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Research

Potentially avoidable admissions to general internal medicine at an academic teaching hospital: an observational study

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Abstract

Background: Identifying potentially avoidable admissions to Canadian hospitals is an important health system goal. With general internal medicine (GIM) accounting for 40% of hospital admissions, we sought to develop a method to identify potentially avoidable admissions and characterize patient, provider and health system factors.

Methods: We conducted an observational study of GIM admissions at our institution from August 2019 to February 2020. We defined potentially avoidable admissions as admissions that could be managed in an appropriate and safe manner in the emergency department or ambulatory setting and asked staff physicians to screen admissions daily and flag candidates as potentially avoidable admissions. For each candidate, we prepared a case review and debriefed with members of the admitting team. We then reviewed each candidate with our research team, assigned an avoidability score (1 [low] to 4 [high]) and identified contributing factors for those with scores of 3 or more.

Results: We screened 601 total admissions and staff physicians flagged 117 (19.5%) of these as candidate potential avoidable admissions. Consensus review identified 67 candidates as potentially avoidable admissions (11.1%, 95% confidence interval 8.8%–13.9%); these patients were younger (mean age 65 yr v. 72 yr), had fewer comorbidities (Canadian Institute for Health Information Case Mix Group+ 0.42 v. 1.14), had lower resource-intensity weighting scores (0.72 v. 1.50) and shorter hospital lengths of stay (29 h v. 105 h) ($p < 0.01$). Common factors included diagnostic and therapeutic uncertainty, perceived need for short-term monitoring, government directive of a 4-hour limit for admission decision-making and subspecialist request to admit.

Interpretation: Our prospective method of screening, flagging and case review showed that 1 in 9 GIM admissions were potentially avoidable. Other institutions could consider adapting this methodology to ascertain their rate of potentially avoidable admissions and to understand contributing factors to inform improvement endeavours.

Canadian hospitals are overcrowded, with occupancy exceeding 100% and patients experiencing long wait times in emergency departments. Concerns about an influx of patients throughout the COVID-19 pandemic and a backlog of patients with unmet care needs have underscored the urgency of addressing emergency department hospital occupancy. General internal medicine (GIM) patients account for 40% of hospital admissions and considerable health care costs.[1–4] Administrative data and anecdotal reports suggest that a portion of GIM hospital admissions are potentially avoidable admissions,[2,5–12] defined as admissions that could be managed in a timely, effective and safe manner in the emergency department or ambulatory setting. In addition to contributing to overcrowding, potentially avoidable admissions may expose patients to hospital-related harm, reduce hospital efficiency and expend unnecessary resources.[9,13–15]

Retrospective analyses of administrative data and physician interviews from other jurisdictions suggest that more than 22% of hospital admissions may be avoidable.[11,12,16,17] However, these studies focus on upstream measures, which may have avoided the emergency department visit altogether, rather than care processes occurring during the actual encounter. Moreover, many of these studies did not examine patient, provider and system factors contributing to avoidable admissions.

We sought to develop a method to accurately identify potentially avoidable admissions at the time of emergency department presentation. We employed a prospective case-finding method to identify potentially avoidable admissions and tested our approach within a large GIM service (5200 GIM consults per year). We characterized patient, provider and system factors associated with potentially avoidable admissions to inform improvement efforts.

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Methods

We conducted our study at Sunnybrook Health Sciences Centre, an academic teaching hospital in Toronto, Ontario. Our research team consisted of research trainees and GIM specialists with expertise in quality improvement, education and informatics. At the time of the study, our institution had 110 inpatient GIM beds distributed across 5 GIM teams, each composed of a staff physician, resident physicians and medical students. A team census typically consists of 15–22 patients.

During daytime hours (Monday to Friday, 8 am to 5 pm), senior resident physicians receive consult requests from emergency department physicians, assess patients and review the care plan with a staff physician to dictate disposition (admission, referral or discharge). During evenings, nights, weekends and holidays, senior residents receive consultation requests, assess patients with assistance from junior residents and medical students and formulate a care plan. Staff physicians are available remotely with access to the electronic medical record (EMR) but are not in hospital from 5 pm to 8 am. Senior internal medicine residents are required to contact the staff physician if they plan to discharge a patient, but will not engage in contact on evenings, nights, weekends or holidays if the decision is to admit. On weekends, staff physicians are in hospital to review admissions and assist with patient care. Our institution does not offer short-term observation resources (e.g., emergency department observation unit).

