

Potentially Avoidable Admissions to General Internal Medicine at an Academic Teaching Hospital

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ABSTRACT

Background: Identifying potentially avoidable admissions (PAAs) to overcrowded Canadian hospitals constitutes an important healthcare system goal. Because General Internal Medicine (GIM) accounts for 40% of hospitalizations, we sought to develop a method to identify PAAs and characterize contributing patient, provider, and system factors.

Methods: We defined PAAs as an admission that could be managed in an appropriate and safe-manner in the emergency department (ED) and/or ambulatory-setting. From Aug 2019-Feb 2020, we asked staff physicians to screen their admissions daily and flag candidate PAAs. For candidate PAAs, we prepared a chart summary supplemented by debriefs with members of the admitting team. We then reviewed each candidate PAA, assigned an admission avoidability score [1 (low) to 4 (high)], and developed a framework for identifying factors contributing to PAAs (scores ≥ 3).

Results: Staff physicians flagged 117/601 patients (19.5%) as candidate PAAs. Consensus-review identified 67 cases as PAAs (11.1%); these patients were younger (mean age 65 vs. 72; $p < 0.05$), had fewer comorbidities (Case Mix Group+ level 0.42 vs. 1.14; $p < 0.001$), lower resource-intensity weighting scores (0.72 vs. 1.50; $p < 0.001$), and shorter length-of-stay (29 vs. 105 hours, $p < 0.001$). Diagnostic/therapeutic uncertainty, perceived need for short-term monitoring, government directive of 4-hour limit for admission decision-making, and subspecialist request to admit were common factors.

Interpretation: Our prospective, real-time method of screening, flagging, and case-review showed that 1 in 9 GIM admissions were PAAs and identified contributing factors. Our method could be applied at other institutions to better understand their rate of PAAs and contributing factors to inform improvement endeavours.

INTRODUCTION

Canadian hospitals are overcrowded, with occupancy often exceeding 100% and patients experiencing long wait-times in emergency departments (ED) for an inpatient bed. Concerns about an influx of patients throughout the COVID-19 pandemic and a backlog of unmet care have underscored the urgency of addressing hospital overcrowding. General internal medicine (GIM) patients account for nearly 40% of all hospitalizations and considerable healthcare costs per year.(1–4) Healthcare administrative data and anecdotal reports suggest that a portion of GIM hospitalizations are potentially avoidable admissions (PAAs),(5–13) defined as an admission that could be managed in a timely, effective, and safe-manner in the ED and/or ambulatory-setting. In addition to contributing to overcrowding, PAAs may expose patients to hospital-related harm, reduce hospital efficiency, and expend unnecessary resources.(10,14–16) Thus, identifying PAAs and their contributing factors represents a potentially important quality improvement (QI) goal.

Retrospective analyses of administrative data and physician interviews from the USA and UK suggest that greater than 22% of hospital admissions may be avoidable.(12,13,17,18) However, these studies typically focused on upstream preventive measures, which may have avoided the ED visit altogether, rather than care processes and decisions occurring during the actual ED care encounter. Many of these studies also did not explicitly examine patient, provider and institutional factors contributing to these avoidable admissions.

We developed a novel approach to more accurately identify PAAs at the time of ED presentation. We employed a prospective case-finding method to identify PAAs and tested our approach in a Canadian institution with a large GIM service (approximately 5,200 consults per year). As an additional goal, we characterized the patient, provider, and system factors associated with PAAs to inform improvement efforts.

METHODS

Study Setting and GIM Service Organization

We conducted this study at Sunnybrook Health Sciences Centre (SHSC), an academic tertiary care hospital in Toronto, Canada. The SHSC REB approved the study. Our GIM Division is composed of 16 GIM specialists and five subspecialists. At the time of the study, our institution had 110 inpatient GIM beds distributed across five GIM teams. Each team is composed of a staff physician, internal medicine (IM) and other resident physicians, and medical students. A team census typically consists of 15-22 patients. In the 2018-2019 academic year, our GIM service received 5,200 requests for ED consults resulting in 4,339 hospitalizations.

