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Characteristics and determinants of high-risk unscheduled return visits to the emergency department

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ABSTRACT

Background High-risk unscheduled return visits (HRURVs), defined as return visits within 72 hours that require admission or die in the emergency department (ED) on representation, are a key quality metric in the ED. The objective of this study was to determine the incidence and describe the characteristics and predictors of HRURVs to the ED.

Methods Case–control study, conducted between 1 November 2014 and 31 October 2015. Cases included all HRURVs over the age of 18 that presented to the ED. Controls were selected from patients who were discharged from the ED during the study period and did not return in the next 72 hours. Controls were matched to cases based on gender, age (±5 years) and date of presentation.

Results Out of 38 886 ED visits during the study period, 271 are HRURVs, giving an incidence of HRURV of 0.70% (95% CI 0.62% to 0.78%). Our final analysis includes 270 HRURV cases and 270 controls, with an in-ED mortality rate of 0.7%, intensive care unit admission of 11.1% and need for surgical intervention of 22.2%. After adjusting for other factors, HRURV cases are more likely to be discharged with a diagnosis related to digestive system or infectious disease (OR 1.64, 95% CI 1.02 to 2.65 and OR 2.81, 95% CI 1.05 to 7.51, respectively). Furthermore, presentation to the ED during off-hours is a significant predictor of HRURV (OR 1.64, 95% CI 1.11 to 2.43) as is the presence of a handover during the patient visit (OR 1.68, 95% CI 1.02 to 2.75).

Conclusion HRURV is an important key quality outcome metric that reflects a subgroup of ED patients with specific characteristics and predictors. Efforts to reduce this HRURV rate should focus on interventions targeting patients discharged with digestive system, kidney and urinary tract and infectious diseases diagnosis as well as exploring the role of handover tools in reducing HRURVs.

Key messages

What is already known on this subject

► There is increasing evidence that unscheduled return visits requiring admission on the return visit have worse outcomes than non-high-risk unscheduled return visits (HRURVs). Understanding the factors associated with these HRURVs may help guide interventions to reduce morbidity and mortality. Previous studies that have focused on HRURVs are limited by small sample size, retrospective chart review design or evaluation of specific subgroups such as adults or elderly.

What this study adds

► We conducted a case–control study to identify the predictors of HRURV. This study shows that patients seen during off-hour shifts, diagnosed with digestive system disorders and infectious diseases, and whose visit includes at least one handover are more likely to have an HRURV within 72 hours. Quality improvement interventions to reduce HRURVs should target these at risk groups.

INTRODUCTION

Unscheduled return visits (URVs) to the emergency department (ED) may signal provider diagnostic or treatment error, health system failure in securing continuity of care or patient noncompliance to treatment.[1–4] While some studies suggest that URVs in general are not associated with higher mortality than those without a prior visit, there is increasing evidence that URVs requiring admission on the return visit, known as high-risk URVs (HRURVs), have worse outcomes than non-HRURVs.[1 5 6] Understanding the factors associated with these HRURVs may help guide interventions to reduce morbidity and mortality.[1 7 8]

The reported rate of URVs ranges from 1.9% to 5.47% and is primarily related to progression of illness and patient non-compliance to treatment, rather than medical errors.[1–4 9] Furthermore, though some studies have shown that URVs show a higher percentage of adverse events than non-URVs,[10] others suggest that patients with URV within 72 hours do not use more resources, are not more severely ill and do not have higher hospital admission than those who have not been previously seen.[11] Focusing on overall URVs and interventions to reduce overall rates may, therefore, not be the best use of quality team resources.[8 11] While rates of HRURVs are lower, ranging from 0.47% to 1.5%, this subgroup of URV patients has been found to have higher mortality, longer hospitalisations, higher rates of intensive care unit (ICU) admissions and transfers to operating rooms.[1 2 7 8]

Previous studies that focused on HRURVs are limited by small sample size, retrospective chart review design[1 7 8] or evaluation of specific subgroups

such as adults or elderly.[12] The purpose of our case–control study was to explore system-related, patient-related and illness-related predictors of HRURVs. In addition, we aimed to determine the incidence of HRURV in our ED and look at their mortality, ICU admission rate and surgical intervention rate.

