emergency care and medicine

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Article

Association Between Polyethylene Glycol Dose and Length of Hospital Stay in Body Packing Patients: A Retrospective Review

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Abstract

Objectives: Body packing is one of the methods used to smuggle illicit drugs and items. Identifying the drug and eradicating drug packs are essential tasks to complete in the shortest possible time to reduce the risk of toxicity. Polyethylene glycol is one of the safer laxatives to use if surgical exploration is not indicated. The objective of this study is to evaluate the association of the dose of polyethylene glycol (PEG) and the length of hospital stay and/or time for body packers to evacuate drug packs. **Methods:** This is a retrospective analysis completed at Hamad Medical Corporation in Qatar, studying adult patients who received polyethylene glycol to evacuate drug packs from January 2018 to September 2019. **Results:** The primary and secondary outcomes are association between PEG doses and length of hospital stay and time to drug pack clearance, respectively. There were a total of 39 patients included in this study. A minority of patients developed signs of systemic toxicity. The average hospital length of stay for all patients was 86.2 h. The results show that the PEG dose at 12 h is inversely proportional to the length of hospital stay where each extra 1 g will decrease length of hospital stay by 0.098 h. The results are even more statistically significant when analyzed compared to time to clearance with a regression coefficient of −0.136 (p = 0.022). **Conclusions:** This study shows that a higher polyethylene glycol dose, especially at 12 h, is safe and reduces the time needed to clear drug packs and reduces length of hospital stay.

Keywords: body packing; illicit drugs; toxicology; polyethylene glycol; length of hospital stay; Qatar

Academic Editor: Raimundas Lunevicius

Received: 16 May 2025
Revised: 13 June 2025
Accepted: 16 June 2025
Published: 14 August 2025

Citation: Mahmoud, S.F.; El Malik, A.; Ibdah, Z.; Saudi, M.; Alinier, G.; Saad, M.O. Association Between Polyethylene Glycol Dose and Length of Hospital Stay in Body Packing Patients: A Retrospective Review. *Emerg. Care Med.* **2025**, 2, 41. https://doi.org/10.3390/ecm2030041

1. Introduction

The smuggling of illicit substances is a common profitable commerce with variable methods of transportation [1,2]. Body packing was first discovered and described in 1973 when a patient developed intestinal obstruction for being a body packer [1]. Such patients are also known as "mules" or "*body-stuffers*" and are forcefully or voluntarily requested to ingest illicit drugs coated with gelatin capsules in order to facilitate their

transportation across border check points [1–4]. Globally, body packing is increasing and is associated with a high risk of morbidity and mortality [5,6]. Complications may include hypertension, cocaine-induced Myocardial Infarction (MI), small bowel obstruction, drug toxicity, and even death [5,7–9].

Patients who present as body packers will have various symptoms ranging from abdominal pain or present with severe toxicity, while others may remain asymptomatic. Signs of toxicity will vary according to the ingested drugs. In patients who ingest cocaine or methamphetamine, the following sympathomimetic toxidrome symptoms may occur: hypertension, tachycardia, agitation, diaphoresis, agitation, tremors, seizures, hyperthermia, and dilated pupils [9,10]. In patients who ingest heroin or other opioid-related drugs, the symptoms may include central nervous system depression, hypoventilation, miosis, and decreased bowel sounds [2,5,8,9].

There are several case reports and descriptive studies providing a suggested protocol for the management of body packers [7]. Different laxatives have been reported to be used for bowel irrigation with various outcomes. Polyethylene glycol seems to be effective and carry a decreased risk of capsule rupture [11]. The suggested treatment of asymptomatic patients is through whole-bowel irrigation using a high dose of two liters per hour [12]. In severe cases associated with systemic toxicity, surgical intervention is recommended [13].

With the lack of evidence regarding the efficacy and safety of high doses of polyethylene glycol (PEG), clinicians are unable to make a clinical decision regarding daily dose and frequency. In our practice, it was observed that doses vary from 26 g to 2256 g per day with variable outcomes. Therefore, the aim of this study was to measure the correlation between PEG dosing and its efficacy and safety to determine the best possible dose for body packers. This will provide evidence on optimum PEG dosing in such dynamic and critical patients, whilst also providing valuable information in terms of the association of PEG doses with capsule evacuation, hospital length of stay, and incidence of severe toxicity. The hypothesis is that administered PEG dose influences hospital length of stay and time of capsule evacuation.

