 ***
Task compensation	3.32	2.81	+0.51	0.004 **
Career opportunities	3.08	2.88	+0.19	0.210 n.s.

*Mann-Whitney U; BH-corrected. ** p < 0.01; *** p < 0.001.*

Gender, Employment Patterns, and Education

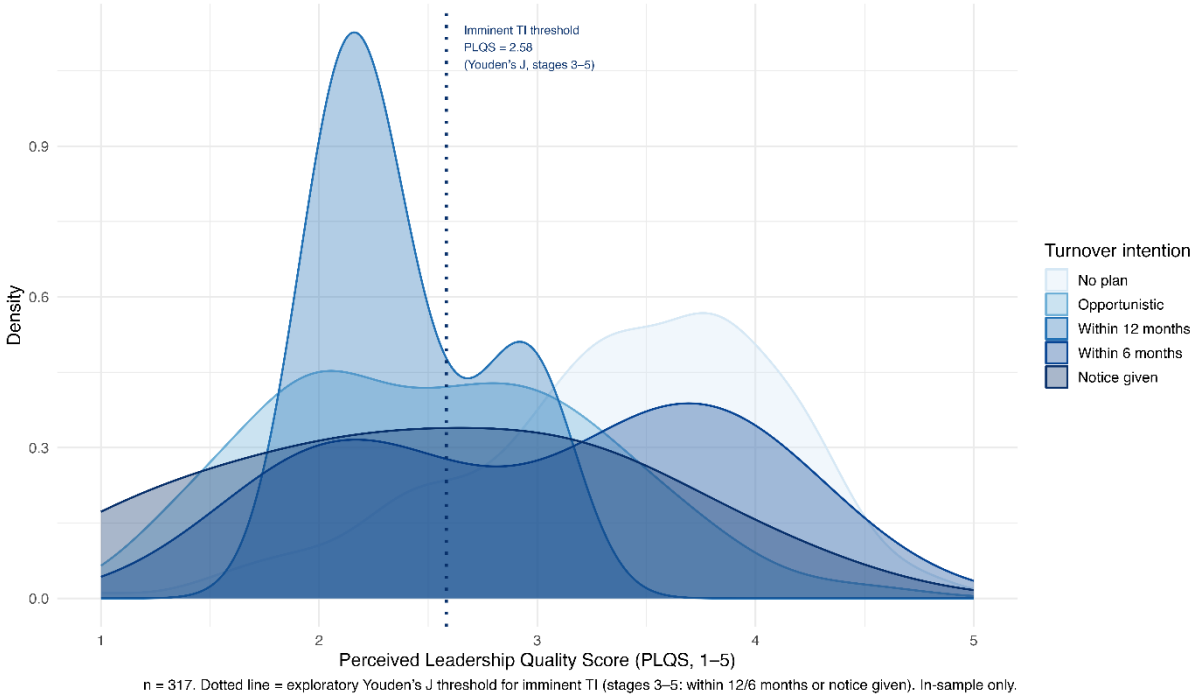
Female paramedics were significantly more likely to work part-time (χ^2(sim.) p < 0.001), with the difference most pronounced in the Millennial cohort. Career expectations were statistically indistinguishable between genders (Q23: Δ = −0.23, p = 0.112; Q38: Δ = −0.10, p = 0.300). Among full time staff, TI was lower among women than men (24.7% versus 34.0%). The association between leadership quality and TI did not differ significantly by gender (LRT p = 0.784).

Educational level had no significant effect on PLQS perception (KW p = 0.531, ε^2 = 0.001). Paramedics with an academic background (n = 59) showed a higher observed TI rate than Tertiary B colleagues (40.7% versus 29.5%), but this difference did not reach statistical significance (χ^2(sim.) p = 0.125). The pattern should be treated as descriptive only.

The dotted line in Figure 4 displays the PLQS distribution by turnover intention status (n = 317). The exploratory Youden-based threshold and its diagnostic indices are reported in Appendix A3. For descriptive context, the cantonal distribution of leadership quality and frustration scores is shown in Figure 5.