METHODS

Study design and setting

We carried out a case–control study at the ED of the American University of Beirut Medical Center (AUBMC), between 1 November 2014 and 31 October 2015. AUBMC is a 384-bed teaching hospital and a referral centre in Beirut, Lebanon. The ED is one of the largest in the country, seeing approximately 54 000 patients annually, of which 27% are paediatrics. The ED is staffed by a mix of American board-certified emergency medicine (EM) physicians as well locally trained non-EM physicians with extensive experience in emergency practice. While ED staffing is based on historical ED visit hourly load, ancillary and consultant service staffing drops to off-hour level between 17:00 and 8:00 hours. The ED is divided into three areas: high acuity, low acuity and paediatrics. The majority of patients (80%) are triaged to an Emergency Severity Index (ESI) score of 3 (intermediate acuity), 15% have an ESI of 4–5 (low acuity) and 5% have an ESI of 1–2 (high acuity). Around 80% are insured, while 20% pay out of pocket. The hospital admission rate of ED patients is 18.7%, while intensive care admission rate is 3%. In-ED mortality is 0.2% and includes all out of hospital cardiac arrests.

Patient and public involvement

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

Participants

Figure 1 shows the selection process of cases and controls. Cases included all HRURV over the age of 18 that presented to the ED during the study period. We defined HRURVs as patients who returned to the ED within 72 hours and were admitted or died on return visit. We excluded patients who were discharged from the ED on 72 hours return. In addition, we excluded patients who: returned with complaints unrelated to the initial visit, were transferred to another facility, left without being seen, were called back for missed lab abnormalities or had an incomplete visit (left the ED after initial screening by a physician without informing the ED team). Moreover, double entries and missing charts were also excluded. Cases were matched by age (±5 years), gender and admission date to controls on a 1:1 basis. Eligible controls included ED visits during the same time period that did not return within 72 hours and were discharged home. We excluded HRURV cases that did not have an eligible match.

Data collection and measurements

Data were extracted from medical records, an administrative database and the departmental Peer-Review Database. A data collection sheet with the deidentified cases and controls was used to facilitate information extraction from the medical records and the Peer-Review Database. This was then merged with the administrative data. Two trained research assistants (medical doctors) blinded to the study objectives reviewed the patient medical records for inclusion criteria and extraction of all clinical data. Final decision on exclusion of cases for unrelated visits was made by the primary investigator.

The administrative database was used to extract sociodemographics, frequency of past-ED visits, ED volume (total number of ED visits on date of case–control visit, as a measure of ED crowdedness) and time measures as well as patient disposition and discharge diagnosis. The International Classification of Diseases, Ninth Revision diagnosis was further classified into 25 Major Diagnostic Categories to collapse the data into more manageable categories. Off-hour visits included all visits on

