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REVIEW-SYSTEMATIC

Pediatric Observation Units in the United States: A Systematic Review

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BACKGROUND: As more efficient and value-based care models are sought for the US healthcare system, geographically distinct observation units (OUs) may become an integral part of hospital-based care for children.
PURPOSE: To systematically review the literature and evaluate the structure and function of pediatric OUs in the United States.
DATA SOURCES: Searches were conducted in Medline, Web of Science, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Health Care Advisory Board (HCAB), Lexis-Nexis, National Guideline Clearinghouse, and Cochrane Reviews, through February 2009, with review of select bibliographies.
STUDY SELECTION: English language peer-reviewed publications on pediatric OU care in the United States.
DATA EXTRACTION: Two authors independently determined study eligibility. Studies were graded using a 5-level quality assessment tool. Data were extracted using a standardized form.
DATA SYNTHESIS: A total of 21 studies met inclusion criteria: 2 randomized trials, 2 prospective observational, 12 retrospective cohort, 2 before and after, and 3 descriptive studies. Studies present data on more than 22,000 children cared for in OUs, most at large academic centers. This systematic review provides a descriptive overview of the structure and function of pediatric OUs in the United States. Despite seemingly straightforward outcomes for OU care, significant heterogeneity in the reporting of length of stay, admission rates, return visit rates, and costs precluded our ability to conduct meta-analyses. We propose standard outcome measures and future directions for pediatric OU research.
CONCLUSIONS: Future research using consistent outcome measures will be critical to determining whether OUs can improve the quality and cost of providing care to children requiring observation-length stays. ***Journal of Hospital Medicine*** **2010;5:172–182.**

KEYWORDS: emergency department, hospitalization, observation unit, pediatric, review.

Additional Supporting Information may be found in the online version of this article.

The first observation units were implemented more than 40 years ago with the goal of reducing the number and duration of inpatient stays. Since then, observation units (OUs) have evolved as a safe alternative to hospitalization[1–4] for the delivery of finite periods of care, typically less than 24 hours.[5–8] Observation services allow for time to determine the need for hospitalization in cases that are unclear after their initial evaluation and treatment.[9] Observation status is an administrative classification related to reimbursement that can be applied to patients whose diagnosis, treatment, stabilization, and discharge can reasonably be expected within 24 hours.[10,11] The site of care for observation is dependent in part upon existing facility structures; some institutions utilize "virtual" OUs within the emergency department (ED) or hospital ward, while others have dedicated, geographically distinct OUs, which may function as an extension of either the ED or inpatient settings.[9]

OUs have been instrumental in providing care to adult patients with chest pain, asthma, and acute infections.[12–18] Recently, there has been an increase in the number of publications from pediatric OUs in the United States and abroad. Observation may be a preferred model of care for select pediatric patients, as hospitalized children often experience brief stays.[19–21] Previous reviews on this model of care have combined adult and pediatric literature and have included research from countries with healthcare structures that differ considerably from the United States.[22–24] To date, no systematic review has summarized the pediatric OU literature with a focus on the US healthcare system.

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As payers and hospitals seek cost-effective alternatives to traditional inpatient care, geographically distinct OUs may become integral to the future of healthcare delivery for children. This systematic review provides a descriptive overview of the structure and function of pediatric OUs in the United States. We also scrutinize the outcome measures presented in the included publications and propose future directions for research to improve both observation unit care, as well as the care delivered to patients under observation status within general inpatient or ED settings.

Methods

Literature Search

With the assistance of a health services librarian, a search of the following electronic databases from January 1, 1950 through February 5, 2009 was conducted: Medline, Web of Science, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Health Care Advisory Board (HCAB), Lexis-Nexis, National Guideline Clearinghouse, and Cochrane Reviews. Key words used for the Boolean search are included in Appendix A. In addition, we conducted a manual search of reference lists from reviews, guidelines, and articles meeting inclusion criteria.

We included English language peer-reviewed publications that reported on pediatric OU care in the United States. Studies were included if they reported outcomes including lengths of stay, admission from observation rates, return visit rates, costs or charges. Descriptive publications of pediatric OU structure and function were also included. Studies were excluded if they were conducted outside the United States, evaluated psychiatric or intensive care, reported on observation status in an ED without an OU or observation status on a traditional inpatient ward. Two reviewers (M.M. and C.K.) identified articles for inclusion. Any disagreements between the reviewers were resolved by discussion and consensus agreement. Interrater reliability was assessed using the kappa statistic.