2. Methods

2.1. Study Design, Setting, and Population

This study's setting was Hamad Medical Corporation (HMC), which is the main governmental healthcare provider and medical teaching organization in the State of Qatar. It is accredited by the American Council of Graduate Medical Education, Joint Commission International, and American Society of Health System Pharmacists with P1–5 medical, surgical, and emergency and P1 pharmacy residency programs [14]. HMC is composed of 14 general and specialized hospitals with more than 2500 beds and over 1 million emergency visits per year [15]. HMC has a dedicated clinical pharmacy service in each Emergency Department (ED).

This a retrospective study that included all patients (>18 years of age) identified in the ED or admitted at AWH or HGH over a period of 21 months from 1 January 2018 until 30 September 2019 with a diagnosis of "foreign intestinal body ingestion" and "PEG medication administration" for the evacuation of the capsules. Patients who concomitantly received other laxatives or prokinetics were included. Exclusion criteria included patients who were not identified as body packer on admission or those who had complete evacuation of capsules prior to admission. The authors decided that any delay in diagnosis would be a confounding factor in calculating length of hospital stay. This study protocol was reviewed and approved by the HMC institutional review board (MRC-01-19-360).

2.2. Data Collection

Data from Al Wakra Hospital (AWH) and Hamad General Hospital (HGH) were retrieved from the electronic health records (EHRs), which include computerized physician order entries, since these were the only two hospitals that received body packers during this time.

For each patient, the following demographic data were collected: age, gender, number of ingested capsules, any medical comorbidities, vital signs on admission (temperature, systolic blood pressure, diastolic blood pressure, heart rate), and any signs and symptoms related to capsule ingestion such as tremors and abdominal pain. The possible different signs and symptoms of toxicity based on the packed illicit drugs were taken into consideration.

The time of the first PEG dose and total PEG dose received during the hospital stay was documented. In addition, cumulative polyethylene glycol dose measured at 8, 12, and 24 h was calculated. All patients were screened for other laxative or prokinetic treatment during their ED or hospital stay. The length of hospital stay was calculated in hours and was equal to the difference between admission and discharge date and time as documented on their EHR. In previous publications, the discharge criteria of body packers is reported as two negative stools, negative X-ray, or a Computed Tomography (CT) scan of the abdomen [5,7,9]. In this study, the time of capsule evacuation (or time to clearance) was defined as two negative stools, the clinical documentation of clearance by the discharge physician, or a negative X-ray or CT scan. The time to clearance was calculated in hours and was equal to the difference between the time of clinical clearance and the time of first PEG dose. The average daily dose was also calculated as the sum of daily doses divided by the number of days.

2.3. Study Outcomes and Statistical Analysis

The primary outcome was the association between PEG doses and length of hospital stay (LOS) calculated in hours. The secondary outcome was the association of PEG dose time to clearance (TOC) corrected for the utilization of other laxatives or prokinetics. Other secondary safety outcomes were the composite endpoint of severe toxicity, such as requiring antidote, the need for surgery, or death.

The Statistical Package for Social Sciences (SPSS) version 25 was utilized for statistical analysis. Simple linear regression analysis methods were utilized to measure the effect of cumulative PEG doses at 8, 12, and 24 h on the LOS and TOC of capsules. All p values were two-tailed, and significance was set as a value of <0.05. Multiple linear regression was used to adjust for the use of other laxatives/prokinetics to measure the effect of PEG dose on the LOS and TOC of capsules.

3. Results

All patients brought in by airport security and police to HGH and AWH between 1 January 2018 and 30 September 2019 and labeled as body packers were screened. This resulted in a total of 45 patients, but 5 were excluded since the diagnosis was not known upon admission. An additional patient was excluded since he passed most of the capsules except one prior to admission.

There were a total of 39 patients included in this analysis. All patients were male with a mean age of 32 years (SD = 10.89), three (7.7%) of which developed signs of systemic toxicity, but it was not identified as severe, meaning it did not require antidote or surgery. All patients were vitally stable on admission with a mean systolic blood pressure of 131.4 mmHg (SD = 16.6), a diastolic blood pressure of 79.6 mmHg (SD = 10.36), and a mean temperature of 36.6° Celsius (SD = 0.3) (Table 1). The total number of capsules

was documented in only 36 patients. Most patients (n = 24; 61.5%) were maintained on concomitant laxative such as sennosides (n = 2, 5.1%), lactulose (n = 1, 2.6%), enema (n = 1, 2.6%), agiolax (n = 1, 2.6%), and a prokinetic such as metoclopramide (n = 18, 46%). Out of these patients, two received both Senna and metoclopramide.

