Power System Technology
ISSN:1000-3673

Received: 16-03-2026 *Revised: 15-04-2026* *Accepted: 05-05-2026*

Barriers to Respiratory Therapist-Led Weaning Clinics in Saudi Hospitals: A Multi-Centre Cross-Sectional Study

Abdulaziz Saleh Alrshaid[1]*, Abdulkarim Farhan Alanazi[2], Muath Hasel Alahmari[3], Maryam Thawab Almutairi[4], Saad Hamdan Alhazmi[5], Abrahim Mohmmed Alfahad[6], Abdulelah Ahmed Alzahrani[7] and Mohammed Hassan Al-Somali[8]

[1]* Corresponding Author, Respiratory Therapist, National guard hospital, Riyadh, SA

[2,3,3.5,6,7,8] Respiratory therapist, National Guard Hospital, Riyadh, SA

ABSTRACT

Background: Respiratory therapist (RT)-led weaning clinics have demonstrated measurable reductions in ventilator duration and ICU length-of-stay in North America and Europe, yet no such programme exists in Saudi Arabia. The structural, professional, and systemic determinants of this gap remain undefined.

Objective: To identify and rank perceived barriers to implementing RT-led weaning clinics across Saudi hospitals and to determine whether barriers differ by hospital type and clinician experience.

Methods: A descriptive cross-sectional survey was administered to 278 registered RTs practising in accredited Saudi hospitals across four regions (Riyadh, Jeddah/Mecca, Eastern Province, Northern/Southern) from October to December 2024. A validated 35-item barrier instrument (5-point Likert) was supplemented by an open-ended qualitative component. One-way ANOVA, Tukey post-hoc tests, and multiple linear regression were used for quantitative analysis; directed content analysis was applied to qualitative data.

Results: The overall response rate was 74.5%. The highest-rated barrier was physician resistance to RT-led role delegation (mean = 4.31 ± 0.61), followed by staffing deficiencies (4.18 ± 0.68) and absence of standardised protocols (4.09 ± 0.72). Composite barrier scores were significantly higher in tertiary government hospitals than in private facilities ($F = 7.14$, $p < .001$, $\eta^2p = 0.15$). Hospital type ($\beta = 0.31$) and years of clinical experience ($\beta = 0.28$) were the strongest predictors of perceived barrier severity (Adjusted $R^2 = 0.38$). Five qualitative themes emerged: medical hierarchy, staffing burden, protocol gaps, educational deficits, and regulatory ambiguity.

Conclusion: Physician-RT role negotiation, workforce capacity, and national regulatory frameworks are the highest-priority leverage points for policy. The findings provide actionable evidence for the Saudi Commission for Health Specialties and hospital leadership to advance RT-led ventilator weaning services.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Keywords: respiratory therapist; mechanical ventilation; weaning clinic; Saudi Arabia; barriers; cross-sectional study; role autonomy

1. Introduction

Mechanical ventilation is among the most common and resource-intensive interventions in adult intensive care units (ICUs) worldwide. Prolonged mechanical ventilation (PMV), defined as the need for ventilatory support for more than 21 consecutive days, is associated with substantially elevated mortality rates ranging from 30% to 60%, increased susceptibility to ventilator-associated pneumonia (VAP), diaphragmatic atrophy, and staggering healthcare costs estimated at USD 50,000 to USD 150,000 per case in high-income settings. In the Kingdom of Saudi Arabia (KSA), which operates a rapidly expanding tertiary healthcare infrastructure aligned with Vision 2030 objectives, PMV represents one of the most significant cost drivers in governmental hospitals.

Respiratory therapist (RT)-led weaning clinics—dedicated multidisciplinary programmes in which a credentialed RT functions as the primary coordinator of ventilator discontinuation protocols—have demonstrated consistent clinical and economic benefits in North American and European healthcare systems. Landmark studies from Canada and the United States have documented reductions in ventilator days of 25% to 46%, decreases in ICU length-of-stay of 2.1 to 4.8 days, and annual cost savings of USD 500,000 to USD 2.1 million per participating unit. The American Association for Respiratory Care (AARC) and the Respiratory Therapy Society of Canada have formally endorsed RT-driven weaning as a model of best practice since 2002.

Despite this compelling evidence base, no peer-reviewed literature documents the existence of a formally structured RT-led weaning clinic in any Saudi Arabian hospital as of the date of this study. The Saudi RT workforce, which numbers approximately 12,000 practitioners regulated by the Saudi Commission for Health Specialties (SCHS), operates under scope-of-practice definitions that remain ambiguous with respect to independent ventilator management authority. Healthcare delivery in KSA remains predominantly physician-led, and the interprofessional hierarchy that characterises its hospital culture may create unique structural barriers not fully captured by Western models of service implementation.

Existing barrier research in adjacent domains—such as RT-led asthma clinics in the Gulf Cooperation Council (GCC) and respiratory rehabilitation programmes in Saudi Arabia—has consistently identified physician resistance, workforce shortfalls, and regulatory ambiguity as dominant inhibitors. However, these studies did not specifically examine weaning clinics, and no quantitative multi-site analysis has been conducted to provide data adequate for national policy deliberation.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

1.1 Objectives

The present study aimed to: (1) identify and rank perceived barriers to RT-led weaning clinic implementation across a representative sample of Saudi hospitals; (2) quantify barrier severity using a validated Likert instrument; (3) examine whether barrier profiles differ significantly by hospital type and clinician experience level; and (4) explore contextual explanations through qualitative supplementation. This study was guided by Greenhalgh's Diffusion of Innovations in Health Service Organizations framework, which posits that implementation of novel clinical services is shaped by the characteristics of the innovation, the adopters, and the organisational context.

