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Association of Geriatric Emergency Department Post-Discharge Referral Order and Follow-Up with Healthcare Utilization

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Abstract

Background
Compared with younger adults who receive care in the emergency department (ED), older patients who are discharged home have greater risk of adverse health outcomes. Connecting older adults with outpatient care following ED discharge are among the guidelines of the Geriatric Emergency Department (GED). The objective of this study was to examine the association between referral order placed during the ED visit for older adults and post-discharge follow-up to the outcomes of 72-h ED revisit, 30-day ED revisit, and 30-day all cause and unplanned hospital admission.

Methods
We conducted a retrospective cohort study. Ten accredited GEDs within one midwestern health system and all ED encounters of older adults aged 65 years and older who were discharged home from the ED between July 2019 and December 2020 were included. Predictor variables included age, sex, race, ISAR©, ED Length of Stay, post-ED referral order, and follow-up.

Results
Among the older adults discharged home from the ED, 17% of older adult encounters had an outpatient referral ordered in the ED, 48.4% attended a follow-up appointment. Referrals were ordered for 69 referral order types with orthopedic, family practice, and urology referrals as the top 3. In mixed-effect regression models, compared with older adults with follow-up, those with a referral order but no follow-up had 19% higher odds of having a 30-day ED revisit (OR = 1.19; 95% CI = 1.07–1.31) and 11% higher odds of having 30-day unplanned hospital admission (OR = 1.11; 95% CI = 0.98–1.26).

Conclusions
Older adults who had an outpatient referral ordered prior to ED discharge and followed up had lower odds of a 30-day ED revisit and 30-day subsequent unplanned hospital admission. However, less than half of patients with a referral order attended a follow-up appointment. Designing interventions for older adults aimed at improving follow-up after an ED visit is needed.

Key points
- Older patients who are discharged home from the ED are at greater risk of adverse health outcomes, including return to the ED, hospitalization, and death.
- Post-ED discharge referral order and follow-up is associated with decreased 30-day ED revisit and subsequent unplanned 30-day hospital admission.
- This study highlights the need for future research to design and test interventions to improve post-ED discharge follow-up appointment attendance for older adults.

Why does this paper matter?
Understanding older adult post-ED 30-day healthcare utilization following post-ED discharge referral order and follow-up is useful for designing interventions to improve care for older ED patients.

INTRODUCTION
Individuals 65 and older represent 25% of emergency department (ED) visits in the United States with the majority of older adults discharged home from the ED. Compared with younger adults who receive care in the ED, older patients who are discharged home are at greater risk of adverse health outcomes, including return to the ED, hospitalization, institutionalization, functional decline, and death. One in four older adults who are discharged from the hospital return to the ED within 30 days. Discharging older adults from the ED who do
not need to be admitted to the hospital is beneficial, however, this should be accomplished through an effective and comprehensive approach.12-15

Geriatric Emergency Department (GED) guidelines were published in 201416 followed by an accreditation process in 2018, 17, 18 The GED guidelines and accreditation standards address structure and processes of care related to staffing, policies, and procedures.5, 18 Additionally, the GED guidelines and accreditation standards recommend identifying older adults at risk for adverse outcomes and address follow-up care by connecting the patient with timely outpatient services.16-19 A previous study reported that older adults who were discharged home after an ED visit and followed-up with primary care and subspecialty care within 30 days had lower ED revisits.20 However, it remains unclear how to accomplish an efficient referral order process and prompt outpatient care post ED visit.

Studies of the GED model of care have shown a decrease in the likelihood of hospital admission from the GED14, 15, 21 and lower cost of care for older adults who receive care in the GED.22 Prior to the GED model and guidelines, other interventions that focused on the older adult ED patient demonstrated lower lengths of stay in the ED.23, 24 One study within the context of the GED demonstrated that transitional care nurses who focused on the patient transition back to the community with coordinated post-discharge care showed a decrease in the likelihood of ED revisits within 30 days.14, 15

Four main barriers to effective ED to community transitions have recently been identified.25 Barriers included that the discharge process was abrupt and navigating outpatient follow-up care was difficult. Recommendations to improve these barriers included communicating within the Electronic Health Record (EHR) with the outpatient care provider prior to discharge from the ED.25

