Short-Stay Patients Could Save $3.1 Billion A Year
Making Greater Use Of Dedicated Hospital Observation Units For Many

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Making Greater Use Of Dedicated Hospital Observation Units For Many Short-Stay Patients Could Save $3.1 Billion A Year

ABSTRACT Using observation units in hospitals to provide care to certain patients can be more efficient than admitting them to the hospital and can result in shorter lengths-of-stay and lower costs. However, such units are present in only about one-third of US hospitals. We estimated national cost savings that would result from increasing the prevalence and use of observation units for patients whose stay there would be shorter than twenty-four hours. Using a systematic literature review, national survey data, and a simulation model, we estimated that if hospitals without observation units had them in place, the average cost savings per patient would be $1,572, annual hospital savings would be $4.6 million, and national cost savings would be $3.1 billion. Future policies intended to increase the cost-efficiency of hospital care should include support for observation unit care as an alternative to short-stay inpatient admission.

The rising demand for acute care—attributable to several factors, including poor access to unscheduled primary care and an aging population with complex chronic illnesses—is placing increasing demands on crowded emergency departments and hospitals in the United States.1 In 2009 there were more than 136 million emergency department visits to 4,967 US hospitals, and 13.4 percent of the visits resulted in an inpatient admission.2–4 The emergency department is now the primary entry point to hospital care, producing over half of non-obstetric inpatient admissions.5

Along with this growing demand, rising costs and lower payments have threatened the financial viability of many hospitals, resulting in a trend of both emergency department and hospital closures over the past decade and creating a mismatch of supply and demand for acute care services.6,7 Given these trends, and considering the fact that hospital care accounted for more than 30 percent of national health expenditures in 2009,8 efforts to improve health care efficiency need to focus on hospital efficiency.

Delivering care in an observation unit is an alternative to admitting patients who cannot be safely discharged to their homes following an emergency department visit. Observation units are dedicated spaces, usually within or immediately adjacent to an emergency department, where patients receive care, usually for up to twenty-four hours.

Numerous studies show that care in observation units is equal or better in quality and lower in cost than inpatient care for specific conditions.9–11 Observation units were identified by the Institute of Medicine as central to improving resource use and patient flow.12 However, payers now categorize observation care as an outpatient status that is not associated with any defined site of care. As a result, observation care is delivered in different settings with variable lengths-of-stay, even within the same hospital.
The strongest evidence supporting the benefits of observation care is specific to care delivered in dedicated observation units, where evidence-based evaluation and standardized protocols are used to avert inpatient admissions. Observation care can be delivered either in these units or in other areas of the hospital, alongside emergency department patients or even among inpatients if no dedicated unit exists. Approximately one-third of hospitals in a recent national survey delivered observation care in an observation unit, while two-thirds did not have a dedicated unit.

Understanding the financial impact of increased use of observation unit care and the corresponding decrease in the use of inpatient care at the national level is important for both administrators and policy makers involved in health care delivery redesign. Previous studies compared only single-site costs of observation care with routine inpatient care. Our objective was to quantify the potential cost savings from a decrease in avoidable inpatient admissions that would result from increasing the use of observation units in eligible hospitals.

Study Data And Methods
We first conducted a systematic literature review to find the average cost savings per observation unit visit. We then created a model and ran a Monte Carlo simulation to estimate the number of avoided inpatient admissions and associated cost savings, both per hospital and at the national level. We chose other key model inputs based on the available literature; these are discussed in more detail in Appendix Exhibit 1.

Systematic Literature Review
We systematically reviewed the literature to find studies that directly compared the costs of observation unit care with standard inpatient admission. We searched the online citation database Medline for clinical trials that compared costs of inpatient care with observation unit care across a variety of conditions, and we identified 197 articles.

We excluded sixty-seven articles that had no original cost data, ninety that were missing cost data about either the observation unit or inpatient visits, twenty-three that used charge data and not cost data, and two that contained cost data on foreign hospitals. A search of each article’s bibliography for related citations yielded a single additional article. A health services reference librarian advised us on this search strategy, which is illustrated in Appendix Exhibit 1.

Final total cost savings for each study are reported in Appendix Exhibit 2. Although the specific costing methods varied across studies, the methodology was consistently applied within each study to both observation unit care and inpatient admissions. All included studies compared only single-site costs of observation care with inpatient admission and calculated costs from the hospital perspective. None of the included studies used charge data.