ED Consultation Workflow

During daytime hours (Monday-to-Friday, 0800h-1700h), senior IM resident physicians receive consult requests from ED physicians, assess patients, and review consults with a staff physician in real-time to determine the care plan (admission, transfer to another service, or discharge). During evenings, nights, weekends, and holidays, senior IM residents receive consult requests from ED physicians, assess patients with assistance from junior residents and medical students, then independently decide on a care plan. Staff physicians are available by phone with access to the electronic medical record (EMR) but are typically not in hospital providing care between 5PM-8AM. Senior IM residents are required to contact the on-call staff physician if they plan to discharge a patient, but will typically not engage in contact on evenings, nights, weekends, or holidays if the decision is to admit.

Screening and Flagging of Potentially Avoidable Admissions

Our process screened GIM admissions from the preceding 24 hours and excluded patients transferred from another institution, admitted from clinic, or from ICU or a surgical service. Each morning, 7 days/week, we randomly selected two GIM teams and e-mailed staff physicians at 0800h with a pre-populated list of their admissions, asking them to flag candidate PAAs.

We defined a candidate PAA as a patient presentation that could be managed in a timely, effective, and safe manner in the ED and ambulatory-setting. We asked staff physicians to provide a one-to-two sentence rationale for flagging and encouraged a low threshold to flag candidate PAAs to make case-finding as inclusive as possible during this initial phase. If a response was not received within 24 hours of the initial request, follow up correspondence was sent from a study team member (AMC).

Case Synthesis and Clinician Debrief

For each flagged PAA, one of us (AMC) reviewed the admission consultation note, investigations, and other consultations up to the time of admission to prepare a chart summary. One of us (AMC) conducted a semi-structured debrief with the admitting resident physician within 24-48 hours of admission date. Here, we explored case details, admission rationale, and discussed contributing patient, provider, and system factors.

Research Team Case Review

At least three members of the research team (AMC, EE, AW, KGS, LS, BMW, SS) met weekly and reviewed case summaries of flagged PAAs along with data obtained from debriefs. The research

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3 team was blinded to admitting residents, staff physicians, date of admission, and admission team. If
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5 a team member had been the most responsible physician for the candidate PAA, they were
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7 withdrawn from discussion.
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12 We developed a scale adapted from prospective surveillance studies of adverse events to
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14 estimate the degree of avoidability of each candidate PAA (1 = virtually no evidence of avoidability, 2
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16 = avoidability not likely, 3 = avoidability likely, and 4 = virtually certain evidence of avoidability).(19)
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18 We used prompts (e.g., “if you were seeing this patient in your outpatient GIM clinic, would you
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20 refer this patient to the ED to be admitted?” and “would more than 50% of your colleagues admit
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22 this patient to hospital?”) to resolve disagreement among team members. A final decision of
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24 avoidability was determined by consensus. For candidate PAAs with avoidability scores of ≥ 3 , we
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26 reviewed and discussed patient, provider, and system factors (Table 2 & Appendix 1). Our data
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28 collection methodology is displayed in Figure 1.
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34 Baseline Characteristics

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39 We gathered patient data including age, gender, comorbidities using comorbidity-level
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41 from CIHI-Case Mix Group (CMG) scores,(20) time and date of admission, consult volumes on date of
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43 admission and in preceding 48 hours, length of stay (LOS), healthcare resource utilization (measured
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45 by resource-intensity weighting (RIW) scores, a relative value measuring total patient healthcare
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47 resource use compared with average typical acute inpatients),(21) along with medical imaging [CT
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49 head, MRI brain/spine], and discharge destination (Table 1).
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54 Statistical Analysis

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3 We used Chi-square (for categorical variables) or Mann-Whitney U (for continuous variables)
4 tests to assess differences between PAA and non-PAA groups. Analyses were completed using SPSS
5 version 27 software (IBM, Armonk, New York, USA). Statistically significant findings were defined as
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10 $p < 0.05$.

