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The enhanced postoperative care system☆

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Abstract The perioperative care system is a continuum that includes preoperative patient evaluation, operating room scheduling, the operation itself, and postoperative care. This costly fast-paced system requires its various components to function efficiently and interact effectively. This review explores the interrelation between the operational elements of the enhanced care postoperative care system (intensive care units, intermediate care units, postanesthesia care units, and monitored floor beds) and other perioperative care activities. This care system provides patients with enhanced (from routine floor) nursing and medical care, continuous physiological monitoring, and sophisticated treatments (eg, continuous infusion of vasoactive substances). A management, rather than clinical, approach is used to provide insight into the operations of the perioperative care system so that bottlenecks to patient flow may be identified and eliminated. Emphasis is placed on the need to switch from a "fiefdom" mentality, where each component of the system acts independently and defensively, to systems thinking, in which complex interrelated patterns are identified, analyzed, and optimized.

1. Introduction

The perioperative care system is a continuum that begins with the preoperative evaluation of the patient and operating room (OR) scheduling, continues with the operation itself, and concludes with postoperative care. This is a costly (surgical expenditures account for 30% of US health care dollars [1]) fast-paced system that requires its various components to function efficiently and interact effectively [2]. Given the current need to balance costs with quality patient care, coordinating the various facets of perioperative services is essential. This action requires a switch from a "fiefdom" mentality, where each component of the system acts independently and defensively, to systems thinking, where complex interrelated patterns are identified, analyzed, and optimized [1].

Many of the recent changes in contemporary surgical practice have significantly altered perioperative activities. At the same time that ambulatory surgery continues to expand, an aging population, increasingly complex operations, and the ability to successfully operate on patients with significant underlying diseases have heightened the need for postoperative care locations staffed and equipped to provide continuous physiological monitoring and more intensive nursing care than regular hospital beds [3]. This enhanced care system tends to be composed of a combination of intensive care units (ICUs), intermediate care units, postanesthesia care units (PACUs), and monitored floor beds.

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This review examines some of the operational elements of the enhanced postoperative care system. Specifically, it studies the interactions between the OR, PACU, surgical ICU, and other enhanced care locations. A management, rather than a clinical, approach is used to provide insight into the operations of the system so that bottlenecks to patient flow may be identified and eliminated.

2. The system

The postoperative care system initially must be viewed from a vantage point that encompasses the entire hospital surgical system [4]. Patients undergoing surgery are destined to go home or remain hospitalized either on regular inpatient floors or in enhanced postoperative care system beds. The enhanced care system cares for patients requiring close physiological monitoring and added nursing care and/or intensive therapeutic interventions. These patients may be cared for in ICUs, intermediate care units, and/or monitored rooms on patient floors. They may also be kept in the PACU for extended (>12 hours) periods [5]. The actual components, capabilities, and bed capacities of the enhanced care system are institution-specific [6]. Hospitals may have 1 ICU that cares for both medical and surgical patients, a single surgical ICU, or multiple specialty-specific ICUs, for example, neurosurgical and cardiac surgical units. Similarly, some hospitals have intermediate care units, whereas others do not. Of 104 004 ICU patients from 28 Cleveland, Ohio, area hospitals, 40% (41 639) were admitted directly from ORs or PACUs. This number nearly equaled the patients admitted directly from emergency rooms [7]. A survey of 4233 US hospitals with 32 850 ICU beds reported that 22% of patients were admitted to the ICU from the OR/PACU [8].

The interactions between OR activities and the postoperative segments of the perioperative care system are among the major rate-limiting steps in the care of postoperative patients. Adequate facilities for postoperative care are essential for the system to operate efficiently. For example, insufficient cardiac surgical ICU beds may limit the number of open-heart operations. A major problem is that the enhanced postoperative care system is used not only by elective surgery cases, but also by patients undergoing emergency surgery, those decompensating on patient floors, and those having complex procedures performed outside the ORs. Examples of the latter include thrombolytic therapy for acute peripheral arterial occlusion and embolization of cerebral aneurysms. The enhanced care system should thus be thought of as a "dual-use" system, one that caters to both elective and emergency patients, with the proportion of elective and emergency cases being institution-specific.

3. The OR

The OR suite is a complex active area that serves heterogeneous groups of patients and surgeons. OR activities are designed to maximize room utilization, patient throughput, and surgeons' schedules [9,10]. Often, the efficient and timely throughput of ambulatory surgery patients is the primary objective because of the patients' need to go home on the day of surgery. Furthermore, surgeons usually have blocks of operating time that are inflexible because of other commitments and duties. Therefore, the effects of OR scheduling on the enhanced postoperative care system is often not fully considered. This is because the proportion of patients destined to spend their immediate postoperative convalescence within the enhanced care system often pales (12% in 1 study [11]) compared with the number of ambulatory surgery patients. However, recognizing the impact the OR schedule has on the functioning of the enhanced care system is important to facilitate efficient patient throughput. Often, such recognition is surgical specialty–specific. Users who depend on enhanced care beds, for example, cardiac surgeons and neurosurgeons, are often more aware than occasional users, for example, gynecologists, of the need to match surgical load with the availability of enhanced care beds.

It is important that individuals responsible for surgical scheduling and OR management consider the effects of scheduling policies on the enhanced postoperative care system. Ideally, elective operations on patients requiring postoperative enhanced care should be distributed over the course of the week in such a way as to minimize fluctuations in ICU bed utilization (Figs. 1 and 2). The number of enhanced care beds available for scheduled elective surgery admissions may vary greatly per day of the week depending on the number of emergency admissions and the number of patients ready for discharge from the ICUs and intermediate care units. In situations where no ICU or intermediate care beds are readily available, elective surgery must be

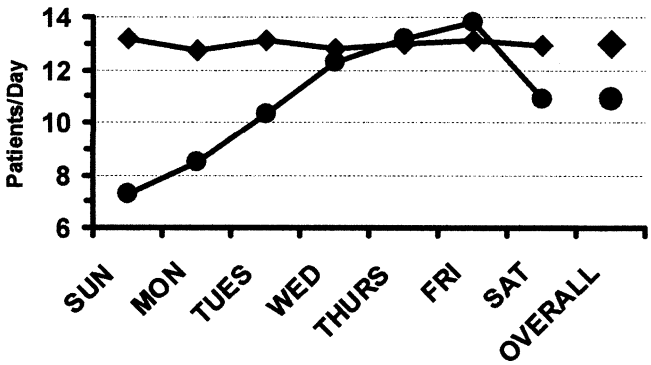

Fig. 1 The average ICU census over 3 months by day (7:00 AM) of the week for 2 surgical ICUs is shown. ICU 1 (circle) admitted mainly elective surgery patients, whereas ICU 2 (diamond) admitted many emergency patients. ICU 1 had peak utilization during the weekdays, especially Wednesdays to Fridays. The institutional review boards of the Columbia-Presbyterian Medical Center and the Hebrew University–Hadassah Medical Center approved the collection and analysis of the data displayed in the figures and tables.