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# A quality improvement initiative aimed at reducing service strain and improving physician wellness in internal medicine

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## Abstract

**Introduction** Hospital strain has been shown to negatively impact physician wellness, educational experience, and patient care. To address rising service demands, a non-academic hospitalist service was implemented to reduce daily clinical teaching unit (CTU) census by approximately 30%. Secondary aims were to evaluate physician and trainee wellness on CTU as well as assess unintended adverse patient outcomes.

**Methods** A two-phase intervention was implemented at one of two academic hospital campuses in January and April 2023. Mean daily census, mortality, 30-day readmissions, and length of stay (LOS) were obtained from an administrative database for the pre-study (October to December 2022) and study (January to December 2023) periods. The Mini-Z physician wellness survey was administered in March, June and December 2023. Data were analyzed by quarters using descriptive statistics as well as parametric and non-parametric testing, and a reflexive thematic analysis was undertaken.

**Results** A CTU census trough of 71.3 was briefly attained in the second quarter of 2023 but increased to 78.6 in the fourth quarter of 2023, while remaining below pre-intervention levels. The proportion of attendings and residents reporting burnout was significantly different at the intervention (65.2%,  $n = 15/23$ ) versus non-intervention site (94.1%,  $n = 16/17$ ) in Q4 2023 ( $p = 0.033$ ). Burnout was positively correlated with daily CTU census across both sites ( $r = 0.906$ ). There were no differences in proportion of in-hospital mortality ( $p = 0.854$ ), 30-day readmissions ( $p = 0.262$ ), or LOS ( $p = 0.977$ ) between the pre- and post-implementation periods. Qualitative analysis identified the hospitalist program as beneficial, but inadequate to address workload, education challenges, and patient safety concerns.

**Conclusion** The addition of a non-academic hospitalist service reduced CTU census numbers and improved burnout, but the improvement in service strain was limited by rising admissions. Multifaceted approaches to wellness are needed, but this study supports ongoing endeavors aimed at reducing clinical workload to optimize the clinical teaching environment.

**Keywords** Hospital medicine, Internal medicine, Quality improvement

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## Introduction

### Problem description

The Division of General Internal Medicine (GIM) at The Ottawa Hospital (TOH) has experienced a 40% increase in admissions from 2013 to 2022. The uncapped internal medicine clinical teaching units (CTU) have been disproportionately affected by increasing service demands. Internal feedback has consistently emphasized that high patient volumes on CTU, because of raising admissions, is having ongoing negative impacts on physician wellness, trainee education, and patient care.

### Available knowledge

Large academic centres are particularly vulnerable to capacity strain, defined as a supply-demand mismatch in resources required to provide care, as well as high physician workload [1]. Hospital capacity strain and excessive physician workload have both been associated with physician burnout [2] and a healthcare practitioner perception of providing low-quality care [3]. Capacity strain has also been associated with poor patient health outcomes such as increased length of stay [4], prescription errors [5], and mortality [6, 7]. In academic centers, capacity strain is also perceived as negatively affecting physicians' ability to fulfill educational and research activities [8], while additionally hindering trainee educational experience [7]. In Canada, this problem has been identified as a priority area, with workload and CTU redesign featured as a keynote topic at the national internal medicine society's annual meeting in 2023 [9].

### Rationale

Solutions to hospital strain and physician workload have been explored. Ensuring adequate staffing by maintaining a stable census across providers was perceived to be effective in addressing hospital strain at large academic centers [8], and limiting workload with a census cap reduction was shown to increase trainee educational experience, while reducing adverse patient outcomes [7, 10–12]. Nocturnist programs [13] and continuous models of admission [14] were also described as mechanisms to improve clinical workload.

Alternate interventions were considered when choosing our approach. Adding a new team staffed by the current pool of GIM attendings was not possible given human resource constraints. For instance, a non-teaching team that had been created to offload the surge of COVID patients during the pandemic was closed at the end of 2022 due to inability to ensure staffing. Creating a new team staffed by a GIM attending and a nurse practitioner or physician assistant (PA) was also considered, however, there was also no available hospital funding to support these uninsured services. In fact, our previously PA-run non-teaching team was closed in the fall 2022.

Thus, a hospitalist service, to be staffed by non-academic family physicians and internists, funded largely by the provincial insurer rather than the hospital, was determined to be the most feasible option.

### Aim

The primary aim was to achieve and maintain a mean daily CTU census of  $\leq 75$  patients (approximately 25 patients per team) at one hospital site representing a 30% relative decrease given a projected CTU census of 111.5 in 2023 with the closure of two non-teaching teams. The secondary aims were to characterize and evaluate physician wellness and trainee experience on CTU in relation to census, as well as to assess for possible adverse outcomes associated with the intervention.