11 12 13 14 **RESULTS**

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18 We screened 601 (57%) of 1,048 ED admissions to GIM between August 2019-February
19 2020. The cohort had a mean age of 71 years (SD 18) and 53% were female. Of the 601 admissions
20 included in our study, 83 (14%) occurred during daytime (0800h to 1700h) while 518 (86%) occurred
21 in the evening and overnight period, reflecting the timing of receipt of consultations and admissions
22 by our GIM service. Admission data, baseline characteristics, LOS, healthcare utilization, and
23 discharge destination are displayed in Table 1.
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34 Our method achieved a 100% response rate within 48 hours of request for case-flagging
35 from staff physicians and case debriefings with the admitting IM residents. To ensure PAAs were not
36 excluded during screening, members of the research team (AMC, SS) independently reviewed a
37 random sample of 30 unflagged cases where only 1/30 constituted a candidate PAA, suggesting that
38 attending physicians captured the vast majority of candidate PAAs. Of the 601 patients screened,
39 117 (19.5%) were flagged by staff physicians as candidate PAAs. After consensus review, 67 (11.1%;
40 95% CI: 8.8% to 13.9%) were deemed PAAs. Approximately 20 minutes was spent for each flagged
41 PAA to examine the electronic medical record, conduct chart review, debrief with IM residents, and
42 review with our research team.
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57 Compared to non-avoidable admissions, consensus PAAs were younger (mean age 65 vs. 72
58 years, $p < 0.05$), had fewer comorbidities (CMG+ 0.49 vs. 1.16, $p < 0.001$), and had shorter median LOS
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3 (29 hours vs. 105 hours, $p<0.001$) (Table 1). There was no relationship between avoidability and
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5 gender, time of admission (daytime vs. evening/night), day of admission (weekdays vs. weekends),
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7 or working hours (Monday to Friday 0800h to 1700h) vs. evening and weekends (all $p>0.05$) (Table
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9 1). The average RIW score (SD) for consensus PAAs was 0.72 (0.42), compared to 1.51 (2.69) for non-
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11 avoidable admissions ($p<0.001$), suggesting lower healthcare resource utilization among PAAs.
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17 Table 2 summarizes the patient, provider, and system factors that contributed to PAAs in our
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19 study. The most frequently occurring contributing factors to PAAs include diagnostic/therapeutic
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21 uncertainty ($n=38$), perceived need for short-term monitoring ($n=32$), government directive for 4-
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23 hour limit for admission decision-making in the ED ($n=28$), and subspecialist request to admit ($n=22$),
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25 (Table 2).
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30 **DISCUSSION**

