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REVIEWS

Evolving Practice of Hospital Medicine and Its Impact on Hospital Throughput and Efficiencies

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Hospitalists are uniquely positioned to implement strategies to improve patient flow and efficiency. Hospital leaders have stated they expect hospitalists to comanage surgical patients, participate in observation units, and screen medical admissions, in addition to providing inpatient care for medical patients. We review how the hospitalists' role in acute inpatient care, surgical comanagement, short stay units, chest pain units, and active bed management has improved throughput and patient flow. *Journal of Hospital Medicine* 2012;7:649–654. © 2012 Society of Hospital Medicine

Hospitalists are physicians whose primary focus is the general medical care of hospitalized patients. Hospitalists are uniquely positioned to implement strategies to improve patient flow and efficiency.[1] With emergency department (ED) diversion reaching rates upward of 70%, lack of access to inpatient beds leads to delayed care with worsened outcomes.[2–5]

To improve access to hospital beds, hospitals may increase capacity by either adding beds or by more efficiently using existing beds. Operations management principles have been applied to healthcare to ensure efficient use of beds. These include: reducing variability of scheduled admissions, remeasuring length of stay (LOS) and bed demand after implementing strategies to reduce practice variation, and employing queuing theory to generate predictions of optimal beds needed.[6] The Joint Commission implemented a leadership standard (LD 04.03.11) that hospitals "develop and implement plans to identify and mitigate impediments to efficient patient flow through the hospital."

To improve access, hospital leaders expect hospitalists to staff in inpatient medicine programs, surgical comanagement, short stay and chest pain units, and active bed management.[7] In the following review, we define hospitalists' roles in the aforementioned programs and their effect on patient flow. We also touch on preoperative clinics, palliative care, geographic rounding, and flexible staffing models.

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ACUTE INPATIENT CARE

Hospitalists are one of the fastest growing physician groups in the United States.[8–10] Hospitalists improve efficiency and quality of care across a variety of demographic, geographic, and healthcare settings.[11,12] A 2002 retrospective cohort study in a community-based urban teaching hospital showed that hospitalists decreased LOS by 0.61 days and lowered risk for death in the hospital (adjusted relative hazard, 0.71; 95% confidence interval [CI], 0.54–0.93).[13] A 2004 prospective quasi-experimental observational study done at an academic teaching hospital showed an adjusted LOS that was 16.2% lower, and adjusted cost 9.7% lower, for patients on the hospitalists' service.[14] In 2007, Lindenauer and colleagues found that a national sample of hospitalists decreased LOS by 0.4 days and lowered cost by $286 per patient.[15] The findings of these individual studies were supported in a 2009 systematic review of 33 studies by Peterson which showed that hospitalists decrease LOS.[16] In a recent study, Kuo and Goodwin showed that while hospitalists decrease LOS and cost, the patients they care for have higher Medicare costs after discharge by $322 per patient, and are more likely to be readmitted (odds ratio, 1.08; CI, 1.04–1.14).[17]

The hospitalist model of care continues to grow, and hospitalists will soon number as many as 30,000.[18] For acute medical inpatients, the evidence suggests that hospitalists improve patient flow by decreasing LOS while improving other aspects of quality of care. However, Kuo and Goodwin's findings suggest that the transition of care from inpatient to outpatient settings still requires attention.[17]

SURGICAL COMANAGEMENT

The Society of Hospital Medicine (SHM) core competencies include perioperative medicine.[19,20] In the 2006 SHM national survey, 85% of hospital medicine groups indicated that they participated in surgical comanagement.[21]

Hospitalists have improved patient flow and outcomes for orthopedic patients. Hospitalist management of hip fracture patients decreases time to surgery and LOS compared to standard care.[22–24] Phy and colleagues studied 466 patients for 2 years after the inception of hospital medicine comanagement of surgical patients, and found that care by hospitalists decreased LOS by 2.2 days.[22] In a retrospective study of 118 patients, Roy and colleagues found that hospitalist-managed patients had shorter time to consultation and surgery, decreased LOS, and lower costs.[23] In a retrospective cohort study, Batsis looked at mortality in 466 patients with hip fracture, and found no difference between hospitalist management and standard care.[24] In patients undergoing elective hip and knee arthroplasty, Huddleston and colleagues reported that patients managed by hospitalists had fewer complications and shorter LOS. The nurses and orthopedic surgeons preferred the hospitalist–orthopedist comanagement model.[25]