Understanding how accredited GEDs have attempted to navigate and standardize the process for outpatient referral prior to ED discharge, rates of follow-up, and the association with 30-day healthcare utilization for older adults is important for understanding the referral transition process and what potential additional gaps remain. Previous studies demonstrate promising findings relative to the GED model of care, however, the evidence regarding post-ED referral order prevalence, how to standardize the referral process for post-ED outpatient and subsequent follow-up, and its impact on 30-day healthcare utilization is limited. The objective of this study was to examine the association between post-ED referral order placed during the GED visit for older adults and follow-up to the outcomes of 72-h ED revisit, 30-day ED revisit, and 30-day subsequent all cause and subsequent unplanned hospital admission.

METHODS

Design, sample, and setting
This was a retrospective cohort study. Older adults aged 65 and older who had an ED encounter at any of the 10 accredited GEDs within one midwestern healthcare system and were discharged home from the ED between July 1, 2019 and December 31, 2020 comprised the study sample. Data from 33,303 unique older adult patients comprised 51,582 encounters.

The study methods outlined for emergency medicine retrospective studies were followed to reduce bias and address reliability of the data.26, 27 Patient demographic and health outcome data were retrospectively exported directly from electronic health record (EHR) healthcare system administrative data base (EPIC Systems© software). All pre-defined variables were extracted using code targeting discrete EHR fields using standardized query written to describe the older adult encounters to the GEDs. Each separate encounter was issued a unique account number. Variables included age, sex, race, Identification of Seniors at Risk score (ISAR©), Emergency Severity Index (ESI), ED Length of Stay (LOS), post-ED referral order and follow-up and the outcomes of 72-h ED
revisit, 30-day ED revisit, 30-day subsequent all cause hospital admission, and 30-day subsequent unplanned hospital admission. We chose to examine 72-h, 30-day ED revisit and 30-day subsequent all cause and unplanned hospital admission as the outcomes as prior research suggests that return to ED or hospital admission within 72 h and/or 30 days may reflect suboptimal care transitions or post-discharge care.20, 28, 29 The Institutional Review Board of the health system approved this study.

Covariates (age, sex, ED LOS, ISAR©, ESI) were selected based on routinely available information collected in the GEDs, GED guideline screening recommendations,16, 17 or based on prior evidence the variable is associated with the patient outcomes.11, 16, 17, 30, 31 While a meta-analysis reports that the ISAR is not predictive of post-ED adverse outcomes,32 we included it as a covariate as it is recommended as a risk identification tool to aid in identifying older adults who may be at risk of requiring more help post-ED discharge,17 both within the GED guidelines and the level 3 GED accreditation standards. We also included ESI as a recent study identified ESI associated with revisit to ED within 48 h.29

Among the 10 GEDs, 9 were community hospitals and 1 was a teaching hospital and all were GED accredited at level 3 during the study period. Level 3 accreditation standards include: one protocol geriatric specific protocol such as a standardized assessment of function and functional decline (e.g., ISAR©) with appropriate follow-up, physician champion with geriatric specific education, nursing champion with geriatric specific education, and access to mobility assist devices and nutrition 24 h a day. Based on the level 3 accreditation standards, the 10 GEDs had a physician champion with geriatric specific education, up to one full time equivalent (FTE) Registered Nurse (RN) case manager and/or social worker with geriatric specific education. Older adults that are screened by the nurse and/or physician as having a need for outpatient referral, a discussion between the nurse, physician, case manager, and/or social worker as to what specific referrals are recommended occurs. Based on the recommendations, the physician enters the outpatient referral order within the EHR prior to ED discharge. The referral order within our GEDs included any type of outpatient referral recommended and available within our system by the ED interdisciplinary team. (Table S1 for the complete list of referral order types).

