

Original Research

Assessing the impact of workload factors on self-assessed sustainability among rural internationally trained physicians

AUTHORS



Sona Witt¹ BA



Udoka Okpalauwaekwe² PhD, Research Officer *  [<https://orcid.org/0000-0002-0973-1163>]



Carla Fehr³ MA, Manager



Jon Witt³ MD, Director



Taofiq Olusegun Oyedokun³ MD, Assistant Director

CORRESPONDENCE

*Dr Udoka Okpalauwaekwe udokaokpala.uo@usask.ca

AFFILIATIONS

¹ University of Victoria, Victoria, British Columbia, V8p 5C2, Canada

² Department of Family Medicine, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5E5, Canada

³ Saskatchewan International Physicians Practice Assessment (SIPPA) Program, Continuing Medical Education, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5E5, Canada

PUBLISHED

7 October 2026 Volume 26 Issue 4

HISTORY

RECEIVED: 27 January 2026

REVISED: 12 July 2026

ACCEPTED: 23 July 2026

CITATION

Witt S, Okpalauwaekwe U, Fehr C, Witt J, Oyedokun TO. Assessing the impact of workload factors on self-assessed sustainability among rural internationally trained physicians. *Rural and Remote Health* 2026; 26: 10907. <https://doi.org/10.22605/RRH10907>

This work is licensed under a [Creative Commons Attribution 4.0 International Licence](https://creativecommons.org/licenses/by/4.0/)

Abstract

Introduction: Rural and remote communities across Canada face persistent physician shortages. Internationally trained physicians (ITPs) have become a critical component of the rural physician

workforce, yet little is known about how specific workload characteristics influence physicians' perceptions of workload sustainability and long-term rural retention. Objectives of this

study were to identify workload-related factors associated with perceived workload sustainability among ITPs practicing in rural Saskatchewan.

Methods: We conducted a secondary cross-sectional analysis of prospectively collected survey data from 87 ITPs practicing in rural Saskatchewan between January and December 2024. Perceived workload sustainability was measured using a three-level ordinal outcome. Descriptive statistics, bivariate analyses, and multivariable ordinal logistic regression were used to examine associations between workload characteristics and perceived sustainability. Open-ended survey responses underwent reflexive thematic analysis and were integrated with the quantitative findings using an explanatory-triangulation approach.

Results: Among the 87 ITPs, 22 (25.3%) perceived their workload as sustainable, while 43 (49.4%) reported it as somewhat sustainable. In our adjusted analyses, access to post-call recovery time, fewer than nine ED shifts per month, and the absence of dual

or overlapping clinic duties during ED shifts were independently associated with greater perceived workload sustainability. Perceived adverse effects of workload on physician wellness and quality of care demonstrated the strongest associations with lower perceived workload sustainability. Our qualitative findings further reinforced these quantitative results, highlighting excessive workload, burnout, overlapping clinical responsibilities, staffing pressures, administrative burden, and adaptation over time.

Conclusion: Perceived workload sustainability among rural ITPs is shaped by several modifiable organizational factors, including scheduling practices, opportunities for post-call recovery, and workload distribution. Targeting these factors may improve physician wellbeing and support long-term rural workforce sustainability and retention. Our findings provide practical evidence to inform physician support strategies and rural workforce planning.

Keywords

emergency department, internationally trained physicians, physician retention, physician wellness, rural workforce, Saskatchewan, workload sustainability.

Introduction

It is widely acknowledged that Canada is facing a primary care crisis, with rural areas being disproportionately affected by physician shortages¹. In response to these shortages, rural physicians are often required to provide ED coverage, inpatient care, long-term care services, and after-hours on-call responsibilities in addition to office-based primary care services². These overlapping clinical demands contribute to physician burnout and may reduce the long-term sustainability of rural practice³. Internationally trained physicians (ITPs; ie physicians who obtained their primary medical degree outside Canada, regardless of citizenship or immigration status) have become essential to addressing these workforce shortages⁴.

In the Canadian context, the term 'international medical graduate' has traditionally been used to describe this group, defined strictly by the location of medical school graduation rather than by nationality or immigration status⁵. This definition encompasses both immigrant physicians who obtained their degrees abroad before arriving in Canada and Canadian citizens or permanent residents who pursued medical education outside the country⁵. However, more recently, the term 'ITP' (and other related designations like 'internationally educated physician') has gained traction in health policy and workforce planning literature, reflecting a shift in framing from a credential-based classification centred on where a degree was obtained, to a workforce-oriented designation that recognizes these individuals as trained professionals contributing to Canada's healthcare system⁵.

In the province of Saskatchewan, approximately 47% of family physicians practice in rural communities, and more than 80% of these rural physicians are ITPs^{2,6}. Given their central role in rural healthcare delivery, understanding ITPs' perceptions of workload sustainability is essential for informing workforce planning, physician wellbeing, and long-term rural retention. Physician sustainability (particularly in rural and remote areas in Canada) is an emerging conversation in workforce sustainability and planning, yet remains poorly understood⁷. Within this context, we define workload sustainability as a physician's perceived ability to

maintain their current clinical workload over time without detriment to personal wellness or the quality of care provided^{8,9}. This construct reflects a blend of practical, psychological, and professional factors and may serve as an early signal of potential burnout or attrition^{7,8,10}. It is especially relevant for ITPs navigating the demands of rural practice in the early stages of independent licensure.

Several key findings have emerged from previous research on rural physician sustainability reporting that financial incentives alone were not sufficient to improve rural physician retention^{2,6,11-14}. Instead, physicians raised in rural communities, or students exposed to rural rotations, were more likely to remain in rural practice^{2,6,11,13,15,16}. Additionally, family satisfaction within the community, educational opportunities, geographical isolation from regional health centres, and isolation from extended family all influence physician retention and sustainability^{2,3,6,11,13,17-19}. Research on rural Australian physician sustainability noted a negative bias associated with rural placement due to students' concerns of professional isolation³. In rural care facilities, strong inter-occupational relationships are essential, as poor team dynamics were cited as a reason for leaving rural practice³. Some facilities report combating the strain of dual clinic and ED schedules through physician cooperation to informally rearrange schedules to reduce the burden placed on individual physicians¹⁷. Alongside these factors, ITPs may encounter unique challenges influencing retention, such as language barriers, racism, and limited cultural diversity in rural communities^{2,20-22}.

Our previous research has examined broad personal, family, professional, and community factors affecting rural physician retention and sustainability, as well as factors influencing ITP retention in rural practice^{2,6}. Yet few studies have explored how modifiable professional duties influence ITPs' perceptions of sustainability in rural practice. This lack of attention to modifiable workload-related factors represents a critical gap, one with direct implications for workforce planning, physician retention, and wellbeing. Without data on how physicians in rural settings experience clinical demands, especially ITPs, system planners risk underestimating burnout and unsustainability. The Saskatchewan

International Physician Practice Assessment (SIPPA) program offers a unique opportunity to explore these dynamics, as it includes structured integration processes and ongoing monitoring of ITP experiences. In this study, we address this issue by analyzing how specific workload demands influence self-reported sustainability among SIPPA-participating ITPs.

