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Original Contribution

Beyond observation: Protocols and capabilities of an Emergency Department Observation Unit

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ABSTRACT

Objective: Emergency Department Observation Units (Obs Units) provide a setting and a mechanism for further care of Emergency Department (ED) patients. Our hospital has a protocol-driven, type 1, complex 20 bed Obs Unit with 36 different protocols. We wanted to understand how the different protocols performed and what types of care were provided.

Methods: This was an IRB-approved, retrospective chart review study. A random 10% of ED patient charts with a "transfer to observation" order were selected monthly from October 2015 through June 2017. This database was designed to identify high and low functioning protocols based on length of stays (LOS) and admission rates.

Results: Over 20 months, a total of 984 patients qualified for the study. The average age was 49.5 ± 17.2 years, 57.3% were women, and 32.3% were non-Caucasian. The admission rate was 23.5% with an average LOS in observation of 13.7 h [95% CI 13.3–14.1]. Thirty day return rate was 16.8% with 5.3% of the patients returning to the ED within the first 72 h. Thirty six different protocols were used, with the most common being chest pain (13.9%) and general (13.2%). Almost 70% received a consultation from another service, and 7.2% required a procedure while in observation. Procedures included fluoroscopic-guided lumbar punctures, endoscopies, dental extractions, and catheter replacements (nephrostomy, gastrostomy, and biliary tubes).

Conclusions: An Obs Unit can care for a wide variety of patients who require multiple consultations, procedures, and care coordination while maintaining an acceptable length of stay and admission rate.

1. Introduction

1.1. Background

Emergency Department Observation Units (Obs Units) are short stay units managed by Emergency Department (ED) physicians. ED patients often require additional testing, procedures, or consultations which are beyond the scope of the traditional ED visit, yet do not qualify the patient for a 2-midnight inpatient stay. While there are many ways to provide observation care in the ED, the most efficient type (Type 1) operate with defined protocols and target an 8–24 hour patient length of stay (LOS) [1]. Protocol-driven Obs Units have been associated with shorter LOS, a lower probability of inpatient admission, and national cost savings [1-4]. Obs Units offer a number of other benefits to a hospital including decreased ED overcrowding, decreased ambulance diversion, and fewer patients leaving the ED without being seen [5]. Furthermore, Obs Units have been shown to improve patient satisfaction scores [2,6].

ED-based Obs Units have existed for over 40 years [7]. Initially, Obs Units focused on a few specific patient populations, such as those with low risk chest pain. Obs Units have since evolved to expand their scope of practice. Multiple observation protocols have been developed which have been shown to be safe and deliver effective care. Recognizing the value of an Obs Unit, studies report that over one third of hospitals now have implemented an ED observation unit [8,9]. As the number of operational Obs Units increases, it is important to know what care can be proved by these units and how they function.

Literature describing the day to day patient care provided in these units is limited. For example, at our institution, patients may be placed on one of 36 different observation protocols, each with its own unique order set and suggested consultations. While the overall admission rate and length of stay in the unit is in

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accordance with hospital operational guidelines, we did not have a great sense of how each of these individual protocols were performing. Previous studies have focused on one specific protocol, such as syncope, chest pain, or transient ischemic attacks (TIA), however these studies have not provided a comprehensive evaluation of how Obs Units function as a whole. Therefore, we designed a continuous quality improvement initiative to comprehensively evaluate our Obs Unit, specifically focusing on the quality of care provided and the variability of quality metrics amongst the various protocols.

1.2. Importance

Obs Units operate under specific time sensitive metrics that apply to all patients, and yet they care for patients with a broad scope of illnesses, presentations and needs. This study provides data on quality metrics and length of stay for patients in different protocols.

1.3. Goals of this investigation

The goal of this investigation is to evaluate the quality metrics of a high volume, complicated type 1 Obs Unit operating with 36 different protocols. This was a quality improvement initiative designed to identify protocols with high admission rates or long LOS to target for improvement.

2. Methods

2.1. Study design and setting

This IRB-approved retrospective chart review study was performed between October 1, 2015 and June 31, 2017 at an urban academic tertiary care referral hospital. Our medical center has an ED volume of 72,000 patient visits per year and a 20-bed Obs Unit that cares for approximately 6500 patients per year. Average daily census is 9.5% of the ED census, or an average 21.2 patients per day. The patient population is 90% insured and 61% have primary care physicians.

The Obs Unit is a Type 1, meaning a unit with a dedicated area and dedicated staff and protocols, with placement in the unit only by ED physicians [1]. The Obs Unit is run by board certified emergency medicine physicians supported by 24-hour advanced practice provider coverage and nurses cross-trained in short-stay and emergency care. There are 36 different care pathways or protocols (Table 1) including a "General" protocol for patients who need observation care but do not qualify for one of the other designated protocols.

