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Management of dyspepsia—The role of the emergency department observation unit to optimize patient outcomes

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ABSTRACT

Background: Dyspepsia is a common complaint that can confer significant burden on one's quality of life and may also be associated with serious underlying conditions. The objective of this study was to determine if patients admitted to the emergency department observation unit (EDOU) for severe or persistent dyspepsia would have cost effective management in terms of investigations performed, length and cost of hospital stay. The secondary objective was to determine if any patient characteristics could predict a need for admission to the inpatient unit.
Methods: Retrospective chart reviews of patients admitted to the EDOU under the Dyspepsia protocol between January 2008 and August 2014 were conducted. Baseline demographics, investigations performed, outcomes related to EDOU stay, admission and 30-day re-presentation outcomes were recorded.
Results: A total of 1304 patients were included. Median length of stay was 1 day. Cumulative bed-saved days were 38 per month. Two hundred eighteen (16.7%) patients required admission to the inpatient service for further management, while 533 (40.9%) and 313 (24.0%) patients underwent esophagogastroduodenoscopy and hepatobiliary ultrasonography, respectively. No major adverse events were attributed to the EDOU admissions or delays in treatment. No significant clinically relevant factors were associated with a need for admission from the EDOU to the inpatient unit. Median cost of the EDOU admission was approximately one-third that of a similar admission to the inpatient unit.
Conclusion: The EDOU is an appropriate setting to facilitate investigations and treatment of patients with dyspepsia with considerable bed-saved days.

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1. Introduction

Dyspepsia is a very common but non-specific complaint that alludes to a group of symptoms referable to the upper gastrointestinal tract, such as epigastric discomfort, abdominal bloatedness or fullness, heartburn, and nausea or vomiting that may be related to meals [1]. The overall global prevalence of uninvestigated dyspepsia is approximately 21%, and confers additional burden to an individual's health-related quality of life, especially physical and social functioning [2,3].

Mild symptoms may often be managed using over-the-counter medications but increase in frequency of symptoms or concerns over underlying serious conditions may prompt patients to seek consultation for further treatment and reassurance [4,5]. When such patients present to the emergency department (ED), part of the management plan involves providing appropriate symptomatic treatment and deciding who requires early endoscopic or ultrasonographic evaluation. The American College of Gastroenterology and the Canadian Association of Gastroenterology [6], and UK NICE [7] dyspepsia guidelines recommend early endoscopy for patients who have red-flag symptoms like dysphagia, vomiting, unintended loss of weight, unexplained anemia and family history of gastrointestinal tract malignancies, especially those above 60 years. In fact, Singapore is a country deemed to have an intermediate-to-high prevalence of upper gastrointestinal malignancy [8], and patients with new onset dyspepsia over the age of 40 or who have been on empirical proton pump inhibitor treatment for >4 weeks [9] should be considered for an esophagogastroduodenoscopy (EGD).

Patients who present to the ED with either recurrent dyspepsia or persistent symptoms may benefit from an admission to the ED observation unit (EDOU) for symptom control with considerations for early EGD or ultrasonography to evaluate for upper gastrointestinal tract or hepatobiliary causes, respectively. A longer period of observation may allow for a definitive diagnosis to be attained, reassure patients on the

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nature of the symptoms, commence earlier effective treatments and arrange follow-ups more expeditiously. To date, there have been no similar evaluations of a dyspepsia protocol in the observation unit setting.

2. Objectives

The primary objective of this study was to determine whether the EDOU admission of patients with recurrent or persistent dyspepsia symptoms would result in more cost-effective management; measured in terms of investigations performed, length and cost of hospital stay. Comparisons were made with the average length and cost of stay of a patient admitted to the inpatient unit with a discharge diagnosis of dyspepsia.

