

BRIEF REPORT

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Airway, breathing, cellphone: a new vital sign?

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Abstract

Introduction In emergency medicine, triage encompasses more than the initial prioritization of treatment; it also includes decisions about the most suitable level of care and disposition for each patient. However, the increasing use of mobile technology by patients in the emergency department (ED) introduces a new factor. This study aims to explore the relationship between patients' cellphone use at the time of initial assessment and final disposition in the ED.

Methods A prospective, cross-sectional study was conducted on 292 patients who presented to the ED between 9/1/2021 and 8/9/2022. Patients were stratified into two cohorts based on their behavior during the initial assessment: actively using a cell phone ($n=32$) or not using a cell phone ($n=259$). Final disposition was dichotomously recorded as admission or discharge. Hospital admission, hospital observation, and admission to the ED observation unit were consolidated into the combined category of admission.

Results Patients not actively using their cell phone on initial assessment exhibited a discharge rate of 64%, while those engaged with their cellphones displayed notably higher dismissal rates at 94%. The calculated odds ratio (OR) of 8.4 (95% confidence interval: 1.96-36.0, $p=0.004$) underscores a significantly heightened likelihood of dismissal among individuals actively using their cellphones, suggesting a potential association between cellphone use and a reduced probability of hospital admission.

Conclusion The study suggests an association between cellphone use during initial ED assessment and higher discharge rates. While this introduces a novel concept, the study's potential contribution to more informed and efficient triage decisions warrants careful consideration in future research and clinical applications.

Introduction

In the dynamic realm of emergency medicine, effective and prompt triage remains a cornerstone for delivering optimal patient care [1]. Traditionally, healthcare providers rely on factors such as chief complaint, vital signs, and other components of a history and physical exam to guide important decision making. However, beyond prioritizing immediate treatment, triage also involves determining the most appropriate level of care and disposition for each patient. With the increasing prevalence of mobile technology usage, an intriguing dimension is added to the established process. The association of cellphone use with ultimate disposition has not heretofore

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been investigated. This study evaluates how mobile technology use in the Emergency Department (ED) may correlate with the ED disposition outcome.

Methods

This study was conducted at the Mayo Clinic Rochester, which is a Level 1 trauma center in Rochester, Minnesota, with 76 beds and accommodating over 80,000 patient visits annually. The study utilized a prospective, cross-sectional design with a convenience sample. Data collection occurred between September 1, 2021, and August 9, 2022. Inclusion criteria included patients aged 18 years and older presenting to the ED during the study period. Exclusion criteria included patients under 18 years old and any medical or trauma resuscitation correlating with an emergency severity index (ESI) of 1, given the high acuity of their illness. Data collected included the date of visit, demographic information such as patient age and gender, ESI score at presentation, and ED disposition. The study received ethical review and approval from by the study site's institutional review board.

Patients were stratified into two cohorts based on their behavior during the initial assessment: actively using a cell phone or not using a cell phone. Final dispositions were dichotomously recorded as admission or discharge. Hospital admission, hospital observation, and admission to the ED observation unit were consolidated into the combined category of admission. Hospital admission refers to inpatient care anticipated to exceed 48 h, hospital observation involves inpatient short-term monitoring typically under 48 h, and ED observation generally involves monitoring within the ED for less than 24 h.

Both providers and patients were blinded to the study. Consent was waived to maintain data validity and reduce the likelihood of the Hawthorne effect and the alteration of patient behaviors [2]. Full-time scribes, trained in data collection, recorded data during their assigned morning, afternoon, or evening shifts. Scribe coverage was assigned by the department according to standard workflow protocols based on ED volumes, and scribes were

not available for every shift. All scribes participated in a dedicated training session that covered the study's rationale and methodology to ensure consistency and adherence to study protocols. We used a consecutive sampling approach, enrolling all eligible patients identified by the scribe in the order they were seen by the attending physician.

To evaluate patient cell phone use, the scribe walked by the entrance of the room and recorded cellphone use prior to entering. Subsequently, the scribe visually identified if a patient was using a cellphone as the provider entered the room. The data were analyzed to determine the frequency of cellphone use by patients during a provider-patient encounter. Statistical analysis involved calculating discharge rates and the odds ratio for discharge among cellphone users versus non-users. A p -value of less than 0.05 was considered statistically significant.

Results

A total of 292 patients were enrolled in the study. The mean age of the patients was 54 years, and 46% were male. The average ESI score was 3. The vast majority of patients were not using their cellphone on initial evaluation ($n=259$), however, a small cohort of patients did demonstrate active use of their cellphone on initial assessment ($n=32$).