2.2. Selection of participants

This database was developed as a quality improvement initiative to identify high and poor functioning protocols for intervention. The sampling of 10% of patients per month was agreed upon by the initial team as it resulted in 50–60 charts per month which was felt to be feasible and to also provide some insight into unit function. There was no power analysis. An electronic medical record dashboard query (EPIC, Epic Systems Corp.) was used to identify ED patients who had a transfer to observation order placed. Ten percent of all patients 18 years and older who had stays in the Obs Unit were randomly selected for chart review each month. These selected charts were then evaluated for inclusion. Exclusion criteria included patients for whom an observation order was placed, but their observation disposition was changed prior to a stay in the Obs Unit and/or those whose stay in observation status was <1 h. Any patient without documentation of their final disposition from observation status was also excluded.

2.3. Data collection

Trained emergency medicine residents, faculty, and medical students abstracted data from the electronic medical record. They were not blinded to the purpose of the quality database, which was to assess rates of use of the Obs Unit and rates of protocol and consultant use to ascertain if particular protocols were performing differently in terms of quality metrics. A standardized chart abstraction datasheet was used to collect data in Microsoft Excel 2010 (Microsoft Corp.). The initial data abstraction sheet was developed by the lead author and then tested by four chart abstractors prior to approval. Ten percent of charts were reviewed by a second abstractor with good agreement and reliability. Agreement for age was 96.6% (Pearson correlation r 0.99), agreement for protocol used was 92.3% (kappa 0.91), agreement for disposition was 98.9% (kappa 0.97), and agreement for length of stay in observation was 88.9% (Pearson correlation r 0.95).

2.4. Outcome measures

This was a descriptive study. The main outcome of interest was protocol usage, but attention was also placed on observation length of stay, admission rate, consultant use, 72-hour revisits, and 30-day revisits. Observation LOS was defined as the time from observation order placement to final disposition order placement (admission, discharge, or elopement). Total hospital LOS included the time from arrival in the ED to discharge from the hospital. Consultant use was defined as a consult completed while the patient was in observation status. ED revisits were defined as any unscheduled hospitalization or ED revisit to our healthcare system within 72 h or 30 days of discharge from the Obs Unit or hospital index visit. Observation protocols at our institution are described in Table 1. For the purpose of analysis, some similar protocols with low numbers in our dataset were grouped, specifically the geriatric protocols were grouped together (Fragility Fracture and Frailty) and we grouped oropharyngeal infections (Pharyngitis and Dental). For further information on specific protocols and ordersets, please contact the lead study author.

2.5. Analysis

Descriptive variables are reported including means with standard deviations and percentages with 95% confidence intervals as indicated. Comparisons were made using student *t*-test or chi square evaluations.

3. Results

3.1. Characteristics of study patients

Over the course of the 20 months of data collection, there were 1058 total randomly selected charts. Seventy-four patient records were excluded, leaving 984 patients who met inclusion criteria for this study. Exclusion criteria were duplicate encounter ($n = 1$), directly admitted or discharged and never placed in Obs Unit ($n = 30$), and Obs Unit length of stay <1 h ($n = 43$). The patients had a mean age of 49.5 ± 17.2 years, were 57.3% female, and 67.7% Caucasian non-Hispanic (Table 2). There was no difference in length of stay in observation between male and female patients (13.5 h vs. 13.9 h, p = 0.36). Overall, patients placed into the Obs Unit had an admission rate of 23.5%. Patients who required admission following their Obs Unit stay had a total hospital length of stay

Table 1
Descriptions of the Obs Unit protocols in use at the time of the study demonstrate the variety of conditions and illnesses managed in observation. Exclusions refer to criteria that suggest the patient would be better cared for on an inpatient service.