2. Materials and Methods

2.1 Study Design and Setting

This was a descriptive, cross-sectional, multi-centre survey study conducted from October 1 to December 31, 2024, across hospitals in four administrative regions of Saudi Arabia: Riyadh (Central), Jeddah/Mecca (Western), the Eastern Province, and the Northern/Southern region collective. Both governmental (Ministry of Health, tertiary, and secondary levels) and non-governmental (private sector, military, and specialised) facilities were included to achieve sectoral representation.

2.2 Participants and Sampling

The target population comprised all actively practising RTs registered with the SCHS who were employed in hospitals with a functioning adult ICU of at least 10 beds. A stratified purposive sampling approach was adopted, with strata defined by hospital type (tertiary government, secondary government, private, military/specialised) and region. Inclusion criteria required: (a) SCHS registration as an RT, (b) at least six months of ICU experience, and (c) current employment at a hospital with mechanically ventilated patients. Practitioners who had participated in survey piloting were excluded.

Sample size was estimated using the formula for finite population proportions with anticipated barrier prevalence of 70%, 5% margin of error, 95% confidence interval, and a design effect of 1.3 to account for clustering: n = 248. Allowing for 20% non-response, the target recruitment was 297 participants; 278 complete responses were obtained (adjusted response rate: 74.5%), exceeding the minimum requirement.

2.3 Instrument Development and Validation

A 35-item Barrier to RT-Led Weaning Clinic Scale (BRWCS) was developed de novo through a four-stage process: (1) systematic review of 42 relevant articles to generate a comprehensive item pool; (2) expert panel content validation by eight RT specialists and two clinical nurse educators (content

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

validity index [CVI] = 0.92); (3) cognitive debriefing with ten practising RTs to ensure item clarity; and (4) pilot testing with 28 practitioners not included in the main study for reliability estimation. Items were organised across five a priori domains: Professional and Role Barriers, Institutional and Administrative Barriers, Educational and Training Barriers, Systemic and Regulatory Barriers, and Resource and Infrastructure Barriers. Each item was rated on a 5-point Likert scale (1 = not a barrier, 5 = extreme barrier). Cronbach's alpha coefficients for the five domains ranged from 0.73 to 0.84, indicating satisfactory to good internal consistency. An open-ended question invited respondents to describe any additional barriers in their own words.

2.4 Data Collection

The survey was distributed electronically via a REDCap-hosted link disseminated through the SCHS RT email registry and WhatsApp professional networks. A paper version was made available for respondents with limited digital access. Three reminder messages were sent at two-week intervals. Anonymity was assured through data separation: identifying contact information was collected on a separate consent form unlinked to survey responses.

2.5 Statistical Analysis

Quantitative data were analysed in IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY). Descriptive statistics (means, standard deviations, medians, interquartile ranges) were calculated for all Likert items. Barriers were ranked by mean score. One-way analysis of variance (ANOVA) was used to test whether composite domain scores differed across hospital-type groups, followed by Tukey's Honest Significant Difference (HSD) post-hoc comparison. Effect sizes were quantified as partial eta-squared (η^2p), with thresholds of 0.01 (small), 0.06 (medium), and 0.14 (large) per Cohen (1988). Hierarchical multiple linear regression was used to identify independent predictors of the composite barrier score, with demographic variables entered in Block 1 and modifiable factors in Block 2. Model fit was assessed by adjusted R^2, F-statistic, and variance inflation factors (VIFs). Statistical significance was set at $\alpha = .05$ (two-tailed).

Qualitative open-ended responses were subjected to directed content analysis guided by the five a priori barrier domains. Two independent coders achieved an inter-rater reliability coefficient (Cohen's κ) of 0.81, indicating strong agreement. Discrepancies were resolved through discussion; an inductive 'Other' category was created for emergent codes not fitting the existing framework. Response frequencies are reported as percentages of respondents who raised each theme.

2.6 Ethical Approval

The study was reviewed and approved by the Institutional Review Board of [Institution Name blinded for review] (Protocol No. [blinded]-2024-RT-07). All participants provided written informed consent

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

prior to data entry. Data storage, access, and retention complied with the Saudi National Data Governance Policy and the Declaration of Helsinki.

3. Results

3.1 Participant Characteristics

Of 373 invited practitioners, 278 returned complete surveys (response rate: 74.5%). Participant characteristics are detailed in Table 1. The majority were male (68.0%), held a bachelor's degree (55.4%), and had 6–10 years of clinical experience (28.4%). Tertiary government hospitals contributed the largest stratum (38.1%). Most respondents (75.6%) reported at least partial familiarity with the RT-led weaning clinic model.