Quality Assessment

The quality of each study was rated using the Oxford Centre for Evidence-based Medicine levels of evidence.[25] With this system, levels of evidence range from 1a (homogeneous systematic review of randomized, controlled trials) to 5 (expert opinion without explicit critical appraisal).

Data Synthesis

Data on study design, OU characteristics, patient populations, and outcomes were extracted using a standardized form. Heterogeneity of study design, interventions, and outcomes precluded the ability to conduct meta-analyses.

Results

A systematic search of the electronic databases identified 222 unique citations (Figure 1). A total of 107 abstracts were evaluated. We identified 48 articles for full-text review, of which 18 met inclusion criteria. Hand search of references yielded 24 additional articles, of which 3 met inclusion criteria. Interrater agreement for selected articles was high at 98% (kappa = 0.85).

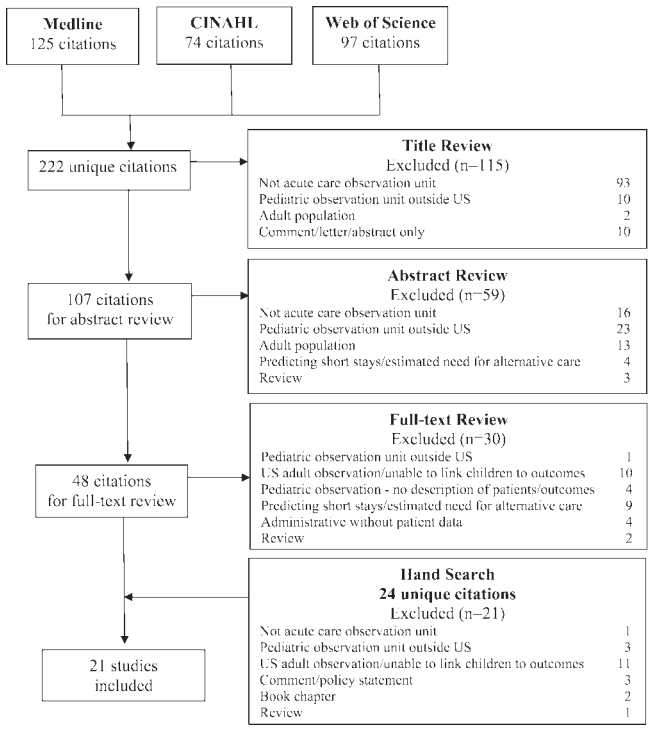

FIGURE 1. Literature search.

Observation Unit Characteristics

The majority of research on OUs has been conducted at large academic pediatric centers. One publication was from a community hospital.[26] These studies present data on more than 22,000 children cared for in OUs of 11 hospitals over a 32-year time span. Most studies were level 2 evidence: 2b, retrospective cohort studies and low-quality randomized, controlled trials; or 2c, "outcomes" research. Three were descriptive and not assigned a formal evidence level.[27–29]

Table 1 highlights general features of U.S. pediatric OUs. Five institutions renovated or expanded clinical space in order to open the OU.[27,29–32] Units ranged in size from 3 to 23 beds. The OU was located in or near the ED in all but 2 hospitals, which had ward-based units. The ED was the primary entry point into the OU with only 2 open model units accepting patients from other settings.[5,32] The annual number of observation cases ranged from 1000 to 3000 in children's hospitals. Approximately 500 ward-based observation cases per year were cared for in the single community hospital studied. Three reports included time trends showing increased OU utilization over study years.[5,30,31]

Staffing and Workflow

Staffing models varied and have undergone transitions over time. Prior to 1997, general pediatricians primarily provided

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TABLE 1. General Description of US Pediatric Short-stay OUs

