# Operating Room Start Times and Turnover Times in a University Hospital

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Study Objective: *To measure the start time for the first case of the day and the turnover times for subsequent cases in the operating rooms (ORs) at an academic hospital.*
Design: *Prospective study.*
Setting: *ORs at a university medical center.*
Patients: *All patients undergoing an operative procedure that started between 7 A.M. and 5 P.M. weekdays for the period January 1, 1989, through June 30, 1989.*
Interventions: *For each patient, the following times were recorded: OR ready, patient enters OR, anesthesia induction complete, surgery start, surgery end, patient leaves OR.*
Measurements and Main Results: *Patients were brought into the OR just before the scheduled start time. Surgical incision was made 21 to 49 minutes after the patient was brought into the OR. Room turnover time (time from patient in to patient out) was almost uniformly 36 minutes. Patient turnover time (time from end of surgery in one patient to end of induction of next patient) was generally 1 hour. Turnover times were shorter for those ORs in which primarily monitored anesthesia care was provided and longer in ORs in which patients routinely required invasive monitoring.*
Conclusions: *The scheduled start time for the first case of the day was generally the time the patient was brought into the OR. Because of the variable amount of time required for anesthesia induction and surgical preparation and draping, incision occurred 21 to 49 minutes later. The time between cases when no surgery was occurring was significantly longer than room turnover time because of the need to wake up one patient and induce the following patient. Because of a lack of standardized definitions, there is probably a strong perceptual difference among anesthesiologists, OR nurses, and surgeons when viewing start and turnover times. At our own teaching institution, shortening turnover times would increase the amount of elective OR time available, but the impact would not be significant because the number of procedures done per OR each day is low.*

**Keywords:** Operating room—efficiency of, management of, start times in, turnover times in.

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## Introduction

Operating room (OR) start times and turnover times may be the most frequently discussed topics among personnel involved in the delivery of OR care.[1] Concerns over perceived late starts or long turnover times are probably expressed at all surgical sites, but they are universal at academic training centers. Complaints concerning delays are usually quickly followed by discussions of who caused them. Unfortunately, these discussions generally degenerate into finger-pointing at someone else's service.

Adding to the confusion are the perceptual differences experienced by OR personnel due to a lack of standardized definitions.[2] Does start time mean

incision time, as many surgeons feel, or does it mean the time the patient enters the OR, the definition more fitting to the nursing perspective? Perceptual differences may be even more dramatic for turnover time. Although housekeepers and OR nurses may feel that turnover time refers to how long it takes to clean and prepare the room for a subsequent case, that time period does not take into consideration how long it takes to prepare the next patient for his or her anesthetic. To a surgeon, who may be concerned about any time not spent operating, the relevant turnover time may be the time between when he or she leaves the OR after one case and the time when incision can be made in the next case. In academic centers, this period of time may be significantly longer than the time it takes to clean the OR, as the attending surgeon often leaves the residents to close the wound and apply the dressing in one case and may not return for the next case until after induction, prepping, and draping are complete.

Surprisingly, given the universality of start time and turnover time discussions, there are no published data in the anesthesia, OR nursing, or surgery literature for these time periods. To provide an objective basis for discussion of OR procedural times, we undertook a prospective study to measure the actual start times and turnover times in an academic hospital.

## Materials and Methods

During the time period January 1, 1989, through June 30, 1989, for each operation started in the main OR of University Hospital on weekdays between 7 A.M. and 5 P.M., the following times were noted on a separate data sheet: room ready (determined by the OR nurse), patient enters OR, anesthesia induction complete, surgery start, surgery end (dressing complete), patient leaves OR. This form was completed by the primary anesthetist [either a resident or a certified registered nurse-anesthetist (CRNA)] and was signed by the surgeon of record after his or her review of the recorded times. The OR number in which the surgery was performed also was recorded. For data analysis, the following definitions were used: room turnover time = time between one patient leaving an OR and the next patient entering that OR; patient turnover time = time between the end of surgery in one patient and the end of induction of the next patient; induction time = time between patient entering the OR and end of induction; wake-up time = time between end of surgery and patient leaving OR; surgical prep time = time between completion of anesthesia induction and start of surgery.