## Methods

### Context

TOH is a tertiary care academic center with over 1300 beds at two campuses, the General and the Civic sites. Both campuses operate under the same leadership, have access to the same financial resourcing, and have similar patient acuity as well as proportions of medically inactive patients. Half of the GIM attendings and all internal medicine (IM) trainees work across both sites. Both campuses host three uncapped CTU teams, that are each comprised of one attending physician and variable house staff (0–1 senior internal medicine residents and 0–4 junior first year residents). There are also two  $\leq 15$ -patient non-traditional GIM teams per site that are staffed by one attending and often, a senior resident. The General campus was chosen as the intervention site given historically higher census numbers.

### Intervention

The intervention was rolled out at the General Campus site only. The GIM service continued to operate 3 CTU teams and 2 non-traditional teams (collectively referred to as "GIM"). Additionally, a new hospitalist service line was added ("hospitalist"). In phase 1, two 15-patient hospitalist teams were established in January 2023. In phase 2, a third team opened, bringing the total number of patients cared for by the hospitalist teams to 45 as of April 2023. Patients admitted to the GIM and hospitalist teams were initially assessed by the internal medicine consult service, with unstable and more medically complex patients being admitted to the GIM service. Admissions were distributed in a continuous fashion and balanced across the teams. Admission algorithms (Supplement S1) and new workflows (Supplement S2) were introduced. An existing divisional administrative dashboard that includes census, admission numbers, length of stay, and mortality was monitored for potential adverse outcomes throughout the implementation period.

Regular feedback was sought from divisional members regarding the logistics and workflow of the intervention, and issues were addressed as required. The approximate costs required to run the program over the course of the year are presented in Supplement S3.

### Outcomes

Mean daily CTU census was the primary outcome to assess the aim of improving CTU service strain. The secondary process measures of mean daily and monthly admissions, as well as the percentage of non-acute patients who remained in hospital with ongoing discharge barriers as designated by alternative level of care (ALC) [15] status, were reported for context when evaluating the intervention. Physician wellness scores as well as reported perceptions of the work environment and hospitalist program further assessed the impact of the intervention. Finally, in-hospital mortality rates, 30-day readmission rates, patient safety incidents, and mean length of stay were chosen as balancing measures based on adverse outcomes reported in the literature [6].

### Data sources and analysis

#### Administrative data

Administrative health data was obtained for the cohort of patients who were admitted to the GIM and hospitalist services at TOH between October 1, 2022 and December 31, 2023. Patient characteristics (age, sex, Charlson Comorbidity Index [16]), admission details (date, campus, service), acute length of stay (LOS), days to re-admission, and in-hospital death were obtained from the hospital administrative database, MDClone. Mean daily team census and monthly ALC proportions were obtained from TOH administrative data tracking system. Finally, the number of patient safety incidents was obtained from TOH patient safety learning system (SLS).

#### Survey data

Physician wellness scores were captured using the Mini-Z physician 10-item survey that was validated among internal medicine physicians to assess three wellness outcomes: burnout, stress, and job satisfaction [17–21]. The voluntary survey was initially emailed to GIM attendings and IM residents who worked at the intervention site in March 2023. Survey administration in June and December 2023 included all GIM division attendings, IM residents, and hospitalist staff. Important passive qualitative feedback on CTU educational experiences of both attendings and learners as well as perceptions of the hospitalist program were captured in the final mini-Z open-ended question. Prospective respondents were given two weeks to complete the survey, with two email reminders sent during that period.

### Analysis

Data were aggregated by calendar quarters (Q1–Q4). Comparisons were made between the pre-implementation quarter (Q4 2022) and the intervention study period (Q1–Q4, 2023), as well as between the intervention and non-intervention sites (TOH Civic Campus), where the CTU teams are structured similarly. Attendings who worked at both sites and learners who worked at the General campus after the intervention was implemented were analyzed as intervention site respondents. Mean scores and associated 95% confidence intervals were reported for the overall total and subscale survey scores and significant differences were defined by non-overlapping confidence intervals. Pearson's correlation coefficient was reported for the correlation between burnout and CTU census. A Chi-squared test of independence was used to test differences in proportions while a t-test was used to report differences in mean LOS over time.

An inductive thematic analysis of the open-ended responses from the Mini-Z Survey was undertaken [22]. Two reviewers (JE, MGS) initially independently created codes from anonymized survey responses and met to create the final codebook. The reviewers also determined that data saturation was met. The codebook was used to code the anonymized open ended survey responses in Excel in duplicate (MGS & JE) and any disagreements were discussed with a third reviewer (SR) until consensus was reached. The final coding reports were analyzed, and themes were identified.