The benefits of hospitalist comanagement are not limited to adult patients undergoing orthopedic surgery. For high-risk patients undergoing lower extremity reconstruction surgery, Pinzur and colleagues noted that LOS was shorter for a cohort of patients managed by hospitalists than for a group of historical controls not treated by hospitalists.[26] Simon and colleagues studied comanagement for pediatric spinal fusion patients, and found a decrease in LOS from 6.5 to 4.8 days.[27]

Several factors should be considered in developing and implementing a successful comanagement program. Since comanagement duties may fall upon hospitalists in order to protect surgeons' time,[28] hospital medicine groups should ensure adequate staffing prior to taking on additional services. Clear guidelines to delineate roles and responsibilities of the comanaging groups also need to be developed and implemented.[29,30]

Comanaging may also involve additional training. Hospitalists who manage neurologic, neurosurgical, trauma, and psychiatric patients report being undertrained for such conditions.[31,32] Hospital medicine groups need to ensure training needs are met and supported. Given the successes of comanagement and the increasing complexity of surgical patients,[33] this practice will likely expand to a greater variety of nonmedical patients.

SHORT STAY UNITS

In 2003, short stay units (SSU) were present in approximately 20% of US hospitals, with 11% of hospitals planning on opening one in the next year.[34] SSU are designed to manage acute, self-limited medical conditions that require brief stays—usually less than 72 hours. Approximately 80% of SSU patients are discharged home, avoiding hospitalization.[35] Historically, SSU have been under the domain of the ED; however, there is an emerging role for hospitalist-run SSU.[36]

TABLE 1. Examples of Conditions Appropriate for Short Stay Unit

Evaluation of Diagnostic Syndromes	Treatment of Emergent Conditions
Chest pain	Asthma
Abdominal pain	Congestive heart failure
Fever	Dehydration
Gastrointestinal bleed	Hypoglycemia or hyperglycemia
Syncope	Hypercalcemia
Dizziness	Atrial fibrillation
Headache	
Chest trauma	
Abdominal trauma	

NOTE: Adapted from SHM White Paper: Observation Unit White Paper.[35]

Despite demand for SSU, little research has been performed on hospitalist-led SSU. In 2000, Abenhaim and colleagues showed that a hospitalist-run SSU at a university-affiliated teaching hospital had a shorter LOS and lower rates of complications and readmissions when compared to medicine teaching services.[37] In 2008, Northwestern Memorial Hospital opened a 30-bed hospitalist-run SSU; for those patients, LOS decreased by 2 days.[38] In 2010, Leykum and colleagues showed that a hospitalist-run observation unit can decrease LOS from 2.4 days to 2.2 days.[39] Careful selection of SSU patients is needed to obtain these results. Lucas and colleagues found that whether or not SSU patients required assistance of specialists was the strongest predictor of unsuccessful stays (>72 hours or inpatient conversion) in SSU.[36]

Whether SSU are run by hospital medicine or emergency medicine is decided at an institutional level. Location of SSU in a specifically designated area is crucial, as it allows physicians to round efficiently on patients and to work with staff trained in observation services. Development of admission criteria that include specific diagnoses which match hospitalists' scope of practice is also important (Table 1).[32]

The protocol-based and diagnosis-specific nature of SSU may enhance quality of care through standardization. Future research may delineate the utility of SSU.

CHEST PAIN UNITS

In the United States, in 2004, approximately 6 million patients present annually to EDs with chest pain.[40] Cost of care of patients unnecessarily admitted to coronary care units has been estimated to be nearly $3 billion annually.[41] Still, as many as 3% of patients with acute myocardial infarction are discharged home.[42] Chest pain units (CPU) were developed to facilitate evaluation of patients with chest pain, at low risk for acute coronary syndrome, without requiring inpatient admission. A number of studies have suggested that admission to a CPU is a safe and cost-effective alternative to hospital admission.[43–48]