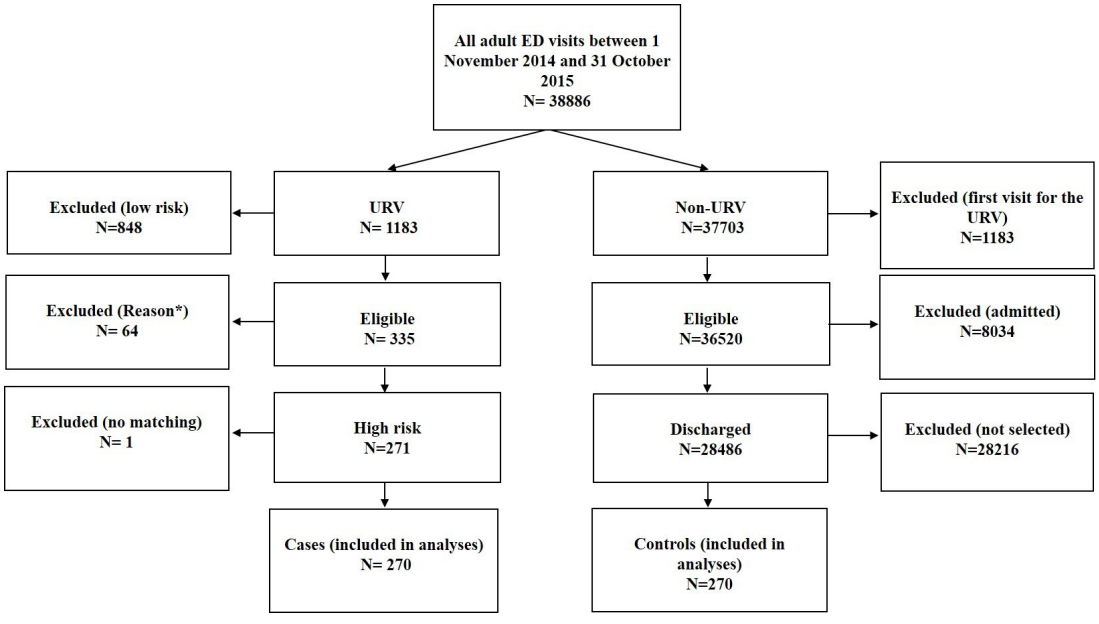

Figure 1 Flow chart showing the selection process of cases and controls. *Reasons: second visit unrelated to initial visit, patient discharged on second visit, double entry, empty file, file missing, incomplete file, patient's first visit does not fall under the study period, admitted on both mentioned dates, called back for lab study abnormalities. ED, emergency department; URV, unscheduled return visit.

weekends or between 17:00 and 8:00 hours on weekdays. A visit had a handover if the name of the discharging physician was different from the assigned physician on arrival.

For the analysis of cases alone, separate from the case–control analysis, additional information was collected on cases including: disposition on return visit (ICU admission, need for surgery or death), severity score of HRURV and root cause assessment. The latter two variables we extracted from the Peer-Review Database, which includes the reviews of all HRURVs as completed by a committee composed of EM physicians that reviews all HRURVs in the ED as part of the ED quality assurance programme. This includes a case severity scoring of the index visit reflecting the peer assessment of physician practice and a root cause assessment, categorised as: illness related, physician related, patient related, healthcare system related and 'other reasons' where legibility or missing elements of documentation limited capacity for review. Severity scores of 1, 2, 3, 4, 5 correspond to 'no physician issues', 'no physician issues but system factors need improvement', 'minor physician issues need improvement or difference of opinions on management', 'physician issues requiring performance improvement but no change in scope of practice' and 'physician issues requiring performance improvement with change in scope of practice', respectively. A more detailed explanation of the peer-review assessment can be found in the online supplementary file to this article.

Incidence of URV and HRURV was defined as the total number of URV and HRURVs, respectively, divided by the total number of ED visits during the study period.

Analysis

Data were described as number and per cent for categorical variables, whereas the mean and ±SD (for normal distributed variables) or median and IQR (for non-normal distribution) were calculated for continuous ones. Association between each of the predictors and the HRURV group was assessed by the Pearson X^2 test for categorical variables, whereas the Student's t-test was used for continuous predictors. Moreover, multivariate stepwise logistic regression was carried out to identify the predictors of HRURV, where the p value for entry was 0.15 and that for removal was 0.20. For the purpose of the multivariate analyses, we replaced the missing data by the mean of the respective variable, where sensitivity analysis was conducted to identify the effect of this replacement. Results are presented as adjusted ORs and 95% CIs. Clinical characteristics and follow-up results were compared between the two visits using the paired t-test or McNemar's test, as appropriate.

A p<value less than 0.05 was used to indicate statistical significance. We used IBM SPSS statistical software for Windows V.22 (SPSS for Windows, V.22; SPSS).

RESULTS

During the study period, there were a total of 38 886 ED visits, of which 1183 were URVs, giving an overall incidence of 3.04% (95% CI 2.88% to 3.22%) (figure 1). Out of the 1183 URVs, 271 were HRURVs, giving an incidence of 0.70% (95% CI 0.62% to 0.78%). Our analysis included 270 cases and 270 controls. Table 1 presents baseline and demographic characteristics of all participants on first visit. Cases and controls had similar distribution, where 51.5% of the patients were males and 48.5% were females. The average age in our study for cases versus controls was 48.5±19.6 and 48.6±19.2, respectively. We found that cases had a higher number of ED visits within the past year (p=0.001) and were more likely to have been hospitalised within the past 30 days (p<0.0001). Regarding the discharge diagnosis, it was found that HRURV cases were more likely to be discharged with digestive system disorders, infectious and parasitic disease, and kidney and urinary tract disorders, as compared with controls (p<0.0001).