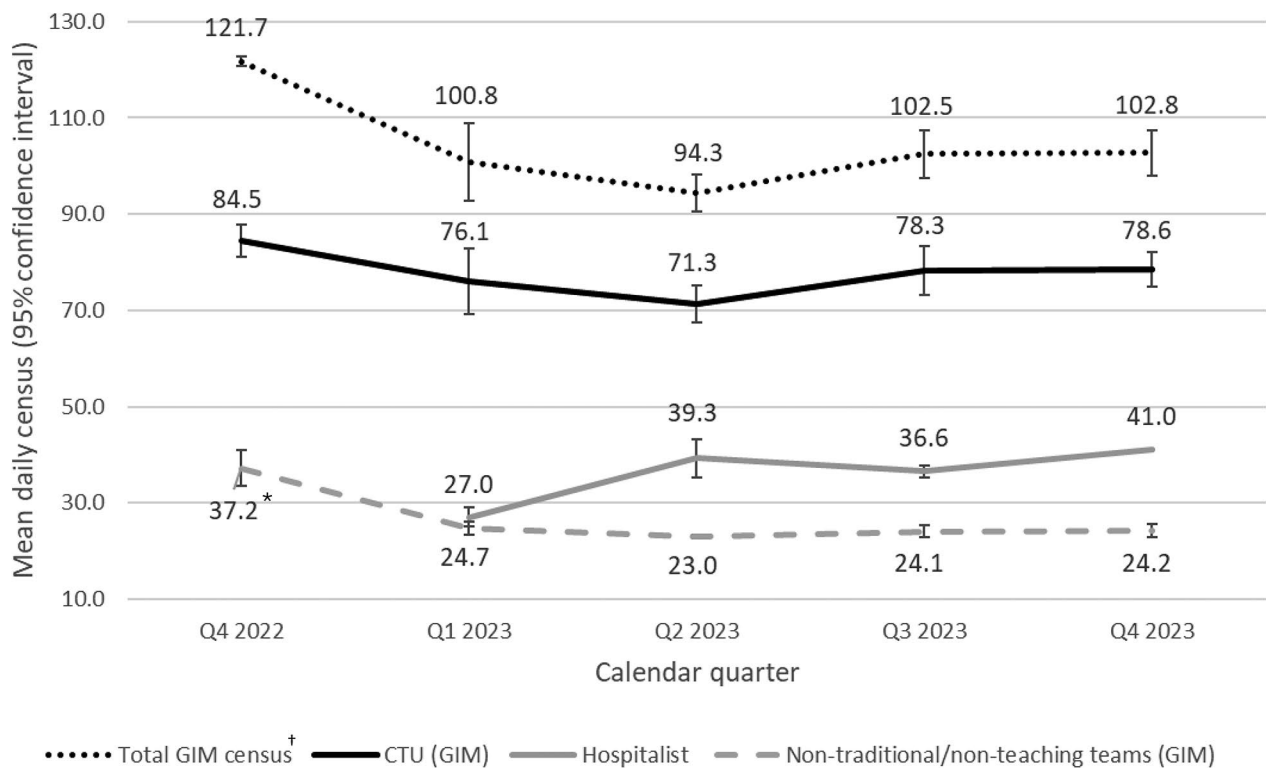
### Positionality statement

Authors JE, KW, DHS, and MGS are General Internal Medicine physicians who have personal experience with working in the study setting and know through their work how increased CTU patient numbers can impact physician wellness. SR is a researcher and has no experience working within the specific study setting.

### Results

#### Census and administrative outcomes

There was a total of 5092 admissions to internal medicine at TOH's General campus from January to December 2023 (Supplement S4). There was an initial 9.9% relative decrease in mean CTU census at the intervention site in Q1 (coinciding with phase 1) where the average census decreased from 84.5 to 76.1, followed by a further decrease in Q2 to 71.3, achieving a maximum decrease of 15.6% (phase 2) (Fig. 1). CTU census then increased and plateaued in Q3 (78.3) and Q4 (78.6). In comparison, at the non-intervention site, the mean daily CTU census was 84.5 in Q4 of 2023, representing a 15.2% increase from a mean daily census of 73.4 the year prior (Q4 2022) (Supplement S5).



**Fig. 1** Mean daily census by quarter and admitting service at the intervention site. CTU – clinical teaching unit; GIM – general internal medicine. \* One ≤ 15-patient non-teaching GIM team as well as the ≤ 12-patient non-teaching GIM physician assistant (PA) team closed in the period between Q4 2022 and Q1 2023. † Total GIM census in 2023 is comprised of three uncapped CTU teams and two non-traditional teams each with ≤ 15 patients; in 2022 total GIM census additionally included a ≤ 15-patient non-teaching and ≤ 12-patient PA team