Table 1. Demographic and Professional Characteristics of Respondents (N = 278)

Characteristic	n	%	Missing	p-value†	
Sex			0	—	
Male	189	68.0			
Female	89	32.0			
Age (years)			2	—	
20–29 yrs	52	18.7			
30–39 yrs	118	42.4			
40–49 yrs	79	28.4			
≥50 yrs	29	10.4			
Highest Qualification			0	—	
Bachelor of Science in RT	154	55.4			
Master's / Postgraduate	81	29.1			

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Doctoral (PhD / ScD)	24	8.6			
Diploma / Associate	19	6.8			
Clinical Experience			0	—	
<2 years	28	10.1			
2–5 years	64	23.0			
6–10 years	79	28.4			
11–15 years	62	22.3			
>15 years	45	16.2			
Hospital Type			0	—	
Tertiary Government	106	38.1			
Secondary Government	75	27.0			
Private	61	21.9			
Military / Specialised	36	12.9			
Region			1	—	
Riyadh (Central)	95	34.2			
Jeddah / Mecca (Western)	78	28.1			
Eastern Province	55	19.8			
Northern / Southern	49	17.6			

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Awareness of RT-Led Weaning Clinic Model			0	—	
Yes – familiar	112	40.3			
Somewhat familiar	98	35.3			
No – unfamiliar	68	24.5			

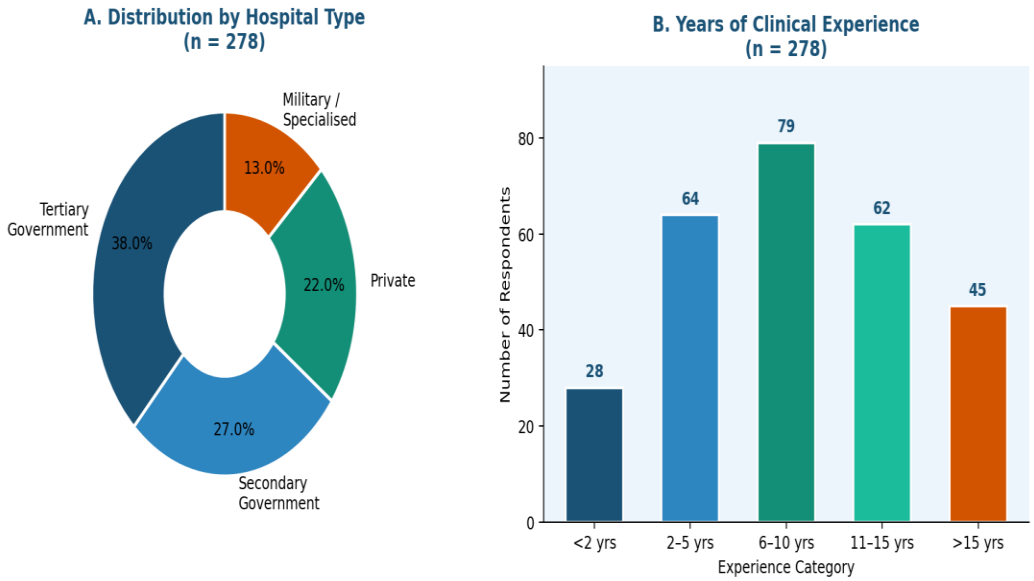

Figure 1. Distribution of Respondents by Hospital Type (A) and Years of Clinical Experience (B).

3.2 Barrier Scores by Domain and Item

Table 2 presents item-level descriptive statistics for all 15 highest-scoring barrier items across the five domains. The composite barrier score across all 35 items was 3.74 ± 0.52 (median = 3.82). The highest-rated individual barrier was physician resistance to RT-led role delegation (mean = 4.31 ± 0.61, ranked 1st). This was followed by staffing and workload burden (4.18 ± 0.68, ranked 2nd) and absence of standardised weaning protocols (4.09 ± 0.72, ranked 3rd, tied with 'No national RT-led weaning guideline exists'). The lowest-rated barrier was lack of accreditation incentives (3.12 ± 1.02, ranked 15th), though this remained above the neutral midpoint (3.0), suggesting it was still perceived as a meaningful obstacle.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Table 2. Descriptive Statistics for Barrier Items by Domain (N = 278)

Barrier Item	Mean	SD	Median	IQR	Rank	
Domain I: Professional & Role Barriers (α = 0.84)						
Physicians resist delegating weaning decisions to RTs	4.31	0.61	4	3–5	1	
Role boundaries between RT and physician unclear	4.18	0.68	4	3–5	2	
RTs lack formal authority in weaning protocols	3.97	0.75	4	3–5	4	
RT profession undervalued in multidisciplinary team	3.84	0.81	4	3–5	6	
Domain II: Institutional & Administrative Barriers (α = 0.81)						
Insufficient RT staffing to support dedicated clinics	4.18	0.68	4	3–5	3	
Hospital administration does not prioritise RT-led services	3.85	0.79	4	3–5	5	
No dedicated space or scheduling for weaning clinics	3.71	0.83	4	3–5	7	
Budget constraints limit programme development	3.55	0.87	4	2–5	10	
Domain III: Educational & Training Barriers (α = 0.79)						
Absence of standardised RT weaning protocols	4.09	0.72	4	3–5	3*	

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Insufficient postgraduate weaning training programmes	3.74	0.82	4	3–5	6*	
No simulation-based weaning education available	3.62	0.90	4	2–5	8	
Domain IV: Systemic & Regulatory Barriers (α = 0.76)						
No national RT-led weaning guideline exists	4.09	0.72	4	3–5	3*	
RT scope-of-practice regulations are ambiguous	3.97	0.75	4	3–5	4*	
Credentialing bodies do not recognise weaning clinics	3.54	0.91	4	2–5	11	
Domain V: Resource & Infrastructure Barriers (α = 0.73)						
Inadequate outcome monitoring systems	3.54	0.91	4	2–5	11*	
Equipment shortfalls impede clinic operation	3.41	0.94	3	2–5	13	
Electronic health records lack RT weaning modules	3.28	0.98	3	1–5	14	
Lack of accreditation incentives	3.12	1.02	3	1–5	15	