Methods

Study design

This study was a secondary analysis of prospectively collected administrative data from the SIPPA program (ie the *SIPPA Rural Practice Monitoring Survey*). As part of routine program monitoring, SIPPA collects structured survey and assessment data from ITPs during their integration into rural practice in Saskatchewan. See **Supplementary material S1** for a sample of the survey.

Although the SIPPA dataset is longitudinal in nature, the present analysis used a cross-sectional approach, drawing on the most recent complete observation for each participant within a 1-year period beginning January to December 2024. This approach allowed examination of associations between current workload characteristics and self-perceived workload sustainability at a single point in time, rather than changes over time.

Setting and participants

Participants were internationally trained family physicians who had completed the SIPPA Clinical Field Assessment and were currently practicing in rural or regional communities across Saskatchewan²³. The SIPPA program, a part of the College of Medicine at the University of Saskatchewan, provides work-based assessments, structured evaluation and supervises practice while physicians are on a provisional licence²⁴. ITPs were selected as the focus of this study due to their disproportionate representation in Saskatchewan's rural physician workforce and the availability of longitudinal SIPPA monitoring data^{6,25}.

Variables and data sources

Workload data were obtained from the *SIPPA Rural Practice Monitoring Survey*, a structured questionnaire administered periodically to ITPs as part of routine program monitoring during their first 2 years of independent rural practice. The survey comprised structured fixed-choice and open-ended questions designed to capture multiple dimensions of clinical workload, work organization, physician wellbeing, and perceptions of workload sustainability. Survey items were developed collaboratively by SIPPA faculty, clinical supervisors, and academic researchers to reflect workload domains considered most relevant to rural ITP practice in Saskatchewan.

Administrative program records were used to supplement survey data where applicable.

Participants were asked to report their perceived workload characteristics across several domains, including ED workload, clinic patient volume, post-call recovery time, concurrent clinical responsibilities, administrative workload, and the perceived impact of workload on quality of care and personal wellness. For example, physicians were asked, 'How would you rate the sustainability of your current clinical workload?' using a five-category ordinal

response scale ranging from 'not sustainable' to 'sustainable', with an additional 'prefer not to answer' option. The survey items used in the present study are provided in **Supplementary material S1**.

Dependent (outcome) variable

The primary outcome was self-assessed workload sustainability. The original survey measured this construct using a five-category ordinal response scale ('not sustainable', 'seldom sustainable', 'somewhat sustainable', 'sustainable', and 'prefer not to answer'). For analysis, responses were recoded into three ordered categories (1 = 'not sustainable', 2 = 'somewhat sustainable', and 3 = 'sustainable'), with the original 'seldom sustainable' and 'somewhat sustainable' response categories combined to form a single intermediate category. Participants selecting 'prefer not to answer' were excluded from the analysis. This recoding improved interpretability, ensured adequate observations within each outcome category, and preserved the ordinal nature of the outcome while capturing physicians' overall perceptions of whether their current workload was maintainable over time.

Independent (predictor) variables/correlates

Independent variables were derived from both the *SIPPA Rural Practice Monitoring Survey* and administrative program records. Variables were operationalized using the original survey response options wherever possible. Where appropriate, response categories were collapsed into clinically meaningful groupings to improve interpretability and ensure adequate observations within categories. These groupings were developed collaboratively by the research team, clinical faculty, and SIPPA program leaders to reflect operationally meaningful workload categories relevant to rural practice in Saskatchewan rather than statistically derived thresholds. They included:

- ED shifts per month: coded as 0–8 versus 9–≥16
- ED shift length (hours): grouped as <12, 12, 24
- consecutive ED workdays on weekends: coded as 1–2 versus 3–≥4
- clinic patients seen per day: categorized as <15, 15–20, >20
- weekly clinical hours: categorized as <60, 60–80, >80
- post-call time off: dichotomized as Yes versus No
- number of patients seen after midnight (no post-call off): coded as <1, 2, 3, ≥4
- concurrent ED responsibilities: binary indicators (Yes/No) were created for each concurrent duty during ED shifts, including telephone call duties, prescription refills, inpatient rounding, long-term care coverage, walk-in clinic coverage, and simultaneous clinic duties
- charting and administrative hours per day (outside clinical care): grouped as <1, 2, 3, ≥4
- perceived impact on quality of care: coded as 'affects quality of care', 'sometimes affects quality of care', 'does not affect quality of care'
- perceived impact on personal wellness: similarly coded as 'affects wellness', 'sometimes affects wellness', 'does not affect wellness'
- proportion of patient complexity: self-reported estimates of patient case mix were captured using continuous variables for percentage of complex versus uncomplicated patients.

In addition to fixed-choice items, the survey included an open-ended question that invited physicians to describe their workload experiences, sustainability perceptions, and adaptation strategies.

Data analysis

Descriptive statistics were calculated to summarize physician workload profiles. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using medians and interquartile ranges. Because the outcome variable was ordinal and did not meet normality assumptions, bivariate relationships between workload indicators and perceived sustainability were assessed using Kruskal–Wallis tests across the three sustainability categories.

Ordinal logistic regression (proportional odds model) was used to examine the independent associations between workload-related factors and physicians' self-assessed workload sustainability, with the three-level outcome defined as 1 = 'not sustainable', 2 = 'somewhat sustainable', and 3 = 'sustainable'. Candidate variables were selected based on their theoretical relevance to physician workload sustainability and evidence of association in the bivariate analyses ($p < 0.15$). All selected variables were entered simultaneously into a single multivariable model (forced-entry approach) to estimate adjusted associations while accounting for the remaining workload characteristics. Regression coefficients (β), Wald statistics, 95% confidence intervals, and p -values were used to evaluate the strength and statistical significance of associations. Positive regression coefficients indicated a greater likelihood of being in a higher sustainability category, whereas negative coefficients indicated a greater likelihood of perceiving workload as less sustainable.

Model adequacy was assessed by examining overall model fit statistics and the proportional odds assumption using the test of parallel lines and graphical assessment of cumulative logits. No evidence of violation of the proportional odds assumption was detected, supporting the use of the ordinal logistic regression model. All quantitative analyses were conducted using the Statistical Package for the Social Sciences v17 (IBM Corp; <https://www.ibm.com/products/spss-statistics>).

Open-text responses from the self-assessment survey were analyzed using a reflexive thematic approach²⁶. Two researchers (SW and UO) independently reviewed and inductively coded the data, identifying recurring patterns related to workload experiences, sustainability perceptions, and adaptation strategies.

Themes were refined through iterative discussions, and illustrative quotes were extracted to capture participants' perspectives. The qualitative findings were subsequently integrated with the quantitative results using an explanatory triangulation approach to provide contextual understanding of the observed statistical associations, consistent with established mixed-methods integration principles^{27,28}.