**Table 1** Administrative measures and adverse events by calendar quarter at the intervention site

	Pre-implementation	Implementation period			
	Q4 2022 (n = 1204)	Q1 2023 (n = 1219)	Q2 2023 (n = 1198)	Q3 2023 (n = 1301)	Q4 2023 (n = 1374)
Mean # monthly admissions (SD)	401.3 (14.6)	406.3 (42.4)	399.3 (22.7)	433.7 (14.2)	458.0 (60.4)
Mean % ALC	18.7%	17.1%	21.2%	20.2%	20.0%
% In-hospital death*	8.1% (97)	9.5% (116)	7.7% (92)	8.3% (108)	8.3% (114)
% 30-day readmission <sup>†</sup>	10.4% (93/890)	10.1% (99/904)	11.5% (104/907)	11.1% (111/1002)	8.9% (95/1066)
Mean acute LOS, days (SD)	7.6 (8.2)	7.9 (9.4)	8.2 (10.1)	8.1 (9.7)	7.5 (7.9)
% SLS harm incidents <sup>‡</sup>	2.6% (31)	3.7% (45)	3.8% (45)	2.2% (29)	2.3% (32)

ALC – alternative level of care; LOS – length of stay; MAID - medical assistance in dying; SD – standard deviation; SLS – safety learning system

\* Excludes MAID

<sup>†</sup> Re-admissions to TOH only. Denominator excludes patients who died in-hospital, left against medical advice, or were transferred to a different inpatient care facility

<sup>‡</sup> SLS incidents associated with minor, moderate, serious, and critical events

The mean number of monthly admissions to internal medicine increased by 14.3% from Q4 2022 to Q4 2023 (Table 1). At the end of the study (Q4 2023), the mean daily census per CTU team was 26.2 patients with a mean of 3.0 admissions per day. The proportion of patients designated as ALC on the internal medicine services also increased over the year (Table 1), with the relative increase being over six-fold greater for patients admitted

to the GIM service with uncapped CTU teams compared to the hospitalist service.

The proportion of 30-day readmissions ( $p=0.262$ ), in-hospital deaths ( $p=0.854$ ), and safety incidents associated with harms ( $p=0.622$ ), as well as mean LOS ( $p=0.977$ ) for all patients admitted to internal medicine were not different from pre-implementation (Q4 2022) to the end of the study period (Q4 2023) (Table 1).

**Table 2** Wellness survey responses among GIM attendings and internal medicine residents over the intervention study period

	GIM attendings and internal medicine residents*		
	March 2023 (n = 34)	June 2023 (n = 22)	December 2023 (n = 23)
% Satisfied with current job <sup>†</sup>	41.2% (14)	45.5% (10)	52.2% (12)
% Self-reported burnout <sup>‡</sup>	58.8% (20)	40.9% (9)	65.2% (15)
% Feeling significant job-related stress <sup>†</sup>	55.9% (19)	59.1% (13)	56.5% (13)
Mean total score (95% CI) <sup>§</sup>	27.6 (25.5–29.8)	27.3 (24.8–29.9)	25.9 (24.3–27.5)
Mean subscale 1 score (95% CI) <sup>§</sup>	15.4 (14.4–16.5)	15.5 (14.0–16.9)	14.6 (13.4–15.7)
Mean subscale 2 score (95% CI) <sup>§</sup>	12.2 (10.9–13.6)	11.9 (10.3–13.4)	11.3 (10.4–12.3)

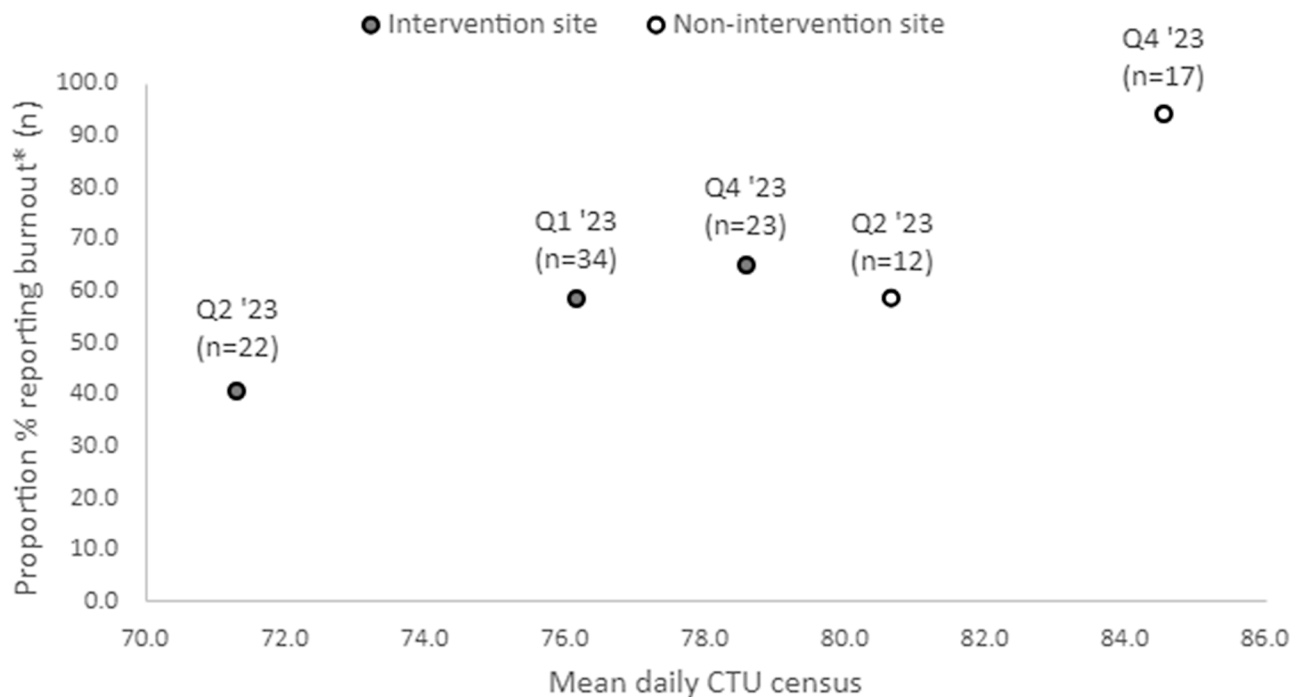
CI – confidence interval; GIM – general internal medicine