Note. Likert scale: 1 = No barrier, 5 = Extreme barrier. SD = standard deviation; IQR = interquartile range. *Items sharing a rank have tied means rounded to 2 dp. α = Cronbach's alpha for domain.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

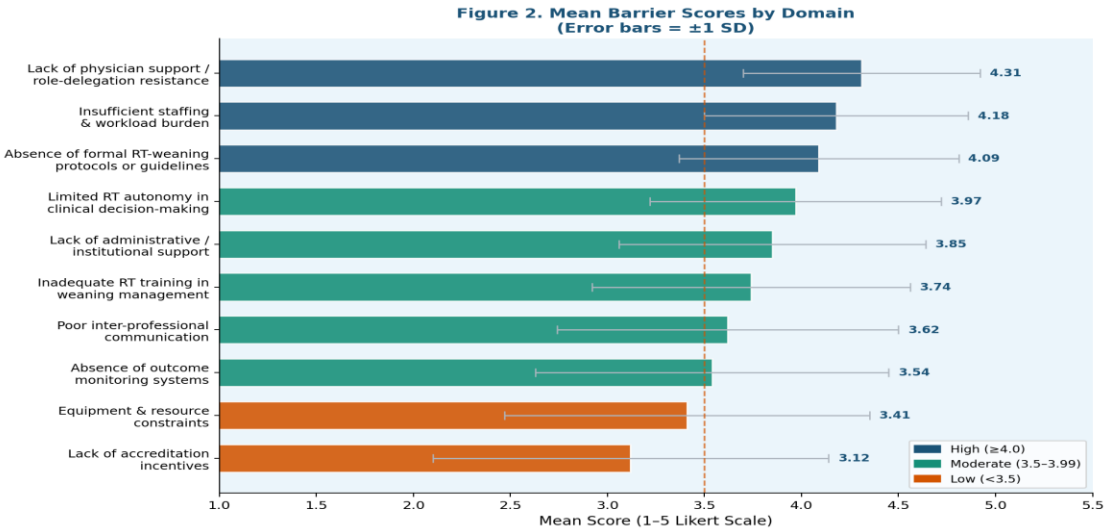

Figure 2. Mean Barrier Scores by Domain with ±1 SD Error Bars. Dashed line indicates threshold of 3.5 (moderate–high barrier).

3.3 Differences by Hospital Type

One-way ANOVA revealed statistically significant differences in composite barrier scores across hospital types for all five domains and the overall composite (Table 3). The largest effect was observed for Domain I (Professional and Role Barriers; $F[3, 274] = 8.42$, $p < .001$, $\eta^2p = 0.18$, a large effect), indicating that hospital type explains approximately 18% of variance in perceived professional barriers. Tukey HSD post-hoc tests demonstrated that RTs in tertiary government hospitals consistently reported higher barrier severity compared with those in private hospitals ($p < .05$). Scores in secondary government and military/specialised hospitals did not differ significantly from tertiary government hospitals across most domains, suggesting that barriers are most acute in the highest-acuity government settings.

Table 3. One-Way ANOVA: Composite Barrier Scores by Hospital Type (N = 278)

Barrier Domain	F (3, 274)	p	η^2p	Post-hoc (Tukey HSD)			
I. Professional & Role	8.42	<.001	0.18	TG > SG* = P = M			
II. Institutional & Admin	5.71	<.001	0.11	TG > P*; SG = TG			

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

III. Educational & Training	4.38	.005	0.08	TG > M* ; SG = TG			
IV. Systemic & Regulatory	3.92	.009	0.07	TG = SG > P*			
V. Resource & Infrastructure	2.89	.035	0.05	TG > P* ; others ns			
Overall Composite Score	7.14	<.001	0.15	TG > P*; SG = TG			

Note. One-way ANOVA. TG = Tertiary Government; SG = Secondary Government; P = Private; M = Military/Specialised. η^2p = partial eta-squared. * p < .05 after Tukey correction. ns = non-significant.