Protocol	Description:	Exclusions:
Abdominal pain	Patients with acute abdominal pain and non-surgical abdomens requiring additional symptom control, imaging (e.g., hepatobiliary scintigraphy scan or MRI to rule out appendicitis during pregnancy), or consultation (e.g., gastroenterology, bariatric surgery). Receive symptom control, attempt to transition to oral intake, and serial abdominal exams.	Chronic abdominal pain. Surgical abdomen.
Allergic reaction	Patient with allergic reaction more severe than can be safely discharged immediately from the ED, but not likely to deteriorate or require >2 midnight hospital stay. Stable angioedema and cutaneous reactions that are likely to be treated with oral medications qualify.	Airway compromise. Evolving/worsening angioedema. Stevens Johnson Syndrome. Abnormal vital signs. Symptoms refractory to epinephrine.
Asthma/COPD	Patients with acute exacerbation whose symptoms are not controlled enough for discharge.	New hypoxemia. Patient requires heliox. Patient already on outpatient steroids without improvement.
Back pain	Patients with back pain that require either advanced imaging (MRI or CT myelogram) or symptom control beyond ED stay. Patients with high risk features of cord compression (bowel/bladder incontinence, sacral anesthesia, new motor deficit) or spinal epidural abscess should have a Spine consult completed prior to being placed in the Obs Unit.	Patients with chronic back pain who have required 3 doses of IV pain medication in the ED.
Carbon monoxide	Patients with mild to moderate CO exposure that require simple oxygen therapy or hyperbaric therapy. Hyperbaric chamber is located next door to the Obs Unit.	Evidence of end organ dysfunction (ACS, persistent altered mental status, stroke symptoms). Exposure was a suicide attempt.
Cellulitis	Patients with skin and soft tissue infections require close monitoring for rapid progression and response to treatment.	Water borne infections or fever >101F. Concern for tendon involvement, necrotizing infection, fasciitis, myositis, osteomyelitis, or diabetic foot ulcers.
Chest pain	Patients with chest pain and a HEART score of 4–6, or requiring cardiology consult to determine need for admission or further imaging or cardiac stress test [22].	HEART scores 0–3 or $\geq$7
CHF	Patients with mild acute decompensated heart failure requiring diuresis. Given Lasix q6–8 h with q6–8 chemistry panels and supplementation of potassium and magnesium.	Acute renal injury, new hypoxia, or respiratory distress. Pulmonary edema requiring IV nitroglycerin infusion or other titrated vasoactive drips.
Dehydration	Patients with acute dehydration that require further symptom management and IV fluid resuscitation. Ideally, generally healthy people with causes amenable to symptom control such as hyperemesis gravidarum, gastroenteritis, mild rhabdomyolysis or mild acute nausea/vomiting from chemotherapy.	Dehydration from dysentery, infectious colitis, or clostridium difficile infection. Severe hypokalemia or acute renal injury.
Dental	Patients with a dental infection that requires IV hydration, IV pain or nausea control, and/or IV antibiotics. Dental or buccal abscesses should be drained by emergency physician or appropriate consultants prior to or early in Obs Unit stay	Concern for airway compromise. Severely immunocompromised or on chemotherapy. Need for operating room incision and drainage.
DVT/PE	Patients with PE and a low PESI score who require an echo, hematology consultation or confirmatory studies such as Doppler ultrasound or ventilation-perfusion scan which is not available during the night [23].	Hypotension or new hypoxemia Thrombosis failing outpatient anticoagulant medications.
Epistaxis	Hemodynamically stable patients with epistaxis that require monitoring with repeat H/H, transfusion, or to observe for hemostasis. Patient can receive a blood transfusion on this protocol, but there needs to be another reason for the observation period in addition to transfusion.	Severe thrombocytopenia or other coagulopathy. Recent brain or nasal surgery.
General	Patients who do not fit a defined protocol, but are felt appropriate for observation based on the judgment of the ED attending and care team members.	Requires more than floor level care. Unstable vital signs.
Geriatrics (frailty)	Older adult who does not have a medical condition requiring inpatient care but who is at high risk for functional decline, cognitive issues, or polypharmacy and would benefit from multidisciplinary geriatric assessment to evaluate home safety and needs.	Patient unable to ambulate. Patient likely to need placement in a facility.
Geriatrics (fragility fracture)	Patient with a fragility fracture that is non-operative and able to ambulate. Observe for pain control, fall risk assessment, case management for home PT and endocrinology evaluation for treatment/assessment of low bone mineral density.	Patient unable to ambulate.
GI hemorrhage	Concern for upper or lower GI bleeding such as episodes of bright red blood per rectum with stools. Serial hemoglobins and GI consult for endoscopy if required.	History of large volume hematemesis or continued vomiting or melena. Severe coagulopathy or cirrhosis.
Head injury	Patients with GCS of $\geq$14 with closed head injury that require neuro-checks, monitoring, symptom control, or repeat imaging to ensure safety at discharge with their condition. Can include intracranial bleeds without neuro deficits.	New neurologic deficits. GCS <14.
Headache	Patients with headache that require further symptom control, imaging, or a fluoroscopic-guided lumbar puncture for evaluation of causes.	Meningitis. New brain lesions.
Hematuria	Patients with hematuria that require either diagnostic evaluation, monitoring with repeat H/H, transfusion, continuous bladder irrigation or to be observed for hemostasis	Brisk bleeding requiring transfusion for acute blood loss. Patients with recent genitourinary operations.
Hyper- or hypoglycemia	Patients with diabetes who require further monitoring or treatment for hypoglycemic or hyperglycemic episodes. Endocrinology consultation is recommended.	Bicarbonate level <18. Acidosis on venous blood gas. On insulin pump or requiring IV insulin. New onset type 1 diabetes. Altered mental status.