We adjusted cost data to 2012 US dollars based on inflation as estimated by the medical portion of the Consumer Price Index. We excluded two studies even though they met all inclusion criteria, because they were clear outliers—well over two standard deviations from the mean.

Monte Carlo Simulation
We used Monte Carlo analysis to generate an estimate of the potential cost savings of using observation unit-based care in the most possible hospital visits in order to account for the uncertainty of the many inputs needed for the calculation. The final outputs were the mean and standard deviation for annual avoided inpatient admissions and the resulting total cost savings from increased observation unit use—both for the individual hospitals and at the national level.

We used national survey data to estimate the number of hospitals that have sufficient emergency department visit volume to justify the fixed costs of a dedicated observation unit but currently lack one. In the sensitivity analysis, we tested the impact on the final output of variations in model assumptions, to better understand the relative importance of each model input. See the Appendix for a detailed description of the model inputs, formulas, and calculations.

Monte Carlo methods are useful for modeling phenomena that have significant uncertainty in inputs, such as the calculation of risk in business. Monte Carlo simulations calculate and record the results of many simulated trials using random values of the input variables in each trial. These values are chosen from predetermined distributions of the data. Monte Carlo modeling has been used successfully in medical research on such topics as iron-deficiency anemia, influenza transmission, and fetal radiation exposure.

We conducted our simulation using Crystal Ball software, version 11.1.1.3.00. This is a spreadsheet-based application suite used within Microsoft Excel.

Limitations
First, we made no distinction between observation units that were run by emergency physicians and those that were located elsewhere in the hospital and managed by another specialty. Some previous studies have suggested that emergency physician–controlled observation units are most efficient, but we did not specifically address this distinction in our analysis.
Second, this analysis was limited to published cost estimates, skewed by the clinical conditions studied and hospitals that publish their data. For example, chest pain analyses make up a large portion of the available literature. This bias may not reflect the true spectrum of observation unit care, but we attempted to reveal the effects of this limitation by performing the sensitivity analysis in a subsequent section. We found that the cost savings reported in the chest pain literature were very similar to those reported in the heterogeneous mixture of other studies, showing that this bias is unlikely to be a major problem.

Third, we determined the cost savings by averaging the savings from single-center studies that used different costing methods. This variability in costing methods created nonuniform savings per visit, and these, too, were averaged. Because we did not have access to the source data for each of these studies, we could not apply a uniform costing method to them. As a result, the average cost savings per visit must be interpreted with caution.

That said, there is no reason to suspect a systematic bias in a single direction that would either overestimate or underestimate the cost savings across all of the included studies. Therefore, using the average was a reasonable strategy to determine a composite estimate for cost savings per visit.

Additionally, only two of the studies used a randomized design.9,24 The other fourteen studies used either historical or contemporaneous controls for the cost comparison. As a result, selection bias toward patients with less complicated conditions could have exaggerated the cost-savings difference if the controls were not properly chosen.

Finally, our analysis did not account for the fixed costs of creating an observation unit. There may be situations in which there is excess inpatient capacity. In those cases, observation care can be delivered to patients efficiently in the available space, so the costs of creating a dedicated unit in a different part of the hospital may not be justified or necessary. Also, the cost of unit creation can be amortized over many years of unit operation, which adds little marginal cost to the management of individual patients.

Study Results
The systematic literature review yielded sixteen studies with seventeen data points.15 The average amount of inflation-adjusted cost savings was $1,572 per observation unit visit (standard deviation: ±$812) compared to an inpatient admission. The Monte Carlo simulation estimated that the annual national cost savings would be $3.1 billion (standard deviation: ±$1.9 billion) if observation unit use were maximized (Exhibit 1). These savings would result from the avoidance of about 2.4 million (standard deviation: ±490,000) inpatient admissions each year (Exhibit 2). For an average hospital with the visit volume to justify operating an observation unit, the annual direct cost savings would be $4.6 million (standard deviation: ±$2.9 million) from maximum use (Exhibit 3), resulting from about 3,600 (standard deviation: ±740) inpatient admissions avoided each year (Exhibit 4).