Publication (Year); Condition	Study Design; Level of Evidence; Time Frame; Sample Size	Hospital; Observation Setting; Year Opened	Site	Beds	Entry Point	Staffing; Physicians; Nurses
Gururaj et al.[43] (1972); all conditions	Retrospective cohort; 2c; 1 year; 437 cases under observation	King's County Downstate Brooklyn; short-stay unit	ED	3	Not reported	Pediatric residents; general pediatricians
Ellerstein and Sullivan,[32] (1980); all conditions	Retrospective cohort; 2c; 6 years; 5858 cases of unscheduled care plus 1403 elective surgery cases	Children's Hospital Buffalo; observation unit; 1972	ED	8	ED, clinic, procedure/OR	Primary care pediatricians; other specialists; pediatric residents
O'Brien et al.[37] (1980); asthma	Retrospective cohort; 2c; 1 month; 434 cases of asthma, 328 discharged directly from ED, 106 treated in holding unit	Children's National DC; holding unit	ED	6	ED	1-2 pediatric residents; 1-2 nurses
Willert et al.[35] (1985); asthma	Randomized*; 2b; 578 cases of asthma; 166 cases 1.5 hours postaminophylline, 103 randomized, 52 to holding unit	Children's Memorial Chicago; holding room	ED	5	ED	General pediatricians; pediatric residents; PEM nurses
Listernick et al.[38] (1986); dehydration	Randomized†; 2b; 29 cases of dehydration; 22 to holding unit	Children's Memorial Chicago				
Balik et al.[31] (1988); all conditions	Descriptive; none given	Minneapolis Children's; short-stay unit observation area; 1985	Day surgery area adjacent to ED	Not reported	Not reported	General pediatricians; pediatric nurses (shared with ED)
Marks et al.[7] (1997); all conditions	Retrospective cohort; 2c; 5 months; 968 cases in short-stay unit	Children's Hospital Boston; short-stay unit; 1994	Ward	4-18	ED	Primary care pediatricians; PEM physicians; pediatric residents; pediatric nurses; 1:6 nurse:patient ratio
Marks et al.[7] (1997); asthma	Pre-post; 2b; 400 cases of asthma; 102 pre/298 post short-stay unit	Children's Hospital Boston				
Wiley et al.[6] (1998); all conditions	Retrospective cohort; 2c; 1 year; 805 cases of unscheduled observation; plus 595 scheduled cases	Connecticut Children's; outpatient extended treatment site	ED	10	Not reported	PEM physicians; other specialists; 1:5 nurse:patient ratio
Scribano et al.[65] (2001); all conditions	Retrospective cohort; 2b; 2 years; 1798 cases under observation	Connecticut Children's				
Leduc et al.[30] (2002); all conditions	Retrospective cohort; 2c; 6 months; 686 cases under observation (4.8% of ED visits)	Children's Hospital Denver; OU	ED	6	Not reported	Not reported
Bajaj and Roback,[30] (2003); intussusception	Retrospective cohort; 2b; 4.5 years; 78 cases of intussusception (51 under observation)	Children's Hospital Denver				
Wathen et al.[36] (2004); dehydration	Convenience sample; 2c; 10 months; 182 cases of dehydration (48 under observation)	Children's Hospital Denver				
Crocetti et al.[26] (2004); all conditions	Retrospective cohort; 2b; 2 years; 956 cases under observation	John Hopkin's Bayview; observation status beds; 1997	Ward	Not reported	99% ED 1% "other location"	General pediatricians covering ED and ward
Silvestri et al.[29] (2005); all conditions	Descriptive; none given	Children's Hospital of Philadelphia; OU; 1999	ED	12	ED	PEM physicians; PEM fellows; urgent care pediatricians; ED nurse practitioner; inpatient nurses
Alpern et al.[34] (2008); all conditions	Prospective cohort; 1b; 30 months; 4453 cases under observation	Children's Hospital of Philadelphia				
Thomas[27] (2000); all conditions	Descriptive; none given	Primary Children's Medical Center; RTU; 1999	ED	22-26	ED, clinic, procedure/OR	PEM physicians; general pediatricians; other specialists; no residents
Zebrack et al.[25] (2005); all conditions	Retrospective cohort; 2b; 2 years; 4189 cases of unscheduled observation plus 2288 scheduled cases	Primary Children's Medical Center				PEM nurses; 1:4 nurse:patient ratio

TABLE 1. (*Continued*)

Publication (Year); Condition	Study Design; Level of Evidence; Time Frame; Sample Size	Hospital; Observation Setting; Year Opened	Site	Beds	Entry Point	Staffing; Physicians; Nurses
Miescier et al.[40] (2005); asthma	Retrospective cohort; 2b; 2 years; 3029 asthma visits; 384 admitted, 301 observed, 161 cases met inclusion	Primary Children's Medical Center				
Holsti et al.[41] (2005); head injury	Retrospective cohort; 2b; 2 years; 827 CHI visits, 273 admitted, 285 observed, 284 cases met inclusion	Primary Children's Medical Center				
Greenberg et al.[42] (2006); croup	Retrospective pre-post; 2b; 1 year each; 694 croup cases pre-RTU, 66 admitted; 789 croup cases post-RTU, 33 admitted; 76 observed	Primary Children's Medical Center				
Mallory et al.[33] (2006); dehydration	Retrospective cohort; 2b; 1 year; 430 dehydration cases under observation	Primary Children's Medical Center				