The secondary objective was to determine if there were any patient characteristics that could predict for the success or failure of the EDOU admission. Failure of the EDOU admission was defined as the necessity for admission to the inpatient unit from EDOU or repeat presentations to any ED within 30 days for the same presenting complaint requiring readmission to the hospital. Identification of such characteristics may help guide clinicians on admission directly to the inpatient unit instead.

3. Methods

We conducted a retrospective observational study of consecutive adult patients 21 years and above who were admitted under the admission protocol of "Dyspepsia" to the EDOU of National University Hospital (NUH), Singapore. The ED is situated in a 1100-bed tertiary academic medical center that received an average of 120,000 adult attendances per year during the study period. The study included subjects over an 80-month period from 1 January 2008 to 31 August 2014. The study was approved by the National Healthcare Group's domain specific review board (DSRB 2014/01299), which also granted waiver of informed consent.

The electronic medical records and physical records were reviewed. Data collected at the ED included demographic information, symptoms experienced and duration of symptoms. EDOU records were reviewed for the use of investigations such as EGD and hepatobiliary ultrasonography, and their findings, length of hospital stay, primary disposition from EDOU, reasons for inpatient admission (if any), discharge diagnosis, presentations to the ED in the 30 days prior to and after the EDOU admission as well as diagnosis at re-presentation. Patients were classified to either successful discharge from the EDOU (EDOU Success) or admitted for further inpatient care (EDOU Failure) as part of the final disposition. Patients who were discharged from the EDOU were taken to have a maximum length of stay of 1 day, while the length of stay of patients who were admitted for inpatient care was rounded up to the next 24-h block. Patients who had repeat admissions to the EDOU under the same protocol were included as a new subject in the analysis. Patients who were admitted under two or more EDOU protocols (which included the Dyspepsia protocol) were also included in the analysis.

Financial data and bed-saved days were obtained from the Finance Department of the National University Hospital, Singapore for assessment of cost-benefit. Cost comparison of the EDOU admission was made with that of an equivalent inpatient admission with a final discharge diagnosis of "Dyspepsia".

Data were recorded and populated in a Microsoft Excel spreadsheet (Microsoft Corp, Redmond, WA, USA). The data was then exported to Stata 14 (StataCorp LP, College Station, TX, USA) for statistical analyses. Categorical variables are reported as frequency and percentage values. For continuous variables, median and its interquartile range (IQR) are reported. Differences in categorical variables between the patient groups "EDOU Success" and "EDOU Failure" were compared using the chi-square test or Fisher's exact test. Highly skewed continuous outcomes were analyzed using the Mann-Whitney *U* test. Multivariate logistic regression analysis was performed to determine the characteristic differences between the two groups using odds ratio (OR) and 95% confidence intervals (CIs). A stepwise approach was used while including only variables with $p < 0.10$ into the model.

4. Results

A total of 1304 patients who fulfilled the inclusion criteria were admitted to the EDOU under the Dyspepsia protocol from 1 January 2008 to 31 August 2014 (Fig. 1. Enrolment flowchart). There was a steady increase in utilization of the protocol from 80 patients in 2008 to 175 patients in the first 8 months of 2014 (Fig. 2. Utilization of Dyspepsia protocol). The median age was 49 (IQR 36–60) years with a slight female preponderance (52.0%) (Table 1. Baseline characteristics). The majority (66.5%) presented with acute symptoms shorter than 2 weeks and 224 (17.2%) patients had presented to the ED in the 30 days prior to the EDOU admission. The 3 most common symptoms were abdominal pain (91.8%), vomiting (58.1%) and bloatedness (20.5%). More than three-quarter of the patients had at least 2 symptoms, of which the most common combination of symptoms was abdominal pain with vomiting (21.0%). Among 1304 patients who were admitted to the EDOU, 218 (16.7%) were admitted for further inpatient care after one-day stay in the EDOU. The median length of hospital stay after a patient was admitted to the ward was 3 days. Common reasons for admission from EDOU to the inpatient unit were persistent symptoms (49.5%), significant diagnosis requiring further inpatient management (44.5%), social reasons (3.2%) and a variety of other reasons (2.8%).

