Care and Outcomes of Patients With Cancer Admitted to the Hospital on Weekends and Holidays: A Retrospective Cohort Study

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Abstract

Background: Patients admitted to the hospital on weekends experience worse outcomes than those admitted on weekdays. Patients with cancer may be especially vulnerable to the effects of weekend care. Our objective was to compare the care and outcomes of patients with cancer admitted urgently to the hospital on weekends and holidays versus those of patients with cancer admitted at other times. **Materials and Methods:** This was a retrospective study of all adult patients with cancer having an urgent hospitalization in Canada from 2010 to 2013. Patients admitted to hospital on weekends/holidays were compared with those admitted on weekdays. The primary outcome was 7-day in-hospital mortality. We also compared performance of procedures in the first 2 days of hospital admission and admission to critical care after the first 24 hours. **Results:** 290,471 hospital admissions were included. Patients admitted to hospital on weekends/holidays had an increased risk of 7-day in-hospital mortality (4.8% vs 4.3%; adjusted odds ratio [OR], 1.13; 95% CI, 1.08–1.17), corresponding to 137 excess deaths per year compared with the weekday group. This risk persisted after restricting the analysis to patients arriving by ambulance (7.1% vs 6.4%; adjusted OR, 1.11; 95% CI, 1.04–1.18). Among those who had procedures in the first 4 days of admission, fewer weekend/holiday-admitted patients had them performed in the first 2 days, for 8 of 9 common procedure groups. There was no difference in critical care admission risk after the first 24 hours. **Conclusions:** Patients with cancer admitted to the hospital on weekends/holidays experience higher mortality relative to patients admitted on weekdays. This may result from different care processes for weekend/holiday patients, including delayed procedures. Future research is needed to identify key outcome-driving procedures, and ensure timely access to these on all days of the week.

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Background

Improving the quality of cancer care is an international priority.[1,2] Studies have identified considerable variation in timing and processes of care for patients with cancer.[3–9] Clinical practice guidelines and performance measurement have been used to address this problem by clearly delineating best practices.[2] Although many improvement efforts have centered on the coordination of outpatient care services, there are few studies of in-hospital care processes and their outcomes in patients with cancer.[10]

Several studies have identified a relationship between timing of hospital care and adverse outcomes. Patients admitted to the hospital on weekends have higher rates of mortality than those admitted at other times, across several urgent medical and surgical conditions, in both adults and children.[11–17] Higher mortality has also been reported in patients undergoing surgery at the end of the week.[15,18,19] Reported delays in urgent and/or important procedures have provided a possible mechanism by which weekend care affects patient outcomes.[19–24] Hospital practices, including reduced staffing, may decrease access to necessary interventions and care, leading to worse patient outcomes.

As a result of a higher overall risk of mortality, patients with cancer may be especially vulnerable to changes in care occurring on the weekend.[17] Patients

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admitted to the hospital for induction chemotherapy after a diagnosis of acute myeloid leukemia were reported to have a delay in triple-lumen catheter insertion, although there was no difference in mortality.[25] No previous hypothesis-driven study has specifically examined the effect of weekend care on the outcomes of a broader cancer population. We hypothesized that patients admitted on the weekend will have a higher in-hospital mortality than those admitted at other times. We also sought to identify differences in timely access to inpatient procedures and admission to a critical care unit.

Materials and Methods

Setting and Data Sources

We used data on all hospital admissions occurring across Canada, available through the Canadian Institute for Health Information (CIHI) Hospital Morbidity Database (HMDB) for the province of Quebec, and the Discharge Abstract Database (DAD) for all other provinces. The DAD contains demographic, clinical, and administrative information on all hospital stays and is more than 99% accurate for date of admission and death.[11,26] The information in the DAD/HMDB is submitted by trained medical abstractors at each hospital. As a result of universal health insurance coverage in Canada, this study is considered population-based.

Study Population

The cohort consisted of patients older than 18 years discharged from an acute care facility with a diagnosis of cancer between April 1, 2010, and March 31, 2013. Cancer diagnosis was identified using most responsible or secondary admission diagnosis in the CIHI DAD/HMDB. In situ cancers were excluded from this definition. A re-abstraction study of the DAD demonstrated 76% agreement for a most responsible diagnosis of malignant neoplasm of bronchus and lung, and 87% for malignant neoplasm of the colon, with overall 85% agreement on the most responsible diagnosis across all conditions.[26]

Exclusions

Elective admissions and admissions not classified as urgent (urgent admissions were defined as those admitted through the emergency department or after arrival by ambulance) were excluded. We also excluded admissions for obstetric delivery, mental health, and transfers across institutions. Patients with palliative care listed as a most responsible or secondary diagnosis were excluded from the primary (mortality) analysis, because it was not possible to distinguish patients receiving palliative care concurrently with active treatment from those receiving end-of-life care for an imminent death.

