

ORIGINAL ARTICLES—ALIMENTARY TRACT

Intentional Swallowing of Foreign Bodies Is a Recurrent and Costly Problem That Rarely Causes Endoscopy Complications

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BACKGROUND & AIMS: Guidelines support endoscopic removal of certain gastric foreign bodies (FBs) and all FBs lodged in the esophagus. We studied the poorly understood group of patients who intentionally ingest FBs. **METHODS:** Cases of intentional ingestion of FBs (n = 305) were identified, retrospectively, from an electronic endoscopy database and followed. Cases occurred among 33 different patients, who underwent endoscopy from October 1, 2001, to July 31, 2009 (39.0 cases/year); 79% were diagnosed with a psychiatric disorder. Financial cost analysis was performed using hospital billing and cost systems. **RESULTS:** Commonly ingested FBs included pens (23.6%), batteries (9.2%), knives (7.2%), and razor blades (6.9%). Most endoscopic procedures were performed under general anesthesia. FBs were commonly retrieved by snares (58.0%), rat-toothed forceps (14.4%), and nets (11.5%), assisted sometimes by use of overtubes (10.8%), and hoods (4.6%). FB extraction was unsuccessful at the initial endoscopy in only 20 cases; 2 cases eventually required surgical extraction. Minor complications occurred in 11 endoscopies. There were no deaths or perforations. The total estimated costs were \$2,018,073 (\$1,500,627 in hospital costs, \$240,640 in physician fees, and \$276,806 for security services). Costs were significantly higher for inpatients. Major payers were Medicare (48%) and Medicaid (31%). **CONCLUSIONS: Intentional FB ingestion occurs among a relatively small number of patients with psychiatric disorders and is costly. Endoscopic retrieval is relatively effective and safe, but often requires general anesthesia. These cases utilize significant hospital and fiscal resources. Attention should be focused on preventing these recurrent and costly episodes.**

Keywords: Foreign Bodies; Deliberate Ingestion; Therapeutic Upper Gastrointestinal Endoscopy.

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Prior literature on foreign body ingestion (FBI) has focused predominantly on accidental ingestions in adult and pediatric populations. However, a recent study involving a lower socioeconomic population in Los Angeles reported that recurrent FBI occurred primarily in psychiatric patients.¹ Patient characteristics associated with FBI include male gender, incarceration, and a history of psychiatric and substance abuse disorders, which has led to the suggestion that endoscopic

interventions in patients with repeated episodes of FBI were more likely to be complex, and with high failure rates (Swize L, Spier B, Grimes I, et al. Predictors of recurrent ingestion of gastrointestinal foreign bodies [abstract]. *Gastrointest Endoscopy* 2009;69:AB 317z).² Motives for FBI among institutionalized residents and inmates often involve secondary gain, and can include attempts at self-injury, suicide, manipulation, and escape.³ Unfortunately, attempts at interventions for recurrent swallows with medication additions or changes have met with limited success (Swize L, Spier B, Grimes I, et al. Predictors of recurrent ingestion of gastrointestinal foreign bodies [abstract]. *Gastrointest Endoscopy* 2009;69:AB 317z).

Although endoscopic complication rates have been reported to increase with delay from ingestion to presentation, the initial management of FBI is usually conservative, as a majority of foreign bodies pass spontaneously.^{1,2,4} According to the 2002 American Society for Gastrointestinal Endoscopy guidelines for the management of ingested foreign bodies, "Objects longer than 6 to 10 cm, such as toothbrushes and spoons, will have difficulty passing the duodenal sweep and should be removed."⁵ Endoscopic removal within 24 hours is also recommended for all esophageal FBs,⁵ and sharp objects or disk batteries lodged in the esophagus should prompt immediate removal. However, these recommendations are based upon expert opinion only, and the management of patients with deliberate FBI has been little studied or discussed previously.