Table 1 Baseline and demographic characteristics for cases and controls on first visit

	Cases n=270	Controls n=270	P value
Gender			1.00*
Male	139 (51.5)	139 (51.5)	
Female	131 (48.5)	131 (48.5)	
Age (years), mean (±SD)	48.5±19.6	48.6±19.2	0.98*
Marital status			0.28
Not married	90 (33.1)	102 (37.8)	
Married	180 (66.7)	168 (62.2)	
Guarantor†			0.06
Insured	213 (78.9)	230 (85.2)	
Self-paying	57 (21.1)	40 (14.8)	
Hospitalisation (past 30 days)	45 (16.7)	7 (2.6)	<0.0001
No of ED visits (past year)			0.08
Mean (±SD)	0.93±1.80	0.64±2.06	
Median (IQR)	0.0 (1.0)	0.0 (1.0)	
0	158 (58.5)	202 (74.8)	0.001
1	53 (19.6)	34 (12.6)	
2	34 (12.6)	18 (6.7)	
3+	25 (9.3)	16 (5.9)	
Major diagnostic category			<0.0001
Digestive system	67 (24.8)	42 (15.6)	
Musculoskeletal system and connective tissues	25 (9.3)	75 (27.8)	
Infectious and parasitic diseases	22 (8.1)	6 (2.2)	
Kidney and urinary tract	37 (13.7)	20 (7.4)	
Others‡	119 (44.1)	127 (47.0)	

*Matching characteristics.
†Guarantor group: includes university insurance, private insurance, social assistance and diplomatic coverage.
‡Others include: the circulatory system, the skin, subcutaneous tissue and breast, the ears, nose, mouth and throat, the respiratory system, the eye, the blood and blood forming organs and immunological disorders, the female reproductive system, the hepatobiliary system and pancreas, the male reproductive system, the nervous system, endocrine, nutritional and metabolic diseases, factors influencing health status and other contacts with health services, injuries, Poisonings and toxic effects of drugs, mental diseases and disorders, pregnancy, childbirth, and puerperium, alcohol/drug use, burns and vaginal bleeding.
ED, emergency department.

Table 2 presents the clinical characteristics, patient management and disposition during the first visit for both cases and controls. As compared with controls, cases were more likely to be tachycardic (p=0.03). As for diagnostics, cases compared with controls were significantly more likely to have had laboratory testing in the ED (p<0.0001), and to have required a consultation in the ED (p=0.001), whereas they were significantly less likely to have received parenteral fluids (p=0.001). Imaging in the ED, however, was not found to be associated with URV. Although the length of stay (LOS) (hours) of ED stay was significantly associated with HRURV (p<0.0001), measures of ED crowdedness (ie, ED volume/day and volume/hour) were not found to be significantly different. However, as compared with controls, cases were more likely to have presented on 'off-hours' (p=0.003) and have had a handover during their stay

Table 2 Clinical characteristics, patient management and disposition of cases and controls on first visit

	Cases n=270	Controls n=270	P value
Acuity, high*	15 (5.6)	7 (2.6)	0.08
SBP <90 (mm Hg)	2 (0.7)	0 (0.0)	0.50
Heart rate, ≥100	72 (26.7)	51 (19.0)	0.03
O_2 saturation, ≤95%	20 (7.4)	10 (3.7)	0.06
Temperature, ≥38.5°C	8 (3.0)	7 (2.7)	0.83
Respiratory rate, ≥22	32 (13.8)	25 (11.1)	0.39
Imaging	134 (49.6)	120 (44.4)	0.23
Laboratory tests	203 (75.2)	124 (45.9)	<0.0001
Drugs	9 (3.3)	9 (3.3)	1.00
Intravenous fluid	27 (10.0)	55 (20.0)	0.001
ECG	88 (32.6)	83 (30.7)	0.64
ED consult	97 (35.9)	61 (22.6)	0.001
LOS (hours)			<0.0001
Mean (±SD)	3.39±2.19	2.35±1.98	
Median (IQR)	2.91 (2.61)	1.78 (1.86)	
ED volume/day, mean (±SD)	148.29±19.60	149.39±18.98	0.50
Volume/hour, mean (±SD)	8.22±3.42	8.17±3.36	0.87
Off-hour visits	196 (72.6)	164 (60.7)	0.003
Handover	62 (23.0)	36 (13.3)	0.005
AMA	37 (13.7)	18 (6.6)	0.01

Imaging: includes ultrasound, CT and X-ray; drug: drug used in ED; consult: presence of any consultation of specialised physicians (medical and surgical) at the ED; LOS in the ED in hours; working hours: on hours (weekday 8:00–17:00 hours), off hours (weekday 17:00–8:00 hours and anytime on weekends).
*Acuity, as defined by Emergency Severity Index: 1 and 2=high; 2 and above=other acuity (reference).
. AMA, against medical advice; ED, emergency department; LOS, length of stay;SBP, systolic blood pressure.