**Measures**

The ED index encounter was defined as an ED to home encounter. The outcomes were 72-h ED revisit, 30-day ED revisit, 30-day subsequent all cause hospital admission, and 30-day subsequent unplanned hospital admission. 72-h ED revisit was defined as one or more return to the ED within 72 h of the index encounter. 30-day ED revisit was defined as one or more return to the ED within 30 days of the index encounter. Expanding upon Landrum and colleagues33 definition of subsequent hospital admission defined as a hospitalization following an index visit that does not meet criteria for readmission, we defined 30-day subsequent all cause hospital admission as an admission that was a non-elective admission or elective admission to an inpatient hospital unit within 30 days of the ED index encounter. A 30-day subsequent unplanned hospital admission is defined as a non-elective admission to an inpatient unit within 30 days of the ED index encounter.

ED referral order was defined as an outpatient referral order placed within the EHR prior to ED discharge. Follow-up was defined as a post-ED discharge referral order appointment attended within 30 days of the ED encounter. The type and total number of referral orders and follow-up appointments for each ED encounter were collected. Less than 1% (n = 153) of encounters had more than one referral ordered. Accordingly, we restricted our analysis to whether at least one referral was ordered and at least one associated follow-up appointment was attended. Referral order and follow-up includes three levels: (a) no referral order and no follow-up appointments, (b) at least one referral order and no follow-up appointments, (c) at least one referral order and at least one follow-up appointment attended.

ED LOS is defined in minutes from when the patient was admitted to their discharge from the ED. ISAR © is a self-report screening tool composed of six yes/no items, related to functional dependence, recent
hospitalization, impaired memory and vision, and polypharmacy. The total scale range is from 0 to 6, as each item is scored 1 if the patient reports having the problem and 0 if not; 2 or greater indicates at risk. The ESI is a tool used for ED triage and stratifies all patients on both acuity and resource needs into five groups; Level 1 = most urgent to level 5 = least urgent (3 or lower indicates urgent needs).

Statistical methods
Demographic and clinical characteristics were summarized using appropriate descriptive statistics such as means (±SDs) or frequencies and percentages. The characteristics were compared for ED revisit and hospital admission as binary outcomes using chi-square or t-test as appropriate. We excluded ED encounters without a documented ISAR© score from the regression analyses (n = 12,745). Demographic and clinical characteristics that were statistically significant in the bivariate analyses were included in the mixed-effects logistic regression models. In the mixed-effects regression analyses we examined the association of characteristics as predictors of 72-h ED revisit, 30-day ED revisit, and 30-Day subsequent all cause and subsequent unplanned hospital admission as the outcomes. Patient was included as the random effect in our analysis to account for unobserved patient level heterogeneity that might be correlated with outcomes. Adjusted associations were reported as odd ratios (OR) with 95% confidence intervals. The area under the receiver operating characteristic (ROC) curve was used to quantify the prediction accuracy of the developed models based on the Hosmer-Lemeshow test. The area under the curve (AUC) of 0.8–0.89 is a good test while 0.7–0.79 is a fair test. Significance level of \( p \leq 0.05 \) was used. All statistical analysis were conducted using SAS software v.9.4 (SAS Institute, Inc., Cary, NC).

RESULTS
A total of 33,303 unique older adults representing 51,583 encounters comprised the study sample, while 26,879 older adults representing 38,838 ED encounters were included in the regression analyses. The overall study population based on first encounter had a mean age of 76 (SD = 8) years old, 52% of the older adults were younger than 75 years, 57% were female, 90% were white, and 8% of older adults were black. The average length of emergency department stay was 179 (SD = 90) minutes. Older adults averaged 1.7 ED encounters. Outpatient referral orders were placed during an average of 8% of ED visits (range, 2.9%–39.2%) at the 10 GEDs. Among the 51,583 older adult ED encounters, 17% (n = 8854) had a referral order. Of the referral orders placed, 48.4% (n = 4287) had a subsequent follow-up appointment attended. Table 1 reports older adult ED encounter characteristics by referral order and follow-up status.
TABLE 1. Characteristics of older adults discharged from the GED by referral order and follow-up status at encounter level