We have experience with a large number of adult patients who presented to Rhode Island Hospital with intentional FBI. The goal of our study was to review the care and outcomes of our patients who underwent endoscopy for intentional FBI, focusing not only on endoscopic aspects of the cases but also on the costs — caring for patients who intentionally ingest FBs involves many hospital departments, including the emergency room, psychiatry, gastroenterology, anesthesiology, surgery, operating rooms, endoscopy, nursing, and security services. We report the magnitude of the problem, types of patients admitted, range of objects ingested, complications involved, and the

Abbreviations used in this paper: ASPD, antisocial personality disorder; BLPD, borderline personality disorder; FB, foreign body; FBI, foreign body ingestion; SIB, self-injurious behavior.

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financial implications of taking care of these patients. In so doing we provide an evidence base for the development of future interventions designed to improve management of such cases.

Methods

Cases of FBI at Rhode Island Hospital were identified through retrospective review of the hospital's electronic endoscopy database (ProVation, Wolters Kluwer Health, Philadelphia, Pennsylvania), followed by review of the paper or electronic medical records as necessary to obtain additional clinical and demographic data. We included subjects >18 years old who had at least 1 upper gastrointestinal endoscopy for FBI between October 1, 2001, and July 31, 2009. Exclusion criteria included accidental ingestions and food impactions. We collected data on the patient's age at time of ingestion, gender, category of endoscopic sedation, type and location of the foreign body (FB) within the upper gastrointestinal tract, method of FB removal, outcome of retrieval, ancillary findings on endoscopy, and endoscopic complications. The patient's residing address, type of medical insurance coverage, and length of stay at Rhode Island Hospital were also recorded. Financial cost analysis of the hospitalization, including inpatient nursing care, endoscopy staff and unit resources, the emergency department, and surgical service costs were performed through Rhode Island Hospital's billing and cost accounting systems. Security service expenses were calculated based on 24-hour coverage during each patient's hospitalization and straight time and overtime hourly wage rates for guards. Medical professional fees were based on Medicare allowable charges, and based on typical fees for consultations on medical patients.

Differences in the costs of managing patients according to admission status (as in- or outpatients) were compared by Mann-Whitney *U* test.

This study was approved by Rhode Island Hospital's Institutional Review Board.

Results

Patient Demographics

A total of 33 individual patients were identified, 19 (57.6%) were male, and 14 (42.4%) were female. The mean age of

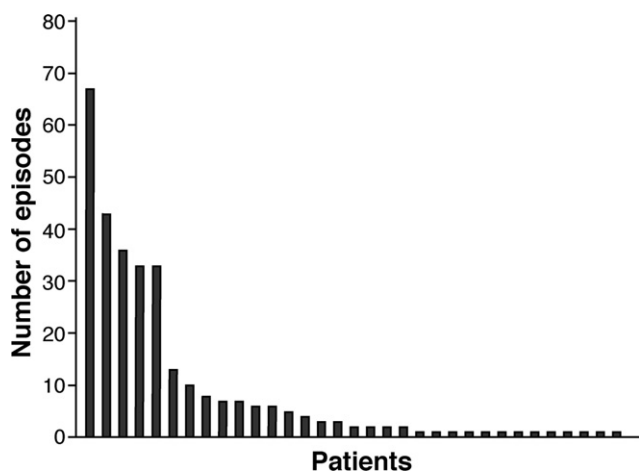


Figure 1. Frequency distribution of number of intentional foreign body ingestions, according to individual patients.

these patients at the time of ingestion was 35.4 years (range 18–56 years). These 33 patients were responsible for 305 total FBI cases over the 7-year 9-month period of the study (39.4 cases per year). The 19 males were responsible for 161 (52.6%) of the cases, and the females for 144 (47.2%) of the cases. Figure 1 shows the breakdown of individual patients responsible for the 305 cases. One patient was responsible for 67 (22.0%) of cases; 4 patients were responsible for 179 (58.7%) of cases. Overall there were 9.2 episodes per patient on average.