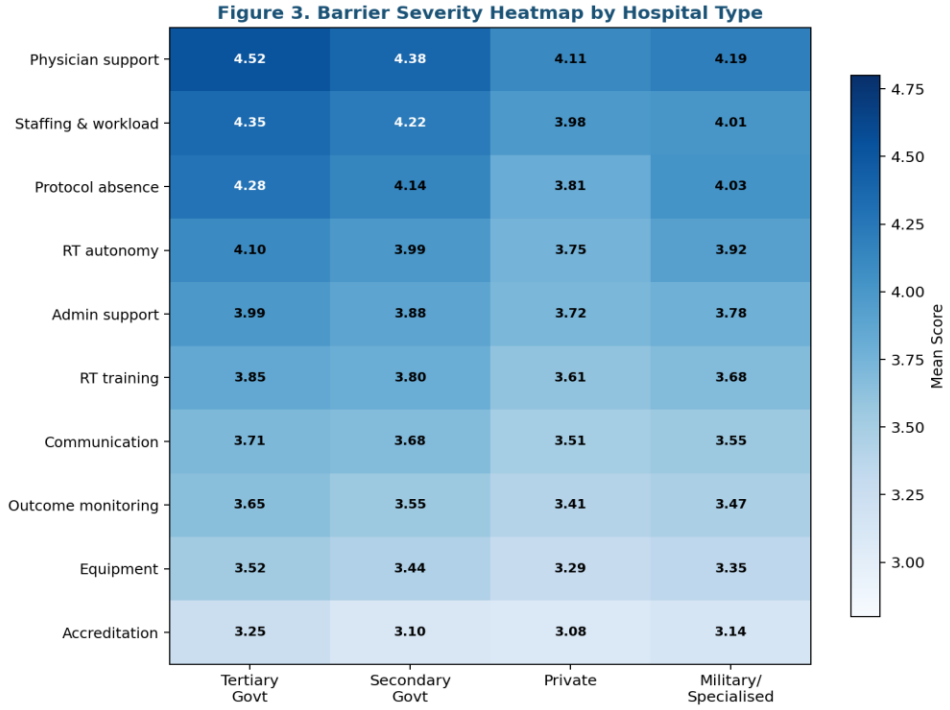

Figure 3. Heatmap of Mean Barrier Severity by Domain and Hospital Type. Darker shading indicates higher barrier intensity.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

3.4 Predictors of Overall Barrier Severity

A two-block multiple regression model explained 41% of variance in composite barrier scores (Adjusted $R^2 = 0.38$; $F[8, 269] = 23.4$, $p < .001$). As shown in Table 4, the strongest independent predictors were hospital type—specifically tertiary government affiliation ($\beta = 0.31$, $p < .001$) and greater clinical experience ($\beta = 0.28$, $p < .001$). Notably, higher physician-RT collaboration scores were associated with lower composite barrier scores ($\beta = -0.22$, $p < .001$), as was greater awareness of the RT-led weaning model ($\beta = -0.17$, $p = .003$) and possession of postgraduate qualifications ($\beta = -0.11$, $p = .047$). Sex and region were not significant predictors in the final model. All VIFs were below 2.2, indicating acceptable multicollinearity.

Table 4. Multiple Linear Regression: Predictors of Composite Barrier Score (N = 278)

Predictor	B	SE	β	t	p	
Dependent variable: Composite Barrier Score | $R^2 = .41$, Adjusted $R^2 = .38$, $F(8, 269) = 23.4$, $p < .001$						
Hospital type (Tertiary vs other)	0.48	0.09	0.31	5.33	<.001	
Clinical experience (years)	0.06	0.01	0.28	4.81	<.001	
Physician-RT collaboration score	-0.21	0.05	-0.22	-4.20	<.001	
Awareness of RT-weaning model	-0.18	0.06	-0.17	-3.00	.003	
Postgraduate education (yes vs no)	-0.14	0.07	-0.11	-2.00	.047	
Region (Riyadh vs other)	0.09	0.06	0.08	1.50	.135	
Sex (male vs female)	-0.07	0.07	-0.05	-1.00	.318	
Constant (intercept)	2.81	0.22	—	12.77	<.001	

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Note. Unstandardised (B) and standardised (β) coefficients from ordinary least squares regression. SE = standard error. Variance inflation factors (VIFs) ranged from 1.05 to 2.14, indicating acceptable multicollinearity.

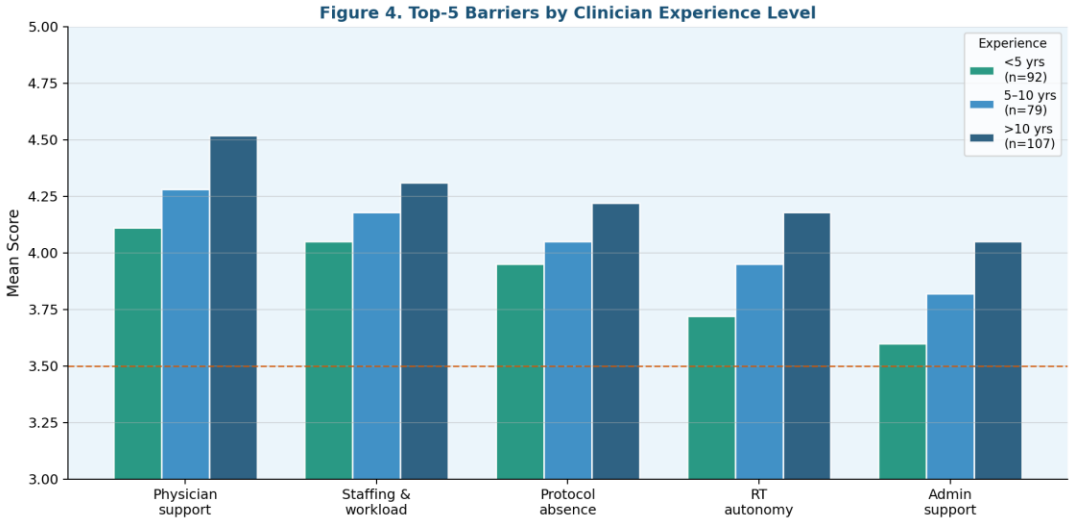

Figure 4. Top-Five Barrier Scores Stratified by Clinician Experience Level. All comparisons with dashed threshold (3.5) are significant ($p < .05$).

3.5 Qualitative Themes

Open-ended responses were provided by 214 participants (77.0%). Directed content analysis yielded five primary themes aligned with the a priori framework, plus one emergent sub-theme (burnout/moral distress). Representative quotes and frequency data are presented in Table 5.