There were 190 (14.6%) patients who re-attended the ED within 30 days of discharge from the EDOU; the vast majority (77.4%, 147/190) had similar complaints. Of those who re-attended for similar complaints, 82.3% (121/147) were admitted to the hospital. One-third (40/121) of the patients who were admitted after re-attending the ED had significant pathology (e.g. appendicitis, acute cholecystitis and newly diagnosed cancers) that required specific medical or surgical interventions. Multivariate logistic regression analysis revealed that the initial presentation of vomiting (OR 3.59; 95% CI 1.47–8.78) or bloatedness (OR 4.26; 95% CI 1.37–13.19) was associated with the presence of significant pathology. No major adverse events or deaths were attributed to the EDOU admissions or delays in treatment. Multivariate logistic regression was not able to identify any significant clinically relevant factors that were associated with the need for admission from the EDOU to the inpatient unit.

Five hundred thirty-three (40.9%) patients underwent EGD and 313 (24.0%) patients had hepatobiliary ultrasonography (Table 2. Findings on EGD and Table 3. Findings on hepatobiliary ultrasound). Both tests were performed on 121 (9.3%) patients while 579 (44.4%) patients did

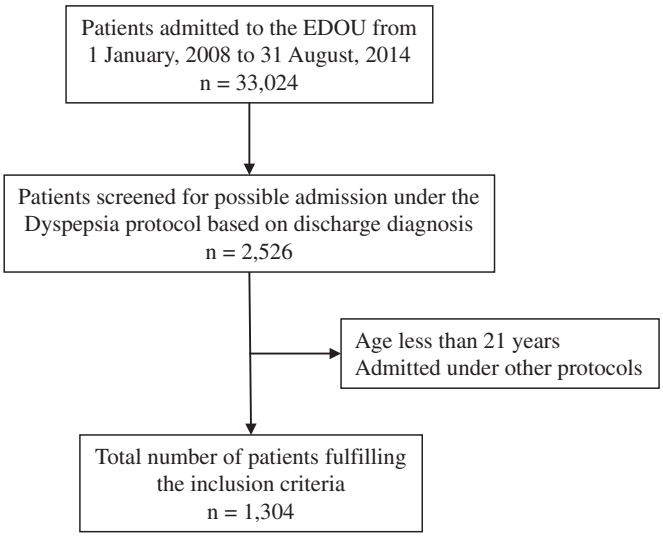

Fig. 1. Enrolment flowchart. Legend: EDOU, Emergency Department Observation Unit.

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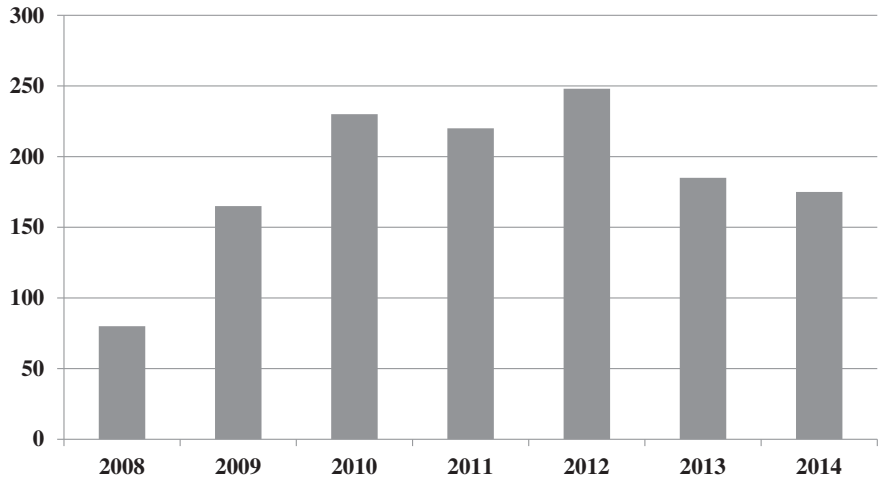