Twenty-two of the patients had at least 1 inpatient admission, with an average of 4.6 admissions per patient and a maximum of 23 admissions for 1 patient. These patients were hospitalized for a total of 566 days, or 5.66 days per admission. Twenty-seven of the patients were endoscoped but not admitted to the hospital at least once, with an average of 5.78 such visits per patient and a maximum of 27 visits for 1 patient. The decision to admit a patient was related to several factors, including the time of presentation, availability of anesthesia services, the patient's level of agitation or combativeness, the level of risk the patient was felt to pose to themselves or others, and the availability of outside support or monitoring services if endoscopic retrieval was not considered immediately necessary.

Of the patients who were inpatients at the time of endoscopy, 9% were admitted from prison and 38% from private homes in the community. The remaining 53% of these patients were admitted from residential institutions, mostly from a state-run chronic psychiatric inpatient facility.

Among the patients who were outpatients at the time of endoscopy, 11% were admitted from prison and 20% from private homes in the community. The remaining 69% of these patients presented from residential institutions, again mainly from a state-run chronic psychiatric facility.

Psychiatric Comorbidity

Among the 33 patients, 27 (79%) had concomitant psychiatric diagnoses coded in their medical records. Eight patients carried more than 1 psychiatric diagnosis; 4 patients had 2 diagnoses, and 4 had 3 diagnoses. Accounting for comorbidity across psychiatric diagnoses (thus totaling greater than 27), 20 patients were diagnosed with a mood disorder (major depression, bipolar disorder, or mood disorder not otherwise specified), 4 with anxiety disorders (posttraumatic stress disorder or anxiety disorder not otherwise specified), 6 with substance abuse disorders, 4 with psychotic disorders (schizophrenia and schizoaffective disorder), 2 with impulse control disorder not otherwise specified, 1 with developmental delay/mental retardation, and 2 patients were diagnosed with malinger.

Ingested Foreign Bodies and Their Removal

The most commonly ingested FBs were pens (intact or as individual components, 72 cases; 23.6% of total ingested foreign bodies), batteries (28; 9.2%), knives (22; 7.2%), razor blades (21; 6.9%), other metal objects (20; 6.6%), pencils (19; 6.2%), toothbrushes (18; 5.9%), spoons (15; 4.9%), and coins (13; 4.2%). Figure 2 shows the chest radiograph of a patient who swallowed a large knife that was ultimately removed by endoscopy using a snare.

Indications for endoscopic removal of foreign bodies were based on American Society for Gastrointestinal Endoscopy guidelines.⁵ The most common location of the FBs at endos-