Screening and flagging of avoidable admissions

We captured GIM admissions from the preceding 24 hours (8 am to 8 am the prior day) and excluded patients transferred from other institutions, intensive care units, surgical services or admitted from clinic. Each morning, 7 days a week, we randomly selected 2 of 5 GIM teams using a random number generator and emailed staff physicians at 8 am with a list of their admissions, asking them to flag candidates as potentially avoidable admissions. We provided the definition for potentially avoidable admissions as a presentation that could be managed in a timely, effective and safe manner in the emergency department or ambulatory setting. We asked staff physicians to provide a rationale for flagging a candidate and encouraged a low threshold for case finding. If a response was not received within 24 hours, a reminder was sent from a study team member (A.M.C.). To test the sensitivity of our method for screening, 2 members of the research team (A.M.C. and S.S.) independently reviewed a random sample of 30 unflagged cases selected by way of a random number generator.

Case synthesis and debrief

For each flagged potentially avoidable admission, a study team member (A.M.C.) reviewed the admission note and EMR up to the time of admission decision-making to prepare a case review then conducted a debrief with the admitting resident physicians within 24 to 48 hours of the admission date. The purpose of the debriefing session was to verify and enrich the characterization of details abstracted from consultation notes and to identify potential factors that contributed to potentially avoidable admissions from the perspective of the residents that might not have been documented in the EMR (Appendix 1, available at www.cmajopen.ca/content/11/1/E201/suppl/DC1). A single reviewer approach was used to maintain consistency and efficiency in case review, debriefing and case presentation.

Research team review

At least 3 members of the research team met weekly and reviewed case summaries of flagged potentially avoidable admissions. The research team was unaware of patient identifiers, admitting residents, staff physicians, date of admission and admission team. If a team member was the responsible physician for the candidate, they were withdrawn from discussion.

We developed a 4-point Likert scale to estimate the degree of avoidability for each candidate (1 = no evidence of avoidability, 2 = avoidability unlikely, 3 = avoidability likely and 4 = certain evidence of avoidability). We devised prompts (e.g., "If you were seeing this patient in outpatient GIM clinic, would you refer this patient to the emergency department to be admitted?" and "Would more than 50% of your colleagues admit this patient to hospital?") to resolve disagreements, which occurred infrequently. A final decision of avoidability was determined by consensus. For candidates with avoidability scores of 3 or more, we discussed patient, provider and system factors as outlined in Appendix 1. Data collection methodology is outlined in Figure 1.

Patient characteristics and health care utilization

We gathered patient data including age, sex, comorbidity level from the Canadian Institute for Health Information (CIHI) Case Mix Group (CMG+) scores,[18] time and date of admission, consult volumes on date of admission and in preceding 48 hours, hospital length of stay and discharge destination. Health care utilization was assessed for the hospital admission and included medical imaging and a resource-intensity weighting score, a relative and standardized measure of health care resource use compared with an average acute inpatient admission.[19]

Statistical analysis

We used a Clopper–Pearson method to construct 95% binomial confidence intervals (CIs) for proportions. We used χ^2 (for categorical variables) or Mann–Whitney (for continuous variables) tests to assess differences between groups. Multivariable analyses were completed using IBM SPSS statistics version 27 (IBM Corp.). Statistically significant findings were defined as a p value of less than 0.05.

Ethics approval

The Sunnybrook Research Ethics Board approved the study (ID 2170).