Weekend and Holiday Admission

The principal exposure was the timing of hospital admission. Weekday admission was defined as occurring between 12 AM on a Monday and 11:59 PM on Friday. A weekend admission was defined as occurring between 12 AM on Saturday and 11:59 PM on Sunday, consistent with previous studies.[11,27] Holidays were identified as federal and provincial statutory holidays and are listed in Table 1. When a holiday fell on a weekend, the following Monday was defined as a weekend day until 11:59 PM.

Patient and Hospital Characteristics

We collected information on potential patient and hospital-level confounders. Information on age, sex, Charlson comorbidity score,[28] arrival by ambulance, and critical care unit admission in the first 24 hours of admission were obtained for both groups. Hospital peer group (teaching, large community, medium community, and small community[29]) and province were based on the location of submitting hospitals. In addition, we identified subgroups of patients admitted to the hospital with 1 of 4 common types of cancer (breast, colon, lung, and hematologic).

Table 1. Definition of the Statutory Holidays Included in This Study

Name of Holiday	Definition
New Year's Day	January 1st
Family Day	Second or third Monday in February[a]
Good Friday	Friday before Easter day
Easter Monday	Monday after Easter day
Victoria Day	Monday on or before May 24th
Canada Day	July 1st
Civic Holiday	First Monday in August[a]
Labor Day	First Monday in September
Thanksgiving Day	Second Monday in October
Remembrance Day	November 11th[a]
Christmas Day	December 25th
Boxing Day	December 26th

[a]For some provinces.

Outcome

The primary outcome in our study was 7-day all-cause in-hospital mortality. This indicator of short-term mortality was selected because it is most sensitive to differences in early hospital care and has been used in similar studies.[11,14,27] Longer periods can lead to prolonged reexposure to weekday care, potentially diluting the effect of altered care practices occurring on the weekend.[30]

Secondary, exploratory outcomes in this study were timing of select in-hospital procedures and transfer to a critical care unit. Patients with palliative care listed as a most responsible or secondary diagnosis were also excluded from the transfer to critical care analysis.

Statistical Analysis

Baseline patient and hospital characteristics were compared using the chi-square test. For all outcome measures, multivariable logistic regression models were used to compare groups. All hypothesis testing was 2-tailed and odds ratios (ORs) are presented with their 95% confidence intervals. All the data were analyzed using Statistical Analysis System, version 9.2 (SAS Institute Inc., Cary, NC).

Mortality

We tested for differences in all-cause 7-day in-hospital mortality between patients with cancer admitted on weekdays versus weekends/holidays after accounting for differences in measured patient characteristics except arrival by ambulance, which is not available for Quebec residents. By converting the adjusted OR to relative risk, we determined the adjusted number of excess deaths in the higher-risk group.[31] We presented ORs for patients admitted on Saturday, Sunday, or holidays compared with patients admitted on weekdays, in order to test each component of the outcome. In addition, we calculated adjusted ORs for the following groups: patients with hematologic, breast, lung, or colon cancer; patients arriving by ambulance; patients not arriving by ambulance; and admissions to teaching or large, medium-sized, and small community hospitals.

Next, we identified the 5 most responsible diagnoses with the highest number of inpatient deaths in this patient cohort, in addition to the cancer diagnosis itself. For each of these conditions, we calculated the adjusted risk of 7-day mortality for patients admitted on weekends/holidays versus weekdays.

Procedures

We identified the 50 most common procedures performed in the first 4 days of admission. These early procedures were selected because they were considered to more likely reflect care needs at the time of admission, rather than care needs arising from later inpatient complications. We grouped these 50 procedures according to type of procedure. Procedure groupings, including names and codes from the Canadian Classification of Health Interventions,[32] are presented in Table 2. For patients having a procedure in the first 4 days of admission, we compared the proportion receiving it in the first 2 days, between weekday and weekend/holiday-admitted patients.

Transfer to a Critical Care Unit

We compared the proportion of patients being transferred to a critical care unit between 24 and 72 hours. Because early admission to critical care can be seen with patients presenting with greater severity of illness, critical care admission in the first 24 hours was excluded from this outcome definition.