Figure 4

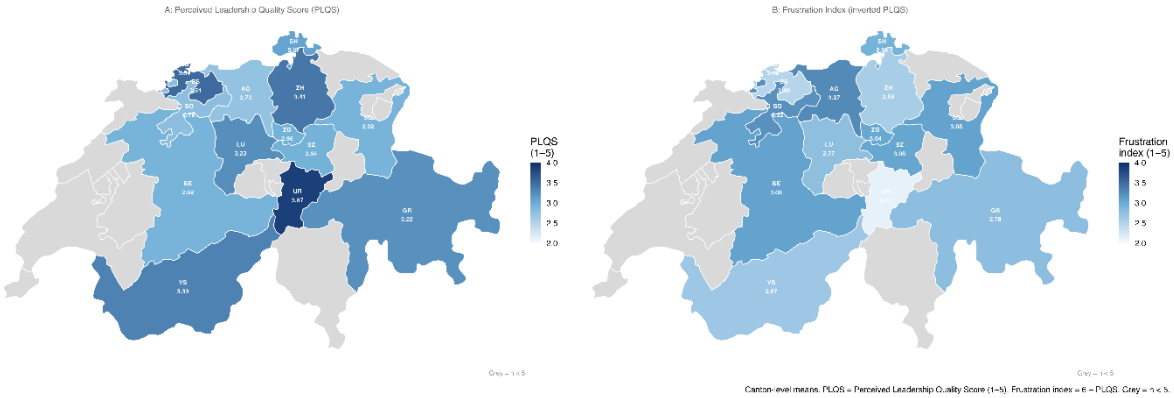
Leadership Quality Distribution by Turnover Intention Status



n = 317. Dotted line = exploratory Youden's J threshold for imminent TI (stages 3–5: within 12/6 months or notice given). In-sample only.

Figure 5

Leadership Quality Index and Frustration Index by Canton



Canton-level means. PLQS = Perceived Leadership Quality Score (1–5). Frustration index = 6 − PLQS. Grey = n < 5.

Discussion

Leadership Quality and Retention-Related Outcomes

In this sample, perceived leadership quality showed stronger associations with job satisfaction, employer recommendation, and turnover intention than the measured structural covariates included in the comparison models. Adding the remaining covariates increased Nagelkerke R^2 by 0.06 beyond the PLQS-only model. This aligns with international literature identifying supervisor support as a strong predictor of job satisfaction and poor leadership as an important correlate of TI globally (Thielmann et al., 2023; Zarei et al., 2026). Within the JD-R framework, leadership is one of the few modifiable organisational resources in a system with collectively negotiated pay and certification constraints (Bakker et al., 2023; Bakker & Demerouti, 2007). A multiclass AUC of 0.665 (Hand-Till method, all five TI levels) indicates moderate in-sample discrimination but does not establish a validated screening threshold.

Two pathways

The observed pattern was consistent with job satisfaction acting as a partial mediator of the association between PLQS and TI, accounting for approximately half of the total association (51.7%). A significant direct effect remained (ADE = −0.177, p = .030), suggesting that factors beyond job satisfaction may also be relevant to the PLQS – TI association. The organisational identification pathway did not reach significance in the analysis. This may reflect overlap with PLQS or insufficient statistical power for a secondary pathway given the sample size. PLQS was associated with employer recommendation partly through job satisfaction (proportion mediated = 35.4%), consistent with evidence linking leadership support to endorsement-related organisational outcomes (Galanis et al., 2024). All mediation estimates are exploratory and require replication in longitudinal designs.

Psychological Safety in High-Reliability EMS

Leadership in high-reliability healthcare environments such as EMS differs substantively from leadership in non-healthcare settings, with patient safety and a psychologically safe team climate as core leadership responsibilities. Psychological safety has been associated with employee outcomes such as job satisfaction and intention to leave, as well as with patient safety indicators in adjacent prehospital and clinical contexts (Etti et al., 2025; Mitterer & Mitterer, 2023; Stuby et al., 2026). The PLQS as developed here was anchored in empowering leadership behaviours (coaching, informing, participative decision-making, recognition, leading by example) and does not explicitly capture psychological safety as a distinct dimension. Whether perceived leadership quality in Swiss EMS would be more fully characterised by adding an explicit psychological safety dimension, and whether this would carry incremental association with retention-related outcomes beyond the existing PLQS items, is a question for future Swiss EMS workforce studies.