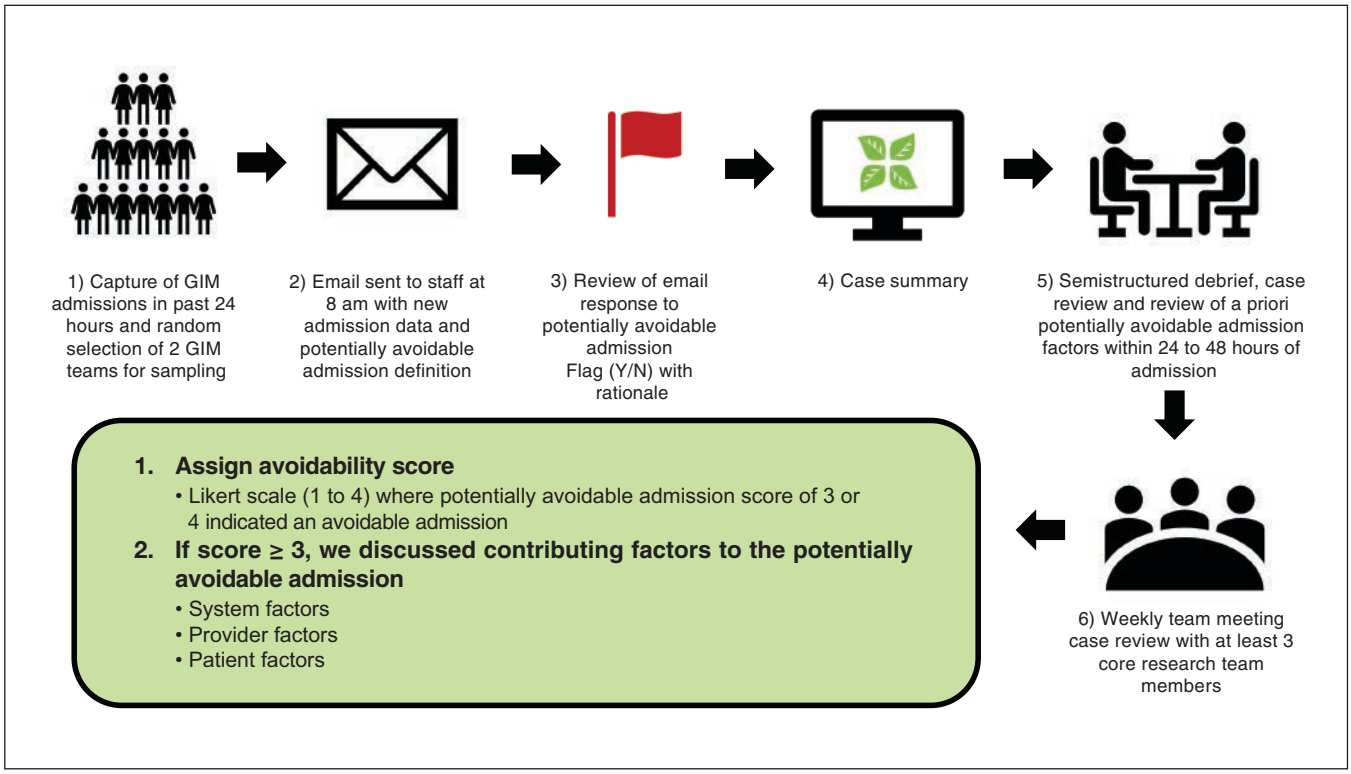

Figure 1: Avoidable admissions screening, flagging and case review methodology. 1) Our method captured GIM admissions from the preceding 24 hours (8 am to 8 am) and excluded patients transferred from other institutions, admitted from the clinic or transferred from the intensive care unit or surgical services. Each morning, 7 days a week, we randomly selected 2 GIM teams through random number generation. 2) We emailed staff physicians at 8 am with a prepopulated list of their admissions, asking them to review our definition of a potentially avoidable admission and to flag candidates. 3) The email response from the staff physician was reviewed including the rationale for avoidability and a list was compiled of all flagged candidates. 4) For each flagged candidate, we reviewed the admission consultation note and electronic medical record up to the time of admission decision-making to prepare a case review. 5) A semistructured debrief was conducted with the admitting resident physician within 24–48 hours of the admission date. We explored case details and contributing patient, provider and system factors. 6) At least 3 members of the research team met weekly and reviewed case summaries of flagged candidates along with data obtained from debriefs. We estimated the degree of avoidability of each candidate (1 = no evidence of avoidability, 2 = avoidability unlikely, 3 = avoidability likely and 4 = certain evidence of avoidability). A final decision of avoidability was determined by consensus vote. For candidates with avoidability scores of 3 or more, we discussed patient, provider and system factors. Note: GIM = general internal medicine.