Table 4 Comparison between visit 1 and visit 2 for HRURV cases

	Visit 1 n=270	Visit 2 n=270	P value
Acuity, high*	15 (5.6)	12 (4.4)	0.70
SBP <90 (mm Hg)	2 (0.7)	7 (2.6)	0.07
Heart rate, ≥100	72 (26.7)	186 (69.7)	0.33
O_2 saturation, ≤95%	20 (7.4)	21 (7.9)	0.85
Temperature, ≥38.5°C	8 (3.0)	20 (7.5)	0.03
Respiratory rate, ≥22	32 (13.8)	32 (14.4)	0.87
Imaging	134 (49.6)	109 (40.4)	0.04
Laboratory tests	203 (75.2)	193 (71.5)	0.38
Drugs	9 (3.3)	6 (2.2)	0.58
Intravenous fluid	27 (10.0)	23 (8.5)	0.62
ECG	88 (32.6)	97 (35.9)	0.21
ED consult	97 (35.9)	161 (59.6)	<0.0001
Procedure in ED†	21 (7.8)	27 (10.0)	0.40
LOS (hours)			<0.0001
Mean (±SD)	3.39±2.19	4.51±3.17	
Median (IQR)	2.91 (2.61)	3.80 (3.37)	
Major diagnostic category			<0.0001
Digestive system	67 (24.8)	44 (16.3)	
Musculoskeletal system and connective tissues	25 (9.3)	14 (5.2)	
Infectious/parasitic diseases	22 (8.1)	14 (5.2)	
Kidney and urinary tract	37 (13.7)	26 (9.6)	
Others	119 (44.1)	172 (63.7)	

*Reference is the other acuity.
†Includes endotracheal tube, central line, lumbar puncture, chest tube, interventional radiology and endoscopy,
ED, emergency department; HRURV, high-risk unscheduled return visit; LOS, length of stay; SBP, systolic blood pressure.

(p=0.005). Similarly, patients who left against medical advice (AMA) were more likely to be cases than controls (p=0.01).

The results of the stepwise multivariate logistic regression are presented in table 3. Variables considered in the model included working hours, handover, heart rate, hospitalisation in the past 30 days and discharge diagnosis. The LOS was excluded from the list of potential predictors, due to its collinearity with handover (p<0.0001, data not shown). We found that cases had higher odds of being seen on off-hours and experiencing a handover during their stay as compared with controls (OR 1.64, 95% CI 1.11 to 2.43; and 1.68, 95% CI 1.02 to 2.75, respectively). Furthermore, cases were more likely to be hospitalised prior to index visit as compared with controls (OR 8.39, 95% CI 3.54 to 19.86). In terms of diagnosis, cases were more likely than controls to be diagnosed with digestive system disorders, infectious and parasitic diseases, and kidney and urinary tract disorders (OR 1.64, 95% CI 1.02 to 2.65, OR 2.81, 95% CI 1.05 to 7.51, and OR 1.97, 95% CI 1.06 to 3.68, respectively).

Table 3 Stepwise multivariate logistic regression of predictors of HRURV

	OR (95% CI)	P value
Off-hour shift	1.64 (1.11 to 2.43)	0.01
Heart rate, ≥100	1.45 (0.94 to 2.25)	0.10
Handover	1.68 (1.02 to 2.75)	0.04
Hospitalisation in the past 30 days	8.39 (3.54 to 19.86)	<0.0001
Digestive system	1.64 (1.02 to 2.65)	0.04
Musculoskeletal system	0.34 (0.20 to 0.60)	<0.0001
Infectious and parasitic diseases	2.81 (1.05 to 7.51)	0.04
Kidney and urinary tract	1.97 (1.06 to 3.68)	0.03

Variables included in the model: working hours (reference: on hours shift); handover (reference: no); heart rate (reference: <100); hospitalisation in the past 30 days (reference: no); major diagnostic category (reference: other diagnosis).
HRURV, high-risk unscheduled return visit.

Table 4 presents the comparison between visit 1 and visit 2 for HRURV patients. We found that adult patients who experience an HRURV were more likely to represent with a temperature ≥38.5°C (p=0.03). They were more likely to require consultations in the ED and stay longer on their return visit (p<0.0001 in both cases) as compared with their initial visit. Finally, HRURVs were less likely to have a digestive-related diagnosis on their second visit; they were more likely to have a kidney and urinary tract, infectious or musculoskeletal system-related diagnosis.