Ethical Approval

This study protocol was approved by the Research Ethics Board of Mount Sinai Hospital in Toronto, Canada (reference 15-009-C). Because of the deidentified nature of the study data and the absence of any primary data collection from patients, consent was not required for this study.

Results

The study cohort included 290,471 hospitalizations, of which 210,287 (72.3%) were weekday admissions and 80,184 (27.6%) were weekend/holiday admissions.

There were 61,092 patient admissions (21.0%) with a diagnosis of hematologic malignancy; 52,244 (18.0%) with lung cancer; 18,283 with breast cancer (6.3%); and 36,281 with colon cancer (12.5%). Patients admitted to the hospital on weekends and holidays were more likely to arrive by ambulance (Table 3).

Mortality

The unadjusted 7-day in-hospital mortality rate was 4.5% overall and 3.8%, 7.5%, 3.5%, and 3.3% for patients with hematologic, lung, breast, and colon cancer, respectively. Patients in the full cohort demonstrated an increased risk of death in-hospital if they were admitted on a weekend or holiday (4.8% vs 4.3%, adjusted OR, 1.13; 95% CI, 1.08–1.17; adjusted relative risk [RR], 1.12; 95% CI, 1.08–1.16). During our study, 412 excess deaths (137 deaths per year) occurred in patients admitted on weekends/

Table 2. The 50 Most Common Procedures Performed in the First 4 Days of Admission[a]

Procedure Category	Procedure Name	Procedure Code
Biopsies and endoscopies	Inspection, small intestine	2NK70
	Biopsy, stomach	2NF71
	Biopsy, bronchus	2GM71
	Inspection, large intestine	2NM70
	Biopsy, large intestine	2NM71
	Bone marrow biopsy	2WY71
	Biopsy, liver	2OA71
	Biopsy, small intestine	2NK71
	Biopsy, lung	2GT71
	Inspection, bladder	2PM70
	Biopsy, esophagus	2NA71
	Inspection, bronchus	2GM70
	Biopsy, abdominal cavity	2OT71
	Biopsy, rectum	2NQ71
CT scans and ultrasound	CT abdomen	3OT20
	CT thorax	3GY20
	CT brain	3AN20
	CT head	3ER20
	CT lung	3GT20
	CT total body	3ZZ20
	CT thoracic vessels	3JY20
	Abdominal ultrasound	3OT30
Drainage	Drainage, pleura	1GV52
	Drainage, abdominal cavity	1OT52
	Drainage, renal pelvis	1PE52
	Drainage, bile ducts	1OE52
	Drainage, bladder	1PM52
	Dilation, bile ducts	1OE50
	Dilation, renal pelvis	1PE50
MRIs	MRI brain	3AN40
	MRI, spinal vertebrae	3SC40
Transfusion	Transfusion, circulatory system	1LZ19
Surgery	Excision partial, large intestine	1NM87
	Excision partial, small intestine	1NK87
	Fixation, femur	1VC74
	Implantation of internal device, hip joint	1VA53
	Excision, partial, brain	1AN87
	Excision, partial, rectum	1NQ87
	Excision, partial, bladder	1PM87
	Repair, muscles of the chest and abdomen	1SY80
Radiation	Radiation, spinal vertebrae	1SC27
Pharmacotherapy and infusions	Pharmacotherapy, whole body (all systemic pharmacotherapy, by all routes of administration)	1ZZ35
	Pharmacotherapy, local, by circulatory system (infusion of colloid, crystalloid, and total parenteral nutrition)	1LZ35
Miscellaneous	Implantation of internal device, vena cava (superior and inferior)	1IS53
	Ventilation	1GZ31
	X-ray, heart with coronary arteries	3IP10
	X-ray, biliary ducts with pancreas	3OG10
	Dialysis	1PZ21
	Imaging Intervention NEC, brain	3AN94
	Implantation of internal device, stomach	1NF53

Abbreviation: NEC, not elsewhere classified.
[a]Procedures were grouped according to type. Procedure names and their corresponding code were obtained from the Canadian Classification of Health Interventions.[32]

holidays compared with weekdays. The increased risk of mortality was consistently observed in patients admitted on Saturdays (OR, 1.13; 95% CI, 1.05–1.21), Sundays (OR, 1.08; 95% CI, 1.01–1.16), and holidays (OR, 1.22; 95% CI, 1.07–1.38).