Exhibit 1
Simulated Frequency Distribution Of Annual Cost Savings At The National Level, 2012

SOURCE Authors’ analyses of Monte Carlo simulations. NOTES Based on 1,000 Monte Carlo simulations. Only selected avoided admissions values are shown, because of space constraints. Mean $3.1 billion (standard deviation: ±$1.9 billion).
We conducted a sensitivity analysis to evaluate which variables and assumptions had the most impact on the reported cost-savings estimate. Variables such as number of beds and length-of-stay cluster around a narrow spectrum and are unlikely to deviate from our estimates; therefore, variation there had little effect on our final result.

For example, the number of beds in observation units was reported to vary between 1 and 200 beds. However, the lowest and highest numbers were outliers. In practice, the minimum for efficient staffing was approximately five beds (usually the maximum number of patients for one nurse), and unit size very rarely exceeded twenty beds, with the majority of units studied clustering around ten beds.

We also considered the impact of specific diagnoses on our cost-savings estimates. Chest pain is the most common and the most studied presenting complaint of observation unit patients. Nine of the fifteen data points used to find the final average cost savings were chest pain studies. In these studies, the mean cost savings for observation unit care in comparison with inpatient care was $1,773 per visit (standard deviation: ±490,000).

**Exhibit 2**

Simulated Frequency Distribution Of Annual Avoided Admissions At The National Level, 2012

<table>
<thead>
<tr>
<th>Admissions avoided (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,386</td>
</tr>
</tbody>
</table>

**Source** Authors’ analyses of Monte Carlo simulations. **Notes** Based on 1,000 Monte Carlo simulations. Only selected avoided admissions values are shown, because of space constraints. Mean 2.4 million (standard deviation: ±490,000).

**Exhibit 3**

Simulated Frequency Distribution Of Annual Cost Savings At The Institutional Level, 2012

<table>
<thead>
<tr>
<th>Dollars saved (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4,242</td>
</tr>
</tbody>
</table>

**Source** Authors’ analyses of Monte Carlo simulations. **Notes** Based on 1,000 Monte Carlo simulations. Only selected dollar savings values are shown, because of space constraints. Mean $4.6 million (standard deviation: ±$2.9 million).
deviation: ±$897).

This mean and standard deviation was slightly higher than, but similar to, the non–chest pain literature, a finding that confirmed the relative consistency across complaints. Based on this relationship, we used the composite mean and standard deviation across all available conditions in the literature for our final cost-savings estimate in order to avoid overstating the cost impact of observation unit use.

The percentage of observation unit visits that represent definite avoided inpatient admissions is the component of our model that was based on the least amount of clinical evidence. Although many or even most observation unit visits can be considered avoided inpatient admissions, there is a subgroup of patients who—instead of being admitted—would have remained in the emergency department for an extended stay or would have been sent home with an outpatient follow-up plan.

Each hospital selects its observation unit patients based on resource availability, directives from hospital leadership, census levels in different areas of the hospital, and even the degree of access to rapid outpatient follow-up care in the surrounding community. Therefore, if we assumed that every observation unit admission represented an avoided inpatient admission, then the model would have overstated the impact of increased use of observation units.

Under this assumption, the annual number of avoided inpatient admissions at the national level would be 3.6 million (standard deviation: ±1,700), with savings of $7.2 million (standard deviation: ±$4.5 million).

Not wanting to overstate the impact of increased use of observation units, we used empirical national data from the National Hospital Ambulatory Medical Care Survey to determine a more accurate estimate of the percentage of observation unit admissions that were actually avoided admissions. These data were also used in a recent study by Jennifer Wiler and coauthors to estimate that an additional 2.4 million emergency department visits (1.8 percent of 136 million visits in 2009) are currently managed as short-stay inpatient admissions that are potentially amenable to observation unit care instead.

This number of potential observation unit visits represents about 67 percent of the avoided admissions calculated above (3.6 million). We therefore used 67 percent for our final model to better reflect current maximum observation unit use.

**Discussion**

Observation unit care is an established and well-studied health care delivery model that is more cost-efficient than inpatient care for specific patient populations. However, we are unaware of any prior attempts to quantify the potential financial impact of observation unit expansion.

We quantified the gap between the current use of observation units and potential maximum use using a Monte Carlo simulation model informed by analyses of Monte Carlo simulations. Based on 1,000 Monte Carlo simulations. Only selected avoided admissions values are shown, because of space constraints. Mean 3,600 (standard deviation: ±740).
by a systematic literature search and a review of national survey data. Our model showed that nearly half of hospitals that would benefit from an observation unit did not yet have one. Each visit managed in an observation unit instead of as an inpatient admission generated an average cost savings of about $1,572 (standard deviation: ±$812). If all hospitals with sufficient emergency department volume created an observation unit and ran it at benchmark levels of efficiency, more than $3 billion in avoidable health care costs could be saved every year.