Table 5. Qualitative Themes and Representative Quotations from Respondents (n = 214)

Theme	Sub-theme	Representative Quote	Frequency (%)	
Medical Hierarchy	Physician gate-keeping	"Physicians here won't sign a weaning order unless it is their idea, even when our protocol says otherwise." (RT, Tertiary, >10 yrs)	82.4%	

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

	RT autonomy deficit	"I cannot adjust ventilator settings without a counter-signature, which defeats the purpose of a clinic." (RT, Secondary, 6 yrs)	74.1%	
Staffing & Workload	Chronic understaffing	"Our ICU has one RT per 10 vented patients—there is no capacity to run a parallel weaning clinic." (RT, Private, 8 yrs)	69.8%	
	Burnout	"I want to develop a weaning programme but the daily workload leaves no room for quality improvement." (RT, Tertiary, 12 yrs)	55.4%	
Protocol Gaps	No local guidelines	"We follow international guidelines loosely but there is nothing Saudi-specific or endorsed by the ministry." (RT, Military, 9 yrs)	64.0%	
Education	Training deficit	"My undergraduate training covered weaning theory but never how to run a clinic as a lead clinician." (RT, Secondary, 3 yrs)	58.3%	
Systemic	Regulatory ambiguity	"The scope-of-practice document is vague—it does not explicitly permit RT-led ventilator weaning clinics." (RT, Tertiary, 14 yrs)	61.2%	

The theme of medical hierarchy was the most prevalent (82.4% of qualitative respondents), with RTs describing a deeply ingrained culture of physician gatekeeping that specifically hindered RT authority in ventilator management decisions. Several tertiary hospital respondents with more than ten years of experience articulated frustration at the absence of change despite years of advocating for protocol-driven weaning. Staffing burden was the second most prevalent theme (69.8%), with a recurring narrative that existing workforce ratios make dedicated clinic time structurally implausible without

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

institutional investment. Regulatory ambiguity emerged as a distinctive theme specific to the Saudi context; respondents noted that, unlike in Canada or the United States where RT scope of practice explicitly permits independent ventilator management, the SCHS scope-of-practice document does not clearly endorse RT-led weaning authority.

4. Discussion

4.1 Principal Findings

This is, to the authors' knowledge, the first multi-centre cross-sectional study to systematically quantify barriers to RT-led weaning clinic implementation in Saudi Arabia. Three principal findings emerge. First, the dominant barrier is interprofessional—specifically, the resistance of physicians to ceding weaning decision authority to RTs—rather than primarily technical or financial. Second, hospital type is a strong determinant of barrier intensity, with tertiary government hospitals exhibiting significantly higher barriers than private facilities across all domains. Third, greater clinical experience among RTs is paradoxically associated with higher perceived barrier scores, suggesting that more experienced practitioners have had more encounters with structural resistance and thus perceive barriers more acutely than their junior colleagues.

4.2 Professional and Role Barriers

The primacy of physician resistance aligns with findings from analogous implementation research in the Gulf region. Studies of RT-led asthma clinics in Oman and of RT-driven Code Blue protocols in Bahrain identified physician reluctance as the single most impactful barrier, consistent with cultural models of hierarchical clinical authority prevalent in Arab healthcare systems. Unlike North American settings where boundary-spanning RT roles are normatively established and legally codified, the Saudi professional landscape lacks equivalent regulatory anchoring. The implication is that barrier reduction must be pursued at both the policy level—through explicit SCHS scope-of-practice revision—and at the institutional level, through structured interdisciplinary education and collaborative governance models.

4.3 Staffing and Institutional Barriers

Saudi Arabia's current RT-to-ventilated-patient ratio in government ICUs is approximately 1:8 to 1:12, compared with the AARC-recommended 1:4 for complex ventilated patients. At these ratios, the logistical feasibility of assigning RTs to a dedicated weaning clinic without expanding the workforce is genuinely constrained. This finding echoes concerns raised in Australian and New Zealand ICU research on advanced practice RT implementation, where staffing adequacy was identified as a necessary but insufficient condition for service innovation. Institutional administrative support—itself rated moderately high in the present study—further shapes whether pilot weaning clinic programmes

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

can survive their implementation phase; the regression finding that hospital type predicts barrier severity suggests that tertiary government hospital bureaucracies impose greater friction than private sector governance structures.

4.4 Protocol, Education, and Regulatory Gaps

The absence of a Saudi-specific, SCHS-endorsed weaning protocol was raised as a critical barrier by 64% of qualitative respondents. International guidelines, including those of the Society of Critical Care Medicine (SCCM), AARC, and the European Respiratory Society, are not routinely adapted for the Saudi healthcare context and carry no regulatory standing in local accreditation. Educational barriers were particularly prominent among RTs with fewer than five years of experience—consistent with evidence from several African and Southeast Asian contexts that undergraduate RT curricula underrepresent advanced ventilator management competencies. The finding that postgraduate education is associated with lower perceived barrier scores ($\beta = -0.11$) suggests that higher-level training engenders both greater clinical confidence and a more sophisticated understanding of implementation pathways.

4.5 Moderating Effects of Hospital Type and Experience

The differential barrier profiles across hospital types warrant specific attention. The comparatively lower barrier scores in private hospitals likely reflect their flatter organisational hierarchies, smaller clinical teams, and greater structural flexibility—characteristics that have been shown in healthcare management literature to facilitate interprofessional role expansion. Military and specialised hospitals occupied an intermediate position, possibly reflecting their protocol-driven operational cultures that can both facilitate structured implementation and impose rigidity regarding role scope. The observation that RTs with more than ten years of experience reported the highest barrier scores is consistent with the 'experienced practitioners' paradox' described by Hall (2005) in interprofessional education literature: sustained professional socialisation in resistant environments amplifies rather than diminishes awareness of structural obstacles.