Abbreviations: CHI, closed head injury; ED, emergency department; IV, intravenous; OR, operating room; OU, observation unit; PEM, pediatric emergency medicine; RTU, rapid treatment unit.
* Limited by bed availability, patient preference.
† IV hydration, admission per parent preference.

physician services. In more recent years, OUs have utilized pediatric emergency medicine (PEM) providers. Three of the 11 units allowed for direct patient care by subspecialists.[5,6,32] One OU was staffed by nurse practitioners.[29] OU nursing backgrounds included pediatrics, emergency medicine, or PEM.

Five institutions assembled multidisciplinary teams to define the unit's role and establish policies and procedures.[7,27,29–31] Workflow in the OU focused on optimizing efficiency through standardized orders, condition-specific treatment protocols, and bedside charting.[7,26,33] Several units emphasized the importance of ongoing evaluations by attending physicians who could immediately respond to patient needs. Rounds occurred as often as every 4 hours.[5,7] Two centers utilized combined physician-nursing rounds to enhance provider communication.[7,34] No publications reported on patient transitions between sites of care or at shift changes.

Criteria for Observation

All 11 hospitals have developed protocols to guide OU admissions (Table 2). Nine publications from 4 OUs commented on treatments delivered prior to observation.[33,35–42] The most commonly cited criteria for admission was approval by the unit's supervising physician. Utilization review was not mentioned as an element in the OU admission decision. Common OU exclusions were the need for intensive care or monitoring while awaiting an inpatient bed; however, these were not universal. Eight centers placed bounds around the duration of OU stays, with minimum stays of 2 hours and maximum stays of 8 to 24 hours.

Ages of Children Under Observation

Seven of 11 hospitals reported the age range of patients accepted in their OU (Table 2). All but 1 unit accepted children from infants to young adults, 18 to 21 years of age.[43] In the 6 units that reported the age distribution of their OU population, roughly 20% were <1 year, more than 50% were <5 years, and fewer than 30% fell into an adolescent age range.[5,6,26,32,34,43]

Conditions Under Observation

Many conditions under observation were common across time and location (Table 3). The list of conditions cared for in OUs has expanded in recent years. Medical conditions predominated over surgical. While the majority of observation cases required acute care, nearly one-half of the units accepted children with scheduled care needs (eg, routine postoperative care, procedures requiring sedation, infusions, and extended evaluations such as electroencephalograms or pH probes). These scheduled cases, cared for within the OU structure, provided more steady demand for OU services.

Reimbursement

One publication highlighted the special billing rules that must be considered for observation care.[27] In 3 studies, payers recognized cost-savings associated with the OU's

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TABLE 2. OU Entry Criteria

Hospital	Entry Criteria	Age Range	Time	Exclusion Criteria
King's County, Downstate Brooklyn	Otherwise required inpatient admission Acute problem of uncertain severity Acute problem not readily diagnosed Short course periodic treatment Diagnostic procedures impractical as outpatient	0-13 years	Maximum 24 hours	Not reported
Children's Hospital, Buffalo	Admission from any source Short stay elective surgery Estimated length of stay <24 hours	0-21 years	Maximum 24 hours	Intensive care needs Routine diagnostic tests Holding prior to admission
Children's National, Washington, DC	Inadequate response to 3 subcutaneous epinephrine injections	8 months to 19 years	Not reported	Not reported
Children's Memorial, Chicago	Asthma: Available parent Asthma score ≤5 Inadequate response to ED treatment Dehydration: Cases receiving oral hydration Parent preference if given IV hydration	>1 year 3-24 months	Maximum 24 hours 12 hours for oral 8 to 12 hours for IV	Past history of BPD, CF, CHD, other debilitating disease Intensive care need Hypernatremia
Minneapolis Children's	Conditions listed in Table 3	Not reported	Maximum 10 hours	Not reported
Children's Hospital, Boston	"Straightforward" diagnoses as determined by ED staff Bed availability	Not reported	Not reported	Other complex medical issues
Connecticut Children's	PEM attending discretion Limited severity of illness Usually confined to a single organ system Clearly identified plan of care	Not reported	After 3-4 hours in ED Low likelihood of requiring "extended care" >23 hours	Asthma: no supplemental O_2 need, nebulized treatments >Q2 hour Croup: no supplemental O_2 need, <2 racemic epinephrine treatments Dehydration: inability to tolerate orals, bicarbonate >10, 40 mL/kg IVF Seizure: partial or generalized, postictal, unable to tolerate orals Poisoning: mild or no symptoms, poison control recommendation
Children's Hospital, Denver	Intussusception: following reduction Dehydration: based on clinical status	0-18 years	After 3-4 hours in ED	Not reported
Johns Hopkins, Bayview	Consultation with on-duty pediatrician	0-18 years	Minimum of 2 hours High likelihood of discharge at 24 hours	Patients requiring subspecialty or intensive care services
Children's Hospital of Philadelphia	Sole discretion of the ED attending Single focused acute condition Clinical conditions appropriate for observation	Not reported	Minimum 4 hours Maximum 23 hours	No direct admissions Diagnostic dilemmas Underlying complex medical problems
Primary Children's Medical Center	Observation unit attending discretion Scheduled procedures as space available ED admit after consult with OU doctor Clear patient care goals Limited severity of illness Diagnostic evaluation	0-21 years	Minimum 3 hours Maximum 24 hours	Admission "holds" Intensive care needs Complicated, multisystem disease Need for multiple specialty consults Psychiatric patients