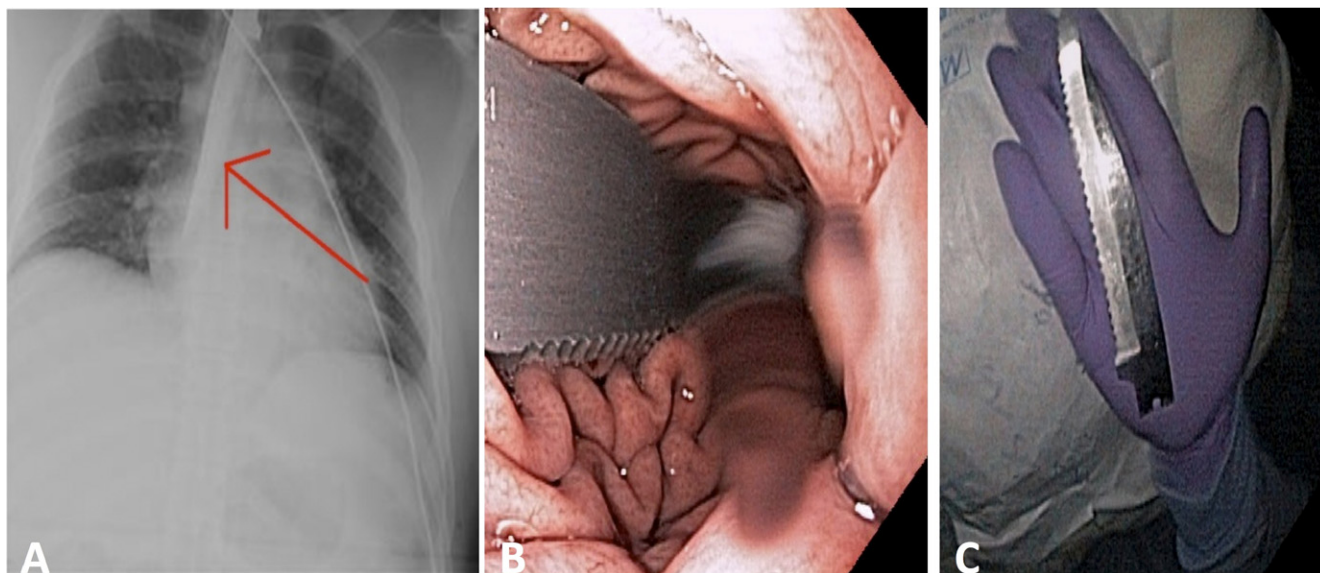


Figure 2. Deliberate ingestion of a serrated knife blade in a patient with adjustment disorder with depressed mood, not diagnosed as having suicidal intent. (A) Chest radiograph showing knife blade (arrow) tip down in esophagus. (B) Same serrated knife tip now lying within stomach. (C) Successfully removed knife blade.

copy was the stomach (140 cases; 45.9% of the total) of which 47.2% were found in the fundus, 33.7% in the body, and 13.5% in the antrum. The next most common location was the esophagus (39 cases; 12.8% of the total) with 62.2% of these objects located principally in the upper third, 18.9% in the middle third, and 18.9% in the lower third. The third most common location was the duodenum (17 cases or 5.6%). Other sites were: embedded in the cricopharyngeus muscle (1 case), at the gastroesophageal junction (2 cases), and in the proximal jejunum (2 cases). In 42 cases (13.8%), no FB was found at endoscopy, presumably because it had passed beyond the proximal jejunum, had been missed at endoscopy, or because the patient had not actually ingested an FB.

Of the 42 cases in which no FB was found, the indications for endoscopy were a history of FBI and supportive imaging studies (plain radiography or computed tomography) in 39 cases. In 3 cases no pre-endoscopy imaging was performed. The decision to proceed directly to endoscopy on these 3 occasions was based upon a history of FBI alone in 2 different patients with multiple prior verified FBI episodes.

Among the endoscopic accessories used for FB extraction, the most frequently specified on the endoscopy report were snares (177 cases; 58.0%). Other commonly used devices were rat-toothed forceps (44; 14.4%) and nets (35; 11.5%). Retrieval was sometimes performed with overtubes (33; 10.8%) and rubber hoods (14; 4.6%). In 48 cases (15.7%) no accessories were employed, either because no FB was visualized (42 cases) or due to inability to adequately sedate the patient (6 cases). In 17 cases (5.6%) the retrieval method was not specified.

Location of Procedure and Type of Sedation Provided

Most commonly the procedures to extract FBs were performed in the endoscopy suite (134 cases; 43.9%). However, 58 cases (19.0%) were undertaken in the operating room, 86 cases (28.2%) at the patient's bedside (usually in the emergency

room), and in 27 cases (8.9%) no location was specified in the medical record. The operating room was used for out-of-hours cases requiring anesthesia due to an institutional policy necessitating staff anesthesiologist availability at this site when on call.

Whereas moderate sedation is usually used for gastrointestinal endoscopy at our institution, more of these intentional FBI cases were performed under general anesthesia or deep sedation (162 cases or 53.1%) as compared with moderate sedation (136 cases or 44.6%). The use of deep sedation or general anesthesia was based upon clinical judgment, usually predicated by a previous lack of patient cooperation with FB retrieval under moderate sedation. Other contributory factors included a history of high chronic opiate, benzodiazepine, or psychotropic use, a high level of anxiety, agitation, or combativeness, and the size and type of the object ingested (for example, the knife in Figure 2). In 7 cases (2.3%) the type of sedation used was not specified.