The rising cost of inpatient hospitalization has drawn increased scrutiny from both public and private payers.29,30 Specifically, the Centers for Medicare and Medicaid Services was recently authorized to expand the Recovery Audit Contractor program to all fifty states after a successful pilot demonstrated more than $900 million in savings by identifying short-stay inpatient admissions that were deemed inappropriate.30

As a result, hospitals have felt pressure to avoid short-stay inpatient admissions and have increased the use of observation care, employing the “admit-to-observation” status. But this status is largely a billing change and not a delivery model change intended to improve efficiency.31 At the national level, the use of observation care after emergency department visits increased from 0.6 percent in 2001 to 1.9 percent in 2008.32 It is not unusual for unstructured observation visits that occur outside of a dedicated unit to extend beyond twenty-four hours. Medicare data reveal that observation status stays that were longer than forty-eight hours increased from 3 percent in 2006 to 6 percent in 2008.33

Observation visits with prolonged lengths-of-stay are procedurally similar to inpatient admissions and do not capture the benefits of observation units.9 In fact, largely in reaction to patient cost shifting and confusion caused by this practice, a patient advocacy group filed a lawsuit against the Centers for Medicare and Medicaid Services on behalf of Medicare patients in November 2011.34 A 2012 study by Zhanlian Feng and coauthors also showed the recent increase in observation unit use among Medicare patients and highlighted the disproportionate increase in observation stays over seventy-two hours.35 These long observation stays have the potential to shift substantial costs to patients because charges are not bundled under a prospective payment system. In the aggregate, the cost of these stays can even exceed the inpatient deductible. Self-administered medications can result in high out-of-pocket costs, and time spent in observation does not count toward the Medicare Part A inpatient length-of-stay requirement for subsequent skilled nursing facility benefits.

In contrast to these kinds of observation status visits with prolonged lengths-of-stay, our analysis focused on stays in dedicated observation units, where care was typically delivered for a maximum length-of-stay of twenty-four hours, with a mean length-of-stay of about fifteen hours.25 Patients are at much lower risk for excessive out-of-pocket costs when observation is used in this way.

Efficiencies generated by the use of observation units ease constraints on inpatient hospital capacity. According to an American Hospital Association survey in 2007, most US hospitals routinely functioned at 100 percent capacity or higher, which suggests a possible unmet demand for acute hospital services.36 The greatest potential for lowering hospital costs and thus lowering health care spending exists at hospitals that can, as a result of observation unit use, direct patients away from more costly and less efficient inpatient care and subsequently remove the newly created excess inpatient capacity or repurpose it in a way that does not generate additional health care expenses.37

For example, an inpatient care area could be used instead as administrative space. For capacity-constrained hospitals, the use of observation units might alleviate crowding and reduce wait times, but it would not necessarily lower hospital spending. If extra patients were absorbed into a more efficient system, then the total amount of health care delivered might actually increase, resulting in no change or an increase in health care spending.

Recent trends favoring hospital closures and consolidation make our analysis, which demonstrates the potential of observation units to reduce inpatient admissions, relevant to most large hospitals whose operations are strained by capacity limitations. Hospitals that fall in this category are most likely to benefit from an observation unit.7

The effects of increased use of observation care on total costs may be underestimated if one looks only at the direct cost savings reported above. The indirect cost savings from increased observation use, although more difficult to estimate accurately, are likely to be of greater value than the direct savings.

Direct costs are typically more visible and, as a result, easier to track and quantify. They include costs of the physician as well as diagnostic and therapeutic interventions, such as medications and imaging. Direct costs are rarely time-dependent.