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35 In this prospective study of admissions to GIM at a tertiary care academic teaching hospital,
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37 we found that 1 in 9 were deemed potentially avoidable. Our method of active surveillance and case
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39 ascertainment was effective in identifying PAAs, had high participant engagement, and may help to
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41 inform quality improvement and medical education ideas. We estimate that nearly 480
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43 hospitalizations (i.e., 11% of 4,339 admissions) and over 500 GIM hospital bed-days per year could
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45 be potentially avoided at our institution alone. Our work is timely given the healthcare constraints
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47 imposed by the COVID-19 pandemic and as we begin to address the backlog of services due to
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49 delayed care.(22,23) Our method could be applied at other institutions to better understand their
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51 rate of PAAs and local contributing factors.
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57 In contrast to prior studies investigating avoidable admissions, we used a prospective case-
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59 specific method focused on avoidability at the time of presentation and involved frontline physicians
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3 who made the admission decision. Our estimate of avoidability (11%) was lower than those
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5 previously found in the USA and UK for several reasons.(12,13,17,18) Our definition of an avoidable
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7 admission considered only factors relevant to the care encounter once a patient arrived in our ED
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9 rather than upstream factors such as access to physicians in the days preceding hospitalization. This
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11 may have led to a narrower cohort of patients identified. Other institutional programs already exist
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13 to divert patients from the ER to avoid hospitalization, such as rapid outpatient clinics for GIM,
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15 stroke, and cardiology, among others.(24) Lastly, physicians may have been less inclined to flag cases
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17 as PAAs due to concern for judgement about the decision to admit where care might have been able
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19 to be managed as an outpatient. However, we feel this is a minor contributor given our institutional
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21 culture with a focus on QI (i.e., patient safety, morbidity & mortality rounds, division members
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23 formally appointed in QI, and past/current chief residents supported to pursue QI training). We also
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25 found a very low rate of missed PAAs among unflagged cases (1 of 30).
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32 From debriefs with resident physicians, we were able to better understand the admission-
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34 process and decision-making factors beyond those documented in the EMR. Our consensus review
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36 process helped to identify factors contributing to PAAs including diagnostic and therapeutic
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38 uncertainty, perceived need for short-term patient monitoring, hospital 4-hour time limit for
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40 admission decision-making in the ED, and a subspecialist recommendation to admit. These factors
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42 have been reported previously in studies from other jurisdictions.(12,13,17,18) Of note, previously
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44 identified factors such as lack of access to outpatient/specialist care, community-based resources,
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46 and patient/social factors such as isolation, mental illness, or lack of housing were not commonly
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48 cited. This may reflect the demographic composition of our patient population or rapid access to
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50 allied healthcare specialists within our ED.
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57 To reduce the prevalence of PAAs, educational initiatives for resident physicians focused on
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59 understanding and coping with uncertainty could be explored.(25–27) Improved orientation to local
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3 resources and briefing on scope and capacity for outpatient GIM workup and management may also
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5 help ease clinical uncertainty. To address a subspecialists recommendation to admit, which may
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7 occur more often outside usual working hours when GIM is overseen by junior trainees, resident and
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9 staff physicians may need to engage in earlier discussion to determine if workup can be feasibly
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11 completed on an outpatient basis. However, this must be balanced with the educational value of
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13 graded autonomy and independent decision-making throughout IM training.
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19 We found that nearly half of PAAs were for diagnoses such as mild congestive heart failure,
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21 chronic obstructive pulmonary disease, and acute kidney injury. These conditions could be amenable
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23 to short-term observation (<12 hours) in the ED with outpatient follow up. ED observation units or
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25 “hospital-at-home” programs have been used in other jurisdictions with varying effectiveness,(28–
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27 32) however most do not involve direct GIM consultation. Our findings also highlight a potential
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29 benefit of developing rapid care pathways. For example, for a new diagnosis of multiple sclerosis,
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31 urgent access to MRI imaging, administration of medications, and referral to subspecialty clinics
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33 could take place on an outpatient basis, potentially negating need for hospitalization.
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39 Strengths of our study include the prospective nature of data collection, real-time
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41 debriefings, and consensus review. Our process, modelled after trigger-tool methodologies and
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43 prospective surveillance of adverse events,(19,33) allowed for detailed review of workflow and
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45 processes that would be unavailable from administrative data or delayed review. Our debriefing
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47 process with residents was case-based, brief, and illustrated the practicality of our method. While
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49 our results reflect the unique experience of a tertiary care academic teaching hospital, our method
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51 for identifying and classifying PAAs could be adapted and applied to any GIM service in Canada.
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57 Our study has limitations. Cohort collection and data extraction was time-intensive and
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59 could be improved through an EMR-based flag for PAAs. As nearly 60% of flagged PAAs were
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3 confirmed via consensus, an initial EMR-embedded screening tool for avoidability might allow
4 scalability. Our efforts likely did not need to be sustained as our data saturated before completion of
5 data collection. We did this to further develop our method and included two periods of varied
6 hospital occupancy (i.e., fall and winter). A discrete high-intensity data collection period would likely
7 have yielded similar results and provided rich institutional learnings. Although we asked attending
8 physicians to consider only data at the time of initial assessment, their decision regarding
9 avoidability may have been subject to bias. Attending physicians had more information when judging
10 avoidability than residents at the time of admission, which could bias our initial screen toward a
11 higher rate of avoidable admissions. This was mitigated through case review, debriefs, and research
12 team deliberations. Lastly, institutions might view reducing 11% of GIM admissions (i.e., 1 in 9 as
13 PAAs) as too small a number to warrant intervention or that multiple interventions, spanning various
14 aspects of PAAs would be needed to accomplish such a change. However, we believe our method
15 will help organizations determine their own rate of PAAs and facilitate discussion about process
16 improvements and potential QI interventions.
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36 **CONCLUSION**