Swiss Context and Comparison with International Data

PACE-CH TI rates of 32% to 38% exceed the global pooled EMS estimate of 23.5% and the European subgroup estimate of 31.6% (Zarei et al., 2026). The broader Swiss picture adds context: 67.7% of EMS professionals have considered leaving and 43.4% show clinically relevant burnout (Stuby et al., 2026). The leading exit reasons are missing career opportunities and

shift dissatisfaction (Regener & Trede, 2024). Similar workforce pressures have also been described in German EMS (Bathe et al., 2024). The present findings are consistent with international evidence that leadership quality is associated with retention outcomes; whether Swiss regulatory structure modifies this relationship was not directly tested (Schmutz et al., 2022; Zarei et al., 2026).

High-Risk Group and Hospital-Based EMS

The exploratory high-risk subgroup had a mean professional experience of 13.6 years. Their higher proportion of hospital-based personnel (64% vs. 40.5% in the remainder; χ^2 $p = 0.038$, Cramér's $V = 0.116$) should be interpreted as a descriptive pattern rather than as a robust institutional difference. The study did not test dual accountability structures, leadership ambiguity, or hospital governance directly. Given the small subgroup size and modest effect, this observation should be treated as hypothesis-generating only.

Subgroup Comparisons and Broader Implications

No significant differences in PLQS, satisfaction, or TI were found across organisation types, genders, or generational cohorts (all $p > 0.40$). This pattern is consistent with evidence that leadership is associated with TI regardless of subgroup and with meta-analytic data showing near-zero corrected effect sizes for generational differences in workplace attitudes (Costanza et al., 2012; Ravid et al., 2025; Wynendaele et al., 2025). The cantonal ICC of 0.076 indicates modest canton-level clustering in PLQS scores, although the practical implications of this variation for workforce monitoring would require further investigation.

More broadly, PACE-CH represents a first attempt to generate systematic workforce evidence for Swiss EMS. The limited availability of longitudinal data, validated Swiss EMS-specific instruments, and institutionally supported research infrastructure appears to reflect a broader gap in the field rather than a limitation unique to this study.

Gender, Part-Time Work, and the Mobility Constraint

Lower TI among women should not automatically be taken to imply lower career ambition. One possible explanation is that employer change may be more complex for part-time workers, who must renegotiate flexible arrangements with each new employer (Harrop et al., 2026; Maraziotis, 2024). Work-family imbalance has been associated with TI via perceived stress, and family-supportive leadership behaviour has been linked to lower TI and burnout in the literature (Guo et al., 2024; Hao et al., 2025; Lin & Li, 2025). Caregiving responsibilities were not directly measured in PACE-CH. Part-time women in this sample reported lower job satisfaction than full-time women ($M = 3.84$ vs. 4.01), yet lower TI, a pattern that may be consistent with structural exit barriers. These findings suggest caution in assuming that currently lower female TI would necessarily remain stable over time.

Education as a Mobility Signal

An 11% observed TI difference was seen between paramedics with an academic background and Tertiary B colleagues, despite nearly identical group mean PLQS scores (3.08 vs. 3.13) and job satisfaction (3.75 vs. 3.87). One possible explanation is that academic credentials may expand perceived alternatives outside EMS. Social identification with the

paramedic professional group has been associated with work engagement (r = 0.36 to 0.40), and both organisational and occupational commitment independently predict lower TI in the literature, suggesting professional identity investment may partially offset credential-driven mobility (Kellerer & Süß, 2026; Kukla et al., 2024).

Leadership Self-Assessment

Manager and staff ratings differed consistently: managers rated overall staff satisfaction lower than staff self-reports, while rating developmental support and task compensation more positively than staff did. Whether such discrepancies persists in settings without structured feedback mechanisms cannot be determined from this cross-sectional design. Trust in leadership and information quality have been identified as relevant to organisational change processes (Stefánsdóttir et al., 2022). Where group-level rating differences of this kind exist, they may limit the accuracy of leadership self-assessment at the individual level. Leadership positions in EMS are not necessarily linked to academic credentials. The present data partly confirm and partly nuance this: consecutive academic degrees were held by only 18.9% of managers, yet all held some form of post-paramedic qualification, and 37.7% held continuing education at university level (CAS, DAS, or MAS). For nearly one-third, the highest qualification was acquired after taking up the leadership role, suggesting partial post-hoc professionalisation. Whether the type or timing of formal qualification shapes perceived leadership quality could not be tested here because the manager and staff samples were not matched at the service level and warrants future investigation.