Results

We screened 601 of 1048 admissions between August 2019 and February 2020. The cohort had a mean age of 71 years and 53% were female. Among the 601 admissions, 83 (14%) occurred during the day whereas 518 (86%) occurred during the evening or overnight, reflecting the timing of consultation requests and admissions to GIM. Patient characteristics and health care utilization are displayed in Table 1.

Our method achieved a 100% response rate within 48 hours of request for case flagging from staff physicians and debriefings with admitting physicians. To ensure potentially avoidable admissions were not excluded during screening, 2 members of the research team independently reviewed a random sample of 30 unflagged cases from the 484 unflagged admissions. One of 30 (3.3%, 95% CI 0%–17%) constituted a candidate for potentially avoidable admissions, suggesting our method captured most cases.

Among the 601 patients screened, 117 (19.5%, 95% CI 16.5%–22.8%) were flagged by staff physicians as candidates for potentially avoidable admissions. After consensus review, 67 (11.1%, 95% CI 8.8%–13.9%) were deemed potentially avoidable admissions. About 30 minutes were spent for each flagged candidate to examine the EMR, prepare a case summary, debrief with admitting physicians and review with our research team.

Compared with nonavoidable admissions, in consensus potentially avoidable admissions, patients were younger (mean age 65 yr v. 72 yr), had fewer comorbidities (CIHI-CMG+ 0.49 v. 1.16) and had shorter median length of stay (29 h v. 105 h [all $p < 0.05$]) (Table 1). We conducted multivariable modelling and found there was no relation between avoidability and sex, time of admission (daytime v. evening or night), day of admission (weekdays v. weekends), or working hours compared with evening or weekends or consult volumes on the date of admission or the preceding 48 hours ($p > 0.05$) (Table 1). The average resource-intensity weighting score for consensus potentially avoidable admissions was 0.72 (standard deviation [SD] 0.42), compared with 1.51 (SD 2.69) for nonavoidable admissions ($p < 0.001$), suggesting

Table 1: Patient characteristics, health care utilization and discharge disposition

Characteristic	Total cohort *n* = 601	Nonavoidable *n* = 534	Avoidable *n* = 67	*p* value
Age, yr, mean ± SD	71 ± 18	72 ± 18	65 ± 20	0.007
Sex, female, no. (%)	316 (53)	255 (48)	37 (55)	0.6
Time of admission, no. (%)				
Daytime*	83 (14)	76 (14)	7 (10)	0.6
Evening†	190 (32)	170 (31)	20 (30)	
Night‡	328 (55)	288 (54)	40 (60)	
Day of week, no. (%)				
Weekday§	393 (65)	352 (66)	41 (61)	0.4
Weekend¶	208 (35)	182 (34)	26 (39)	
ED consults day of admission, mean ± SD	15 ± 3	15 ± 3	16 ± 3	0.5
ED consults in preceding 48 h, mean ± SD	28 ± 5	28 ± 4	26 ± 4	0.4
CIHI Case Mix Groups**	1.09 (1.34)	1.16 (1.34)	0.49 (1.02)	< 0.001
Length of stay, h, median (IQR)	95 (159)	105 (158)	29 (91)	< 0.001
Resource Intensity Weights††	1.42 (2.54)	1.50 (2.68)	0.72 (2.54)	< 0.001
Health care utilization, no. (%)				
CT, head	47 (8)	4 (8)	3 (4)	0.3
MRI, brain and spine	61 (10)	50 (9)	11 (17)	0.07
Discharge destination,‡‡ no. (%)				
Home with supports	123 (20)	112 (21)	11 (16)	0.008
Home without supports	312 (52)	271 (51)	41 (61)	
Assisted living	51 (8)	43 (8)	8 (12)	
Rehabilitation	61 (10)	57 (11)	4 (6)	
Palliative care unit	13 (2)	13 (2)	0	
Transitional unit	9 (2)	9 (2)	0	
Another care facility	6 (1)	6 (1)	0	
Deceased	16 (3)	16 (3)	0	
Against medical advice	10 (2)	7 (1)	3 (4)	