Table 5 describes the secondary analyses of HRURV cases, disposition, peer-review classification and reasons for URV. The majority of patients were admitted to a regular floor (88.1%), while 11.1% were admitted to an ICU, and 0.7% died in the emergency. In total, 22.2% of the HRURV patients required a surgical procedure during their second visit. Through the analyses of the surgical procedures required, we found that abdominal surgeries were the most frequent (35.3%) with laparoscopic cholecystectomy being the most common (54.2%). Urological procedures were the second highest category (19.1%), followed by obstetrics and gynaecology (11.8%), orthopaedic surgeries (8.8%) and finally neurological, cardiovascular and ears, nose and throat (ENT) surgeries with 7.4%, 4.4% and 2.9%, respectively.

Table 5 Secondary analyses of HRURV cases, disposition, peer-review classification and reasons for URV

		HRURV cases n=270
Disposition	ICU	30 (11.1)
	Regular floor	238 (88.1)
	Death	2 (0.7)
Required surgery		60 (22.2)
Peer-Review Severity Score*	1	193 (71.5)
	2	47 (17.4)
	3	23 (8.5)
	4	7 (2.6)
	5	0 (0.0)
Reason for URV		
Illness related	**Total**	**166 (61.5)**
	Progression of disease	83 (50.0)
	Failure of outpatient treatment	39 (23.5)
	Recurrent disease process	33 (19.9)
	New problem	10 (6.0)
	Complication	1 (0.6)
Physician related	**Total**	**45 (16.7)**
	Admission indicated but consultant recommended outpatient management	14 (31.1)
	Failure of reassessment	9 (20.0)
	Misdiagnosis	9 (20.0)
	Treatment error	8 (17.8)
	Admission indicated on initial visit and ED attending did not attempt to admit	5 (11.1)
Patient related	**Total**	**53 (19.6)**
	Discharge against medical advice	48 (90.6)
	Social issues	2 (3.8)
	Habitual use of ED	1 (1.9)
	Missed clinic follow-up	1 (1.9)
	Psychiatric disorder	1 (1.9)
	Non-compliance	0 (0.0)
Healthcare system related	**Total**	**6 (2.2)**
	Called back because of missed radiograph abnormalities	4 (66.7)
	Instructed to return for re-evaluation	1 (16.7)
	Sent from clinics	1 (16.7)
	Patient unable to get medication	0 (0.0)

1: Appropriate with no identified physician issues; 2: Appropriate with no physician issues, but system factors that need improvement; 3: Appropriate, but minor physician issues need improvement or differing opinions on management; 4: Inappropriate requiring performance improvement without change in scope of practice; 5: Inappropriate requiring performance improvement with change in scope of practice until remediation is complete.
ED, emergency department; HRURV, high-risk unscheduled return visit; ICU, intensive care unit; URV, unscheduled return visit.

As for the Peer-Review Severity scoring of the HRURVs, the majority were classified as having no physician-related issues (71.5%). With regard to the reasons for HRURV, the majority were categorised as illness-related reasons (61.5%), followed by patient related (19.6%), then physician related (16.7%) and finally by system related (2.2%). Specifically, the top three reasons overall were progression of disease (83/270, 30.7%), AMA (48/270, 17.8%) and failure of outpatient treatment (39/270, 14.4%).

DISCUSSION

The aim of our study was to determine the incidence of HRURV and to look comprehensively at patient-related, illness-related and setting-related predictors of HRURVs in adult ED visits. The incidence of HRURV in our study was found to be comparable to other studies with an overall rate of 0.70%, and the overall URV rate was found to be 3.04%. Mortality and ICU admission rates on the return visit were 0.7% and 11.1%, respectively, as compared with 0.2% and 3% in our overall ED population, based on the departmental quality data during the same time period. Furthermore, 22.2% of HRURV cases required surgery on return visit. This reflects the complexity of this group of patients and the value of understanding the factors that contribute to HRURVs.