Because each OR at University Hospital was dedicated to an individual surgical service, data were grouped according to service for analysis *(Table 1)*. The average times for each surgical service were compared with the average of all the services using analysis of variance. A $p$-value less than 0.05 was considered statistically significant.

## Results

### *Start Times (Figure 1)*

During the 6-month study, 5,043 cases were scheduled to start at 7:30 A.M. The ORs were ready for the patient between 7:21 and 7:27. The actual time the patients were brought into the ORs varied between 7:25 and 7:32. Induction was completed between 7:27 and 7:49. Incision occurred between 7:33 and 8:21. Compared with the average of all the surgical services, anesthesia ready time was significantly later for the Neurosurgical Service. Incision occurred significantly later than the overall average for the Orthopedic, Neurosurgical, and Cardiac Surgical Services.

### *Turnover Times (Figure 2)*

With the exception of being shorter for the ophthalmology OR, room turnover times were almost uniformly 36 minutes for all the surgical services. Patient turnover

**Table 1.** Operating Room Designations for Surgical Specialties at the University of California, San Diego, Medical Center

| Operating Room | Surgical Service |
|---|---|
| 1 | Ophthalmology (OP) |
| 2 | Plastics/Burns (PL) |
| 3 | Orthopedics (OR) |
| 4 | Spinal Surgery (SP) |
| 5 | General Surgery (GS) |
| 6 | Obstetrics (GY) |
| 7 | Neurosurgery (NS) |
| 8 | Trauma (TR) |
| 9 | Cardiac Surgery (CS) |
| 10 | Otolaryngology (HN) |

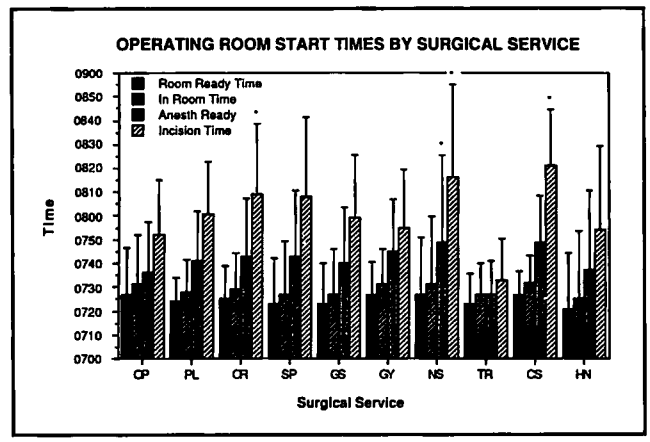


**Figure 1.** Average room ready, in room, anesthesia ready, and incision times by surgical service. *$p < 0.05$; average value for service significantly different from average value for all services combined. (See Table 1 for Surgical Service abbreviations.)

times were much longer than room turnover times. Patient turnover times were generally about 1 hour, but they were significantly longer for the Neurosurgical and Cardiac Surgical Services and shorter for the Ophthalmologic Service.

### *Wake-up, Induction, and Surgical Preparation Times (Figure 3)*

Wake-up times were between 5 and 11 minutes, while induction times varied between 8 and 32 minutes. Induction times were significantly shorter for the Ophthalmologic Service and longer for the Neurosurgical and Cardiac Surgical Services. Surgical preparation times varied from 10 to 27 minutes; they were shorter for the Ophthalmologic Service and longer for the Orthopedic and Neurosurgical Services.