Note: CIHI = Canadian Institute for Health Information, CT = computed tomography, ED = emergency department, IQR = interquartile range, MRI = magnetic resonance imaging, SD = standard deviation.
*Daytime (8 am to 4:59 pm).
†Evening (5 pm to 12 am).
‡Night (12:01 am to 7:59 am).
§Weekday (Monday, 8 am to Friday, 5 pm).
¶Weekend (Friday, 5:01 pm to Monday, 7:59 am). No significant findings comparing daytime versus evening or night, or typical working hours versus evening and weekend.
**CIHI Case Mix Groups are a commonly used health service methodology designed to aggregate acute care inpatients with similar clinical- and resource-utilization characteristics for comparisons.
††Resource Intensity Weights is a CIHI-derived estimate of the cost to provide care relative to the average typical inpatient.
‡‡χ^2 test compared home and home with supports/nursing home/retirement home/group home versus all other locations (rehab, transitional unit, etc.).

lower health care utilization among potentially avoidable admissions.

Our analysis of potentially avoidable admissions found that the most frequently occurring contributing factors were diagnostic or therapeutic uncertainty (*n* = 38, 57%), perceived need for short-term monitoring (*n* = 32, 47%), government directive for a 4-hour limit for admission decision-making in the emergency department (*n* = 28, 42%) and subspecialist request to admit (*n* = 22, 33%) (Table 2).

Interpretation

We found that 1 in 9 admissions to GIM at an academic teaching hospital were potentially avoidable. Our method of prospective surveillance and case ascertainment was effective in identifying potentially avoidable admissions, had high participant engagement and may inform improvement endeavours in the future. We estimate that nearly 480 hospital admissions (i.e., 11.1% of 4339 admissions) and more than 500 GIM hospital bed days per year could be reduced

Table 2: Factors associated with potentially avoidable admissions

Factor	Potentially avoidable admissions, no (%)* *n* = 67
Health system	
Government directive of 4-hour limit for admission decision-making	28 (42)
Subspecialist request to admit	22 (33)
Overcrowding in the ED	13 (19)
Lack of available services to determine suitability of safe discharge	10 (15)
Poor access to urgent outpatient investigations	10 (15)
Unavailable specialist or ancillary care	8 (11)
Lack of timely access to community-based resources	4 (6)
Provider	
Diagnostic and therapeutic uncertainty	38 (57)
Perceived need for short-term patient monitoring	32 (47)
High number of consults during shift, admitted to increase efficiency with workload	12 (18)
Resident–faculty culture (admitting to avoid overnight call to staff physician)	4 (6)
Uncertainty regarding patient preference	2 (3)
Patient and family	
Frailty (physical or cognitive)	16 (24)
Health literacy: language barrier	10 (15)
Socially isolated; lack of social support; unsafe to discharge without access to caregivers	4 (6)
Lack of access to housing/transportation home	1 (1)
Mental illness or substance use; concern re: risk of harm	1 (1)

Note: ED = emergency department.
*More than 1 factor may have been selected for each avoidable admission.

at our institution if these admissions were avoided. Our work is timely given the health care demands during the COVID-19 pandemic and as we begin to address the backlog of delayed care.[20,21] Our method could be considered at other institutions to ascertain their rate of potentially avoidable admissions and understand contributing factors to inform improvement endeavours.

In contrast to prior studies investigating avoidable admissions, we used a prospective, case-specific method, focused on avoidability at the time of presentation and involved front-line physicians who made the admission decision. Our estimate of avoidability was less than other jurisdictions for several hypothesized reasons.[11,12,16,17] Our definition of an avoidable admission considered only factors relevant to the emergency department encounter rather than upstream factors such as access to physicians in the days preceding hospital admission. Several programs exist at our institution to divert patients from hospital admission, including our rapid GIM clinic that assesses thousands of patients per year.[22] Underreporting is a possibility as staff physicians may have been hesitant to flag cases owing to concern for judgment where care may have been adequately managed as an outpatient. However, we feel this is a minor contributor given our institutional focus on continuous improvement along with several residents and division members with advanced quality improvement training.

From debriefs with resident physicians, we were able to better understand the admission decision-making beyond those documented in the EMR. Although we did not conduct a qualitative study, our consensus review helped identify factors contributing to potentially avoidable admissions including diagnostic and therapeutic uncertainty, perceived need for short-term patient monitoring, government directive of a 4-hour time limit for admission decision-making in the emergency department and subspecialist recommendation to admit. These factors have been reported previously from other jurisdictions.[11,12,16,17] In contrast, factors such as lack of access to outpatient care, community-based resources and patient and social factors (e.g., isolation, mental illness or lack of housing) were not commonly cited. This may reflect our patient population or access to allied health care within our emergency department.