Ethics approval

This study was approved by the University of Saskatchewan Behavioural Research Ethics Board (Beh ID: E499). The original data were collected as part of the SIPPA program evaluation and ongoing physician monitoring. All participants provided informed consent to participate in ongoing program evaluation activities, including the use of anonymized data for secondary analysis.

Results

Participant characteristics

A total of 87 ITP physicians working in rural Saskatchewan participated in the workload sustainability study. Most participants (69/87; 79.3%) reported working eight or fewer ED shifts per month, with 24-hour ED shifts being most common (52/87; 59.8%). Nearly half (40/87; 46.0%) reported working three or more consecutive days over weekends, and 69% (60/87) reported not receiving post-call time off.

In terms of clinical workload, 41.4% (36/87) of physicians saw 15–20 patients per day in clinic, while 26.4% (23/87) reported very high patient loads (more than 20 patients daily). More than two-thirds (59/87; 68%) of participants worked more than 60 hours weekly, and most (73/87; 83.9%) spent at least 2 hours daily on administrative/charting tasks. Concurrent roles were common: 88.5% (77/87) managed other responsibilities alongside ED duties such as inpatient consultations (60/87; 69.0%), long-term care patient consultations (57/87; 65.5%), prescription refills (44/87; 50.6%), telephone consults (34/87; 39.1%), simultaneous regular clinic consultations (23/87; 26.4%), and walk-in clinic coverage (20/87; 23.0%).

Notably, only one in four physicians (22/87; 25.3%) rated their workload as sustainable, nearly half (43/87; 49.4%) reported it as somewhat sustainable, while another 25.3% (22/87) classified it as unsustainable. Over one-third reported that their workload negatively affected their personal wellness (30/87; 34.5%) and perceived quality of care (22/87; 32.2%). See Table 1 for more details.

Table 1: Workload characteristics of participating internationally trained physicians practicing in rural Saskatchewan, Canada (N=87)

Characteristic	Variable	n (%) / median (IQR)
ED shifts per month	0–8	69 (79.3)
	≥9	18 (20.7)
ED shift length (hours)	<12	14 (16.1)
	12	21 (24.1)
	24	52 (59.8)
Consecutive ED weekend workdays (days)	1–2	47 (54.0)
	≥3	40 (46.0)
Clinic patients per day	<15	8 (9.2)
	15–20	36 (41.4)
	>20	23 (26.4)

Weekly clinical time (hours)	<60	28 (32.2)
	60–80	36 (41.4)
	>80	23 (26.4)
Perceived workload sustainability	Not sustainable	22 (25.3)
	Somewhat sustainable	43 (49.4)
	Sustainable	22 (25.3)
Post-call time off	Yes	27 (31.0)
	No	60 (69.0)
Number of patients seen after midnight (no post-call time off)	0 or 1	42 (48.3)
	2	13 (14.9)
	3	15 (17.2)
	≥4	17 (19.5)
Concurrent ED responsibilities [†]	None	10 (11.5)
	Telephone consultations	34 (39.1)
	Prescription refills	44 (50.6)
	Inpatient care	60 (69.0)
	Long-term care	57 (65.5)
	Walk-in clinic	20 (23.0)
	Simultaneous clinic duties	23 (26.4)
Charting/administrative time per day (hours)	<1	14 (16.1)
	2	37 (42.5)
	3	23 (26.4)
	≥4	13 (14.9)
Perceived impact of workload on quality of care	Affects quality of care	22 (32.2)
	Sometimes affects quality of care	46 (52.9)
	Does not affect quality of care	19 (21.8)
Perceived impact of workload on personal wellness	Affects wellness	30 (34.5)
	Sometimes affects wellness	39 (44.8)
	Does not affect wellness	18 (20.7)
Uncomplicated patients (%)		50.0 (30.0–65.0)
Complex patients (%)		50.0 (35.0–70.0)

[†] Concurrent ED responsibilities were not mutually exclusive; participants could report more than one responsibility.
IQR, interquartile range.

Bivariate associations between workload characteristics and perceived sustainability

Bivariate analyses revealed several workload variables associated with perceptions of sustainability. ED shift length showed a statistically significant association with sustainability ratings ($p=0.035$), with 77.3% of physicians reporting unsustainable workloads also reporting 24-hour shifts.

Post-call time off was more commonly reported among those with sustainable workloads (77.3%) compared to only 40.9% among those reporting unsustainable workloads. While not statistically significant, physicians with lower daily patient loads and less administrative burden trended toward reporting greater sustainability. Physicians who reported their workload negatively affected either the quality of care ($p<0.0001$) or their personal wellness ($p<0.0001$) were significantly more likely to view their workload as unsustainable (Table 2).

Table 2: Bivariate associations between workload characteristics and perceived workload sustainability among participating internationally trained physicians practicing in rural Saskatchewan, Canada (N=87)

Characteristic	Variable	Not sustainable (n=22) n (%) / median (IQR)	Somewhat sustainable (n=43) n (%) / median (IQR)	Sustainable (n=22) n (%)	p-value [†]
ED shifts per month	0–8	18 (81.8)	33 (76.7)	18 (81.8)	0.845
	≥9	4 (18.2)	10 (23.3)	4 (18.2)	
ED shift length (hours)	<12	1 (4.5)	7 (16.3)	6 (27.3)	0.035*
	12	4 (18.2)	10 (23.3)	7 (31.8)	
	24	17 (77.3)	26 (60.5)	9 (40.9)	
Consecutive ED weekend workdays (days)	1 or 2	11 (50.0)	21 (48.8)	15 (68.2)	0.308
	≥3	11 (50.0)	22 (51.2)	7 (31.8)	
Clinic patients per day	<15	2 (9.1)	3 (7.0)	3 (13.6)	0.597
	15–20	12 (54.5)	19 (44.2)	7 (31.8)	
	>20	8 (36.4)	21 (48.8)	12 (54.5)	