<table>
<thead>
<tr>
<th></th>
<th>All encounters</th>
<th>Referral order and follow-up</th>
<th>Referral order/no follow-up</th>
<th>No referral order/no follow-up</th>
<th>p value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of encounters</td>
<td>51,583</td>
<td>4085</td>
<td>4769</td>
<td>42,729</td>
<td></td>
</tr>
<tr>
<td>Length of ED stay, mean minutes (SD)</td>
<td>178 (92)</td>
<td>186 (84)</td>
<td>196 (84)</td>
<td>175 (92)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Age, no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>22,254 (49.0)</td>
<td>2053 (50.3)</td>
<td>2240 (47.0)</td>
<td>20,961 (49.0)</td>
<td>0.005</td>
</tr>
<tr>
<td>75–89</td>
<td>16,657 (32.3)</td>
<td>1328 (32.5)</td>
<td>1585 (33.2)</td>
<td>13,744 (32.2)</td>
<td></td>
</tr>
<tr>
<td>90+</td>
<td>9672 (18.7)</td>
<td>704 (17.2)</td>
<td>944 (19.8)</td>
<td>8024 (18.8)</td>
<td></td>
</tr>
<tr>
<td>Sex, no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>29,375 (57.0)</td>
<td>2255 (55.2)</td>
<td>2660 (55.8)</td>
<td>24,460 (57.0)</td>
<td>0.01</td>
</tr>
<tr>
<td>Male</td>
<td>22,208 (43.1)</td>
<td>1830 (44.8)</td>
<td>2109 (44.2)</td>
<td>18,269 (43.0)</td>
<td></td>
</tr>
<tr>
<td>Race, no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>45,932 (89.8)</td>
<td>3823 (93.6)</td>
<td>4332 (90.8)</td>
<td>37,777 (88.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Black</td>
<td>4685 (9.1)</td>
<td>191 (4.7)</td>
<td>347 (7.3)</td>
<td>4147 (9.7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>966 (1.9)</td>
<td>71 (1.7)</td>
<td>90 (1.9)</td>
<td>805 (1.9)</td>
<td></td>
</tr>
<tr>
<td>ISAR©, no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>22,228 (43.1)</td>
<td>2077 (50.8)</td>
<td>2150 (45.1)</td>
<td>18,001 (42.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>≥2</td>
<td>16,610 (32.2)</td>
<td>1179 (28.9)</td>
<td>1660 (34.8)</td>
<td>13,771 (32.2)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>12,745 (24.7)</td>
<td>829 (20.3)</td>
<td>959 (20.1)</td>
<td>10,957 (25.6)</td>
<td></td>
</tr>
<tr>
<td>ESI, no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3</td>
<td>39,503 (76.6)</td>
<td>878 (21.5)</td>
<td>1167 (24.5)</td>
<td>9973 (23.3)</td>
<td>0.016</td>
</tr>
<tr>
<td>≥3</td>
<td>12,018 (23.3)</td>
<td>3204 (78.4)</td>
<td>3597 (75.4)</td>
<td>32,702 (76.5)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>69 (0.1)</td>
<td>3 (0.1)</td>
<td>5 (0.1)</td>
<td>54 (0.1)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ESI, emergency severity index; ISAR©, Identification of Seniors at Risk score.

\(^a\) p values comparing referral order/follow-up, referral order/no follow-up, no referral order/no follow-up.
Bivariate analyses found that age, sex, race, ISAR©, LOS, referral order, and referral order plus follow-up were significantly associated with 72-h and 30-day ED revisits, 30-day subsequent all-cause, and 30-day subsequent unplanned hospital admission. ESI was not significantly associated with any of the outcomes and was not included in the regression analyses (72-h ED revisit: $\chi^2 = 0.52, p = 0.37$; 30-day revisit; 30-day ED Revisit: $\chi^2 = 0.20, p = 0.66$; 30-day all-cause admission: $\chi^2 = 4.75, p = 0.09$; 30-day unplanned admission: $\chi^2 = 0.86, p = 0.35$).

Emergency department revisit and hospital admission
Among the 38,838 older adult ED encounters, 2.9% ($n = 1141$) of older adults returned to the ED within 72-h of their index ED encounter and 19.5% ($n = 7592$) returned to the ED within 30 days. Whereas, 21.7% ($n = 8415$) of older adults had a subsequent unplanned hospital admission within 30 days of the index ED encounter while 39.6% ($n = 15,381$) had a subsequent all-cause 30-day hospital admission.