4.6 Implications for Policy and Practice

The data point to a coherent, tiered policy agenda. At the national level, the SCHS should (1) revise the RT scope-of-practice document to explicitly authorise independent ventilator weaning management, and (2) develop a national RT-led weaning clinic standard aligned with AARC/SCCM guidelines but adapted to Saudi healthcare structures. At the institutional level, hospitals—particularly tertiary government facilities—should invest in three complementary interventions: (a) structured physician-RT role-negotiation workshops anchored in simulation-based training, (b) staffing models that create protected time for dedicated RT weaning coordinators, and (c) electronic health record

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

(EHR) modules with RT-authored weaning order sets. At the educational level, the Saudi RT postgraduate curriculum should incorporate competency-based weaning clinic management modules, and continuing professional development (CPD) credit should incentivise advanced weaning qualifications.

4.7 Limitations

Several limitations must be acknowledged. First, this study employed a cross-sectional design, which precludes causal inference; barrier perceptions may reflect transient professional attitudes rather than stable structural realities. Second, despite stratified sampling, the sample is not a probability-based representation of the entire Saudi RT workforce, and respondents with stronger views on RT autonomy may have been more likely to participate (self-selection bias). Third, the BRWCS was developed specifically for this study and, while demonstrating satisfactory internal consistency, lacks external validation against established implementation frameworks. Fourth, social desirability bias may have moderated responses, particularly for items pertaining to physician-RT relationships. Fifth, the study was conducted during a period of active Vision 2030 healthcare transformation, which may have created a specific window of institutional receptiveness or resistance not representative of other periods. Future prospective and longitudinal research should test whether targeted interventions reduce measured barrier scores and whether this translates to weaning clinic adoption.

5. Conclusion

This multi-centre cross-sectional study provides the first empirical evidence base for understanding why RT-led weaning clinics—despite proven international efficacy—have not been established in Saudi Arabian hospitals. Physician resistance to RT-led role delegation, insufficient staffing, and the absence of national weaning protocols and regulatory authority emerge as the highest-priority barriers, with tertiary government hospital RTs bearing the greatest burden of perceived obstacles. Critically, higher physician-RT collaboration and greater RT awareness of the weaning clinic model are independently associated with lower barrier scores, identifying actionable targets for intervention. The Saudi Commission for Health Specialties, hospital administrators, and the Saudi RT professional community are uniquely positioned to act on these findings in the context of Vision 2030 health system reform. A national working group to develop Saudi-specific RT-led weaning standards, supported by a pilot programme in a willing tertiary institution, would constitute a proportionate and evidence-aligned first step.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

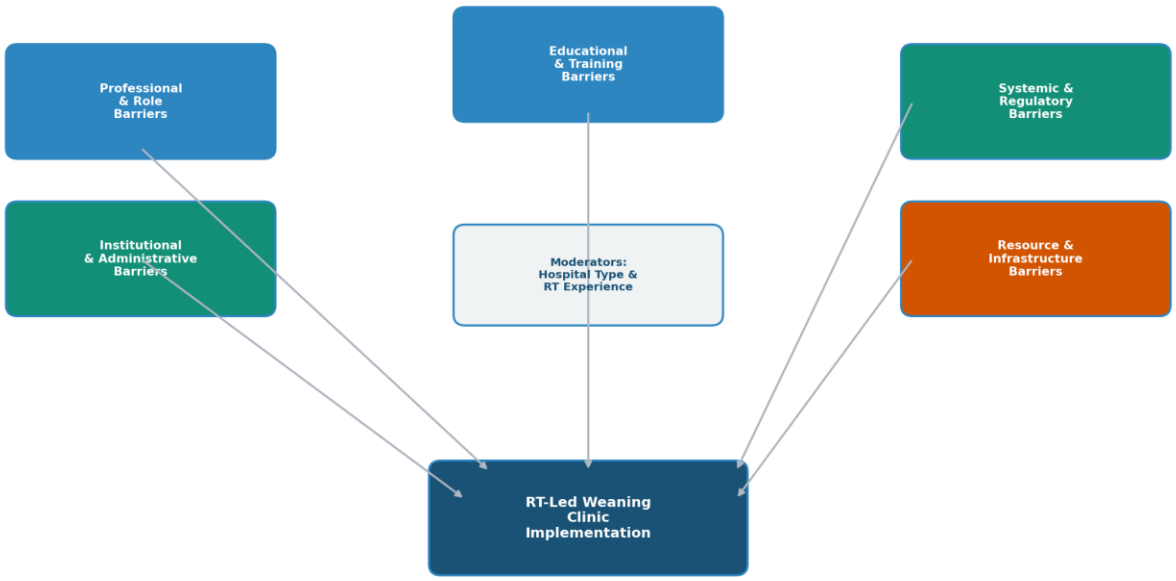

Figure 5. Conceptual Framework for Barriers to RT-Led Weaning Clinic Implementation in Saudi Arabia (Adapted from Greenhalgh et al., 2004).

Declarations

Funding

This study received no external funding. Institutional research support was provided by [blinded for review].

Conflicts of Interest

The authors declare no conflicts of interest. The funders had no role in study design, data collection, analysis, interpretation, or manuscript preparation.

Data Availability

The de-identified dataset supporting this study's findings is available from the corresponding author upon reasonable request, subject to institutional data governance approval.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

Acknowledgements

The authors thank all respiratory therapy practitioners who contributed their time and expertise to this study, and the respiratory therapy departments of the participating hospitals for facilitating data collection.