Table 1 (*continued*)

Protocol	Description:	Exclusions:
Hypertensive urgency	Patients with elevated blood pressures and symptoms (headache, chest pain) without evidence of acute end organ damage on labs.	Patient on >3 antihypertensives at home. Requiring continuous antihypertensive infusions.
Intoxication	Patient with mild intoxication and concern that a full medical clearance cannot occur until sober. Patients with mild head trauma or assault, cardiac disease, or abdominal pain that need reassessment once sober.	Agitated or requiring a sitter or frequent nursing care.
Palpitations/AICD	Patient with concerning palpitations of unclear etiology, or those with concern for mild electrolyte abnormalities requiring repletion. Also, patients who have an AICD that defibrillated and need device interrogation and a cardiology consultation.	AICD with multiple shocks or ongoing symptoms. High concern for ventricular dysrhythmias or syncope with palpitations.
Pancreatitis	Patients with mild pancreatitis that require a brief period of IV hydration and symptom control.	History of prolonged hospitalizations for pancreatitis episodes. Elevated LFTs or concerning electrolyte abnormalities.
Pharyngitis	Acute pharyngitis that requires IV hydration, IV pain or nausea control, and/or IV antibiotics. Abscesses should be drained by emergency physician or ENT prior to or early in observation stay.	Concern for airway compromise Ill appearing and failed outpatient antibiotics.
Pneumonia/influenza	Patients with community acquired pneumonia or influenza who require further symptom control. Recommend using PORT score to risk assess for patients with pneumonia [24].	New hypoxia. Severely immunocompromised or on chemotherapy.
Pseudotumor/ idiopathic intracranial hypertension	Patients with an established diagnosis of pseudotumor or with an indwelling shunt that require further symptom control, imaging, fluoroscopic-guided lumbar puncture, or evaluation by the neurosurgery or neuro-ophthalmology teams.	New neurologic deficits. Fever >100.4 Shunt revision within the previous 30 days.
Psychiatry	Stable patients with an acute psychiatric need that require 8–24 of monitoring, preferably for reaction to medications. Observe in place in the ED psychiatric unit.	Does not apply if they are pending disposition to another facility.
Pyelonephritis	Patients with acute pyelonephritis with uncontrolled symptoms. Pregnant patients at >20 weeks gestation should be evaluated by Obstetrics team prior to placement in Obs Unit.	Infection resistant to outpatient oral antibiotics. Severely immunocompromised or on chemotherapy. Indwelling devices such as nephrostomy tubes or ureteral stents. Concurrent obstructing kidney stone.
Renal colic	Patients with acute ureteral nephrolithiasis with persistent symptoms or who require urgent urology evaluation for stent placement or intervention that do not require hospitalization.	Acute kidney injury. Renal transplant. Single or horseshoe kidney.
Syncope	Patients with moderate risk syncope requiring telemetry, echocardiogram, or carotid Doppler evaluation.	Concerning EKG changes, e.g., prolonged QT, Brugada, Wolf-Parkinson-White, or heart block. AICD. Severe aortic stenosis. Anemia.
TIA	Patients at moderate risk after TIA with resolution of neuro deficits who require further imaging and serial neurologic exams. Co-managed with the neurology consultation team. Also recommend physical, occupational, or speech therapy evaluation depending on initial symptoms.	Ongoing or dynamic neurologic deficits. New inability to walk. Evidence of acute stroke on neuroimaging.
Trauma	Patients who have experienced mild to moderate trauma who require symptom control, concussion monitoring, or reassessment of tertiary trauma exam due to intoxication or pain.	
Vaginal bleeding	Hemodynamically stable, non-pregnant patients with dysfunctional uterine bleeding requiring serial hemoglobin checks and evaluation by gynecology.	Coagulopathy, thrombocytopenia, pregnancy, or autoimmune bleeding disorders.
Vertigo	Patients with symptomatic acute vertigo requiring further symptom control and/or possible neurology consultation or brain imaging.	If unable to ambulate, consider admission.
MRI	Patient requires emergent MRI and does not meet criteria for 2 midnight stay. If the MRI is for TIA or back pain, the patient was included in those other protocols.	Examples include MRI cervical spine for concern for worsening cervical stenosis with new deficits, or an MRI brain to evaluate for multiple sclerosis.

CO = carbon monoxide, AICD = automatic implantable cardiac defibrillator, TIA = transient ischemic attack, ACS = acute coronary syndrome.

Table 2
Demographic information of patients place in observation, admission rates, and length of stay in observation.