Table 1. Demographic parameters of the 39 body packers included in our study between 1 January 2018 and 30 September 2019.

Variable	Result Mean (SD)
Age (years)	32 (10.89)
Systolic blood pressure (mmHg)	131.4 (16.6)
Diastolic blood pressure (mmHg)	79.16 (10.36)
Temperature (°Celsius)	36.6 (0.3)
Signs of toxicity (n, %)	3 (7.7%)
Received laxative (n, %)	24 (61.5%)

The average LOS (in hours) for all patients was 86.2 h (SD = 33.55). This was slightly different than the TOC of capsules, which was 76.33 h. (+/−32.9). The average daily dose of PEG was 86.78 g. Capsule evacuations were primarily enumerated by the assigned police officer; therefore, the total number of capsules was not documented for all patients. Only 26 patients had a known number of capsules. Their median number of ingested capsules was 70. Their median daily dose of PEG was 64 g. This is depicted in Table 2. A great variation in dosing was noted. For some patients, a total of 225 g was prescribed in the first eight hours by emergency physicians. In the case of patients admitted under internal medicine service, PEG was prescribed under a more conservative approach such as 13.5 g every 8 h.

Table 2. Clinical outcomes of the 39 body packers included in this study (TOC = time to clearance or time to capsule evacuation defined as the time to two negative stools or a negative X-ray/CT of the abdomen; daily PEG dose, calculated as total dose during hospital stay divided by the length of hospital stay.

Variable	Median (IQR)
Length of Stay (hours)	86.85 (68.11–97.55)
Daily Dose (grams)	64.93 (48.3–96.6)
Dose at 8 h (grams)	41.4 (27.6–55.2)
Dose at 12 h (grams)	55.2 (41.4–96.6)
Dose at 24 h (grams)	96.6 (82.8–155)
TOC (hours)	57.78 (36–79.3)
Capsules ingested or passed per patient (number)	70 (46–97)

Only a few patients had a documented type of ingested illicit drug. Reported drugs included heroin (n = 1, 2.6%), cocaine (n = 2, 5.1%), hashish (n = 5, 12.8%), and others such as marijuana and opium (n = 1, 2.6% for each). This is represented in Table 3.

Table 3. Type of ingested drug for whom the drugs carried were known (n = 10) between 1 January 2018 and 30 September 2019.

Drug	Number of Patients (n = 10)	Percentage (%)
Cocaine	2	5.1%
Hashish	5	12.8%
Heroin	1	2.6%
Marijuana	1	2.6%
Opium	1	2.6%

The type of drug ingested by patients was not confirmed for most patients. A total of 10 patients had a confirmed documented type of illicit drug (Table 3).

Primary and Secondary Outcomes

In the simple linear regression, the dose at 12 h was the only predictor that had a significant effect on length of hospital stay and time of clearance. Therefore, the dose at 12 h was utilized to measure association with LOS. The results show that the PEG dose at 12 h is inversely proportional to the LOS, where each extra 1 g decreases LOS by 0.098 h. This extrapolates to each extra PEG sachet (13.8 g) as reducing LOS by 1.35 h (regression coefficient = −0.098; $p = 0.042$). The results are even more statistically significant when association was measured against TOC, where the regression coefficient was −0.136 ($p = -0.022$). The extrapolation of this is that if all patients admitted as body packers received a total of 16 sachets (220.8 g) in the first 12 h, this may lead up to a 15 h reduction in LOS or TOC of capsules. The total LOS was corrected for utilization of other laxatives. The results show that utilizing other laxatives and/or prokinetics is associated with longer LOS. We did not notice any side effects with a high dose of PEG on admission (i.e., 2 L/hour).

4. Discussion

Given the life-threatening risks associated with body packing, it is important that medical professionals identify and treat these patients in a timely manner. In this study, the results show that an increased polyethylene glycol dose was associated with the decreased LOS and TOC of capsules. There is a scarcity of studies that report and analyze pharmacological treatment and clinical outcomes. Most of the available evidence is found in the form of case reports [8,9]. Different cities have reported different routes of passengers depending on their geographical location. However, cocaine was seen to be the most smuggled drug. Only one study conducted on 77 patients described that there was no correlation between PEG dose and LOS. However, the final analysis included only 16 patients with some of them refusing to take PEG [16]. Therefore, our study is currently the largest of its kind. However, this study is only observational and retrospective, and we believe that a larger sample size would provide more informative results.