\* Includes only GIM attendings and residents who worked at the intervention site

<sup>†</sup> Defined as ‘agree’ or ‘strongly agree’ responses to job satisfaction/ stress related questions [21]

<sup>‡</sup> Defined as ‘present’, ‘moderate’, or ‘severe’ to single item burnout question [21]

<sup>§</sup> Joyful workplace defined as total survey score ≥ 40; highly supportive workplace defined as subscale 1 score ≥ 20; reasonable work pace defined as subscale 2 score ≥ 20<sup>21</sup>



**Fig. 2** Physician burnout versus CTU census by calendar quarter and site. \* Burnout defined as ‘present’, ‘moderate’, or ‘severe’ on the single item burnout question [21]

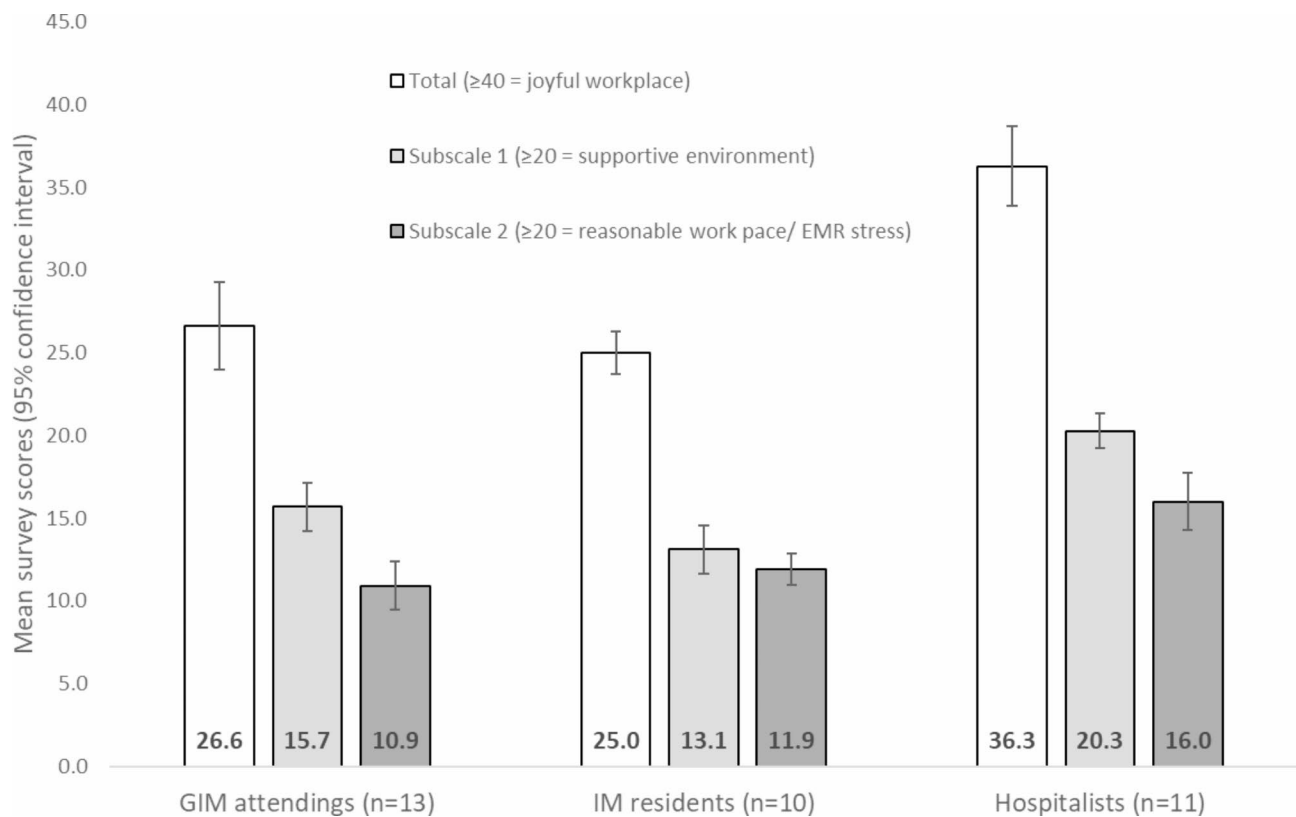
**Wellness survey outcomes**

The response rate for GIM attendings decreased with time and was 61.5% (n = 16/26), 43.6% (n = 17/39), and 41.9% (n = 18/43) in March, June, and December. The average resident response rate was 24.0% (n = 68/283) while the hospitalist response rate was 37.0% (n = 20/54) across all surveys.

There was an upward trend and an absolute increase in the proportion reporting job satisfaction of 11.0% among attendings and residents who worked at the intervention site over the survey period (Table 2). Work stress remained stable throughout the study period, with just

over half of respondents reporting significant job-related stress (Table 2).

The proportion of GIM attendings and IM residents reporting burnout at the intervention site initially decreased after the implementation of the third hospitalist team in Q2, but then increased again at the end of the study period (Table 2). Burnout was positively correlated with rising average daily CTU census numbers (Pearson correlation coefficient 0.906) (Fig. 2). This trend was observed when comparing burnout rates during phase 1 and 2 of the intervention period at the General campus as well as when analyzed across sites. The proportion reporting burnout among GIM attendings and residents



**Fig. 3** December wellness survey scores among physicians working at the intervention site

who worked on CTU at the intervention campus (65.2%,  $n = 15$ ) versus those who did not (94.1%,  $n = 16$ ) was significantly different ( $p = 0.033$ ).

The mean total and subscale wellness scores on the final survey in December are significantly greater for the hospitalist group as compared to the GIM attendings and residents (Fig. 3). Correspondingly, the burnout rate was only 9.1% ( $n = 1$ ) for the hospitalist group, but 53.8% ( $n = 7$ ) and 80.0% ( $n = 8$ ) for the GIM attendings and residents, respectively. GIM attendings (38.5%,  $n = 5$ ) and residents (30.0%,  $n = 3$ ) also reported low control over workload as compared to hospitalists (100.0%,  $n = 11$ ).