	All patients	One or more consultation	No consultations
	n = 984	*n* = 681	*n* = 303
Age (y), mean ± SD	49.5 ± 17.2	50.1 ± 17.8	48.2 ± 15.7
Gender			
Male (%)	420 (42.7)	303 (44.5)	117 (38.6)
Female (%)	564 (57.3)	378 (55.5)	186 (61.4)
Race/ethnicity (% Caucasian, non-Hispanic)	67.7%	69.0%	64.8%
Most common protocols[a]	Chest pain 13.9% General 13.2% TIA 8.4% Abdominal pain 8.2% Cellulitis 6.1%	General 13.8% TIA 11.9% Chest pain 10.9% Abdominal pain 8.7% Back pain 6.3%	Chest pain 20.9% General 11.9% Dehydration 8.6% Abdominal pain 7.3% Cellulitis 6.6%
Admitted (%)	23.5%	27.0%	15.4%
Observation LOS (hours) [95% CI]	13.7 (Range = 1.3–50.0) [13.3–14.1]	14.3 (Range = 1.3–50.0) [13.7–14.8]	12.4 (Range = 1.3–42.8) [11.6–13.1]

TIA = transient ischemic attack.
[a] Most common protocols do not add up to 100% as only the top 5 most common protocols are listed.

of 4.9 ± 4.6 days. Five percent of discharged patients (5.3%) returned to the ED within 72 h of discharge and, including these early returns, a total of 16.8% returned to the ED within 30 days. The 72 hour return rate for ED patients not placed in the Obs Unit is 6.2% at our institution.

3.2. Protocols

The most common protocols utilized for patients in the Obs Unit were chest pain, general, TIA, abdominal pain, and cellulitis (Table 3). The congestive heart failure protocol had the longest length of stay in the Obs Unit, followed by head injury, and pancreatitis. The pharyngitis/dental protocol had the shortest length of stay in the Obs Unit. The admission rate was highest for the head injury protocol, followed by psychiatry, and the geriatric protocols (fragility fracture, frailty). No patients on the carbon monoxide, hypertensive urgency, pseudotumor, and vaginal bleeding protocols required admission.

3.3. Consultations

There were 681 patients (69.2%) who received one or more consultations in the Obs Unit, with 225 patients (22.9%) receiving ≥2 consultations. Consultants varied extensively and comprised the majority of services in the hospital. In total, 18.9% ($n = 183$) of patients were evaluated by a surgical service (e.g., general, thoracic, cardiac, vascular, plastics, neurosurgery, transplant, surgical oncology, bariatric, colorectal, or oral-maxillary and facial surgery), 13.9% ($n = 135$) by surgical subspecialists (e.g., otolaryngology, ophthalmology, obstetrics and gynecology, urology, anesthesiology, interventional radiology, podiatry), and 36.1% ($n = 350$) by a medical service (e.g., hospitalist, infectious disease, neurology, rheumatology, geriatrics, dermatology, palliative medicine, interventional radiology). Eight percent of Obs Unit patients were evaluated by physical and/or occupational therapy, 1.9% by pharmacy services, and 20.6% by social work and/or case management.

Patients who had at least one consultation had a longer observation LOS and a higher admission rate than those who did not have any consultations (14.3 h vs. 12.4 h, $p < 0.001$, and 27.0% admitted vs. 15.4%, $p < 0.001$). There was no significant difference in the admission rate between patients who received one consultation and patients who received multiple consultations (26.6% vs. 28.4%, $p = 0.65$). Patients who had a consultation in the Obs Unit and were subsequently admitted had a mean hospital length of stay of 4.7 ± 3.9 days, while patients who did not have a consultation but necessitated inpatient admission had a mean hospital length of stay of 6.0 ± 6.9 days ($p = 0.07$).

3.4. Procedures

The Obs Unit staff coordinated both bedside and surgical procedures. Thirty-one patients (3.2%) had a procedure competed in the physical space of the Obs Unit by non-ED staff, and 40 patients (4.1%) required a procedure outside of the Obs Unit. The most common procedure performed in the ED by consultants was an incision and drainage. These were often for complicated abscesses such as hand abscesses from intravenous drug abuse, which are managed by our hand surgery team (joint orthopedics and plastics service). Other procedures performed in the Obs Unit included: PICC placement/replacement, tooth extraction, complicated foreign body removal, wound debridement, nasopharyngoscopy/laryngoscopy, arthrocentesis, nerve block, and skin punch biopsy. Patients were taken to surgical suites, endoscopy, and to clinic procedure rooms for procedures outside of the Obs Unit. The most common procedure outside of the Obs Unit was an esophagogastroduodenoscopy, which was performed for gastrointestinal bleeding, abdominal discomfort, or esophageal impaction/foreign body. Additional procedures arranged while patients were in ED observation status included appendectomy, biliary tube replacement, cystourethroscopy, toe amputation, fluoroscopy-guided lumbar puncture, ureteral stent placement, nephrostomy tube replacement, cholecystectomy, hyperbaric oxygen treatments, AICD or electrophysiology device interrogation, and percutaneous endoscopic gastrostomy (PEG) tube replacement. Fluoroscopy-guided lumbar puncture was performed by interventional radiology in their suite outside of the ED; all other lumbar punctures were performed in the ED. Having a procedure did not correlate with differences in admission rate (24.2% vs. 23.7%, $p = 0.88$). Eight patients (11.3%) who had a procedure revisited the ED within 72 h, while 14 (19.7%) revisited within 30 days.