Abbreviations: BPD, bronchopulmonary dysplasia; CF, cystic fibrosis; CHD, coronary heart disease; ED, emergency department; IV, intravenous; IVF, IV fluids; PEM, pediatric emergency medicine; OU, observation unit; Q2, 2 per unit time specified.

ability to provide outpatient management for cases that would traditionally require inpatient care.[31,35,38]

Observation Unit Outcomes

Outcomes reported for pediatric OU stays fall into 4 major categories: length of stay (LOS), admission rates, return visit rates, and costs. Despite these seemingly straightforward groupings, there was significant heterogeneity in reporting these outcomes.

Length of Stay

The start time for OU length of stay (LOS) is not clearly defined in the articles included in this review. While the start of an observation period is assumed to begin at the

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TABLE 3. Conditions Cared for in US Pediatric OUs

	King's County, Downstate Brooklyn	Children's Hospital, Buffalo	Minneapolis Children's	Children's Hospital, Boston	Connecticut Children's	Children's Hospital, Denver	Johns Hopkins, Bayview	Children's Hospital of Philadelphia	Primary Children's Medical Center, Salt Lake City
Respiratory		•				•			
Asthma	•		•	•	•		•	•	•
Pneumonia	•			•			•	•	•
Bronchiolitis	•			•			•	•	•
Croup	•		•	•	•		•	•	•
Allergic reaction			•					•	
Cardiology								•	
Gastrointestinal	•	•				•			
Vomiting					•			•	•
Gastro/dehydration			•	•	•		•	•	•
Abdominal pain					•		•	•	•
Constipation									•
Diabetes								•	
Neurologic		•				•			
Seizure	•				•		•	•	•
Head injury	•		•		•			•	•
Infection		•				•	•		
Sepsis evaluation				•					•
UTI/pyelonephritis	•			•				•	•
Cellulitis				•				•	•
Fever						•		•	•
Pharyngitis								•	
Otitis media								•	
Adenitis								•	
Ingestion/poisoning	•	•	•		•	•	•	•	•
Hematologic			•			•		•	
Sickle cell disease	•								
Transfusion/infusion			•						•
Psychological/social	•	•			•		•	•	
Dental								•	
Surgical conditions									
Foreign body								•	•
Trauma		•				•	•	•	
Burn							•		
Orthopaedic injury					•			•	•
Postoperative complication								•	•
Scheduled care									
Diagnostic workup	•				•				•
Procedures/sedation					•				•
Elective surgery		•	•		•				•

Abbreviations: OU, observation unit; UTI, urinary tract infection.

time the order for observation is placed, it is possible that the LOS reported in these publications began at the time of ED arrival or the time the patient was physically transferred to the OU. The average LOS for individual OUs ranged from 10 to 15 hours.[5,6,26,30,35,38,40,41,43] One ward-based and 1 ED-based unit reported LOS extending beyond 24 hours,[7,30] with averages of 35 and 9 hours, respectively. Two units limited the duration of care to <10 hours.[31,38]