CPU have traditionally been staffed by ED physicians and/or cardiologists. In a pre–post study, Krantz and colleagues found that a CPU model, incorporating hospitalists at an academic public safety-net hospital, decreased ED LOS with no difference in 30-day cardiac event rate.[49] Myers and colleagues created a hospitalist-directed nonteaching service in an academic medical center to admit low-risk chest pain patients. Patients admitted to the hospitalist service had a statistically significant lower median LOS (23 hours vs 33 hours) and approximately half the median hospital charges than those admitted to teaching services.[50] At the same academic medical center, Bayley and colleagues showed that 91% of patients admitted for chest pain waited more than 3 hours for a bed. This adversely affected ED revenue by tying up beds, resulting in an estimated annual loss of $168,300 of hospital revenue. Creation of a hospitalist-managed service for low-acuity chest pain patients reduced hospital LOS by 7 hours.[51] Somekh and colleagues demonstrated that a protocol-driven, cardiologist-run CPU results in a decreased LOS and readmission rate compared to usual care.[52] In a non-peer reviewed case study, Cox Health opened an 8-bed, hospitalist-led CPU in 2003. They decreased LOS from 72 to 18 hours, while increasing revenue by $2.5 million a year.[53] These studies suggest that hospitalist-run CPU can decrease LOS, increase revenue, and relieve ED overcrowding.

Development of a successful CPU depends upon clear inclusion/exclusion criteria; close collaboration among ED physicians, hospitalists, and cardiologists; the development of evidence-based protocols, and the availability of stress testing.

ACTIVE BED MANAGEMENT

As of 2007, 90% of EDs were crowded beyond their capacity.[2] ED crowding leads to ambulance diversion,[54] which can delay care and increase mortality rates.[55] One of the main causes of ED crowding is the boarding of admitted patients.[56] Boarded, admitted patients have been shown to have decreased quality of care and patient satisfaction.[3–5]

Active bed management (ABM) by hospitalists can decrease ED diversion. Howell and colleagues instituted ABM where hospitalists, as active bed managers, facilitate placement of patients to their inpatient destinations to assist ED flow.[57] This 24-hour, hospitalist-led, active bed management service decreased both ED LOS and ambulance diversion. The bed manager collaborated real-time with medicine and ED attending physicians, nursing supervisors, and charge nurses to change patient care status, and assign and facilitate transfer of patients to appropriate units. These hospitalist bed managers were also empowered to activate additional resources when pre-diversion rounds identified resource limitations and impending ED divert. They found overall ED LOS for admitted patients decreased by 98 minutes, while LOS for non-admitted patients stayed the same. AMB decreased diversion due to critically ill and telemetry patients by 28% (786 hours), and diversion due to lower acuity patients by 6% (182 hours). This intervention proved cost-effective. Three full-time equivalent (FTE) hospitalists' salaries staff 1 active bed manager working 24/7. Nearly 1000 hours of diversion were avoided at an annual savings of $1086 per hour of diversion decreased.

ABM is a new frontier for hospitals in general, and hospitalists in particular. Chadaga and colleagues found that a hospital medicine-ED team participating in active bed management, while caring for admitted patients boarded in the ED, can decrease ED diversion and improve patient flow. The percentage of patients transferred to a medicine floor and discharged within 8 hours was reduced by 67% ($P < 0.01$), while the number of discharges from the ED of admitted medicine patients increased by 61% ($P < 0.001$).[58]

To decrease initial investment, components of ABM (ED triage, bed assignment, discharge facilitation) can be instituted in parts. Hospital medicine groups with limited resources may only provide a triage service by phone for difficult ED cases. Bedside evaluations and collaboration with nursing staff to improve bed placement may be a next step, with floor and/or intensive care unit (ICU) rounds to facilitate early discharges as a final component.

OTHER AREAS

Preoperative Clinics

In 2005, SHM cited preoperative clinics as an important aspect of preoperative care.[59] Sehgal and Wachter included preoperative clinics as an area for expanding the role of hospitalists in the United States.[60] These clinics can decrease delays to surgery, LOS, and cancellations on the day of surgery.[61] The Cleveland Clinic established the Internal Medicine Preoperative Assessment, Consultation, and Treatment (IMPACT) Center in 1997, and has decreased surgery delay rate by 49%.[59] At Kaiser Bellflower Medical Center, a preoperative medicine service that provides preoperative screening decreased the number of surgical procedures cancelled on the day of surgery by more than half.[62] Gates Hospitalists LLC's perioperative care decreased delay to surgery and lost operating room time.[63] In order for a preoperative service to be successful, there must be buy-in from hospitalists, surgeons, and primary care physicians, as well as adequate staffing and clinical support.[59]