Endoscopic Outcomes

In 237 cases (77.8% of the total) all FBs were successfully retrieved. In 42 cases (13.8%) no foreign bodies could be identified. In 10 cases (3.3%) only some of the objects were removed successfully and in a further 10 cases (3.3%) the attempt at removal was completely unsuccessful. In the 20 cases in which FBs remained at the end of the procedure, the endoscopy was repeated within 0–3 days with successful outcome in 12 cases. In 6 cases the remaining FB was allowed to pass spontaneously without complication, and 2 cases eventually underwent surgery (see below). In 6 cases (2.0%), the procedures were terminated prematurely due to inability to sedate patients.

Surgical consults were requested in 10 cases (3.3%), in 5 cases due to unsuccessful endoscopic removal of the FB (2 of these cases involved knives, 1 case involved razor blades, 1 involved bed springs, and 1 involved batteries). Another 4 consults were called because during endoscopy the FB which had been iden-

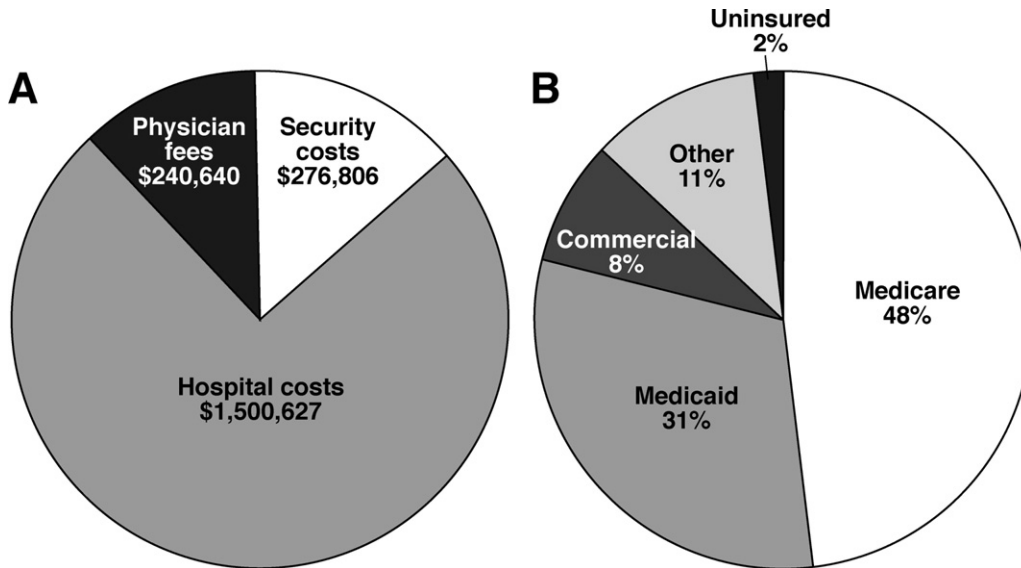


Figure 3. (A) Categories of costs incurred in patient care, and (B) total payer mix.

tified as being in the stomach on abdominal radiography could not be found, and the endoscopist was concerned that further passage through the intestine could result in a perforation. The remaining consult was for advice on the management of tears of the gastroesophageal junction during endoscopic removal of the FB. Only 2 cases required surgery. One was a patient who had ingested multiple bedsprings — this patient developed intestinal obstruction 1 month later and underwent laparotomy and small bowel resection. In another case a patient had multiple large metallic FBs in the stomach that could not be removed endoscopically (2 attempts). These FBs were removed by gastrotomy 5 days after initial presentation.

In none of these 305 cases was surgery performed for endoscopic complications, and there were no cases of perforations or patient deaths. Minor complications were reported in 11 cases (3.6%) including mucosal trauma and/or bleeding not requiring transfusion (in 10 cases; 3.3%). In 1 case, a pencil became embedded in the oropharynx during extraction and was removed manually with only minor trauma. No immediate complications were documented in the remaining 294 cases (96.4% of the total).

Cost Analysis

The total costs incurred in the care of these cases were \$2,018,073 (Figure 3), borne primarily by governmental payers. Major payers were Medicare (48% of total patients) and Medicaid (31%).