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40 We developed a novel, prospective method of active surveillance and case-ascertainment
41 for potentially avoidable admissions. We found that 1 in 9 admissions to GIM were potentially
42 avoidable and characterized contributing provider and system factors to inform local QI and medical
43 education ideas. Our method could be applied at other healthcare institutions to better understand
44 their rate of PAAs and local contributing factors to help inform potential interventions to alleviate
45 hospital overcrowding.
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3 **AUTHORSHIP CONTRIBUTIONS**
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6 Concept and design: AMC, UP, ES, EE, AW, KGS, LS, BMW, SS
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9 Acquisition, analysis, or interpretation of data: AMC, UP, ES, EE, AW, KGS, LS, BMW, SS
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11 Drafting of the manuscript: AMC
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13 Critical revision of the manuscript for important intellectual content: AC, EE, AW, KGS, LS, BMW, SS
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17 **CONFLICT OF INTEREST STATEMENT**
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20 None to declare.
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Confidential

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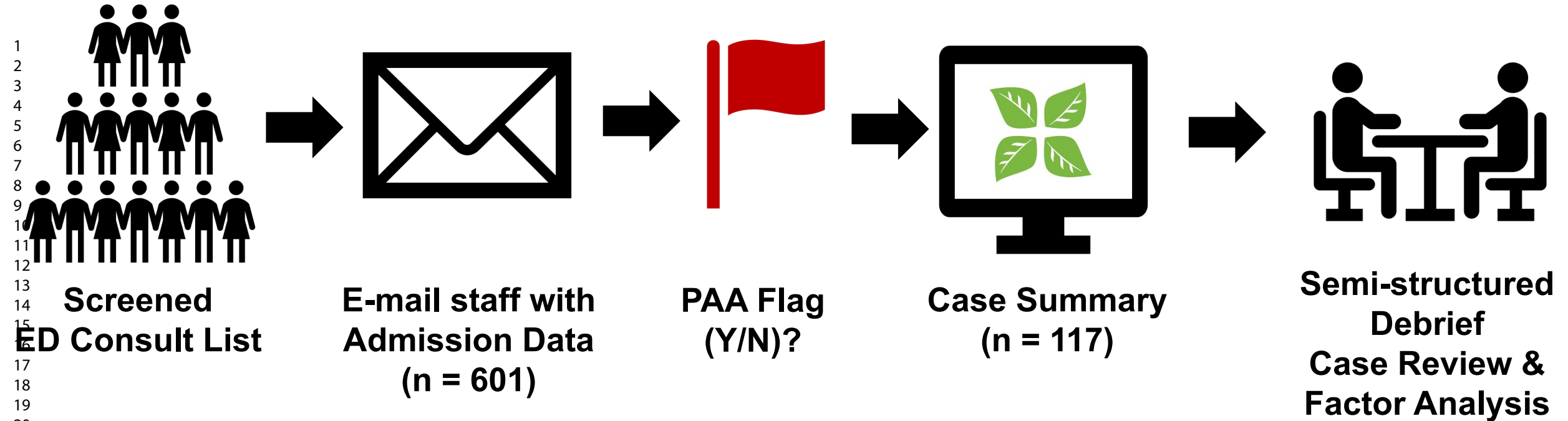
Table 1: Baseline Characteristics of Cohort, Healthcare Utilization and Disposition

	Total Cohort	Non-Avoidable	Avoidable	P-value
Total Cases (n)	601	534	67	
Age (Mean, SD)	71 (18)	72 (18)	65 (20)	0.007
Female, n (%)	316 (53%)	255 (48%)	37 (55%)	0.646
Time of Admission, n (%)				
Daytime ^a	83 (14%)	76 (14%)	7 (10%)	0.590
Evening ^b	190 (32%)	170 (31%)	20 (30%)	
Night ^c	328 (55%)	288 (54%)	40 (60%)	
Day of Week, n (%)				
Weekday ^d	393 (65%)	352 (66%)	41 (61%)	0.444
Weekend ^e	208 (35%)	182 (34%)	26 (39%)	
CIHI Case Mix Groups	1.09 (1.34)	1.16 (1.34)	0.49 (1.02)	<0.001
LOS (h) (median, IQR)	95 (159)	105 (158)	29 (91)	<0.001
RIW Score	1.42 (2.54)	1.50 (2.68)	0.72 (0.44)	<0.001
Healthcare Utilization				
CT (Head)	47 (8%)	4 (8%)	3 (4%)	0.280
MRI Brain/Spine	61 (10%)	50 (9%)	11 (17%)	0.071
Discharge Destination^f				
Home with supports	123	112	11	0.008
Home without supports	312	271	41	
Assisted Living	51	43	8	
Rehab	61	57	4	
Palliative Care Unit	13	13	0	
Transitional Unit	9	9	0	
Another Care Facility	6	6	0	
Deceased	16	16	0	
Against Medical Advice	10	7	3	