A sensitivity analysis restricting the study population to patients arriving by ambulance demonstrated a similar weekend/holiday-related mortality risk (OR, 1.11; 95% CI, 1.04–1.18). This risk was not identified in patients arriving by other means (OR, 1.03; 95% CI, 0.94–1.13).

A significant difference in risk of mortality on weekends/holidays was observed in the subset of patients with hematologic and lung cancer, but not for patients with breast and colon cancer (Table 4). The most responsible diagnoses with the highest 7-day mortality in our cancer cohort were the cancer diagnosis itself, pneumonia, sepsis, chronic obstructive pulmonary disease, and heart failure. A cancer diagnosis as most responsible diagnosis accounted for the greatest number of deaths in the cohort (5,758) and demonstrated an increased risk of mortality for patients admitted on weekends/holidays compared with weekdays (adjusted OR, 1.17; 95% CI, 1.10–1.24). None of the other 5 most responsible diagnoses demonstrated a significant weekend effect. Mortality differed between weekday and weekend/holiday patients at large (OR, 1.13; 95% CI, 1.04–1.22) and medium-sized community hospitals (OR, 1.17; 95% CI, 1.04–1.31), but not at small community or teaching hospitals.

Procedures

CT scans and ultrasounds were the most commonly performed procedures, occurring in 15% of admissions, followed by biopsies and endoscopies, performed in 14% of admissions (Table 5). For 8 of 9 procedure types, patients admitted on weekends and holidays were significantly less likely to have early procedures (those occurring in the first 4 days) performed in the first 2 days of admission.

Point estimates for the proportion of procedures occurring in the first 2 days of admission were lower for Saturday-admitted than Sunday-admitted patients for 8 of 9 procedure types (Table 6). Radiation showed the greatest difference in timing between weekend and weekday patients, whereas nonbiopsy surgical procedures showed no difference in timing between weekend and weekday/holiday groups.

Table 3. Patient Characteristics by Weekday Versus Weekend/Holiday Admission, for Full Cancer Cohort

Characteristic	Weekday N=210,287	Weekend/ Holidays N=80,184	*P* Value
Age, n (%)			
18–44 y	9,685 (4.6)	3,932 (4.9)	
45–64 y	60,709 (28.9)	23,151 (28.9)	.006
65–84 y	111,693 (53.1)	42,303 (52.8)	
≥85 y	28,200 (13.4)	10,798 (13.5)	
Sex, female, n (%)	92,246 (45.8)	36,943 (46.1)	.14
Charlson group, n (%)			
0	39,386 (18.7)	13,983 (17.4)	
1	86,881 (41.3)	34,340 (42.8)	<.001
≥2	84,020 (40.0)	31,861 (39.7)	
Malignancy type			
Hematologic	44,108 (21.0)	16,984 (21.2)	
Lung	38,106 (18.1)	14,138 (17.6)	
Breast	13,090 (6.2)	5,193 (6.5)	.004
Colon	26,312 (12.5)	9,969 (12.4)	
Other	88,671 (42.2)	33,900 (42.3)	
Hospital group, n (%)			
Teaching	70,762 (33.7)	25,505 (31.8)	
Large community	86,723 (41.2)	33,670 (42.0)	<.001
Medium community	32,829 (15.6)	12,965 (16.2)	
Small community	19,973 (9.5)	8,044 (10.0)	
Transfer to critical care within 24 hours of admission, n (%)[a]	8,003 (6.0)	3,443 (6.4)	.003
Admission by ambulance, n (%)[a]	52,279 (39.2)	22,803 (42.6)	<.001

[a]N=133,444 for weekday and 53,476 for weekend/holidays because patients from the province of Quebec were excluded due to missing information on these variables.

Transfer to Critical Care Unit

A small percentage of patients were transferred to a critical care unit between 24 and 72 hours after admission (1.45% of patients admitted on weekdays and 1.53% of patients admitted on weekends/holidays). There was no difference between the groups for the adjusted risk of transfer to a critical care unit (OR, 1.07; 95% CI, 0.99–1.17).

Discussion

Our study identified an increase in 7-day in-hospital mortality for patients with cancer admitted on weekends and holidays. This increased risk was consistent for admissions on Saturdays, Sundays, and holidays when compared separately with weekday-admitted patients. Over the study period of 3 years, the excess risk of mortality with weekend/holiday admission accounted for an additional 412 patient deaths.