#### Qualitative assessment

Of the GIM attendings, residents, and hospitalists who worked at the intervention site, 68 responses to the Mini-Z open-ended survey question were obtained over the three survey periods, representing a written response rate of 16.2% ( $n = 68$ ). The themes identified from qualitative analysis are presented below in detail (Supplement S6).

#### Clinical service demands

High patient volumes, acuity, and complexity, coupled with the lack of control over workload when on service for the clinical teaching units, were consistently reported

as stressors by GIM attendings and internal medicine residents alike. Suboptimal scheduling of residents, in conjunction with high patient loads, was also reported by both groups to be the main contributors to prolonged and unpredictable workhours. This heavy clinical burden was repeatedly described as unsustainable, overwhelming, and exhausting. One attending reported:

*“The issue with clinical care on Medicine teams is that there are too many too sick patients on teams.... The reality of an unpredictable workforce...is an undue and unacceptable stress.” (#15mGIM).*

Resident comments frequently reflected similar concerns. In addition, residents reported call burden and frequent urgent call coverage requests as other key stressors. One resident captured these sentiments well:

*“Ongoing high cognitive burden due to high case-loads of complex patients requiring involved care/multiple follow-ups throughout the day, busy calls/consult services.” (#48dIM).*

There were no hospitalist responses under this theme. Similarly, GIM attendings also reported that working on

smaller capped non-traditional teams was less stressful and more enjoyable than working on CTU.

#### **Academic matters**

Attendings and residents responded that teaching and learning were impeded significantly by high clinical service demands. One attending wrote:

*"It has been a long time since I was able to do proper bedside teaching on CTU the way the students and residents deserve." (#16dGIM).*

Similarly, a resident opined:

*"Because of very service heavy i can count the number of times we had teaching in all CTU rotations on one hand. There isn't even enough time to finish up seeing patients and doing the notes to have any sensible teaching.." (#26mIM).*

Moreover, attendings indicated that non-clinical work demands, such as learner evaluations, external teaching activities, and research, were underrecognized and undercompensated, which further reduced work satisfaction.

#### **Patient safety/ quality of care**

Patient safety concerns were emphasized in association with high patient volumes and limited house staff on the clinical teaching units. GIM attendings and residents described the current environment on CTU using language such as dangerous and unsafe.