Palliative Care

Palliative care has been identified by SHM as a core competency in hospital medicine.[64] There are several key components in delivery of quality palliative care, including communication about prognosis, pain and symptom control, and hospice eligibility.[65] Hospitalists are in a unique position to offer and

improve palliative care for hospitalized patients. The majority of hospitalists report spending significant amounts of time caring for dying patients; thereby, hospitalists frequently provide end-of-life care.[66,67] Compared to community-based physicians, patients cared for by hospitalists have higher odds of having documented family discussions regarding end-of-life care, and have fewer or no key symptoms (pain, anxiety, or dyspnea).[66] In addition, hospitalists' availability improves response time when a patient's clinical status changes or deteriorates, leading to prompter delivery of symptom alleviation.[65] Hospitalists are becoming more experienced with end-of-life care, as they are exposed to terminally ill patients on a daily basis. More experience leads to improved recognition of patients with limited prognosis, which leads to earlier discussions about goals of care and faster delivery of palliative care. Perhaps this could decrease LOS and be a future area of study.

Geographic Rounding

In the last 5 years, hospital administrators have promoted geographic rounding, where hospitalists see all their patients in 1 geographic location.[69] The driving forces behind this include poor patient satisfaction with physician availability, large amounts of time spent by hospitalists in transit to and from patient locations, and frustrations regarding communication with nursing.[70] Several groups have instituted this with success. Cleveland Clinic and Virtua Memorial Hospital have found improved patient satisfaction and decreased LOS.[69,70] O'Leary and colleagues found improved awareness of care plans by the entire team.[71] Caution should be taken to assure proper physician-to-patient ratios, avoid physician isolation, and coordinate physician shifts with bed assignments.[69] To address some of these issues, groups have used a hybrid model where a hospitalist is primarily located on one unit but can "flex" or "overflow" onto another unit.[70] Steps to success with geographic rounding include buy-in from the institution and nursing, assuring a safe physician-to-patient ratio, avoiding wasted beds, and facilitating multidisciplinary rounds.[69]

Flexible Staffing Models

In SHM's 2010 State of Hospital Medicine Report, 70% of hospitalist groups used a fixed shift-based staffing model (ie, 7 days on/7 days off).[72] Flexible staffing models in which physician coverage is adjusted to patient volume are growing in popularity. This model can be tailored for each institution by examining admission and patient volume trends to increase coverage during busy periods and decrease coverage during slower periods. Potential benefits include alleviating burn out, reducing LOS, and improving patient outcomes. Nursing data suggests that a higher patient-to-nursing ratio is associated with increased 30-day mortality,[73] and an ED study found that increasing physician coverage during the evening shift shortened ED LOS by 20%.[74] To date, none of these endpoints have been studied for hospital medicine.

CONCLUSION

While many hospital medicine groups were started to provide acute inpatient medical care, most have found that their value to hospitals reaches beyond bedside care. With an epidemic of ED diversion and lack of access to hospital beds and services, optimizing throughput has become imperative for hospital systems. While hospital access can be improved with addition of new beds, improving throughput by decreasing LOS maximizes utilization of existing resources.

We have reviewed how hospitalists improve patient flow in acute inpatient medicine, surgical comanagement, short stay units, chest pain units, and active bed management. In each instance, the literature supports measures for decreasing LOS while maintaining or improving quality of care. Hinami and colleagues showed physician satisfaction with hospitalist-provided patient care.[75] Most studies have been limited by tracking upstream effects of improved efficiency. As there is now some evidence that decreasing LOS may increase readmissions,[17] future studies should incorporate this metric into their outcomes. The effect of formal operations management principles on patient flow and bed efficiency is not well known and should be further examined.

In addition, we have touched on other areas (perioperative clinics, palliative care, geographic rounding, and flexible staffing models) where hospitalists may impact patient throughput. These areas represent excellent opportunities for future research.

Hospitalist participation in many of these areas is in its infancy. Hospital medicine programs interested in expanding their services, beyond acute inpatient care, have the opportunity to develop standards and continue research on the effect of hospital medicine-led services on patient care and flow.

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