An important clinical factor emerged as a predictor of HRURVs in our study. Patients with prior hospitalisations (within 30 days of ED visit) were more likely to have an HRURV than controls. This supports Horney *et al* who found higher risk of HRURVs in patients who had previous hospitalisations.[13]

We found that HRURV cases were more likely than controls to have an initial visit diagnosis of digestive system disorders, kidney and urinary tract disorders, and infectious and parasitic diseases. This is comparable to the literature, which also shows that digestive system disorders and infectious diseases are among the most common diagnoses on initial visit for HRURV patients.[1] Though studies conducted on URV patients show that the most common diagnoses in this group are ENT and alcohol-related disorders, abdominal pain was still one of the top five.[14] This highlights the need to develop specific interventions for patients discharged from the ED diagnosed with abdominal pain, such as rigorous predischarge reassessment criteria, scheduled follow-up visits for re-evaluation[15] and targeted follow-up phone calls. Regarding infectious diseases, in the Lebanese setting, there is a high prevalence of community-acquired-drug-resistant pathogens, which may explain the association with HRURVs.[16] On the other hand, Martin-Gill and Reiser found that mental health disorders were the most common initial visit diagnosis among HRURVs, which did not emerge in our study.[8] In fact, in a study on disease spectrum of ED visits in Lebanon, mental health disorders were not among the diagnoses found in their sample.[17]

ED crowdedness is associated with multiple adverse outcomes,[18] however, ED volume did not emerge as a predictor for HRURVs in our study. We did not, however, look at ED boarding or patient to staff ratios, which are other measures of degree of ED crowding and proxies for resource constraints.[14] We did find that patients who were seen on off-hours were more likely to have an HRURV. This is in line with multiple other studies that have found a drop in quality metrics on off-hours including door-to-balloon time[19] and door to antibiotic inpatients with sepsis.[20] This could be related to differences in staffing, turnaround time of images or consultations in the ED on off-hours, although these were not explored in our study.

Handover is an increasingly recognised cause of error in medicine.[21] Most studies on handover in the ED have focused on information transmission/loss and perceived impact of 'poor' handovers.[22–24] Our study is the first to assess the impact of handover on patient outcome. We found that patients who had at least one handover during their stay had 1.68 (95% CI 1.02 to 2.75) higher odds of HRURV than those who did not. Not surprisingly, handover was found to be collinear with LOS as the longer the patient stays in the ED the more likely they will experience at least one handover. In fact, Hayward *et al* found that LOS was a predictor of HRURV.[25] Given the increasing literature on potential impact of handover on quality, however, we decided to keep it in the analysis. During the study period, the ED was not using a specific handover tool, with some physicians doing verbal handover at the bedside while others doing verbal handover at the nursing station. While the use of handover tools has been shown

to improve information retention and recall,[26] assessing the impact of such tools on outcome metrics is an area of needed research.

Categorisation of cause of return visits varies among studies, limiting our ability to make clear-cut comparisons across all categories. Illness-related reasons for patient return, however, were found to be a primary contributor across several studies including ours.[7] Similarly, leaving AMA emerged as one of the most common reasons in our study, consistent with previously reported findings.[1 4 7] Given the variability in AMA rates among providers within a practice, this may reflect patient decision-making and provider communication and conflict resolution skills. Thus, provider-specific communication training may impact this and potentially HRURVs. As for health system-related causes, although these were only 2.2% of contributors in our study, this is higher than what was reported elsewhere,[3] and mainly driven by call backs for discrepant radiology reads which are reported as preliminary reads by radiology residents during the patient's ED visit and released as final attending-read. This system-related contributor could be avoided by the attending-level reads in EDs, a practice that is increasingly becoming the recognised best practice.[27]

Limitations

Our study has some potential limitations. First, this study had a case–control design that relied on retrospective chart review and cannot, therefore, provide explanations of causation. The cases were also matched to controls by age, therefore, we were unable to assess age as a predictor of return visits. In addition, the study was conducted at a single centre, which could affect the external validity of our findings. AUBMC, however, is the largest medical centre in Lebanon and receives patients from all over the country. Furthermore, patients who revisited other EDs would not have been captured in our study. We believe this number to be negligible since our ED is the busiest and largest in the area. Finally, patients who returned and were transferred to outside facilities were also excluded because of lack of access to their complete medical records and outcomes. Our overall ED transfer rate, however, is less than 1% so we believe the number of transfers of return visits to be even smaller.

CONCLUSION

The incidence of HRURV in our ED was 0.70%. We identified several predictors of HRURV including presenting during off-hour shifts, hospitalisation in the past 30 days and handover. The main diagnoses that we found to be associated with HRURV were digestive system disorders, kidney and urinary disorders and infectious and parasitic diseases. Future interventions to reduce HRURV should focus on these diagnoses as well as explore the impact of handover tools on this key quality metric.

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