Figure 1 illustrates the ED revisit and hospital admission rates based on the three categories of referral order and follow-up status. Among the 31,771 ED encounters with no referral order or follow-up, 2.9% ($n = 922$) of older adults revisited the ED within 72 h, in contrast with the 3256 ED encounters with a referral order and follow-up, 2.5% ($n = 82$) older adults revisited the ED within 72 h. This pattern of lower revisits was consistent with 30-day ED revisit with 19.8% ($n = 6291$) of older adults with no referral order or follow-up revisiting the ED within 30 days and 16.5% ($n = 538$) with a referral order and follow-up revisiting within 30 days. For unplanned 30-day hospital admission, 22% ($n = 6985$) of older adults with no referral order and no follow-up had a 30-day unplanned hospital admission while 18.7% ($n = 609$) of older adults with a referral order and follow-up had a 30-day unplanned hospital admission. The all-cause 30-day hospital admission rate was higher for older adults with a referral order and follow-up at 49.3% ($n = 1604$) compared with 39% ($n = 12,377$) of older adults with no order or follow-up.

Figure 1 Revisit and admission rates by referral order and follow-up status ($N = 38,837$). Percent of older adults who (A) revisited the ED within 72 h of the index visit, (B) revisited the ED within 30 days of the index visit, (C) were admitted to the hospital for an unplanned reason within 30 days of the index visit, and (D) were admitted to the hospital for any reason within 30 days of the index visit. In each panel, left bars show older adults with at least one referral order and attended follow-up appointment ($n = 3256$ encounters), middle bars show older adults with at least one referral order but no attended follow-up appointments ($n = 3810$ encounters), and right bars show older adults with no referral order or attended follow-up appointments ($n = 31,771$ encounters). Number of older adult encounters shown below each bar. Percent of older adults with a revisit or admission are
shown above each bar. P-values are shown in parentheses above each bar, with values for order/no follow-up and no order/no follow-up shown for relationship to order/follow-up reference revel. Number of older adults shown below each bar.

The results of the mixed-effects logistic regression analyses are shown in Table 2. Figure 2 depicts the ROC curve for each of the outcomes. All models have an AUC greater than 0.70 (range = 0.708–0.885) indicating adequate predictability. Compared with older adults with a follow-up, older adults with a referral order but no follow-up had 41% higher odds of revisiting the ED within 72 h (OR = 1.41; 95% CI = 1.07–1.86). Older adults with no referral order and no follow-up were not more likely to revisit the ED within 72 h compared with older adults who attended at least one follow-up appointment (OR = 1.17; CI = 0.93–1.48). Compared with older adults with a follow-up, older adults with a referral order but no follow-up had 19% higher odds of revisiting the ED within 30 days (OR = 1.19; 95% CI = 1.05–1.36).

### TABLE 2. Adjusted odds ratios for 72 h, 30-day ED revisit and 30-day subsequent all cause and unplanned hospital admission among older adults discharged from the GED

<table>
<thead>
<tr>
<th>Variables</th>
<th>72-h ED revisit</th>
<th>30-day ED revisit</th>
<th>30-day all cause admission</th>
<th>30-day unplanned admission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adjusted OR (95% CI)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74 Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>75–89 1.18 (1.04–1.34)</td>
<td>1.15 (1.09–1.22)</td>
<td>0.93 (0.88–0.97)</td>
<td>1.13 (1.07–1.20)</td>
<td></td>
</tr>
<tr>
<td>90+ 1.15 (0.93–1.42)</td>
<td>1.14 (1.03–1.26)</td>
<td>0.61 (0.56–0.67)</td>
<td>1.13 (1.03–1.26)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Female 0.88 (0.78–0.99)</td>
<td>0.89 (0.84–0.94)</td>
<td>0.92 (0.88–0.96)</td>
<td>0.88 (0.83–0.93)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>White Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Black 0.81 (0.64–1.01)</td>
<td>1.06 (1.03–1.14)</td>
<td>0.83 (0.76–0.90)</td>
<td>1.08 (0.98–1.20)</td>
<td></td>
</tr>
<tr>
<td>Other 1.26 (0.82–1.92)</td>
<td>1.19 (0.97–1.47)</td>
<td>0.95 (0.79–1.14)</td>
<td>1.20 (0.97–1.49)</td>
<td></td>
</tr>
<tr>
<td>ISAR©</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low risk (&lt;2) Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>At risk (≥2) 1.15 (1.01–1.30)</td>
<td>1.59 (1.51–1.68)</td>
<td>1.47 (1.41–1.54)</td>
<td>1.78 (1.68–1.88)</td>
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<tr>
<td>Length of stay</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.001 (1.001–1.002)</td>
<td>1.00 (1–1.001)</td>
<td>1.00 (1–1.001)</td>
<td>1.001 (1–1.001)</td>
<td></td>
</tr>
<tr>
<td>Referral order and Follow up</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Order/follow-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order/no follow-up 1.41 (1.07–1.86)</td>
<td>1.19 (1.07–1.31)</td>
<td>0.57 (0.52–0.63)</td>
<td>1.11 (0.98–1.26)</td>
<td></td>
</tr>
<tr>
<td>No order/no follow-up 1.17 (0.93–1.48)</td>
<td>1.19 (1.05–1.36)</td>
<td>0.63 (0.58–0.68)</td>
<td>1.14 (1.03–1.26)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Analyses: N = 38,838 encounters. Patient was treated as random effect in models.