Weekly clinical time (hours)	<60	6 (27.3)	15 (34.9)	7 (31.8)	0.630
	60–80	9 (40.9)	15 (34.9)	12 (54.5)	
	>80	7 (31.8)	13 (30.2)	3 (13.6)	
Post-call time off	Yes	9 (40.9)	13 (30.2)	17 (77.3)	0.426
	No	13 (59.1)	30 (69.8)	5 (22.7)	
Number of patients seen after midnight (no post-call time off)	0 or 1	8 (36.4)	20 (46.5)	14 (63.6)	0.530
	2	5 (22.7)	7 (16.3)	1 (4.5)	
	3	5 (22.7)	7 (16.3)	3 (13.6)	
	≥4	4 (18.2)	9 (20.9)	4 (18.2)	
Concurrent ED responsibilities [†]	None	3 (13.6)	2 (4.7)	5 (22.7)	0.093
	Telephone consultations	10 (45.5)	18 (41.9)	6 (27.3)	0.410
	Prescription refills	13 (59.1)	24 (55.8)	7 (31.8)	0.125
	Inpatient care	17 (77.3)	30 (69.8)	13 (59.1)	0.426
	Long-term care	16 (72.7)	29 (67.4)	12 (54.5)	0.421
	Walk-in clinic	4 (18.2)	14 (32.6)	2 (9.1)	0.088
	Simultaneous clinic duties	8 (36.4)	13 (30.2)	2 (9.1)	0.092
Charting/administrative time per day (hours)	<1	2 (9.1)	7 (16.3)	5 (22.7)	0.630
	2	10 (45.5)	21 (48.8)	6 (27.3)	
	3	5 (22.7)	10 (23.3)	8 (36.4)	
	≥4	5 (22.7)	5 (11.6)	3 (13.6)	
Perceived impact of workload on quality of care	Affects quality of care	14 (63.6)	7 (16.3)	1 (4.5)	<0.001***
	Sometimes affects quality of care	8 (36.4)	31 (72.1)	7 (31.8)	
	Does not affect quality of care	0 (0.0)	5 (11.6)	14 (63.6)	
Perceived impact of workload on personal wellness	Affects wellness	19 (86.4)	9 (20.9)	2 (9.1)	<0.001***
	Sometimes affects wellness	3 (13.6)	30 (69.8)	6 (27.3)	
	Does not affect wellness	0 (0.0)	4 (9.3)	14 (63.6)	
Patient complexity (%)	Uncomplicated	45.0 (28.8–60.0)	50.0 (30.0–60.0)	52.5 (47.5–71.3)	0.179
	Complex	55.0 (40.0–71.3)	50.0 (40.0–70.0)	50.0 (28.6–52.5)	0.200

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

[†] p -values were obtained using Kruskal–Wallis tests for ordinal and continuous variables and χ^2 or Fisher's exact tests for categorical variables, as appropriate.

[‡] Concurrent ED responsibilities were not mutually exclusive.

IQR, interquartile range.

Multivariable associations between workload characteristics and perceived workload sustainability

The multivariable ordinal logistic regression model demonstrated good overall fit (pseudo $R^2=0.763$), and the proportional odds assumption was satisfied. Several workload-related factors remained independently associated with perceived workload sustainability after adjustment for other workload characteristics (Table 3). Because workload sustainability was modelled as a three-level ordinal outcome ('not sustainable', 'somewhat sustainable', and 'sustainable'), the reported associations reflect progressively greater or lower odds of perceiving one's workload as more sustainable across this continuum.

Lack of post-call time off was independently associated with lower perceived workload sustainability. Similarly, physicians who reported that their workload adversely affected the quality of care they provided or their personal wellness were significantly less

likely to perceive their workload as sustainable. Among all workload characteristics examined, perceived adverse impact on personal wellness demonstrated the strongest association with lower perceived workload sustainability.

Conversely, physicians were more likely to perceive their workload as sustainable if they worked fewer than nine ED shifts per month, saw fewer than 15 clinic patients per day, and did not undertake simultaneous clinic duties while covering ED shifts.

After adjustment for other workload characteristics – ED shift length, consecutive weekend workdays, weekly clinical hours, number of patients seen after midnight, charting, and administrative workload – other concurrent ED responsibilities (telephone consultations, inpatient care, prescription refills, long-term care coverage, and walk-in clinic duties) and the proportion of complex versus uncomplicated patients were not significantly associated with perceived workload sustainability. Adjusted regression coefficients, 95% confidence intervals, and p -values for all variables included in the model are presented in Table 3.

Table 3: Multivariable ordinal logistic regression examining factors associated with perceived workload sustainability among internationally trained physicians practicing in rural Saskatchewan (N=87)

Variable [†]	Comparison (reference)	Adjusted $\beta^{\ddagger}$	95%CI	p -value
ED shifts/month	0–8 v ≥ 9	3.013	0.805–5.222	0.007**

ED shift length (hours)	<12 v 24	0.966	-1.141-3.072	0.369
	12 v 24	0.404	-1.435-2.243	0.667
Consecutive ED weekend workdays (days)	1-2 v ≥3	0.963	-0.984-2.909	0.332
Clinic patients/day	<15 v >20	3.564	0.299-6.829	0.032*
	15-20 v >20	0.811	-0.797-2.418	0.323
Weekly clinical time (hours)	<60 v >80	-1.084	-3.157-0.988	0.305
	60-80 v >80	-0.999	-2.752-0.754	0.264
Post-call time off	No v Yes	-2.183	-3.804--0.562	0.008**
Number of patients after midnight	0 or 1 v ≥4	0.393	-1.858-2.645	0.732
	2 v ≥4	-0.822	-4.080-2.436	0.621
	3 v ≥4	0.739	-1.652-3.130	0.545
Concurrent ED responsibilities	Telephone (No v Yes)	-0.453	-2.728-1.822	0.696
	Prescription refills (No v Yes)	0.578	-1.703-2.859	0.620
	Inpatient care (No v Yes)	-1.281	-3.835-1.272	0.325
	Long-term care (No v Yes)	0.168	-1.844-2.180	0.870
	Walk-in clinic (No v Yes)	-0.431	-2.515-1.654	0.685
	No simultaneous clinic duties v Yes	3.144	1.152-5.135	0.002**
Charting/administrative time/day (hours)	<1 v ≥4	0.844	-1.873-3.562	0.542
	2 v ≥4	-0.217	-2.382-1.949	0.844
	3 v ≥4	1.756	-0.392-3.904	0.109
Impact on quality of care	Affects v Does not affect	-3.011	-5.647--0.375	0.025*
	Sometimes affects v Does not affect	-2.159	-4.275--0.044	0.045*
Impact on personal wellness	Affects v Does not affect	-6.903	-10.255--3.550	<0.001***
	Sometimes affects v Does not affect	-3.663	-6.099--1.227	0.003**
Patient complexity	Uncomplicated (%)	-0.140	-0.773-0.493	0.665
	Complex (%)	-0.130	-0.756-0.496	0.684

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

† Variables were selected for inclusion based on theoretical relevance and/or evidence of association in bivariate analyses ($p < 0.15$) and entered simultaneously into a multivariable ordinal logistic regression model (forced-entry approach).

‡ Outcome categories were coded as 1 = not sustainable, 2 = somewhat sustainable, 3 = sustainable. Positive adjusted β coefficients indicate greater odds of reporting a higher (more sustainable) workload category, whereas negative coefficients indicate greater odds of reporting a lower (less sustainable) workload category. β , regression coefficient. CI, confidence interval.

Qualitative findings

A total of 41 participants provided free-text responses regarding their experiences with clinical workload. Thematic analysis revealed seven overarching themes (see Table 4 for further description).

- theme 1: unmanageable workload and call schedules, often characterized by long shifts and lack of recovery time
- theme 2: role-based differences, with ED work perceived as less sustainable than clinic work
- theme 3: contextual modulation of workload based on seasonal patterns or staffing changes
- theme 4: staff turnover (ie understaffing and staff attrition), affecting workload distribution and team capacity
- theme 5: signs of burnout, including emotional exhaustion and perceived errors in care
- theme 6: adaptation and resilience, with some physicians reporting improved sustainability over time
- theme 7: administrative burden, particularly related to documentation after clinical hours.