For studies that included a comparison group, OU stays were consistently shorter than a traditional inpatient stay by 6 to 110 hours.[7,36,38,39,42] No significant differences in clinical parameters between groups were reported. There was appreciable variation in the average LOS across institutions for similar conditions, 12 to 35 hours for asthma,[5,7,34,35] and 9 to 18 hours for dehydration.[5,34,36,38]

Admission Rates

Rates of hospital admission after observation from the 9 OUs reporting this outcome are presented in Table 4. Three publications from a single institution counted hospital admission in the 48 to 72 hours following discharge from the OU as though the patient were admitted to the hospital directly from the index OU stay.[33,40,41] Conditions with the lowest admission rates, <10%, included croup, neurologic conditions, ingestions, trauma, and orthopedic injuries. The

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TABLE 4. Condition-specific Rates of Inpatient Admission Following OU Care

	King's County, Downstate Brooklyn (%)	Children's Hospital, Buffalo (%)	Connecticut Children's (%)	Johns Hopkins, Bayview† (%)	Children's Hospital of Philadelphia (%)	Primary Children's Medical Center, Salt Lake City (%)
Unscheduled care	42	17	11	25	25	15
Respiratory		32				
Asthma	57		16	26	22	22-25*
Pneumonia				50	23	30-48
Bronchiolitis				46	32	43
Croup			9	17	9	4-6
Allergic reaction					3	
Cardiology					22	
Gastrointestinal	43	19				
Vomiting			5			22
Gastro/dehydration				23	15/21	16*
Abdominal pain				9	17	27
Constipation						9
Diabetes					17	
Neurologic		10				
Seizure			19	8	17	18
Head injury					7	5*
Infection		19		34		
Sepsis evaluation					25	22
UTI/pyelonephritis					25	16
Cellulitis						15
Fever					16	26
Pharyngitis					13	
Otitis media					21	
Ingestion/poisoning	9	4	4	9	10	5
Hematologic					23	
Transfusion/infusion						2
Psychological/social		21		80	17	
Dental					14	
Surgical conditions						
Foreign body						
Trauma		13		2	53	5
Burn				13		
Orthopedic injury					22	3
Postoperative complication					26	16
Scheduled care						
Diagnostic workup						0-5
Procedures/sedation						0.1-9.0
Elective surgery		13				0-5

NOTE: % indicates the percentage of children cared for in the OU with a given condition who went on to require inpatient admission.

Abbreviation: OU, observation unit; UTI, urinary tract infection.

*Admissions within 48-72 hours of OU discharge were counted as cases requiring inpatient admission from the index OU stay.

†Including transfers to tertiary care hospital.

highest admission rates, >50%, were for respiratory conditions including asthma, pneumonia, and bronchiolitis.

Return Visit Rates

Unscheduled return visit rates were reported in 9 publications from 6 institutions and ranged from 0.01% to 5%.[7,26,33,35–37,39–41] Follow-up timeframes ranged from 48 hours to 1 month. Return visits were inconsistently defined. In most studies, rates were measured in terms of ED visits.[26,33,35–37,39,41] One ward-based unit counted only hospital readmissions toward return visit rates.[7] Three publications, from ED-based units, counted hospital readmissions in the 2 to 5 days following observation toward admission rates and not as return visits.[33,40,41] In most studies, data on return visits were collected from patient logs or patient tracking systems. Three studies contacted patients by phone and counted return visits to the clinic.[35–37] No studies reported on adherence to scheduled visits following observation.

Costs

Seven studies reported financial benefits of OU care when compared with traditional hospital care.[7,30,31,35,37,38,42] Two centers admitted patients to inpatient care if their observation period reached a set time limit, after which cost savings

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were no longer realized.[31,35] Cost savings associated with the OU treatment of asthma and dehydration were attributed to lower charges for an OU bed.[35,38] Decreased charges for the OU treatment of croup were related to shorter LOS.[42]

Discussion

In the 40 years since the first studies of pediatric OUs, several US health systems have extended observation services to children. This model of care may be expanding, as suggested by an increase in the number of publications in the past 10 years. However, the number of centers within the US reporting on their OU experience remains small. Our systematic review identified a recurrent theme related to OUs—the opportunity to improve operational processes of care compared with the traditional inpatient alternative. We have identified the need to standardize OU outcomes and propose measures for future OU research.