*"It becomes very unsafe when we're expected to look after 25+ patients on our own with a couple med students and maybe 1...junior [resident] (this happens more often than not)." (#7mGIM);*

Although attendings emphasized patient safety and quality concerns more often than residents, residents also acknowledged these concerns:

*"The amount of patients we see as residents in a daily basis is...unsafe." (#25mIM).*

GIM attendings and residents indicated that high patient to nursing ratios added to safety concerns. One resident wrote:

*"Nursing pressures in terms of unsafe patient ratios adds significant stress to residents... being paged to change the management plan based on the nurse's ability complete tasks when they have too many sick patients to [care] for" (#3mIM).*

Lastly, excessive documentation requirements and information overload associated with the EMR were also noted to detract from patient care and potentially increase medical errors by GIM attendings, hospitalists, and residents.

#### **Human resources/ administrative support**

A significant source of frustration, particularly amongst GIM attendings, but also with hospitalists and residents, was the system expectation for physicians to remain responsible for managing large numbers of medically inactive patients, who remained admitted due to complex social situations and disposition challenges. One GIM attending wrote:

*"Relieving GIM of the care of ALC patients. They are time consuming in their own way due to social/discharge planning and allied health requirements... it does not call on GIM expertise whatsoever." (#10mGIM).*

Similarly, one hospitalist wrote:

*"Many complex social issues...cause stress" (#5jH),*

while a resident requested:

*"Less ALC [alternate level care] patients and social admissions." (#56dIM).*

In addition to a call for offloading ALC patients from medical teams, solutions presented by all three groups included provision of allied health support on the weekends to assist with patient flow, re-hiring of a hospital discharge planning coordinator and/or physician assistants to take over all disposition planning responsibilities, and geographically co-locating patients to limit the time required for the medical team to communicate with multiple allied health teams and nursing leaders.

#### **Communication**

A shared sentiment amongst respondents from all three groups was the strain of frequent messages received, particularly in the EMR chat by nurses, allied health professionals, and clerks, which were described in numerous responses as disruptive, inefficient, non-urgent, and excessive. Proposed solutions were to limit EMR messages to only urgent issues and even potentially remove completely the ability of nurses to contact physicians via the EMR. The other primary communication issue noted by the GIM attendings was the view that other subspecialty services were reluctant to assist with patient care and accept appropriate admissions at times of high patient volumes. One attending suggested:

*"...all subspecialties pulling their weight and admitting appropriate patients...would alleviate some frustration." (#30dGIM).*

Similar opinions were shared across time, on all three surveys.

#### **Assessment of hospitalist service**

The comments solicited from GIM attendings and residents regarding the hospitalist program primarily related to its effectiveness at reducing patient volumes. Both groups consistently reported that they felt the hospitalist program was beneficial. Comparing the site where the hospitalist service had been implemented to the site where it had not, one resident wrote:

*"Having done previous CTU blocks at the civic then doing one at the general with the hospitalist service running, I have definitely seen a huge change in workload (in a positive way) and a great amount of teaching done throughout the block which was not feasible at the civic due to the very high number of very active patients per CTU" (#46jIM),*

while another commented:

*"Large workload; to me it seems with the hospitalist program at the General it's a bit better (i.e. better CTU numbers) while I often hear CTU numbers at the Civic going up to the high 30s and up to 40." (#47dIM).*

However, there were many concerns that these benefits were temporary due to hospitalization trends as well as ongoing challenges with discharging non-medically active patients from the teaching teams. One GIM attending noted:

*"The hospitalist service is good...my only concern is that it feels like adding lanes on a highway to deal with traffic. It is only a short-term solution...this is what has happened on our CTU teams. They were at 18–22 in January which is perfect, but now they are back up to 30 with many social/non-medical pts, and it doesn't feel any different compared to before." (#13mGIM),*

The feedback from the hospitalist respondents regarding the program itself was generally positive, for example one respondent wrote:

*"Great workplace environment, team comradery, and excellent leadership." (#13dH).*

Overall, the hospitalist respondent criticisms were predominantly directed at hospital and health care system issues and not toward the program implementation.

#### **Discussion**

Our project aim of reducing mean daily CTU census to less than 75 patients was only briefly achieved in the second calendar quarter following implementation of the third hospitalist team. Census numbers then increased above target, although stabilized at approximately 7% below historical (Q4 2022) numbers for the second half of 2023. Rising census was most likely due to increasing admissions over time, a trend that has been observed nationally [23]. Our data highlights the need for interventions that target census to be responsive to projected growth in admissions over time. Also possibly contributing to the rising census was the increased proportion of ALC patients admitted to internal medicine such that these patients typically experience longer admissions due to discharge planning barriers [15]. Strategies that address ALC numbers, such as an increase in subacute medical beds on transitional care units, are therefore also important. Finally, the closure of a non-teaching GIM team and a PA-run GIM non-traditional team in the months leading up to the intervention (accounting for  $\leq 27$  beds) may have blunted the impact of the addition of 45 beds ( $\geq 18$  absolute beds added).