In contrast, indirect costs, such as overhead and a large component of nursing costs, are more directly a function of length-of-stay.38 A
typical observation visit accomplishes the same diagnostic and therapeutic interventions as a short-stay inpatient admission, but it does so in less time and in a setting that is usually assigned lower indirect cost per square foot, so the cost savings come largely from a reduction of indirect costs.39

Observation units create additional sources of indirect cost savings that are impossible to quantify accurately. These sources include the avoidance of complications associated with inpatient hospitalization, a decrease in interdepartment hand-off errors, and the creation of virtual inpatient capacity. As opposed to increasing actual capacity by adding additional beds, creating virtual capacity is accomplished with existing beds through efficiency improvements that decrease the length-of-stay per patient.40

In addition, it is possible that the reduction in hospital length-of-stay as a result of increased observation unit care can be associated with reduced inpatient falls and hospital-acquired infections. If this is true, then these sources of cost savings and improvements in patient satisfaction and quality of life are additional indirect impacts that our analysis did not measure.41

In comparison with total national health care expenditures of more than $2 trillion, $3.1 billion in annual national cost savings from 2.4 million avoidable inpatient admissions. The use of observation care in the setting of a dedicated unit should be included in health policy and delivery reform discussions, and payment systems should be evaluated to encourage changes to support it. Observation units represent a feasible care innovation worthy of further evaluation. The wider use of observation units may create cost savings and should be a model for acute care redesign to increase value in the US health care system. ■

Conclusion

Hospitals may realize substantial cost savings by increasing the use of structured observation units, which represent a more efficient mode of care delivery for eligible patients than inpatient wards. Our simulation model showed $3.1 billion in annual national cost savings from 2.4 million avoidable inpatient admissions. The use of observation care in the setting of a dedicated unit should be included in health policy and delivery reform discussions, and payment systems should be evaluated to encourage changes to support it. Observation units represent a feasible care innovation worthy of further evaluation. The wider use of observation units may create cost savings and should be a model for acute care redesign to increase value in the US health care system.

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NOTES


15 To access the Appendix, click on the Appendix link in the box to the right of the article online.


19 The Listernick study was conducted in 1986, and the high savings amount was probably exaggerated by high rates of medical inflation over the subsequent decades. See Listernick R, Zieserl E, Davis AT. Outpatient oral rehydration in the United States. Am J Dis Child. 1986;140(3):211–5.


38 Nursing costs are traditionally accounted for separately from professional (physician) costs in hospital accounting. Typically these costs are included with hospital costs, which reduces the significance of indirect costs.


Christopher W. Baugh is a clinical instructor of emergency medicine at Harvard Medical School. In this month’s Health Affairs, Christopher Baugh and coauthors report on their study estimating the savings that could result from broader use of dedicated observation units in hospitals as an alternative to admitting certain patients. They argue that many people who cannot be safely discharged to their homes following an emergency department visit can be cared for more efficiently in these units than as inpatients until they are ready to be discharged. Using a systematic literature review, national survey data, and a simulation model, the authors estimate annual national cost savings of $3.1 billion and suggest that future policies should support observation unit care as an alternative to short-stay inpatient admissions.

Baugh is a clinical instructor of emergency medicine at Harvard Medical School and an attending physician in the Department of Emergency Medicine, Brigham and Women’s Hospital. He also serves as medical director of the department’s observation unit. Baugh earned an MBA in health care management and a medical degree from the University of Pennsylvania.

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Venkatesh also serves as the out-of-hospital working group chair for the ACEP Transitions of Care Taskforce and as a subcommittee chair for the ACEP Quality and Performance Committee. He holds an MBA from the Ohio State University and earned his medical degree from Northwestern University. Venkatesh served as chief resident in the Harvard-affiliated emergency medicine residency at Brigham and Women’s Hospital and Massachusetts General Hospital.

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Schuur is a member of the Centers for Medicare and Medicaid Services’ Medicare Evidence Development and Coverage Advisory Committee and is the chair of the ACEP Quality and Performance Committee. He earned a master’s degree in health sciences from Yale University and a medical degree from New York University. He served as chief resident of emergency medicine at Brown Medical School.

Stephen Bohan is executive vice chair of the Department of Emergency Medicine at Brigham and Women’s Hospital and director of the department’s Physician Assistant Program. He is also an associate professor at Harvard Medical School and an attending physician at Brigham and Women’s Hospital. Bohan helped develop a new branch of emergency medicine: observation emergency medicine, which bridges the gap between inpatient and outpatient care to extend capabilities for diagnosis, treatment, and disposition. He was awarded the hospital’s Dennis J. Thomson Lifetime Achievement Award in 2009.

Bohan also serves in numerous editorial roles, including as editor of eMedicine on Web MD and associate editor of the Society of Chest Pain Centers and Providers’ Critical Decisions in Emergency Medicine and of Journal Watch Emergency Medicine. He earned a master’s degree in health care management from Harvard University and a medical degree from the Royal College of Surgeons in Ireland.