The total cost of hospital care was \$1,500,627, or \$45,474 per unique patient. The greatest contributors to hospital costs were nursing care (56% of hospital costs), endoscopy (14%), emergency department (10%), and surgical services (6%).

Costs were significantly higher for inpatients. The average cost per inpatient admission was \$11,273, compared with \$2393 for an outpatient episode ($P < .001$). The length of stay was predicated principally on management of psychiatric comorbidities, rather than because of delays related to endoscopy or its complications.

Estimated physician fees were \$240,640, including costs for daily hospital visits by internists/hospitalists, emergency medicine physician evaluation and management, gastroenterology,

psychiatric and surgical consults, endoscopy procedure charges, and anesthesiologists' fees.

The hospital also bears the cost of 24-hour per day security for most of these patients, some of whom required 2 guards to prevent repeat FBI or other self-harm. These costs, estimated at \$276,806, are not reimbursed by third party payers.

Discussion

Our study shows that intentional FBI is a relatively common event at our hospital. A small number of patients, many of whom suffer from comorbid psychiatric diagnoses, were responsible for over 300 FB swallowing cases and 2 million dollars in hospital and physician costs.

While the majority of literature in this field has focused on accidental FB swallowing in adult and pediatric populations, few studies have reported on adult patients with intentional FBI. A recent study from a large urban county hospital examined 262 such cases.¹ Most of these patients had underlying psychiatric diagnoses and repeatedly swallowed common household items such as pens, spoons, and toothbrushes. This study reported a 90% success rate for endoscopic extraction and a 6% perforation rate.¹ In a series of 242 cases of accidental and deliberate FBI the 2 most common objects discovered at endoscopy were meat and bone impaction.⁶ That study reported a 98.8% success rate of extraction, a 1.2% failure rate, and 1 case (0.4%) required surgery.⁶

In our study, 33 patients were responsible for over 300 cases of intentional FBI over an 8-year span. Endoscopy was very safe and highly successful in retrieving the swallowed objects, and minor endoscopic complications occurred in only 11 cases (3.6%). Bleeding, not requiring transfusion, was the most common complication reported. Only 2 cases required elective surgery — to prevent perforation of sharp FBs that did not pass through the pylorus after 5 days' expectant management, and for intestinal obstruction that developed 1 month after the ingestion of multiple large bedsprings. When the initial endoscopy was unsuccessful at removing all ingested FBs, repeating the procedure within a few days under increased moderate

Figure 4. Proposed algorithm for the management of foreign body ingestions.

sedation or general anesthesia was very helpful, usually resulting in complete FB extraction.

We have also addressed the financial implications of these cases on hospital and health care resources. Many of these patients were deemed too difficult to manage as outpatients, and were admitted to hospital for expensive and sometimes lengthy admissions. As inpatients they were usually under the care of medicine, psychiatry, and surgery services and their inpatient stays were often prolonged, even after successful FB retrieval, due to ongoing psychosocial problems. Total costs over this 8-year span were over 2 million dollars. In order to limit the costs of managing these episodes, we suggest that patients be triaged and admission to acute care hospitals restricted when possible, by following the management algorithm shown in [Figure 4](#).

A majority of patients who engage in intentional FBI carry 1 or more psychiatric diagnoses that cut across axis I and axis II

(personality disorder) nosologic groupings.⁷ Psychiatric comorbidity is common, as noted in the population reported here. Axis I conditions typically associated with FBI include cognitive, psychotic disorders, mood, and substance abuse disorders. When mood disorders are the primary diagnosis associated with FBI, they are often of the severe type and accompanied by psychotic symptoms. Posttraumatic stress disorder (PTSD), often comorbid with borderline personality disorder (BLPD), is the most commonly encountered anxiety disorder associated with FBI. Axis II conditions associated with FBI include BLPD and antisocial personality disorder (ASPD). Unfortunately, axis II diagnoses were not regularly coded for and thus could not be reliably ascertained in our patients. When the specific psychiatric condition driving FBI cannot be identified, the diagnosis of “Impulse control disorder not otherwise specified” is often coded to document some element of abnormal behavior.