Fig. 2. Utilization of the Dyspepsia protocol from January 2008 to August 2014. Legend: EDOU, Emergency Department Observation Unit.

not undergo either test. The prevalence of *Helicobacter pylori* was 15.9% among the 533 patients who underwent endoscopy. The performance of an EGD did not significantly affect EDOU success or failure (40.0% vs. 45.5%, $p = 0.14$). Findings of malignancy on EGD or cholecystitis on hepatobiliary ultrasound were associated with a higher likelihood of admission to the inpatient unit for further management (Tables 2 and 3).

Based on hospital administrative data, the average length of stay for patients who were admitted to the inpatient units between 2008 and 2014 with an eventual diagnosis of Dyspepsia was 2.6 days. The cumulative bed-saved days through an admission of similar patients in the EDOU (where the maximum length of stay is 1 day) was 3042 days over the 80-month study period or 38 bed-saved days a month. For patients receiving the same level of financial subsidy, the median cost of the EDOU admission was approximately one-third that of a similar inpatient unit admission (Singapore $690.10 vs. $1841.54).

Table 1
Baseline characteristics

Patient characteristic	Patients ($n = 1304$)
Age (years), median (IQR)	49 (36–60)
Female, n (%)	678 (52.0)
Duration of symptoms, n (%)	
Acute <2 weeks	867 (66.5)
Subacute 2–4 weeks	64 (4.9)
Chronic >4 weeks	41 (3.1)
Intermittent recurring	332 (25.5)
Symptoms, n (%)	
Abdominal pain	1197 (91.8)
Vomiting	757 (58.1)
Bloatedness	267 (20.5)
Chest pain	233 (17.9)
Heartburn	207 (15.9)
Shortness of breath	84 (6.4)
Diaphoresis	72 (5.5)
Fever	25 (1.9)
Symptom burden, n (%)	
1 symptom	196 (15.0)
2 symptoms	535 (41.3)
3 symptoms	420 (32.3)
>3 symptoms	153 (11.4)
Admission to inpatient unit from the EDOU, n (%)	218 (16.7)
Length of hospital stay in those admitted to the inpatient unit ($n = 218$), days (IQR)[a]	3 (2–4)

EDOU: Emergency Department Observation Unit.
[a] Includes 1 day of EDOU stay.

5. Discussion

The EDOU in NUH is a 16-bed unit with round-the-clock attending ED physician oversight daily, and a variety of guided treatment pathways and protocols that caters to admission of patients for up to 24 h. These pathways and protocols provide an additional period of observation and management for patients who require short-term treatment and pain control, or have high-risk complaints requiring up to 24 h to manifest their underlying pathology [10]. Since January 2008, the EDOU, in conjunction with attending physicians from the Division of Gastenterology, has implemented a Dyspepsia protocol (Appendix A) for the admission of patients with dyspepsia-related symptoms for further treatment and facilitated same-day fast-track investigations at the same setting, including EGD and hepatobiliary ultrasonography. Such rapid diagnosis and treatment has been shown in previous studies to be associated with greater patient satisfaction compared to routine inpatient hospitalizations [11,12]. In the management of dyspepsia, improved patient satisfaction and reassurance may be as helpful as medical therapy in symptom management [5].

Our data from just over 6.5 years since inception of the Dyspepsia protocol showed considerable reduction in cost and a large number of cumulative bed-saved days for patients on this protocol. This is likely contributed by factors such as facilitated investigations and treatment, a shorter length of stay in the hospital and patient selection for EDOU admission. Having a protocol like this may be especially helpful in hospitals facing significant ED over-crowding and inpatient access block [13]. Overall, at least 80% of patients were successfully discharged from the EDOU within the 24-h period. This is consistent with previously published EDOU discharge rates of approximately 80%, albeit for other disease processes such as chest pain and atrial fibrillation [13,14].