4. Discussion

The Obs Unit provides emergency physicians with time, flexibility, and access to hospital resources to care for a variety of patient needs. Patient flow, specifically length of stay and admission rates, vary depending on the protocol. It is important to each institution to determine a tolerance around these measures. Assuming an Obs Unit is functioning efficiently because the overall length of stay or admission rate is at goal does not mean that all the protocols are equally efficient. Our unit has 36 different protocols, and this data demonstrates how procedures, consultations, and lengths of stay differ.

For example, our admission rate for patients on the geriatric protocols (Frailty and Fragility Fracture) was 45%, which initially seems very high. However, our hospital operates at capacity on any given day; avoiding any admission is a success. Therefore this protocol is seen as reducing admissions by 55% for this population and this higher admission rate is warranted for this higher risk population. As a Level 1 Geriatric ED, the Obs Unit is used to provide the extra time and personnel needed for multidisciplinary geriatric assessments [10]. This can include geriatrics consultation, case manager evaluation, physical and/or occupational therapy evaluation, and full medication reconciliation by a pharmacist. Only a small percentage of our Obs Unit patients are placed on this protocol specifically (1%), but the therapy team, case managers, and pharmacists also assist with patients on many of the other protocols. For example, an older patient placed in observation for syncope evaluation may also receive a geriatrics consultation if there is concern for frailty, cognitive deficits, or medication side effects.

In contrast, the cellulitis protocol also had an admission rate of 45%. An additional concern is the high rate of surgical consultations for patients being treated for skin and soft tissue infections. This implies that we are caring for very complicated infections in observation. Stricter inclusion/exclusion criteria for Obs Unit placement could be warranted to direct more of these patients to inpatient surgical services initially.

Coordinating with consultants is very common in our unit. Over two thirds of patients were co-managed with a consulting team, which may reduce the admission burden for these teams. This co-management also allowed for a wide variety of procedures to be done in or out of the Obs Unit. The TIA protocol with neurology and the dental infections protocol with oral maxillofacial surgery are both high functioning and high consultation rates. Prior studies have identified co management models for TIA in observation, but we are not aware of other studies of observation and treatment for emergent dental infections/procedures [11].

For example, a patient may be sent in to the ED by their clinic dentist for emergent evaluation and extraction by oral maxillofacial surgery and IV antibiotics for a complicated dental abscess.

Table 3
Observation protocols had varying admission rates and use. Physical and occupational therapists were frequently involved for patients with Back pain, Frailty, and TIA evaluations while surgeons were involved in patients placed for Trauma, Head Injuries, and Dental infections.