See Table 4 for exemplar quotes and subthemes.

Table 4: Themes identified from physicians' open-ended reflections on workload sustainability (N=87)

Theme	Summary	Illustrative quotations
1. Unmanageable workload and call schedules	Excessive on-call duties, long shifts, inadequate recovery time, and resulting exhaustion were frequently described as contributing to unsustainable workloads.	'24 ED difficult with no time off afterwards; 60-80 hours/week.' 'Too much on call - 10 days/month; only two MDs in community.'
2. Variability in sustainability by role (clinic v ED)	Clinic practice was generally perceived as more sustainable than ED work, particularly when both roles were performed concurrently.	'Clinic sustainable / ED not sustainable.' 'Clinic could do it forever; really enjoys ED but simultaneous clinic is seldom sustainable.'
3. Workload moderated by season or practice context	Seasonal changes and local community activities influenced patient volume and perceptions of workload intensity.	'Workload slightly less as people are busy on the farms.' 'Summer is busy because of activities around the lake.'

4. Staffing changes and workforce turnover	Changes in physician staffing affected workload sustainability, with shortages increasing workload and additional support improving sustainability.	'Only two MDs (was originally five); virtual physician support introduced to ER.' 'two SIPPA doctors will be leaving in Oct ... only one left at the clinic plus NP.'
5. Work-life imbalance and burnout	Physicians described emotional fatigue, poor work-life balance, and concerns about fatigue-related clinical errors.	'Work-life balance poor; workload too heavy.' 'Medication error where 60 units of insulin were given instead of 6.'
6. Adaptation and resilience over time	Several physicians reported improved confidence, adjustment, and satisfaction as they became more familiar with their communities and practice environments.	'Difficult initially, but now well adjusted.' 'Much better than before – more familiar with the community/patients.'
7. Administrative burden	Documentation and administrative responsibilities frequently extended beyond clinical hours and contributed to workload burden.	'Heavy workload – lots of admin work.' 'Workload is somewhat sustainable apart from documentation after hours.'

NP, nurse practitioner. SIPPA, Saskatchewan International Physician Practice Assessment.

Triangulation of quantitative and qualitative findings

Our qualitative findings were not intended to stand alone but rather to provide explanatory context for the quantitative results. Overall, the qualitative and quantitative findings converged to demonstrate that perceived workload sustainability is shaped by both organizational factors (eg scheduling, workload distribution, and opportunities for recovery) and physician experiences (eg wellness, work-life balance, and adaptation to practice).

Theme 1 (unmanageable workload and inadequate post-call recovery) reinforced the quantitative finding that lack of post-call time off was associated with lower perceived workload sustainability. Theme 2 (clinic versus ED work) aligned with the finding that physicians working fewer ED shifts reported greater workload sustainability, highlighting the influence of workload type in addition to workload volume. Qualitative accounts of dual

or overlapping responsibilities further supported the association between simultaneous clinic duties during ED shifts and lower perceived workload sustainability.

Theme 5 (work-life imbalance and burnout) reflected the quantitative associations between perceived workload sustainability, physician wellness, and quality of care. Although administrative burden (theme 7) was not independently associated with workload sustainability in the regression model, physicians consistently described documentation as an important contributor to workload burden, suggesting that it may represent a pervasive challenge with limited variability across participants. Theme 4 (staffing changes and workforce turnover), theme 3 (seasonal and contextual influences), and theme 6 (adaptation and resilience over time) identified important contextual factors that were not directly captured in the quantitative model but may influence physicians' perceptions of workload sustainability over time. Table 5 presents the integrated interpretation of these findings.

Table 5: Integration of qualitative themes and quantitative findings on physician workload sustainability

Qualitative theme	Supporting quantitative finding	Integrated interpretation
Unmanageable workload and post-call recovery	Lack of post-call time off was independently associated with lower perceived workload sustainability.	Physicians consistently described inadequate recovery following prolonged ED shifts as a major contributor to unsustainable workloads, reinforcing the importance of post-call recovery as a modifiable organizational factor.
Clinic versus ED workload	Working fewer than nine ED shifts per month was associated with greater perceived workload sustainability.	Physicians distinguished clinic work from ED practice, consistently describing ED duties as less sustainable. Together, the findings suggest that the nature of clinical work, rather than workload volume alone, influences perceived sustainability.
Concurrent responsibilities and administrative burden	Physicians without simultaneous clinic duties during ED shifts reported greater workload sustainability. Administrative workload was not independently associated with sustainability.	Qualitative accounts suggest that overlapping/dual clinical responsibilities are particularly burdensome. Although administrative workload was not statistically associated with sustainability, physicians consistently described documentation as contributing to workload burden, suggesting it may be a ubiquitous challenge with limited variability across participants.
Burnout and emotional distress	Perceived adverse effects of workload on quality of care and personal wellness were independently associated with lower workload sustainability, with wellness demonstrating the strongest association.	Physicians' narratives reinforce the close relationship between excessive workload, declining wellbeing, and concerns about patient care, highlighting physician wellness as central to sustainable rural practice.
Adaptation and resilience over time	Not quantitatively assessed.	Several physicians described becoming more confident and better adapted over time, which suggests that resilience and familiarity with the practice environment may improve perceived workload sustainability. These findings warrant longitudinal investigation.
Staffing and contextual influences	Not quantitatively assessed.	Staffing shortages, physician turnover, and seasonal fluctuations emerged as important contextual influences on workload. These factors were not measured quantitatively but may modify physician perceptions of workload sustainability and should be explored in future studies.

Discussion

This study examined workload-related factors associated with perceived workload sustainability among ITPs practicing in rural Saskatchewan. We identified several interrelated factors shaping physicians' perceptions of sustainable practice, including post-call recovery, physician wellness, ED workload, overlapping clinical

responsibilities, staffing context, and adaptation over time. Our findings, overall, suggested that perceived workload sustainability was influenced by the volume of clinical work as well as how work was organized and experienced within rural practice settings.

We found that additional tasks overlapping with ED shifts were associated with lower perceived workload sustainability among rural ITPs. This finding aligns with research showing that ED physicians experience frequent interruptions (estimated at 7.5 to 10.9 per hour), which are associated with increased error rates and reduced quality of care²⁹⁻³¹. Specifically, interruptions during prescribing have been associated with a 2.8-fold increase in errors, while multitasking further increases error risk (risk ratio = 1.86)³². Cognitive science literature has reinforced these observations, demonstrating that task switching (even between predictable tasks) slows reaction times and increases errors³³. Overall, these findings provide a plausible explanation for our observation that physicians reporting greater workload-related impacts on quality of care were also less likely to perceive their workload as sustainable, as they suggest that workflow fragmentation and dual clinical roles within rural ED practice may contribute to both perceived compromises in patient care and lower workload sustainability^{32,34}. As such, interventions aimed at reducing task switching and dual (or multiple) clinical roles during ED shifts may therefore improve both physician sustainability and patient care.