Observation Unit Operations

The OU care model expands outpatient management of acute conditions to include children who are neither ready for discharge nor clear candidates for inpatient admission. OUs have demonstrated the ability to care for patients across the pediatric age spectrum. Over the decades spanning these publications, advances in medical therapy such as antiemetics for gastroenteritis and early administration of systemic steroids for asthma may have resulted in lower admission rates or shorter time to recovery.[44,45] Despite these advances, there are marked consistencies in the conditions cared for within OUs over time. The data summarized here may help guide institutions as they consider specific pediatric conditions amenable to observation care.

The hospitals included in this review either added physical space or revised services within existing structures to establish their OU. Hospitals facing physical constraints may look to underutilized areas, such as recovery rooms, to provide observation care, as observation does not require the use of licensed inpatient beds. Several units have responded to daily fluctuations in unscheduled observation cases by also serving patients who require outpatient procedures, brief therapeutic interventions, and diagnostic testing. By caring for patients with these scheduled care needs during the day, there is a more steady flow of patients into the OU. While hospitals traditionally have used postanesthesia care units and treatment rooms for scheduled cases, OUs appear to benefit from the consistent resource allocation associated with a constant demand for services.

To date, the vast majority of pediatric OUs in the published literature have emerged as an extension of ED services. Now, with the expansion of pediatric hospitalist services and movement toward 24/7 inpatient physician coverage, there may be increased development of ward-based OUs and the designation of inpatient observation status. While ward-based OUs managed by pediatric hospitalists may be well established, we were not able to identify published reports on this structure of care. A national survey of health systems should be undertaken to gather information regarding the current state of pediatric observation services.

When creating policies and procedures for OUs, input should be sought from stakeholders including hospitalists, PEM providers, primary care providers, subspecialists, mid-level providers, nurses, and ancillary staff. As patients requiring observation level of care do not neatly fit an outpatient or inpatient designation, they present an opportunity for hospitalist and PEM physician groups to collaborate.[46–48] Calling on the clinical experiences of inpatient and ED providers could offer unique perspectives leading to the development of innovative observation care models.

This review focused on institutions with dedicated observation services, which in all but 1 study[26] consisted of a defined geographic unit. It is possible that the practices implemented in an OU could have hospital-wide impact. For example, 1 study reported reduction in LOS for all asthma cases after opening a ward-based unit.[7] Further, pediatric hospitalist services have been associated with shorter LOS[49] and increased use of observation status beds compared with traditional ward services.[50] As pediatric hospitalists expand their scope of practice to include both observation and inpatient care, clinical practice may be enhanced across these care areas. It follows that the impact of observation protocols on care in the ward setting should be independently evaluated.

The costs associated with the establishment and daily operations of an OU were not addressed in the reviewed publications. Assertions that observation provides a cost-effective alternative to inpatient care[4,7,23,42] should be balanced by the possibility that OUs extend care for patients who could otherwise be discharged directly home. Studies have not evaluated the cost of OU care compared with ED care alone. Research is also needed to assess variations in testing and treatment intensity in OUs compared with the ED and inpatient alternatives. Reimbursement for observation is dependent in part upon institutional contracts with payers. A full discussion of reimbursement issues around observation services is beyond the scope of this review.

Observation Unit Outcomes

Length of Stay

Although most studies reported LOS, direct comparisons across institutions are difficult given the lack of a consistently referenced start to the observation period. Without this, LOS could begin at the time of ED arrival, time of first treatment, or time of admission to the OU. Identifying and reporting the elements contributing to LOS for observation care is necessary. The time of OU admission is important for billing considerations; the time of first treatment is important to understanding the patient's response to medical interventions; the time of ED arrival is important to evaluating ED efficiency. Each of these LOS measures should be reported in future studies.

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TABLE 5. Suggested Dashboard Measures for Pediatric OUs

	ED →	OU →	Inpatient →	Clinic
Length of stay*	ED arrival to OU admission	OU admit to disposition	Inpatient admit to discharge	
	ED arrival to discharge home from OU			
	ED arrival to discharge from inpatient following OU care			
	OU admission to discharge home from inpatient care			
Admission*	% ED census admitted inpatient	% OU census admitted		
	% ED census that is observed			
Unscheduled return visits*	To ED	Requiring OU admission	Requiring inpatient admission	
Scheduled follow-up*	To ED			To primary care or subspecialist office
Capacity	ED crowding scales		Unable to accept transfers	
	ED left before evaluation rates		Inpatient occupancy	
	Ambulance diversion			
Satisfaction		Patient/Parent		
	ED providers	OU providers	Inpatient providers	Follow-up providers
Cost	ED care	OU care	Inpatient care	
		Total encounter		

Abbreviations: ED, emergency department; OU, observation unit.
*Condition-specific measurement should be considered. *For same diagnosis at 72 hours, 1 week, and 30 days

Direct comparisons of LOS are further complicated by variability in the maximum permissible duration of an OU stay, ranging from 8 to 24 hours in the included studies. Despite these limits, some OU care will extend beyond set limits due to structural bottlenecks. For example, once the inpatient setting reaches capacity, observation LOS for patients who require admission will be prolonged. The best evaluation of LOS would come from prospective study design utilizing either randomization or quality improvement methods.