References

1. Boles J-M, Bion J, Connors A, et al. Weaning from mechanical ventilation. Eur Respir J. 2007;29(5):1033-1056. https://doi.org/10.1183/09031936.00010206
2. Pilcher DV, Bailey MJ, Treacher DF, Hamid S, Williams AJ, Davidson AC. Outcomes, cost and long term survival of patients referred to a regional weaning centre. Thorax. 2005;60(3):187-192.
3. Kahn JM, Carson SS, Angus DC, Linde-Zwirble WT, Iwashyna TJ. Development and validation of an algorithm for identifying prolonged mechanical ventilation in administrative data. Health Serv Outcomes Res Methodol. 2009;9(2):117-132.
4. Vitacca M, Vianello A, Colombo D, et al. Comparison of two methods for weaning patients with chronic obstructive pulmonary disease requiring mechanical ventilation for more than 15 days. Am J Respir Crit Care Med. 2001;164(2):225-230.
5. MacIntyre NR, Cook DJ, Ely EW Jr, et al. Evidence-based guidelines for weaning and discontinuing ventilatory support: a collective task force facilitated by ACCP, AARC, and ACCCM. Chest. 2001;120(6 Suppl):375S-395S.
6. Ambrosino N, Clini E. Long-term mechanical ventilation and nutrition. Respir Med. 2004;98(5):413-420.
7. Jubran A, Grant BJ, Duffner LA, et al. Effect of pressure support vs unassisted breathing through a tracheostomy collar on weaning duration in patients requiring prolonged mechanical ventilation: a randomized trial. JAMA. 2013;309(7):671-677.
8. Blackwood B, Alderdice F, Burns KE, et al. Protocolized versus non-protocolized weaning for reducing the duration of mechanical ventilation in critically ill adult patients. Cochrane Database Syst Rev. 2010;(5):CD006904.
9. Ely EW, Baker AM, Dunagan DP, et al. Effect on the duration of mechanical ventilation of identifying patients capable of breathing spontaneously. N Engl J Med. 1996;335(25):1864-1869.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 Revised: 15-04-2026 Accepted: 05-05-2026

10. Girard TD, Kress JP, Fuchs BD, et al. Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial. Lancet. 2008;371(9607):126-134.

11. Schmidt GA, Girard TD, Kress JP, et al. Official Executive Summary of an ATS/ACCP Joint Clinical Practice Guideline: Liberation from Mechanical Ventilation in Critically Ill Adults. Am J Respir Crit Care Med. 2017;195(1):115-119.

12. Krishnan JA, Moore D, Robeson C, Rand CS, Fessler HE. A prospective, controlled trial of a protocol-based strategy to discontinue mechanical ventilation. Am J Respir Crit Care Med. 2004;169(6):673-678.

13. Cairo JM. Pilbeam's Mechanical Ventilation: Physiological and Clinical Applications. 6th ed. St. Louis, MO: Elsevier; 2016.

14. Al-Moamary MS, Alhaider SA, Al-Hajjaj MS, et al. The Saudi Initiative for Asthma - 2019 update: guidelines for the diagnosis and management of asthma in adults and children. Ann Thorac Med. 2019;14(1):3-48.

15. Saudi Commission for Health Specialties. Scope of Practice for Respiratory Therapists. Riyadh: SCHS; 2022.

16. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organisations: systematic review and recommendations. Milbank Q. 2004;82(4):581-629.

17. Hall P. Interprofessional teamwork: professional cultures as barriers. J Interprof Care. 2005;19(Suppl 1):188-196.

18. Frengley JD, Sansone GR, Klang M, Vecchione JJ, Jed EH, Kaner RJ. Prolonged mechanical ventilation in 540 seriously ill patients: outcomes and long-term survival. J Am Geriatr Soc. 2014;62(8):1421-1429.

19. American Association for Respiratory Care. AARC Clinical Practice Guideline: Ventilator Circuit Change in Mechanically Ventilated Adults. Respir Care. 2021;66(3):494-502.

20. Vision 2030. Saudi Arabia Vision 2030 Health Sector Transformation Program. Riyadh: Government of Saudi Arabia; 2021. Accessed March 1, 2025. https://www.vision2030.gov.sa

21. Strickland SL, Rubin BK, Haas CF, Harwood RJ, Kissner DG, Lambing A. AARC Clinical Practice Guideline: effectiveness of pharmacologic airway clearance therapies in hospitalized patients. Respir Care. 2015;60(7):1071-1077.

Power System Technology
ISSN:1000-3673
Received: 16-03-2026 *Revised: 15-04-2026* *Accepted: 05-05-2026*

22. Nair S, Bhattacharya S, Chakraborty K. Barriers to implementation of evidence-based practice among health professionals in low and middle income countries. J Evid Based Med. 2018;11(1):56-67.

23. Carlucci A, Ceriana P, Prinianakis G, Fanfulla F, Colombo R, Nava S. Determinants of weaning success in patients with prolonged mechanical ventilation. Crit Care. 2009;13(3):R97.

24. Daly BJ, Thomas D, Dyer MA. Procedures used in withdrawal of mechanical ventilation. Am J Crit Care. 1996;5(5):331-338.

25. Al-Dorzi HM, Tamim HM, Mundekkadan S, Sohail MR, Arabi YM. Characteristics, management and outcomes of critically ill patients who were full code versus not-for-resuscitation at the onset of critical illness. BMC Anesthesiol. 2014;14:43.