Patients arriving by ambulance, those admitted to large or medium-sized community hospitals, those with hematologic and lung malignancies, and patients with a most responsible diagnosis of malignancy demonstrated increased weekend/holiday-related risk. Patients not arriving by ambulance did not have worse outcomes if admitted on weekends or holidays. This may be because their care needs were less urgent, such that any weekend/holiday care effects would be unlikely to lead to differences in outcomes. This could also be the case for patients with breast or colon cancer presenting with complications. In contrast, patients with lung and hematologic cancers may present with more grave conditions, such as massive hemoptysis, blast crisis, or severe sepsis. This could explain the observed weekend effect in these patient groups. The smaller sample size of the breast and colon cancer subgroups could also have made it more difficult to identify differences in outcome between weekday and weekend/holiday groups.

Certain hospital groups might be more vulnerable to differences in access to care on weekends and holidays. For instance, teaching hospitals may benefit from the enhanced access afforded by trainees providing in-house weekend coverage, despite their relative inexperience. Meanwhile, the absence of a significant weekend effect in small community hospitals, along with a higher mortality on all days of the week, may reflect reduced access (vs larger hospitals) at all times.

Patients admitted to the hospital on weekends and holidays and requiring an early procedure were less likely to receive it within 2 days of admission. This difference was observed across most procedural categories, and was most pronounced for radiation. A dose–response effect, whereby patients admitted on Saturdays appeared to wait even longer than those admitted on Sundays, was also observed. This is consistent with reduced access to procedures, rather than lowered demand for procedures, acting as the mechanism of delay.

Higher 7-day inpatient mortality for patients on weekends may reflect deficiencies in urgent and/or lifesaving care as a result of reduced resources and

Table 4. Mortality According to Cancer Type, Most Responsible Diagnosis, and Hospital Type

Subgroup	Mortality Rate According to Day of Admission (%)		Adjusted Odds Ratio (95% CI)
	Weekday	Weekend/Holiday	
Cancer type			
All cancers	4.32	4.81	1.13 (1.08–1.17)
Hematologic	3.65	4.25	1.18 (1.08–1.29)
Lung	7.24	8.18	1.14 (1.06–1.23)
Breast	3.47	3.49	1.04 (0.87–1.25)
Colon	3.21	3.53	1.10 (0.97–1.25)
Most responsible diagnosis			
Cancer diagnosis	5.15	5.90	1.17 (1.10–1.24)
Pneumonia	7.92	8.22	1.04 (0.89–1.20)
Sepsis	15.34	15.75	1.01 (0.84–1.21)
COPD	4.50	3.92	0.85 (0.68–1.07)
Heart failure	5.45	4.74	0.86 (0.66–1.13)
Acute MI	9.77	10.93	1.15 (0.88–1.50)
Hospital type			
Large community	4.19	4.65	1.13 (1.04–1.22)
Medium community	5.07	5.78	1.17 (1.04–1.31)
Small community	5.75	6.40	1.04 (0.91–1.18)
Teaching	3.73	4.03	1.10 (0.99–1.22)

Abbreviations: COPD, chronic obstructive pulmonary disease; MI, myocardial infarction.

staffing over the weekend. Information on timing of procedures further supports this notion.[33] The delay in procedures noted in this study indicates that care is less immediately accessible to patients admitted on weekends/holidays. Whether such delays are truly the cause of worsened patient outcomes cannot be determined from our study. Certain procedure types, such as fluid drainage, are likely to be urgent because they are used for symptomatic relief or as an organ- or life-saving measure. As such, a delay in this procedure suggests ongoing patient discomfort or risk. In some jurisdictions, equalized staffing on all days of the week has been adopted as a remedy for reduced access to care on weekends/holidays.[30] Such a strategy is likely to be expensive and unpopular, and its effectiveness outside critical care settings is unknown.

Our study benefitted from a large sample size, because it included all patients hospitalized with cancer across Canada. In order to address concerns that weekend/holiday risk may reflect differences in patient severity of illness rather than the quality of weekend care, we conducted a sensitivity analysis by restricting the study population to only those patients who arrived by ambulance. Our findings were confirmed in this group. In addition, if weekend patients were more severely ill, one would expect them to experience a lesser degree of procedural delay than weekday patients, yet our findings suggest the opposite.