The motivation and reasons for FBI vary. Elements of affective dysregulation and impulse dyscontrol cut across all the neuropsychiatric diagnoses associated with FBI. FBI as a frank suicide attempt is unusual and is most often associated with mood and psychotic disorders. The specific psychiatric diagnosis and whether or not the patient is considered suicidal do not typically correlate with the potential lethality of the ingested FB or the frequency of ingestion; this was also the case in the patients described in our series.

FBI is one of many forms of self-injurious behaviors (SIB) and can be either suicidal or nonsuicidal in nature. Nonsuicidal forms are particularly prevalent in axis II disorders. Motivations for SIB include relief of pain via induction of the endogenous opioid system, communication of internal distress, acting out due to anger, and manipulation of the environment with identifiable secondary gain.⁸

Patients with chronic axis II-related FBI are overrepresented in institutional settings and comprise the majority of our case series. Recurrent FBI in patients with BLPD and ASPD often represent attempts to manipulate the environment. For incarcerated patients with ASPD, the presumed goal is removal to a more desirable setting — an example of secondary gain consistent with the related and nonpsychiatric diagnosis of malingering.

Recurrent FBI is often resistant to treatment.⁸ Antipsychotic agents, mood stabilizers, and antidepressants are the treatments of choice when FBI is due to a mood or psychotic disorder. However, because recurrent FBI is frequently a volitional and/or malingered act, pharmacologic treatments are limited in efficacy. Admission to acute inpatient psychiatric care is not usually indicated as the behavior is neither suicidal nor acute. As FBI behavior escalates, institutional level of care is often sought to provide the highest level of observation, supervision, and therapy. However, as in the group of patients described here, this rarely succeeds in preventing FBI. Indeed, for 1 of the patients in this report, 13 of 14 recent admissions for FBI were from institutional psychiatric settings and some of our patients have ingested an FB again, even while watched by 2 guards in the acute care hospital. We suspect that expectant management without transfer out of the institutional setting, or definitive treatment in the emergency room with prompt return to the institutional setting may limit the secondary gain of medical admission.

FBI and other recurrent SIB are poorly understood, difficult to treat, and consume considerable physician time and hospital resources. Patients with these behaviors generate frustration, anger, and negative affect in treating physicians and other hospital staff. Frustration with the patient can extend to frustration with colleagues due to the perception that “not enough is being done” to prevent the behavior. It needs to be remembered that (1) the patients and their behaviors are the identified problem; (2) pharmacologic and behavioral treatments are of very limited efficacy in these patients; and that (3) indefinite 1:1 supervision or unlimited restraint (even in institutional settings) is unrealistic.

Several limitations of our study warrant consideration. First, many of our subjects, especially those with repeated FBI, do not always give accurate histories, which can make it difficult to discern deliberate from accidental ingestions. Second, psychiat-

ric comorbidity may have been underestimated as not all admissions for FBI resulted in psychiatric consultation. Third, this was a retrospective chart review, so that rigorous follow-up for long-term complications is lacking, and the endoscopy reports sometimes lacked details, particularly regarding extraction methods.

In summary, intentional FBI is a serious concern at Rhode Island Hospital, occurring almost weekly. Only a handful of patients were responsible for most of the cases. The most commonly swallowed objects were pens, batteries, and knives. Endoscopic retrieval was relatively effective and safe, but unlike standard endoscopy, often required general anesthesia. In only 3.5% of cases was a surgical consult required, and most of these patients were managed conservatively. Two cases required surgical removal of FBs, but there were no reported cases of patient deaths or bowel perforations. Attention should be focused on avoiding these preventable and costly episodes. Cost analysis shows a clear benefit to manage such events on an outpatient basis if possible. Cost-effective and streamlined protocols that do not compromise patient care and safety are needed for managing patients with intentional FBI.

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Reprint requests

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Conflicts of Interest

The authors disclose no conflicts.