Abbreviations: CI = confidence interval; ISAR© = Identification of Seniors at Risk score; OR = odds ratio.

a $p < 0.05$.
b $p < 0.001$.
c Order/Follow-up = yes referral order/yes follow up; Order/no follow-up = yes referral order/no follow-up; no referral order/no follow-up.
d $p < 0.001$. 


Compared with older adults with a follow-up, older adults with a referral order but no follow-up had 11% higher odds of having an unplanned hospital admission within 30 days (OR = 1.11; 95% CI = 0.98–1.26) and older adults with no referral order and no follow-up had 14% higher odds of having an unplanned hospital admission within 30 days (OR = 1.14; 95% CI = 1.03–1.26). Compared with older adults with a follow-up, older adults with a referral order but no follow-up had 43% lower odds of an all-cause hospital admission within 30 days (OR = 0.57; 95% CI = 0.52–0.63) and older adults with no referral order and no follow-up had 37% lower odds of having an all-cause hospital admission within 30 days (OR = 0.63; 95% CI = 0.58–0.68).

Referral order and follow-up
Among the 8854 older adult encounters with a referral order, 9001 referrals were ordered across 69 order types. Ten referral order types represent 82% of all referral orders (Table 3; Table S1 for all referral order types). Patients averaged 1.01 referral order (range 1–3). Orthopedic referral order was the most common referral order (n = 1326, 14.7%), followed by family practice (n = 1276, 14.2%) and urology (n = 768, 8.6%). Older adults attended an average of 1.33 appointments per referral order (range 1–29). Among the top 10 referral orders placed, the most common outpatient follow-up appointments attended based on number of referral orders placed were for orthopedics (68%) and family practice (43%), whereas the lowest follow-up appointments attended were internal medicine (31%) and home care (16%).

<table>
<thead>
<tr>
<th>Referral order type</th>
<th>Referrals ordered, n = 9001</th>
<th>Follow-up, n = 4287</th>
<th>Referral orders that had a follow-up appointment attended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopedics</td>
<td>1326 (14.7)</td>
<td>910 (21.5)</td>
<td>68.6</td>
</tr>
<tr>
<td>Family practice</td>
<td>1276 (14.2)</td>
<td>548 (12.9)</td>
<td>42.9</td>
</tr>
<tr>
<td>Urology</td>
<td>768 (8.6)</td>
<td>397 (9.4)</td>
<td>51.7</td>
</tr>
</tbody>
</table>
DISCUSSION

Among the older adult GED encounters, 17% had a post-ED referral ordered. Older adults who attended the referral follow-up appointment had lower odds of a 30-day ED revisit and 30-day subsequent unplanned hospital admission. However, over 50% of older adults with a referral order placed did not follow-up with an outpatient appointment within 30 days of the initial ED visit. Our results describe the types of referral orders placed by physicians within accredited GEDs and provide evidence in differences in healthcare utilization within 30 days post ED visit by referral order and follow-up.