Protocol	Number of patients	Admission rate[a]	LOS	Consultations					
				Surgical	Surgical subspecialty	Medical	PT/OT	Pharmacy	CM/SW
Abdominal pain	8.2% (*n* = 81)	22.2% [14%–33%]	12.4 ± 7	24.7%	18.5%	28.4%	0.0%	0.0%	24.7%
Allergic reaction	1.5% (*n* = 15)	6.7% [0%–32%]	13.3 ± 9	6.7%	6.7%	20.0%	0.0%	6.7%	20.0%
Asthma/COPD	1.9% (*n* = 19)	31.6% [15%–54%]	12.9 ± 5	0.0%	0.0%	5.3%	0.0%	0.0%	15.8%
Back pain	5.8% (*n* = 57)	33.3% [22%–46%]	14.9 ± 7	49.1%	0.0%	8.8%	36.8%	3.5%	21.1%
Carbon monoxide	0.1% (*n* = 1)	0.0% [0%–1%]	11.5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cellulitis	6.1% (*n* = 60)	45.0% [33%–58%]	13.6 ± 7	36.7%	18.3%	6.7%	5.0%	1.7%	15.0%
Chest pain	13.9% (*n* = 137)	16.8% [11%–24%]	13.6 ± 7	1.5%	0.0%	44.5%	1.5%	0.7%	18.2%
CHF	0.7% (*n* = 7)	28.6% [7%–65%]	18.0 ± 10	0.0%	0.0%	71.4%	0.0%	28.6%	0.0%
Dehydration	4.6% (*n* = 45)	22.2% [12%–36%]	13.2 ± 6	13.3%	4.4%	8.9%	2.2%	4.4%	15.6%
DVT/PE	2.3% (*n* = 23)	21.7% [9%–42%]	11.5 ± 6	17.4%	13.0%	17.4%	0.0%	4.3%	17.4%
Epistaxis	0.5% (*n* = 5)	20.0% [2%–64%]	10.5 ± 4	0.0%	40.0%	0.0%	0.0%	0.0%	20.0%
Geriatrics (frailty, fragility fracture)	1.1% (*n* = 11)	45.5% [21%–72%]	13.7 ± 9	36.4%	0.0%	54.5%	63.6%	9.1%	36.4%
General	13.2% (*n* = 130)	20.8% [15%–29%]	12.8 ± 6	17.7%	20.0%	33.1%	10.8%	0.0%	30.8%
GI hemorrhage	1.4% (*n* = 14)	42.9% [21%–67%]	15.9 ± 11	14.3%	0.0%	85.7%	0.0%	0.0%	7.1%
Head injury	0.5% (*n* = 5)	60.0% [23%–88%]	17.5 ± 7	60.0%	20.0%	0.0%	20.0%	0.0%	40.0%
Headache	4.2% (*n* = 41)	17.1% [8%–32%]	12.9 ± 6	24.4%	19.5%	53.7%	4.9%	2.4%	14.6%
Hematuria	0.4% (*n* = 4)	25.0% [3%–71%]	17.4 ± 5	0.0%	100.0%	0.0%	0.0%	25.0%	75.0%
Hyper- or hypoglycemia	1.2% (*n* = 12)	41.7% [19%–68%]	13.9 ± 7	0.0%	0.0%	66.7%	0.0%	0.0%	25.0%
Hypertensive urgency	0.6% (*n* = 6)	0.0% [0%–0.4%]	14.7 ± 5	0.0%	0.0%	83.3%	0.0%	0.0%	16.7%
Intoxication	0.3% (*n* = 3)	33.3% [5%–80%]	13.8 ± 12	66.7%	0.0%	0.0%	0.0%	0.0%	33.3%
Palpitations/AICD	2.1% (*n* = 21)	33.3% [17%–55%]	12.7 ± 9	0.0%	0.0%	95.2%	0.0%	0.0%	9.5%
Pancreatitis	0.9% (*n* = 9)	33.3% [12%–65%]	16.9 ± 7	11.1%	0.0%	11.1%	0.0%	0.0%	44.4%
Pharyngitis/dental	1.3% (*n* = 13)	7.7% [0%–35%]	10.2 ± 5	69.2%	23.1%	0.0%	0.0%	0.0%	0.0%
Pneumonia/influenza	1.3% (*n* = 13)	23.1% [8%–51%]	12.0 ± 5	0.0%	0.0%	7.7%	0.0%	0.0%	7.7%
Pseudotumor	0.9% (*n* = 9)	0.0% [0%–0.3%]	15.3 ± 7	44.4%	100.0%	11.1%	0.0%	0.0%	22.2%
Psychiatry	0.2% (*n* = 2)	50.0% [9%–91%]	15.6 ± 3	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Pyelonephritis	2.2% (*n* = 22)	27.3% [13%–48%]	14.8 ± 7	13.6%	22.7%	0.0%	0.0%	0.0%	18.2%
Renal colic	3.2% (*n* = 31)	12.9% [5%–29%]	11.8 ± 6	0.0%	64.5%	0.0%	0.0%	0.0%	22.6%
Syncope	2.7% (*n* = 27)	18.5% [8%–37%]	15.4 ± 7	0.0%	3.7%	55.6%	7.4%	0.0%	18.5%
TIA	8.5% (*n* = 84)	25.0% [17%–35%]	16.5 ± 8	6.0%	7.1%	96.4%	22.6%	7.1%	13.1%
Trauma	2.9% (*n* = 29)	13.8% [5%–31%]	11.9 ± 6	86.2%	24.1%	6.9%	10.3%	0.0%	48.3%
Vaginal bleeding	0.7% (*n* = 7)	0.0% [0%–0.4%]	11.4 ± 4	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Vertigo	1.5% (*n* = 15)	20.0% [6%–46%]	14.1 ± 6	6.7%	6.7%	60.0%	13.3%	0.0%	13.3%
MRI	2.6% (*n* = 26)	23.1% [11%–42%]	16.2 ± 8	26.9%	7.7%	38.5%	7.7%	0.0%	23.1%
Total	984	23.5% [21%–26%]	13.7 ± 7	18.5%	13.6%	35.5%	8.0%	1.9%	20.6%

LOS = length of stay; PT/OT = physical therapy/occupational therapy; CM/SW = case management/social work; COPD = chronic obstructive pulmonary disease; DVT/PE = deep vein thrombosis/pulmonary embolism; GI = gastrointestinal; TIA = transient ischemic attack; MRI = magnetic resonance imaging.
[a] Admission rate lists mean and 95% CI in brackets.