Beyond workload organization during ED shifts, adequate recovery time also emerged as an important determinant of perceived sustainability. Sleep deprivation has been associated with impaired memory consolidation, poorer mental health, fatigue, and increased clinical errors^{35,36}. In addition, the widespread use of electronic medical records often extends documentation and administrative tasks beyond scheduled clinical hours, further affecting physician wellness^{35,36}. This also aligned with our qualitative findings, where physicians consistently described after-hours documentation as an important contributor to workload burden. Interestingly, although administrative work emerged as a prominent qualitative theme, charting and administrative time were not independently associated with perceived workload sustainability in the adjusted regression model. One possible explanation is that administrative work was nearly universal within this cohort, with most physicians reporting at least 2 hours of documentation or administrative work each day. As such, the limited variability in exposure may have reduced our model's ability to detect statistically significant differences, despite physicians consistently perceiving these responsibilities as burdensome. Alternatively, it is plausible that documentation may be viewed as an expected component of rural practice, whereas inadequate recovery time, ED commitments, and overlapping clinical responsibilities may be more influential determinants of whether physicians perceive their workload as sustainable.

Our findings also showed that physician wellness was the factor most strongly associated with perceived workload sustainability. This may be particularly important for ITPs practicing in rural communities, who often navigate additional challenges beyond clinical workload, including adapting to a new healthcare system, establishing professional and social networks, and, for many, adjusting to cultural differences while living far from extended family and established support systems. Our previous studies have also identified experiences of discrimination, professional isolation, and community integration as important influences on rural ITP retention and wellbeing^{2,13,21,22}. Although these factors were not directly measured in the present study, they may interact with workload demands to amplify the impact of poor wellness on perceptions of workload sustainability. These further reinforce the

need to support physician wellness as part of rural workforce sustainability strategies. Rural physicians often have fewer opportunities to access formal wellness initiatives than their urban counterparts³⁷. Interventions such as mindfulness training, self-care programs, resilience-building initiatives, mentorship, and organizational supports have demonstrated benefits in reducing physician burnout and may be particularly valuable for rural ITPs navigating the transition to independent practice^{37,38}.

We also found that rural ITPs working fewer than nine ED shifts per month were more likely to perceive their workload as sustainable, while qualitative findings identified ED work as less sustainable than clinic practice. Previous research suggests that emergency physicians experience poorer sleep quality and spend approximately half of their shifts in a state of heightened alertness, both of which contribute to fatigue³⁹. Similarly, a Swiss study reported that each additional in-person ED night shift was associated with a progressive increase in the likelihood of physician burnout⁴⁰. These suggest that reducing ED shift frequency may enhance workload sustainability by providing greater opportunities for mental and physical recovery. Despite these workload factors associated with lower perceived sustainability, our study highlighted the resilience and adaptability of rural ITPs. Several physicians described becoming more confident and perceiving their workloads as increasingly sustainable as they became more familiar with their communities, colleagues, and practice environments. Notably, nearly half of the physicians in this study rated their workload as somewhat sustainable, suggesting that many occupy a transitional middle ground rather than experiencing either clearly sustainable or unsustainable practice. Our qualitative findings further indicated that this intermediate state may be particularly sensitive to contextual influences such as staffing shortages, workforce turnover, and seasonal fluctuations in workload. Conversely, improved team functioning, community integration, and adaptation to rural practice may shift perceptions toward greater sustainability over time.

Practical implications

Our study findings have important implications for rural physician workforce planning and retention. Because several factors associated with perceived workload sustainability (including post-call recovery, ED shift frequency, and dual clinical responsibilities) are potentially modifiable, targeted organizational and policy interventions may improve both physician wellbeing and the quality of care delivered. Strategies such as providing protected post-call recovery time, minimizing simultaneous clinic and ED duties, and strengthening organizational, mentorship, and community supports for internationally trained physicians may enhance long-term workforce sustainability. Importantly, the large proportion of physicians reporting their workload as 'somewhat sustainable' suggests that many are practicing in a transitional state, where relatively modest organizational improvements may help shift perceptions toward sustainable long-term rural practice and support physician retention.

Study strengths and limitations

This study provides novel insights into the workload-related factors associated with perceived workload sustainability among ITPs practicing in rural Saskatchewan. Drawing on a prospectively collected dataset from the SIPP program, our study integrates

structured survey data with open-ended physician reflections, enabling triangulation of quantitative associations and qualitative experiences. The use of ordinal logistic regression allowed examination of workload sustainability across three ordered categories, preserving important distinctions that would have been lost through dichotomization. Furthermore, the study is grounded in real-world data from a provincially coordinated physician integration program, enhancing the practical relevance of the findings for rural workforce planning and policy.

Several limitations should be considered when interpreting these findings. Although the data were drawn from a longitudinally monitored cohort, the present analysis was cross-sectional, representing a single point in time rather than changes in workload sustainability over time. As such, the observed associations should not be interpreted as causal relationships. In addition, all workload measures, including the primary outcome of perceived workload sustainability, were self-reported and therefore subject to recall bias, response bias, and individual interpretation. Although the three-level ordinal measure demonstrated good face validity and allowed differentiation between sustainable, somewhat sustainable, and unsustainable workloads, it may not fully capture the multidimensional nature of physician sustainability, which encompasses wellbeing, quality of care, professional fulfillment, and career longevity. Likewise, several workload indicators (eg post-call recovery time, ED shifts, and patient volume) served as proxies for workload intensity and may not fully reflect less visible aspects of practice such as moral distress, cognitive load, or decision fatigue.

Additionally, although our sample represents a substantial proportion of SIPPA-trained ITPs practicing in rural Saskatchewan, the modest sample size may have limited statistical power to detect smaller associations or explore interactions between workload factors. Similarly, Saskatchewan's physician integration model, return-of-service policies, and rural practice context may differ from those in other provinces or countries, limiting the generalizability of the findings beyond comparable settings.

The qualitative component enriched interpretation of the quantitative findings but was based on brief responses to a single open-ended survey question and therefore lacked the depth achievable through interviews or focus groups. Also, residual confounding remains possible, as several potentially important influences on workload sustainability (including team dynamics,

organizational culture, community integration, resilience, and social support) were not directly measured. Despite these limitations, this study provides important practice-relevant evidence on modifiable organizational factors associated with perceived workload sustainability among rural ITPs.

Conclusion

This study highlights that specific workload factors, including frequent ED shifts, lack of post-call recovery time, dual clinical responsibilities, and poorer physician wellness, are independently associated with lower perceived workload sustainability among rural ITPs in Saskatchewan. In this study, workload sustainability reflects physicians' perceived ability to maintain their clinical workload over time without compromising their personal wellbeing or the quality of care they provide and may serve as an early indicator of future workforce instability. With nearly half of participants reporting their workload as somewhat sustainable, there is a clear opportunity for early organizational intervention before workloads become perceived as unsustainable. Modifiable system-level strategies, including optimizing scheduling, protecting post-call recovery time, reducing dual clinical responsibilities, and strengthening organizational supports, may improve physician wellbeing and contribute to long-term rural workforce sustainability. Given the essential role of ITPs in delivering rural health care, our study findings provide practical evidence to inform physician support strategies, workforce planning, and retention policies aimed at sustaining high-quality care in underserved communities.