It is important to note that some laxatives are contraindicated to use, such as liquid paraffin since it may disrupt the integrity of capsules and hence cause intoxication, which is life threatening [7]. In general, there is a consensus that body packers should be treated conservatively using PEG, which is considered the safest laxative to use [9]. Patients with obstruction or intoxication should be immediately treated using antidotes until emergency surgical intervention and evacuation of the capsules [7,10]. A case series by Markovitz et al. showed that PEG was used safely in 22 patients [9]. Another study by Beckley et al. documented toxicity and complications in 25% of patients who received different laxatives such as senna, lactulose, phosphate enema, etc. [7]. Most previous studies are

either observational or descriptive, providing an outline on how to manage body packers in emergency and surgical settings. Globally, and in Qatar, clinicians have to make a difficult choice in balancing between maintaining the integrity of capsules and rapid evacuation. In this study, PEG was used in all patients with a few exceptions of using concomitant laxatives or prokinetics.

Most studies published about body packers are in the form of case reports or case series, which report that most body packers are predominantly young males [7]. The mean reported age in other case series is 35 years, with cocaine being the most smuggled illicit drug, followed by hashish, heroin, and methamphetamine [7–9,16]. Cocaine toxicity is the most prevalent risk among packers. Most body packers carry a median of 50 capsules with a reported maximum of 200 [8]. The diagnosis of body packing is usually confirmed through X-ray images in which the type of drug can partially be differentiated. Abdominal X-ray has high sensitivity in detecting drug capsule (85–90%), whereas contrast-induced abdominal CT provides a more sensitive tool (96%) for detection [8]. Heroin's X-ray density is similar to that of air and appears as air stool on abdominal X-ray (CT density = −520 HU). Cocaine has a density less than that of water (CT density of −219 HU). In contrast to cocaine and heroin, hashish has a much higher density with an appearance heavier than a regular stool on both X-ray and CT [4].

In the literature, and in this study, the discharge criteria for body packers include two negative stools and or a negative image result via X-ray or CT scans, with X-ray being more commonly utilized [9,17]. The mean length of stay for body packers in our study is shorter compared to in previously published results. In the study by Farmer and Chan, the average dose of PEG was 5 L (566 g) and resulted in a mean average LOS of 42 h (versus a 280 g average total dose that led to a LOS of 82 h) [16]. This observation provides a strong argument that more aggressive dosing will lead to a much shorter hospital LOS and quicker capsule evacuation in body packers [16].

Our study had no patients with signs of toxicity or requirement for surgical intervention. In another study conducted in Hillington Hospital, UK, 8% of their patients developed cocaine toxicity [7]. The most used drug in the literature is PEG. However, other laxatives have been reported to be used, such as senna, lactulose, picolax, phosphate enema, and glycerin suppository [7,9].

5. Conclusions

There is a high prevalence of smugglers around the world, which jeopardizes body packers' lives. Not all laxatives and bowel evacuation methods are safe and effective in illicit drug capsule evacuation. However, PEG is a safe and effective pharmacotherapeutic option for the treatment of body packers. As per this observational study, increased PEG dose, especially at 12 h, is associated with decreased hospital LOS and time to capsule evacuation. This is also observed when compared to previously published articles. It is believed that a prospective study with a larger sample size is required to further confirm these results.

Author Contributions: Conceptualization, S.F.M. and M.O.S.; methodology, S.F.M. and M.O.S.; software, M.O.S.; validation, Z.I. and G.A.; formal analysis, S.F.M. and M.O.S.; investigation, A.E.M. and M.S.; resources, S.F.M., M.O.S., M.S., Z.I., A.E.M. and G.A.; data curation, A.E.M., M.O.S. and Z.I.; writing—original draft preparation, S.F.M., M.O.S. and A.E.M.; writing—review and editing, S.F.M., Z.I. and G.A.; visualization, S.F.M.; supervision, S.F.M.; project administration, S.F.M., M.O.S. and G.A.; funding acquisition, Z.I. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This article is reviewed and approved by ABHATH (Hamad Medical Corporation Research Center). IRB approval code: #MRC-01-19-360; approval date: 24 November 2024.

Informed Consent Statement: Patient consent was waived because this was a retrospective analysis, and that patients were not present in the country during data collection and analysis. In addition, no contact information was available.

Data Availability Statement: Data is not available for privacy reasons and to avoid violation of patient privacy policies as per the law of the state of Qatar.

Conflicts of Interest: The authors declare no conflicts of interest.

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