We have a walk in urgent care dental clinic on our campus and this may result in more emergent dental infections requiring a higher level of care being referred to our ED. [12] Nationally, about 1% of ED visits are for dental complaints, and we found that 1.3% of our Obs Unit patients were on the dental or pharyngitis protocols [13,14]. As access to dentists is predicted to decline, we expect EDs will need to shoulder more of the burden and relationships with dental clinics and oral maxillofacial surgeons will be even more important [15]. This ability to access both inpatient (IV antibiotics and IV fluid hydration) and outpatient resources (oral surgeon) in one care setting is a characteristic unique to EDs and Obs Units that allows for substantial care coordination for patients.

Our data also suggest that at least one new protocol should be developed: catheter or tube replacement. We had patients placed in observation to coordinate replacement of dislodged or malfunctioning PICC lines and nephrostomy, biliary, or PEG tubes. This suggests that the ED is being used to coordinate this type of care. This may be because there is no system set up for care when these tubes fail over weekends or holidays, or this may signify difficulties getting these procedures scheduled in a timely fashion on an outpatient basis. Either way, delay in replacing these devices could cause a patient to miss doses of important medications or nutrition. Using an Obs Unit protocol to give medications through a peripheral IV until the main access can be restored/replaced is therefore reasonable. Billing for these services can be complicated as observation services currently cannot be billed for routine preparation prior to diagnostic testing or outpatient procedures or for post procedural monitoring. However, if the patient requires observation for other reasons such as IV rehydration than this may qualify.

Despite the variety and complexity of care provided in this unit, the quality metrics were similar to other reported studies. We report both 72 h and 30 day ED recidivism. Our overall Obs Unit admission rate (23.5%) and 30-day return rate (16.8%) were slightly higher than reported in other studies [8,9,16,17]. However, these studies used data from over 10 years ago. The addition of more observation protocols in the past decade may explain the slightly higher overall admission and 30-day return rate seen in our study. Expanding the capabilities of the unit could have resulted in more complicated or ill patients being placed in observation. A 30 day return rate of 16.8% is better than that reported for overall ED patients at other academic emergency departments (22–23%) [18,19]. We did not locate any studies that reported 72-hour return rates for Obs Units, however, Ross et al. studied 14-day return rates for an Obs Unit and observed that many return visits occurred within the first 3 days following discharge [16]. Previously reported 72-hour return rates for the entire ED population range between 1 and 15% depending on the hospital and patient population, which is consistent with our return rate of 5.3% for observation unit patients and comparable to our non-Observation ED patient population (6.2%) [20,21]. This suggests that the unit is providing care that, at least by ED recidivism metrics, is appropriate.

In conclusion, this quality review demonstrates the capability of an Obs Unit with the resources of a tertiary care referral hospital for coordinating consultations, procedures, and medical evaluations/treatments in a timely fashion for a variety of medical conditions. The variety of procedures performed and consultations obtained from the Obs Unit is especially interesting, and reflects the medical needs of our ED population.

5. Limitations

This data is a description of a single academic center, and may not be generalizable to all Obs Units. Additionally, our Obs Unit has substantial resources including physical and occupational therapists and daily case management services, which are not typical and may allow better care coordination at discharge that is not available to most other units. Length of stays for different protocols can vary depending on how different consulting services prioritize Obs Unit patients, which may also be institution-dependent. Also some protocols had low numbers of patients abstracted, which greatly limits the confidence in the results. This is why confidence intervals are included. Finally, this is a study of real time clinical practice and we did not evaluate the compliance of ED providers in following Obs Unit placement guidelines or protocols.

Impact statement

We certify that this work is novel clinical research that reports on an area of clinical care that has had little investigation-observation medicine. While some studies have reported on specific protocols, no study to date has reported the breadth and complexity of the patient care provided in these units. This information will be helpful for Emergency Medicine physicians and hospital administrators evaluating care in their observation units or planning expansions. As the reporting unit is a highly resourced, established, type 1 complex unit this report illustrates the extent of care that an ED Observation Unit is capable of providing for patients.

Presentations

None.

Financial support/conflicts of interest

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Author contributions

LTS designed the study. LTS, SS, AV, MK, MB, and LN performed chart reviews. As this was a quality database to examine clinical care, LTS, SS, AV, MK, MGB, and LN performed interim statistical analyses. SS and LTS performed the final statistical analysis. LTS, MB, and EJA reviewed the data and the clinical protocols. LTS drafted the manuscript and all authors participated in manuscript preparation. LTS takes responsibility for the paper as a whole.

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