Acknowledgements

We gratefully acknowledge the physicians who participated in this study, as well as the SIPPA staff (including Grace Sui and Obianuju Asiodu) for their support with data collation and cleaning.

Funding

Funding was provided by SIPPA.

Conflicts of interest

The authors report no conflicts of interest.

AI disclosure statement

Grammarly was used to improve the clarity and grammar of sections of the manuscript. No content was generated by AI. All ideas, interpretations, and conclusions are the authors' own.

References

- 1 Malko A, Huckfeldt V. Physician shortage in Canada: a review of contributing factors. *Global Journal of Health Science* 2017; **9(9)**: 68.
<https://doi.org/10.5539/gjhs.v9n9p68>
- 2 Okpalauwaekwe U, Fehr C, Oyedokun TO, Witt J. Factors influencing retention of international medical graduates in rural practice. *Canadian Journal of Rural Medicine* 2025; **30(1)**: 17–30.
https://doi.org/10.4103/cjrm.cjrm_6_24
<https://www.ncbi.nlm.nih.gov/pubmed/40052776>
- 3 Jolicoeur J, DeMiglio L, R Kin LN, Orrantia E. Why they leave: small town rural realities of northern physician turnover. *Canadian Journal of Rural Medicine* 2022; **27(1)**: 22–28.
https://doi.org/10.4103/cjrm.cjrm_2_21
- 4 Leiva Tobelem LF, Ynoe de Moraes F, Santos FNC. Expanding healthcare capacity in Canada: the potential of internationally trained physicians. *The Lancet Regional Health-Americas* 2025; **46**: 101095.
<https://doi.org/10.1016/j.lana.2025.101095>
<https://www.ncbi.nlm.nih.gov/pubmed/40290133>
- 5 Szafran O, Crutcher RA, Banner SR, Watanabe M. Canadian and immigrant international medical graduates. *Canadian Family Physician* 2005; **51(9)**: 1242–1243.
- 6 Okpalauwaekwe U, MacPhee BK, Balezantis L, Mahani A, Zarzeczny A, Ramsden VR, et al. Facilitators, barriers, and priorities

- for enhancing primary care recruitment and retention in Saskatchewan, Canada. *BMC Primary Care* 2025; **26(1)**: 373. <https://doi.org/10.1186/s12875-025-03049-9> <https://www.ncbi.nlm.nih.gov/pubmed/41266998>
- 7** Handoyo NE, Claramita M, Keraf MKPA, Ash J, Schuwirth L, Rahayu GR. The importance of developing meaningfulness and manageability for resilience in rural doctors. *Medical Teacher* 2023; **45(1)**: 32–39. <https://doi.org/10.1080/0142159X.2022.2128734> <https://www.ncbi.nlm.nih.gov/pubmed/36202102>
- 8** Hansen N, Jensen K, MacNiven I, Pollock N, D'Hont T, Chatwood S. Exploring the impact of rural health system factors on physician burnout: a mixed-methods study in Northern Canada. *BMC Health Services Research* 2021; **21(1)**: 869. <https://doi.org/10.1186/s12913-021-06899-y> <https://www.ncbi.nlm.nih.gov/pubmed/34433434>
- 9** Harry ML, Sudak NL, Engels MJ, Horn KK, Dean K, Poplau S, et al. Physician and advanced practice clinician burnout in rural and urban settings. *The Journal of the American Board of Family Medicine* 2024; **37(1)**: 43–58. <https://doi.org/10.3122/jabfm.2023.230233R1> <https://www.ncbi.nlm.nih.gov/pubmed/38448238>
- 10** McClafferty HH, Hubbard DK, Foradori D, Brown ML, Profit J, Tawfik DS, et al. Physician health and wellness. *Pediatrics* 2022; **150(5)**: e2022059665. <https://doi.org/10.1542/peds.2022-059665> <https://www.ncbi.nlm.nih.gov/pubmed/36278292>
- 11** Fleming P, Sinnot ML. Rural physician supply and retention: factors in the Canadian context. *Canadian Journal of Rural Medicine* 2018; **23(1)**: 15–20.
- 12** Fleming P, Mathews M. Retention of specialist physicians in Newfoundland and Labrador. *Open Medicine* 2012; **6(1)**: e1–e9.
- 13** Okpalauwaekwe U, MacPhee BK, Balezantis L, Ramsden VR, Baerwald A. To stay or leave: an integrative review of factors, personas, and recommendations for retaining family physicians in Canada. *BMC Primary Care* 2025; **27(1)**: 6. <https://doi.org/10.1186/s12875-025-03128-x> <https://www.ncbi.nlm.nih.gov/pubmed/41327059>
- 14** Ostini R, McGrail MR, Kondalsamy-Chennakesavan S, Hill P, O'Sullivan B, Selvey LA, et al. Building a sustainable rural physician workforce. *Medical Journal of Australia* 2021; **215(Suppl1)**: S5–S33. <https://doi.org/10.5694/mja2.51122> <https://www.ncbi.nlm.nih.gov/pubmed/34218436>
- 15** Alexander C. Why doctors would stay in rural practice in the New England health area of New South Wales. *Australian Journal of Rural Health* 1998; **6(3)**: 136–139. <https://doi.org/10.1111/j.1440-1584.1998.tb00299.x> <https://www.ncbi.nlm.nih.gov/pubmed/9883107>
- 16** Kumar S, Clancy B. Retention of physicians and surgeons in rural areas – what works? *Journal of Public Health (Oxford)* 2021; **43(4)**: e689–e700. <https://doi.org/10.1093/pubmed/fdaa031> <https://www.ncbi.nlm.nih.gov/pubmed/32140721>
- 17** Kolhatkar A, Keesey A, Bluman B, Lynn B, Wilkinson T. Understanding how emergency medicine physicians survive and thrive in rural practice: a theoretical model. *Rural and Remote Health* 2017; **17(4)**: 4285. <https://doi.org/10.22605/RRH4285> <https://www.ncbi.nlm.nih.gov/pubmed/29145728>
- 18** Lafortune C, Gustafson J. Interventions to improve recruitment and retention of physicians in rural and remote Canada: a systematic review. *University of Western Ontario Medical Journal* 2019; **88(1)**: 6184. <https://doi.org/10.5206/uwomj.v88i1.6184>
- 19** Malau-Aduli BS, Smith AM, Young L, Sen Gupta T, Hays R. To stay or go? Unpacking the decision-making process and coping strategies of international medical graduates practising in rural, remote, and regional Queensland, Australia. *PLOS One* 2020; **15(6)**: e0234620. <https://doi.org/10.1371/journal.pone.0234620> <https://www.ncbi.nlm.nih.gov/pubmed/32544199>
- 20** Cameron PJ, Este DC, Worthington CA. Physician retention in rural Alberta: key community factors. *Canadian Journal of Public Health* 2010; **101(1)**: 79–82. <https://doi.org/10.1007/BF03405568> <https://www.ncbi.nlm.nih.gov/pubmed/20364544>
- 21** Okpalauwaekwe U, Holinaty C, Smith-Windsor T, Barton JW, MacLean C. From field of dreams to back to the future? Exploring barriers to participating in continuing professional development (CPD) programs. *BMC Medical Education* 2024; **24(1)**: 106. <https://doi.org/10.1186/s12909-024-05038-5> <https://www.ncbi.nlm.nih.gov/pubmed/38302979>
- 22** Okpalauwaekwe U, Holinaty C, Smith-Windsor T, Barton JW, MacLean C. Beyond the surface: exploring how racism, disconnectedness and exclusion shape faculty engagement in continued professional development (CPD). *Journal of Racial and Ethnic Health Disparities* 2026. <https://doi.org/10.1007/s40615-025-02814-x> <https://www.ncbi.nlm.nih.gov/pubmed/41557104>
- 23** Continuing Medical Education. *Clinical field assessment*. University of Saskatchewan, 2025. <https://cmelearning.usask.ca/specialized-programs/sippa/application-information/clinical-field-assessment.php> (Accessed 25 June 2026).
- 24** Saskatchewan College of Family Physicians. *Saskatchewan International Physician Practice Assessment Program – SIPPA*. Saskatchewan College of Family Physicians, 2024. <https://saskcfp.ca/awards/saskatchewan-international-physician-practice-assessment-program-sippa> (Accessed 25 June 2026).
- 25** Okpalauwaekwe U, Rana M, Tzeng HM. Regional patterns of multimorbidity and hospitalization in Saskatchewan's aging population. *Healthcare (Basel)* 2026; **14(2)**: 191. <https://doi.org/10.3390/healthcare14020191> <https://www.ncbi.nlm.nih.gov/pubmed/41595327>
- 26** Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research Psychology* 2006; **3(2)**: 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- 27** Creswell JW, Plano Clark VL. *Designing and conducting mixed methods research*. 3rd edn. SAGE Publications, 2017.
- 28** Feters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs – principles and practices. *Health Services Research* 2013; **48(6 Pt 2)**: 2134–2156.