Defining Success and Failure in Observation Care

In the reviewed literature, "observation failures" have been defined in terms of admission after observation and unscheduled return visit rates. Admission rates are heavily dependent on appropriate selection of cases for observation. Although some observation cases are expected to require inpatient admission, OUs should question the validity of their unit's acceptance guidelines if the rate of admission is >30%.[51] High rates could be the result of inadequate treatment or the selection of children too sick to improve within 24 hours. Low rates could indicate overutilization of observation for children who could be discharged directly home. Full reporting on the number of children presenting with a given condition and the different disposition pathways for each is needed to evaluate the success of OUs. Condition-specific benchmarks for admission after observation rates could guide hospitals in their continuous improvement processes.

Unscheduled return visits may reflect premature discharge from care, diagnostic errors, or development of a new illness. OU care may influence patient adherence to scheduled follow-up care but this has not been evaluated to date. In future research, both scheduled and unscheduled return visits following ED visits, observation stays, and brief inpatient admissions for similar disease states should be reported for comparison. Standard methodology for identifying return visits should include medical record review, claims analyses, and direct patient contact.

As hospitals function at or near capacity,[52,53] it becomes important to delineate the appropriate length of time to monitor for response to treatments in a given setting. Limited capacity was a frequently cited reason for opening a pediatric OU; however, the impact of OUs on capacity has not yet been evaluated. Operations research methods could be used to model OU services' potential to expand hospital capacity. This research could be guided by evaluation of administrative data from across institutions to identify current best practices for pediatric OU and observation status care.

OU benchmarking in the United States has begun with a small number of adult units participating in the ED OU Benchmark Alliance (EDOBA).[54] In Table 5, we propose dashboard measures for pediatric OU continuous quality improvement. The proposed measures emphasize the role of observation along the continuum of care for acute conditions, from the ED through the OU with or without an inpatient stay to clinic follow-up. Depending on the structure of observation services, individual institutions may select to monitor different dashboard measures from the proposed list. Patient safety and quality of care measures for the conditions commonly receiving pediatric OU care should also be developed.

Limitations

The most important limitations to this review are the heterogeneity in interventions and reporting of outcomes, which precluded our ability to combine data or conduct meta-analyses. We attempted to organize the outcomes data into

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clear and consistent groupings. However, we could not compare the performance of 1 center with another due to differences in OU structure, function, and design.

In order to focus this systematic review, we chose to include only peer reviewed publications that describe pediatric OUs within the United States. This excludes expert guidelines, which may be of value to institutions developing observation services.

Our search found only a small number of centers that utilize OUs and have published their experience. Thus, our review is likely subject to publication bias. Along this line, we identified 9 additional publications where children were cared for alongside adults within a general OU.[55–63] This suggests an unmeasured group of children under observation in general EDs, where more than 90% of US children receive acute care.[64] These articles were excluded because we were unable to distinguish pediatric specific outcomes from the larger study population.

Finally, retrospective study design is subject to information bias. Without a comparable control group, it is difficult to understand the effects of OUs. Patients directly admitted or discharged from the ED and patients who require admission after observation all differ from patients discharged from observation in ways that should be controlled for with a randomized study design.

Conclusions

OUs have emerged to provide treatment at the intersection of outpatient and inpatient care during a time of dramatic change in both emergency and hospital medicine. As hospitalists expand their scope of practice to include observation care, opportunities will arise to collaborate with ED physicians and share their growing expertise in quality and efficiency of hospital care delivery to improve observation services for children. OUs have been established with laudable goals—to reduce inpatient admissions, increase patient safety, improve efficiency, and control costs. The current evidence is not adequate to determine if this model of healthcare delivery achieves these goals for children. Through synthesis of existing data, we have identified a need for standard reporting for OU outcomes and propose consistent measures for future observation care research. Only through prospective evaluation of comparable outcomes can we appraise the performance of pediatric OUs across institutions.

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