Limitations

Several limitations constrain interpretation. The PLQS was purpose-built for this context using a questionnaire developed within a single master's thesis; independent external replication of both the instrument and the findings has not yet been conducted. While internal consistency was strong (α = 0.881) and CFA supported unidimensionality, this does not substitute for convergent and discriminant validity testing against established scales. The elevated RMSEA of 0.113 indicates some remaining psychometric ambiguity, including possible breadth across two item clusters, and should be interpreted as a limitation of the current scale. The correlation between PLQS and job satisfaction (r = 0.640) raised a possible multicollinearity concern, although variance inflation factors were below 3.0 in all models. The cross-sectional design prevents causal inference; the mediation findings indicate associations consistent with the proposed pathways, not established mechanisms. All principal variables were self-reported within the same survey wave. Harman's single-factor test (first factor: 46.9% of variance, n = 316) did not indicate dominant common-method variance, although residual inflation cannot be fully excluded and remains a design-inherent limitation. The manager and staff samples were unmatched at the service level; the cross-group comparison should therefore be interpreted as describing aggregate differences between the two samples, not within-organisation perceptual gaps at the individual level. Recruitment via the Swiss Paramedic Association and social media constituted a convenience sample; the response denominator and potential sampling bias cannot be fully characterised. Given the high digital literacy required for current EMS practice in Switzerland, an online-only survey

format is unlikely to have substantially excluded eligible personnel; however, self-selection bias and online-survey fatigue remain plausible sources of non-response not captured by the available data. The gender analysis lacks caregiving data; the education finding rests on n = 59; and results may not transfer to EMS systems with different qualification or regulatory structures. The high-risk group analysis (n = 25) was exploratory.

Conclusions

PACE-CH is the first systematic cross-sectional study of perceived leadership quality, job satisfaction, and turnover intention in German-speaking Swiss EMS. Three findings stand out. First, perceived leadership quality showed stronger cross-sectional associations with all three retention-related outcomes than the measured demographic and organisational covariates. Second, job satisfaction was statistically consistent with a partial mediating role for the PLQS–turnover intention association, while a direct association persisted after this pathway was controlled, suggesting additional mechanisms warrant investigation. Third, the PLQS demonstrated acceptable internal consistency and preliminary structural validity in this sample and provides an initial, context-specific measurement approach that nevertheless requires external validation against established leadership scales before it can be recommended for routine use.

Swiss EMS generates considerable workforce data, yet no routine mechanism appears to exist for translating these data into feedback to front-line staff and supervisors. The associations observed in this study suggest that perceived leadership quality is a plausible and measurable dimension of the working environment that warrants systematic attention. Practical implications for Swiss EMS therefore centre on closing this feedback loop rather than on adopting any single instrument. Several lines of follow-up research would strengthen the evidence base: external validation of the PLQS against the Empowering Leadership Questionnaire and related scales, longitudinal designs linking perceived leadership quality to actual turnover, integration of psychological safety as a high-reliability-specific leadership dimension, and cross-system comparisons between Directive and Professionally Autonomous paramedic systems. Until such evidence is available, the PLQS should be regarded as an early-stage instrument and findings as hypothesis-generating rather than confirmatory.

CRediT-Statement

Felix Brinkmann (FB): Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Visualization, Writing (Original Draft), Writing (Review & Editing)

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Declarations

Declaration of Conflicting Interests

The authors declare no conflicting interests.

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Ethical Approval and Informed Consent

Participation in the survey was voluntary, anonymous, and based on electronic informed consent obtained prior to accessing the questionnaire. A voluntary online survey does not fall under the jurisdiction of the Swiss Human Research Act; no ethical approval was required.

Data Availability Statement

The anonymised survey dataset and analysis code are available from the corresponding author upon reasonable request

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