A previous study found that therapeutic protocols, in particular those for painful conditions such as abdominal pain and headache,

Table 2
Findings on EGD

EGD findings, n (%)	EDOU success ($n = 434$)	EDOU failure ($n = 99$)	p-Value
Normal	101 (77.7)	29 (22.3)	0.21
Non-erosive gastritis	176 (85.0)	31 (15.0)	0.09
Erosive gastritis	50 (84.7)	9 (15.3)	0.49
Ulcer	48 (81.4)	11 (18.6)	0.99
Polyps	16 (69.6)	7 (30.4)	0.13
Malignancy	1 (25.0)	3 (75.0)	0.004
Others[a]	42 (82.4)	9 (17.6)	0.86

EGD: Esophagogastroduodenoscopy; EDOU: Emergency Department Observation Unit.
[a] Others include esophagitis, hiatus hernia and Barrett's esophagus.

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Table 3
Findings on hepatobiliary ultrasound.

Hepatobiliary ultrasound findings, n (%)	EDOU success ($n = 195$)	EDOU failure ($n = 118$)	*p*-Value
Normal	46 (73.0)	17 (17.0)	0.0496
Gallstone	53 (66.3)	27 (33.7)	0.40
Cholecystitis	20 (25.0)	60 (75.0)	<0.001
Polyp	15 (93.8)	1 (6.2)	0.008
Malignancy	0	0	NA
Liver pathology[a]	61 (82.4)	13 (17.6)	<0.001

EDOU: Emergency Department Observation Unit.
[a] Liver pathology include fatty liver, hepatic cysts and hepatic hemangioma.

had higher recidivism rates of >10 to 15% [15]. In this study, approximately 13.5% of patients discharged from the EDOU Dyspepsia protocol re-presented to the ED with a similar complaint within 30 days. Of note, 40 (3.1%) patients who re-attended the ED after discharge from the EDOU eventually had significant pathology (e.g. appendicitis, cholecystitis), which required specific procedures beyond what the protocol provided for, or further evaluation for malignancies. There were however no serious reportable events. Early appendicitis may not be apparent initially as it may be referred to the epigastrium. Patients found to have gallstones may develop acute cholecystitis after discharge from EDOU. While this may represent a natural evolution of the underlying pathology, it does have potentially serious implications for the patients. This highlights the difficulties in selecting patients for admission to such observation units, given the limited 24 h duration of EDOU treatment and observation. Unfortunately, there is also limited evidence in the literature regarding the safety of observation units due to the heterogeneous nature of different protocols, short-stay units and risks of bias, including publication bias [16,17].

The main reasons for admission to the inpatient unit from the EDOU were for persistent symptoms or serious diagnoses. However, it is difficult to predict which patient will have persistence of symptoms when selecting patients with dyspepsia for admission to the EDOU. We were unable to find any significant clinically relevant factors that may predict for a need for inpatient admission. We postulate that this could be related to the heterogeneous and subjective nature of symptoms of dyspepsia, as well as symptom progression. Although vomiting and bloatedness were identified in the multivariate regression analysis to be associated with significant pathology at re-presentation and admission, these features may not be clinically helpful since these symptoms are commonly associated with upper abdominal pain. Nevertheless, the EDOU could still provide a "safety net" for such patients to be observed and treated [13,18], as demonstrated in our study when 6% (80/1304) of the patients developed acute cholecystitis and received timely intervention from the EDOU.

Patients who were diagnosed with cholecystitis on hepatobiliary ultrasonography while in the EDOU were more likely to require inpatient admission. With increasing usage of point-of-care ultrasonography in the ED and better sonographic skills among emergency physicians, this may help to stratify such patients for direct inpatient unit admission instead rather than through the EDOU. Studies have shown that the diagnostic accuracy of ultrasonography to identify cholecystitis performed by an emergency physician can be similar to that performed by a radiographer [19] and radiologist [20]. However, for specific pathology, formal ultrasonography performed by trained radiographers and interpreted by radiologists when the patient is adequately fasted may still be preferred.