In addition to not achieving our goal of a sustained reduction in census, we also did not observe an improvement in wellness during the intervention period. In fact, burnout increased during the intervention period. Interestingly, we observed a strong correlation between burnout and CTU census within and across both sites. The burnout rates in this study were slightly higher than those reported for internal medicine physicians and trainees in the United States [21] as well as for reported rates of resident burnout in other Canadian studies [24, 25]. Notably, these comparison studies were conducted prior to the COVID-19 pandemic, and it has been shown that physician burnout has generally increased since the pandemic [26, 27].

In the literature, drivers of physician burnout include excessive workloads, lack of control, inefficient work processes, and administrative burdens [21, 28]. In our qualitative analysis, these factors were also consistently reported among GIM attendings and residents who worked on high volume CTU teams. Moreover, compared to hospitalists, residents and GIM attendings had significantly lower overall wellness scores, higher reported rates of burnout, lower control over workload, and insufficient time for documentation. This is likely due to higher patient volumes on CTU teams, as well as lack of workload control when team census is not capped.

Reported job satisfaction increased during the study period. This indicates that there are other workplace factors beyond strain that are associated with satisfaction, such as value alignment with leadership [21]. Indeed, in this study, the mean subscale scores corresponding to workplace support were significantly greater than the mean subscale scores that corresponded to pace of work. Even so, aside from improved control of and reduction in workload, our study identified potential solutions to alleviate workplace stressors including increased support for managing complex dispositions as well as non-active medical patients. Additionally, improved communication and collaboration with nursing and other physician colleagues as well as reducing EMR burden were also identified in this study and others as solutions to improve workplace stressors [8, 29].

The ideal CTU census is not known and would be institution dependent, however reducing clinical workload by implementing a census cap of 15–20 patients has been shown to improve educational experience and reduce adverse patient outcomes [7, 10, 11, 14, 30]. Through our qualitative analysis, we show that reducing census from 28.2 (Q4 '22) to between 23.8 (Q2 '23) and 26.2 (Q4 '23) was associated with some perceived improvement of the CTU learning environment. However, given the low wellness scores, the ideal census is likely lower, and may need to be supplemented with other interventions such as enhanced team rounds [31, 32] or geographic wards [10]. Nonetheless, in line with previous evidence [33], our qualitative analysis identified that of the contextual factors influencing attending physicians' and trainees' perceptions of the CTU environment, case load, patient turn-over, medical acuity, social complexity, and house staff absences, were of outmost importance. These factors should be targets of further interventions to improve physician wellness.

This was a single center study and generalization of our findings to other institutions should be undertaken while carefully considering system differences. Regardless, healthcare delivery and training challenges associated with ever evolving population demographics, disease complexity, and technology are not unique to our academic centre and have been reported previously [34]. Volunteer as well as attrition biases may have been introduced if those who were more likely to respond to the surveys over time were experiencing different levels of burnout compared to those who did not respond, and this concern would be greatest for the resident group where response rates were low. Several constraints were imposed due to the rapid rollout of the intervention to address critical service demands. First, this resulted in a lack of pre-implementation wellness data at the intervention site, as well as a delayed start in data collection at the non-intervention site, such that caution should be

employed when comparing burnout rates between sites, despite the highly comparable features between sites and the similar trends observed between burnout and census at both sites. It also limits our study's ability to fully appreciate the impact of the intervention as well as to make conclusions about how wellness trended over time. Second, the study did not include education specific measures, which when combined with low response rates, particularly in the resident group, restricts discussion about how this intervention improves learner experiences. Future studies should have a longer pre-implementation assessment phase, and strive to capture education and resident specific measures [35], as well as include other important workload measures such as house staff ratios, patient turnover rates, and case complexity.

## Conclusion

The addition of a non-academic hospitalist service was received positively and reduced CTU census numbers, but the improvement in service strain was limited by rising admissions with time. Burnout rates, which correlated with census, remained high, and despite half of respondents reporting job satisfaction, overall wellness scores were low. Multifaceted approaches to wellness are needed, and further research to better understand the impact of interventions aimed at improving subacute care demands, increasing supports for managing complex discharges, enhancing communication with nursing and other physician colleagues, and reducing EMR burden is required.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-025-06656-3>.

Supplementary Material 1

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## Author contributions

JE, MGS, KW, DHS, SR contributed to the design of the study. DHS and SR obtained administrative data. JE and SR disseminated the surveys. JE and MGS analyzed the data and wrote the manuscript. All authors reviewed the manuscript.

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Not applicable.

## Data availability

Data is provided within the manuscript or supplementary information files.

## Declarations

### Ethics approval and consent to participate

Our project was reviewed by the Ottawa Health Science Network Research Ethics Board and was deemed to fall within the context of quality initiative, quality improvement, quality assurance, and/or program evaluation. Consequently, as per the Tri-Council Policy Statement 2, Article 2.5, the board deemed that review by the OHSN-REB was not required and that explicit participant consent was deemed unnecessary. Our study was also registered on our institutional quality improvement project registry IQ@TOH.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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