The weekend/holiday-associated risk was observed in patients with a most responsible diagnosis of cancer, but not in patients with cancer who had any of the other 5 most responsible diagnoses accounting for the greatest number of in-hospital deaths. Although previous studies have identified a "weekend effect" in patients admitted with an acute myocardial infarction, we did not observe this relationship. It is possible that access to acute care of certain urgent medical conditions has improved over time, diminishing observed differences between weekend and weekday patients. The weekend/holiday-related risk in patients with a most responsible diagnosis of cancer could indicate deficiencies in hospital recognition and management of cancer-related complications specifically.

Table 5. Occurrence of Early Procedures[a] in the First 2 Days of Hospital Admission

Procedure Group	Proportion of Admissions With Procedure Occurring in First 4 Days, %	Proportion of Early Procedures Occurring in the First 2 Days, Patients Admitted on Weekdays, %	Proportion of Early Procedures Occurring in the First 2 Days, Patients Admitted on Weekends/Holidays, %	Adjusted Odds Ratio (95% CI)
Biopsies and endoscopies	14.1	71.5	59.6	0.59 (0.56–0.61)
CT scans and ultrasounds	15.3	77.6	70.2	0.68 (0.65–0.70)
Drainage procedures	7.1	78.5	70.6	0.66 (0.62–0.70)
MRI	1.6	76.5	66.0	0.60 (0.53–0.68)
Transfusion	4.5	83.4	81.9	0.90 (0.82–0.98)
Surgery	4.6	77.6	76.4	0.92 (0.85–1.00)
Radiation	0.3	72.3	53.2	0.43 (0.33–0.57)
Pharmacotherapy and infusions	2.9	72.8	63.3	0.64 (0.59–0.70)
Miscellaneous	7.1	77.6	72.6	0.72 (0.68–0.77)

[a]Procedures performed in the first 4 days of hospital admission.

Our study used administrative hospital data, and as such was limited in its content of relevant clinical information. Although cancer stage and outpatient treatment are predictors of disease-specific mortality, we were unable to account for them in our analysis. Despite this, we do not have any reason to suspect differences in stage and/or prior treatment between weekday and weekend/holiday patients. Further, the accuracy with which patients with cancer were identified was not perfect. Yet, we have no reason to suspect differential misclassification between weekday and weekend/holiday groups. In addition, administrative data does not capture patient severity of illness.[34] Thus, residual confounding by clinical severity remains a possibility even after adjusting for comorbidities and restricting to patients arriving by ambulance.

Conclusions

Patients with cancer admitted to the hospital on weekends or holidays experience higher mortality than those admitted on weekdays. This may result from different care processes for weekend/holiday patients, including, but not limited to, delayed procedures. This is a potentially modifiable risk factor for a vulnerable population urgently presenting to the hospital. Future research is needed to identify key outcome-driving procedures and barriers to weekend/holiday access. Before implementing widespread

Table 6. Occurrence of Early Procedures in the First 2 Days of Hospital Admission[a]

Procedure Group	Saturday Adjusted Odds Ratio (95% CI)	Sunday Adjusted Odds Ratio (95% CI)	Holidays Adjusted Odds Ratio (95% CI)
Biopsies and endoscopy	0.51 (0.48–0.55)	0.67 (0.62–0.71)	0.84 (0.74–0.96)
CT scans and ultrasound	0.55 (0.53–0.59)	0.81 (0.77–0.86)	0.78 (0.70–0.87)
Drainage	0.57 (0.52–0.63)	0.76 (0.69–0.83)	0.73 (0.61–0.87)
MRI	0.48 (0.40–0.57)	0.72 (0.61–0.86)	0.71 (0.52–0.97)
Transfusion	0.31 (0.10–1.01)	0.99 (0.23–4.19)	1.01 (0.08–13.29)
Surgery	1.03 (0.91–1.17)	0.79 (0.70–0.90)	1.12 (0.86–1.45)
Radiation	0.29 (0.18–0.46)	0.44 (0.29–0.67)	0.46 (0.20–1.07)
Pharmacotherapy and infusions	0.55 (0.46–0.65)	0.67 (0.57–0.78)	0.53 (0.39–0.71)
Miscellaneous	0.65 (0.59–0.72)	0.70 (0.63–0.77)	0.74 (0.61–0.90)

[a]For Saturday, Sunday, and Holiday admission, each compared with weekday admission.

policy change, interventional studies are essential to test the hypothesis that matching weekend and weekday staffing will remedy the weekend/weekday care gap. This information can be used to develop targeted solutions ensuring timely care for patients, regardless of the day of the week.

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