There are several limitations in this study. As a retrospective design, some enrolment bias and record bias may have been present. Physicians may admit patients with dyspepsia who were more likely to be discharged within a day to the EDOU, as compared to patients who were directly admitted to the inpatient unit. The time pressures of a short-stay admission and the limited availability of investigative procedures on weekends, would also play a role in influencing decisions on admission to the EDOU. Patients with multiple comorbidities and poorer social support were more likely to be admitted as an inpatient, and are naturally expected to have a longer length of stay. Due to the diverse nature of conditions causing dyspepsia, we were also unable to make any meaningful comparison with patients who were admitted to the inpatient unit. Furthermore, failure of the EDOU admission was also dependent on the decision of the treating provider in the EDOU, with variability in individual practices and experience. These factors may have influenced overall outcomes. Similarly, there are no strict guidelines on the modality of investigations that individual providers may decide upon while the patient is in EDOU. This may have resulted in over-consumption and unnecessary investigations, especially since >50% of patients admitted underwent either an EGD or hepatobiliary ultrasonography. Among those who underwent these investigations, 25% and 20% of the patients were found to have normal EGD and hepatobiliary ultrasonography, respectively. While the majority of the records were in a computerized system, there is likelihood of bias from missing information in the documentation that may have affected the accuracy of the data.

This study represents a single center's experience with an EDOU protocol for dyspepsia with facilitated investigations and management. It may not be generalizable to other hospitals where access to these investigations may be limited or where medical financing and payment schemes may be different. We did not make any comparisons with patients who were directly admitted to the inpatient unit as this was beyond the scope of the study. Prospective studies (including randomized controlled trials) comparing inpatient admissions and EDOU admissions for dyspepsia, with strict guidelines on the utilization of EGD and hepatobiliary ultrasonography, may better identify the patient population who would benefit from an initial EDOU admission and who may be successfully discharged after a short stay.

6. Conclusion

The EDOU provides an appropriate setting to facilitate investigations and treatment of patients with dyspepsia, with >80% discharged within 24 h, in a more cost effective manner that could lead to considerable bed-saved days. No significant clinically relevant patient characteristics were identified to predict for success or failure of the EDOU admission.

Conflict of interest disclosure

There are no potential conflicts of interest for all the authors.

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Appendix A. Extended diagnostic treatment unit (EDTU) admission: dyspepsia/gastritis

A.1. EDTU interventions

1. Gaviscon advance 10mls tds/Omperazole 20 mg bd
2. Lansoprazole 30 mg stat dose
3. Keep NBM after 12MN (if planned for OGD)/IV hydration
4. List for OGD during office hours for non-responders only. Patients who responded to treatment need not go for OGD
5. 4–8 hourly parameters
6. Ultrasound HBS (Call 22212 for appointment) if clinically indicated ie. high suspicion of gallstone disease. (If required, ultrasound HBS should be done before OGD as gastric insufflation after OGD limits utility of performing ultrasound HBS at the same sitting).

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7. If OGD non-diagnostic and gallstone disease suspected, for outpatient ultrasound HBS
8. Repeat Trop/ECG if indicated

A.2. Discharge criteria

1. Normal vital signs
2. Symptomatic relief
3. Completed OGD (if indicated)
4. If Urease test +ve, to start triple therapy based on endoscopist's recommendation
5. TCU OPS unless specified by endoscopist (see endoscope sheet instructions)
6. TCU Hepatobiliary clinic if suspected gallstones

A.3. Admission criteria

1. Abnormal vital signs
2. Requested by Endoscopist upon OGD findings
3. Persistent symptoms
4. Evolution of other pathology eg. HBS sepsis, acute abdomen, AMI, dissection, pancreatitis, pneumonia, IO, DKA etc.

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