This study provides new evidence on how accredited GEDs navigated the recommended guidelines and implemented a standard referral order process across multiple EDs. We described the types and number of referral orders entered within the EHR prior to ED discharge, the rates of post-ED follow-up and the association of referral order and follow-up to 30-day healthcare utilization. Consistent with other studies, our findings showed that older adults with a follow-up post-ED visit had lower odds of an ED revisit within 30 days. While it is not surprising that older adults with a referral order but no follow-up had a higher rate of returning to the ED within 72-h, a possible explanation for this is that older adults in need of outpatient care were identified as needing more care, but their return within 72-h may reflect that a suboptimal transition occurred. Interventions to improve referral follow-up could be helpful in reducing 72-h and 30-day ED revisits and 30-day subsequent unplanned hospitalization as older adults with a referral order could be proactively identified and assisted with scheduling and attending those follow-up appointments.

Another recent study found that patients (aged 18 and older) following up with the post-hospital discharge appointments had a lower 30-day hospital readmission compared to patients who did not attend their follow-up appointment or did not have an outpatient appointment. However, this was only significant for follow-up appointments during the first week post-hospital discharge. We found a higher odds of all-cause subsequent hospital admission among older adults with a referral order and follow-up compared with those with a referral order and no follow-up. This may be a result of patients being admitted for an elective hospital admission before the follow-up appointment. Further research in this area is needed to understand the primary diagnoses and procedures of older adults contributing to a subsequent unplanned and all-cause hospital admission.

Our study findings of less than 50% of older adults attending post-ED follow-up is consistent with recent research identifying various barriers to older adults attending post-ED follow-up appointments. While we did not qualitatively examine why older adults in our study did not follow-up, Gettal and colleagues identified four possible reasons: abrupt discharge instructions, difficulty navigating post discharge care, physical limitations, and lack of acceptance for follow-up care. Prior GED research found that transitional care nurses in the GED decreased ED revisit and hospital admission rates, however, a randomized clinical trial that included an ED transitional care model and appropriate follow-up for adults 65 years and older did not show any impact on ED
More research is needed to develop and test interventions that target various barriers to post-ED follow-up that are feasible.

This study had several limitations that may affect the results. The data from the EHR was restricted to one integrated healthcare system which limits generalizability of study findings. In addition, the study sample is predominantly white race, which also limits generalizability to a more heterogenous population. Patients who may have received follow-up care outside of the healthcare system were not included in our analyses. We included routinely available information collected during the GED encounter to account for potential predictors and confounders and adjusted for those in our models. We acknowledge that other clinical factors and characteristics such as cognitive impairment, comorbidity, frailty, and social determinants of health, may also contribute to the prediction of the outcomes. Therefore, future research could benefit from their inclusion. We excluded encounters that did not have a documented ISAR score. Older adults without an ISAR score were younger compared with those with an ISAR score. It is not clear how this may have impacted the findings. However, a strength of our study is the size of the sample. Lastly, we did not conduct subgroup analyses on any specific older adult diagnosis. Given the priority to improve the care transitions for older adults with Alzheimer's and dementia post ED, future work is critically needed to determine what types of additional barriers exist to prompt follow-up for this vulnerable population and what specific outpatient referrals are most valuable to older adults with dementia.

In summary, among older adults discharged home from accredited GEDs, we have shown post-ED outpatient referral order entered within the EHR prior to ED discharge and subsequent follow-up of those orders is associated with a decrease in 30-day ED revisit and 30-day subsequent unplanned hospital admission. Our findings suggest that 30-day ED revisit and 30-day unplanned hospital admission rates can be improved. Older adults with post-ED referral orders may benefit from interventions that address known barriers to follow-up.

AUTHOR CONTRIBUTIONS
MS: study design, regulatory, analysis and interpretation of data, and preparation of manuscript. CS: study design, analysis and interpretation of data, and preparation of manuscript. AM: interpretation of data, and preparation of manuscript. SR: interpretation of data, and preparation of manuscript. CR: interpretation of data and preparation of manuscript. MS: analysis and interpretation of data.

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CONFLICT OF INTEREST
The authors have no conflict of interest to report.

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The sponsor had no role in the design, study methods, data collection, analysis, data interpretation, or preparation or approval of this manuscript.

References