Among the patients actively using cellphones, 30 (94%) were discharged and 2 (6%) were admitted to the hospital. In contrast, among patients not using cellphones, 166 (64%) were discharged, 80 (31%) were admitted to the hospital, 7 (3%) were admitted under hospital observation, and 6 (2%) were admitted to the ED observation unit (Table 1).

Patients not actively using their cellphones during the initial assessment exhibited a discharge rate of 64%, while those engaged with their cellphones displayed a discharge rate of 94%. The odds ratio (OR) for discharge among cellphone users was 8.4 (95% confidence interval: 1.96-36.0, $p=0.004$), indicating a significantly higher

Table 1 Patient demographics and Disposition based on Cellphone Use during initial Assessment

Patient characteristics n (%)	Cell Phone Use $n=32$ (11%)	No Cell Phone Use $n=259$ (89%)	Odds Ratio (95% CI)	P -Value
Male	11 (34%)	123 (48%)		
Age, mean (SD)	42 (19)	56 (20)		
ESI Score				
1	0 (0%)	0 (0%)		
2	1 (3%)	22 (8%)		
3	17 (53%)	200 (77%)		
4	14 (44%)	37 (14%)		
5	0 (0%)	0 (0%)		
Disposition				
Admitted	2 (6%)	93 (36%)	reference	
Discharged	30 (94%)	166 (64%)	8.4 (1.96-36.0)	$P=0.004$

likelihood of discharge for this group. The overall discharge rate was 67%.

Discussion

The association of cellphone use with ultimate ED disposition has not heretofore been investigated. The findings suggest a potential association between cellphone use during initial assessment and a higher discharge rate. This correlation highlights the need for further research to understand the underlying reasons and implications for patient care.

Multiple studies have previously assessed specific points, such as patient factors of demographics, triage acuity score, and system-level factors, such as the number of patients in the waiting room, to determine the likelihood of admission [3–6]. Non-medical factors, such as income, health literacy, social support, and living situation have also been studied to identify which factors correlate most with admission [5]. However, to our knowledge, this is the first study to investigate the association of patient cellphone use as a non-medical factor for the likelihood of admission or discharge from the ED.

The ubiquitous nature of mobile internet, applications, and interconnectivity have led to multiple online mechanisms designed to improve patient health outcomes [7, 8]. The use of technology, has also been studied to determine if it is associated with an improvement in hospital environments and patient satisfaction during ED visits [9, 10]. There has also been an important counterbalance. Reports have identified that cellphones can lead to distraction, which may prove deleterious to the learning process [11, 12]. Finally, these distractions may also be a risk factor in other injuries, including direct mechanical injury and cellphone use related injuries secondary to distraction [13].

Our results are only hypothesis generating given the significant limitations of our study. However, several factors might explain the association between cellphone use and a higher discharge rate. Patients engaged with their cellphones might present with less severe symptoms or feel well enough to use their devices, indicating a lower acuity level. Alternatively, cellphone use could distract from symptom reporting, influencing clinicians' perceptions of patient stability. This correlation could influence triage practices, highlighting the need for further research to understand the underlying reasons and implications for patient care. Finally, cellphone use may lead to unconscious bias by providers, causing them to incorrectly conclude that patients are clinically stable in cases where the patient might otherwise be admitted. Further research, such as evaluating the 72-hour bounce-back rate for this cohort compared with patients who do not use cellphones, will be important to better understand the implications.

Limitations

This study has several limitations that should be considered. The prospective, cross-sectional design and use of a convenience sample may limit the generalizability of the results to other ED settings. Data was collected by scribes which only work during morning, afternoon, or evening shifts and thus may not capture patterns in cellphone use and disposition that occur outside of these time frames, such as during night shifts. Mode of arrival, which could reflect severity of illness, was not collected in this study. However, we recorded each patient's ESI score to account for acuity in our analysis. Additionally, the study did not differentiate between reasons for cellphone use, such as emergency-related communication versus distraction, which could provide more nuanced insights into its impact on patient outcomes. The single-center design further limits the generalizability of the findings. Future multi-center studies with diverse patient populations and objective measures of cellphone use are necessary to validate these findings and explore their broader implications in emergency care.

Conclusion

This study suggests that there may be an association with patients' cellphone use on initial assessment in the ED and their disposition outcomes. The association of cellphone use with ultimate disposition has not heretofore been investigated. The observed higher likelihood of discharge among those engaged with their cellphones warrants further investigation. While this introduces a novel concept, the study's potential contribution to more informed and efficient triage decisions warrants careful consideration in future research and clinical applications.

Author contributions

AF, GM, and AJ conceived the study. JF, WG, SJ, and DL undertook recruitment. AM conducted the analysis. SG and AF drafted the manuscript, and all authors contributed substantially to its revision.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

We certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The study was approved by the Mayo Clinic Institutional Review Board.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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