^aDaytime (0800 – 1659), ^bEvening (1700 – 2400), ^cNight (0001 – 0759), ^dWeekday (M0800 – F1700), ^eWeekend (F1701 – M0759). No statistically significant findings comparing daytime vs. evening/night or typical working hours vs. evening & weekend. ^fChi-square test compared Home/Home with Supports/NH/RH/Group Home versus all other locations (Rehab, Transitional Unit, etc.)

Table 2: Factors Associated with Potentially Avoidable Admissions

Factor	N
Health System	
Poor Access to Urgent Outpatient Investigations	10
Subspecialist request to admit	22
Government directive of 4-hour limit for admission decision-making	28
Overcrowding in the ED	13
Lack of Available Services to Determine Suitability of Safe Discharge	10
Lack of Timely Access to Community Based Resources	4
Unavailable Specialist / Ancillary Care	8
Provider	
Diagnostic and Therapeutic Uncertainty	38
Perceived need for short-term patient monitoring	32
High number of consults during shift, admitted to increase efficiency with patient workload	12
Resident-Faculty Culture (Admitting in order to avoid overnight call to staff physician)	4
Uncertainty Regarding Patient Preference	2
Patient & Family	
Frailty (Physical/Cognitive)	16
Socially Isolated; Lack of social support; unsafe to discharge without access to caregivers	4
Lack of Access to Housing / Transportation Home	1
Health literacy: Language Barrier = no translator or family to discuss treatment plan	10
Mental illness / substance use; concern re: risk of harm	1



1. Assign Avoidability Score

- Likert Scale (1 to 4) where PAA score of 3 or 4 indicated an avoidable admission

2. If score ≥ 3 , discussed contributing factors

- System Factors
- Provider Factors
- Patient Factors

Appendix 1: Health System, Patient and Provider Factors for Potentially Avoidable Admissions

Health System Factors

- Poor Access to Urgent Outpatient Investigations (admitted to shorten diagnostic process or circumvent outpatient referral process)
- Subspecialist request to admit
- Government directive of 4-hour limit for admission decision-making
- Overcrowding in the ED = Patient admitted to free-up space in an overcrowded ED
- Lack of Available Services to Determine Suitability of Safe Discharge and Outpatient Allied Health Follow Up (PT/OT/SW/GEM RN)
- Lack of Timely Access to Community Based Resources (to Address Ongoing Concerns regarding Medical/Palliative, Functional, Social)
- Unavailable Specialist / Ancillary Care
- Delay in Urgent GIM Clinic Appointment

Provider Factors

- Diagnostic & Therapeutic Uncertainty
- Perceived need for short-term patient monitoring
- High number of consults during shift, admitted to increase efficiency with patient workload
- Resident-Faculty Culture (Admitting in order to avoid an overnight call to staff physician)
- Uncertainty Regarding Patient Preference (Lack of collateral; admitted without being able to align with goals of care)
- Insufficient Workforce (Insufficient human resources to manage workload)

Patient & Family Factors

- Frailty (Physical/Cognitive); admitted due poor mobility/cognitive impairment; deemed unsafe to send home at time of referral
- Socially Isolated; Lack of social support available to patient; unsafe to discharge without access to caregivers
- Lack of Access to Housing / Transportation Home
- Health literacy: Language Barrier = no translator or family discuss treatment plan
- Mental illness / substance use = admission with recent history of mental illness and/or substance use; risk of self-harm/neglect
- Patient/Family Preference = Patient and/or substitute decision-makers insisting on admission