To reduce the prevalence of potentially avoidable admissions, educational initiatives focused on understanding and coping with uncertainty could be explored.[23–25] These initiatives must acknowledge the challenge in balancing the conservative

decision to admit with clinical ambiguity, trainee experience and consultation workflow realities. Improved orientation to local resources and feasibility of outpatient GIM management may also ease clinical uncertainty. To address a subspecialist recommendation to admit, trainees may need to engage in discussion with staff physicians to determine if workup can be completed on an outpatient basis. However, this must be balanced with the educational value of graded autonomy and clinical efficiency. We also acknowledge that although raising the threshold for admission may reduce the number of potentially avoidable admissions, it may increase the rate of inappropriate discharges. Any future intervention should assess unanticipated return to care after discharge as a balancing measure, as is monitored with the Ontario Emergency Department Return Visit Quality Program.[26]

We found that nearly half of potentially avoidable admissions were for diagnoses such as mild congestive heart failure, chronic obstructive pulmonary disease and acute kidney injury. These conditions could be amenable to short-term observation (< 12 h) with outpatient follow-up. Emergency department observation units or hospital-at-home programs have been used in other jurisdictions with varying effectiveness.[27–31] Our findings also highlight opportunities to develop rapid care pathways. For example, for a new diagnosis of multiple sclerosis, magnetic resonance imaging, administration of medications and referral to subspecialty clinics could take place on an outpatient basis, potentially reducing the need for hospital admission.

Limitations

We relied on colleagues to flag potentially avoidable admissions using the definition provided and acknowledge this may have led to some imprecision. We did not assess inter-rater reliability of flagging and acknowledge that cases may have been misallocated. We attempted to address this by conducting a random sample of nonflagged cases and found that only 1 of 30 (3%, 95% CI 0%–17%) were potentially missed. Based on the CIs, it is possible that our reported 11% potentially avoidable admissions rate is an underestimate. One author reviewed consultations, debriefed with trainees and prepared case presentations for the research team to ensure consistency and efficiency. We acknowledge this approach may be misleading as there was no formal discussion according to a specified format of engagement and exploratory questions. A moderator or assistant may have improved the reliability of our approach. However, we feel potential misclassification was likely reduced by our detailed case review with the research team. Although our analysis did not show an effect of timing of admission on potentially avoidable admissions, we acknowledge that a low rate of daytime potentially avoidable admissions might reflect the collaborative decision-making between residents and staff physicians. Although we did not explore the effect of occupancy on potentially avoidable admissions, we did not find that consultation volumes influenced rates of avoidability. We did not have historical data to determine yearly variations of potentially avoidable admissions and, as such, it is difficult to ascertain that seasonality was not a confounding factor. Our interviews with residents were brief and we did not conduct formal qualitative analyses. Future studies could explore the admission decision-making of resident physicians using qualitative methods (e.g., grounded theory and thematic analyses).[32] Our data collection methodology was time-intensive and might be improved for efficiency and scalability by an EMR-embedded flag. Our efforts did not need to be sustained over prolonged duration as a brief, high-intensity data collection would likely yield similar institutional learnings. We did this to include 2 periods of occupancy (i.e., summer and fall v. winter). Although we asked physicians to only consider data at the time of admission, their assessment may have been subject to hindsight. Attending physicians had more information when judging avoidability than residents, which could create bias toward a higher rate of potentially avoidable admissions. Given that this is a single-centre study at an academic teaching hospital, our findings may not generalize. Some institutions might have the view that reducing 11% of GIM admissions is too small an issue to warrant further study. We believe our method may help organizations determine their rate of potentially avoidable admissions and facilitate discussion about process improvements.

Conclusion

We developed a prospective method of surveillance and case ascertainment for potentially avoidable admissions. We found that 1 in 9 admissions to GIM were potentially avoidable, and we characterized patient, provider and system factors to inform improvement and education ideas. Other institutions could consider adapting this methodology to ascertain their rate of potentially avoidable admissions and to understand contributing factors to inform improvement endeavours.

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