<https://doi.org/10.1111/1475-6773.12117>

<https://www.ncbi.nlm.nih.gov/pubmed/24279835>

29 Weigl M, Beck J, Wehler M, Schneider A. Workflow interruptions and stress at work: a mixed-methods study among physicians and nurses of a multidisciplinary emergency department. *BMJ Open* 2017; **7(12)**: e019074.

<https://doi.org/10.1136/bmjopen-2017-019074>

<https://www.ncbi.nlm.nih.gov/pubmed/29275350>

30 Weigl M, Catchpole K, Wehler M, Schneider A. Workflow disruptions and provider situation awareness in acute care: an observational study with emergency department physicians and nurses. *Applied Ergonomics* 2020; **88**: 103155.

<https://doi.org/10.1016/j.apergo.2020.103155>

<https://www.ncbi.nlm.nih.gov/pubmed/32678775>

31 Weigl M, Müller A, Holland S, Wedel S, Woloshynowych M. Work conditions, mental workload and patient care quality: a multisource study in the emergency department. *BMJ Quality & Safety* 2016; **25(7)**: 499–508.

<https://doi.org/10.1136/bmjqs-2014-003744>

<https://www.ncbi.nlm.nih.gov/pubmed/26350066>

32 Westbrook JL, Raban MZ, Walter SR, Douglas H. Task errors by emergency physicians are associated with interruptions, multitasking, fatigue and working memory capacity: a prospective, direct observation study. *BMJ Quality & Safety* 2018; **27(8)**: 655–663.

<https://doi.org/10.1136/bmjqs-2017-007333>

<https://www.ncbi.nlm.nih.gov/pubmed/29317463>

33 Skaugset LM, Farrell S, Carney M, Wolff M, Santen SA, Perry M, et al. Can you multitask? Evidence and limitations of task switching and multitasking in emergency medicine. *Annals of Emergency Medicine* 2016; **68(2)**: 189–195.

<https://doi.org/10.1016/j.annemergmed.2015.10.003>

<https://www.ncbi.nlm.nih.gov/pubmed/26585046>

34 Westbrook JL, Woods A, Rob MI, Dunsmuir WT, Day RO. Association of interruptions with an increased risk and severity of medication administration errors. *Archives of Internal Medicine* 2010; **170(8)**: 683–690.

Supplementary material is available on the live site <https://www.rrh.org.au/journal/article/10907/#supplementary>

<https://doi.org/10.1001/archinternmed.2010.65>

<https://www.ncbi.nlm.nih.gov/pubmed/20421552>

35 Malmberg B, Kecklund G, Karlson B, Persson R, Flisberg P, Ørbaek P. Sleep and recovery in physicians on night call: a longitudinal field study. *BMC Health Services Research* 2010; **10**: 239.

<https://doi.org/10.1186/1472-6963-10-239>

<https://www.ncbi.nlm.nih.gov/pubmed/20712854>

36 Trockel MT, Menon NK, Rowe SG, Stewart MT, Smith R, Lu M, et al. Assessment of physician sleep and wellness, burnout, and clinically significant medical errors. *JAMA Network Open* 2020; **3(12)**: e2028111.

<https://doi.org/10.1001/jamanetworkopen.2020.28111>

<https://www.ncbi.nlm.nih.gov/pubmed/33284339>

37 Malik M, Penalosa M, Busch IM, Burhanullah H, Weston C, Weeks K, et al. Rural healthcare workers' well-being: a systematic review of support interventions. *Families, Systems, & Health* 2024; **42(3)**: 355–374.

<https://doi.org/10.1037/fsh0000921>

<https://www.ncbi.nlm.nih.gov/pubmed/39418422>

38 McKennon S, Fricke S, DeWitt D. Well-being interventions for rural health professionals: a scoping review. *The Journal of Rural Health* 2025; **41(1)**: e12909.

<https://doi.org/10.1111/jrh.12909>

<https://www.ncbi.nlm.nih.gov/pubmed/39757437>

39 Fowler LA, Hirsh EL, Klinefelter Z, Sulzbach M, Britt TW. Objective assessment of sleep and fatigue risk in emergency medicine physicians. *Academic Emergency Medicine* 2023; **30(3)**: 166–171.

<https://doi.org/10.1111/acem.14606>

<https://www.ncbi.nlm.nih.gov/pubmed/36239410>

40 Heymann EP, Romann V, Lim R, Van Aarsen K, Khatib N, Sauter T, et al. Physician wellbeing and burnout in emergency medicine in Switzerland. *Swiss Medical Weekly* 2024; **154**: 3421.

<https://doi.org/10.57187/s.3421>

<https://www.ncbi.nlm.nih.gov/pubmed/38753467>

This PDF has been produced for your convenience. Always refer to the live site <https://www.rrh.org.au/journal/article/10907> for the Version of Record.