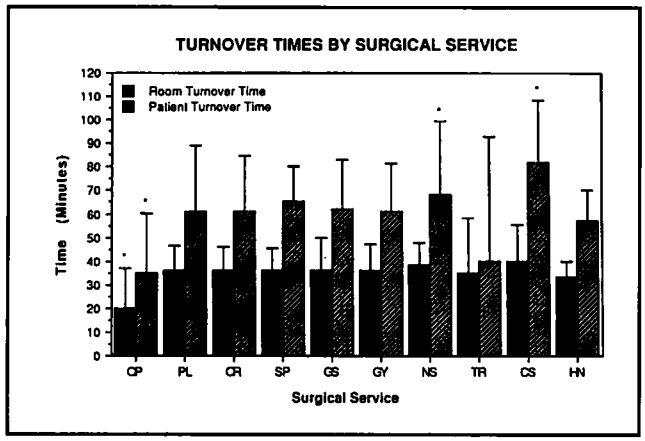


**Figure 2.** Average room turnover and patient turnover times by surgical service. $*p < 0.05$; average value for service significantly different from average value for all services combined. (See Table 1 for Surgical Service abbreviations.)

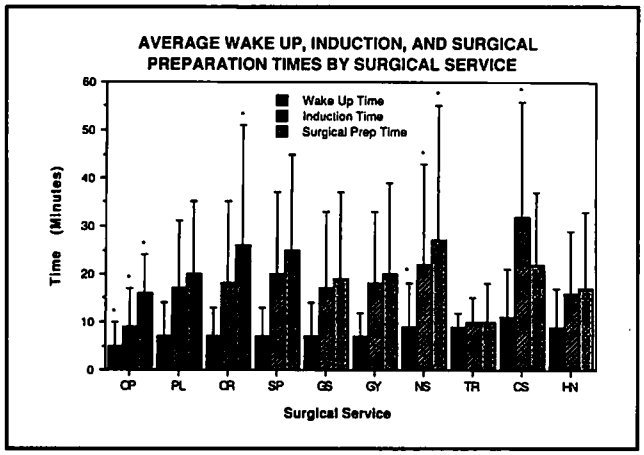


**Figure 3.** Average wake-up, induction, and surgical preparation times by surgical service. $*p < 0.05$; average value for service significantly different from average value for all services combined. (See Table 1 for Surgical Service abbreviations.)

## Discussion

To distinguish among the various factors that contribute to start times and turnover times, it was necessary to collect several sequential time points. As no data sheet existed at our hospital for collection of all the necessary times, a new and separate data form was created. Although the form was completed by the anesthesia resident, the "OR ready" and "patient enters OR" times were determined by the OR nurse. The data sheet was signed after review by the surgeon, thus allowing all interested parties to agree on the collection of data. To examine the perceptual differences caused by a lack of universal definition of turnover time, we chose to define two different epochs: room turnover time and patient turnover time. The former corresponds more closely to the time it takes to clean an OR and prepare it from a nursing standpoint, while the latter reflects time during which the surgeon is not operating.

Regardless of what people believed start time meant, it was clear in our institution that the ORs were not ready for occupancy for the first case of the day until a few minutes before 7:30 A.M. and that occupancy did not generally occur until 7:30. The only exception to this rule was for the Cardiac Service, for which a policy of bringing the patient to the OR earlier had been established. Given this time of arrival of the patient in the OR, it is understandable that anesthesia induction was completed after 7:30 and that incision occurred even later. Although patients were generally in the ORs for the first case of the day at about the same time, end of induction and incision times varied among the surgical services. This finding was due to the different induction and surgical preparation times required for the various surgical services. In the ophthalmology OR, procedures were performed with monitored anesthesia care, and minimal prepping was required. Thus, the anesthesia induction and surgical preparation times were short. Conversely, for cardiac surgical procedures, almost all the patients required arterial and pulmonary artery catheter insertion, leading to longer times to complete induction. Similarly, patients undergoing spinal surgery or neurosurgery often required arterial and central venous pressure monitoring; thus the induction times for those services were somewhat longer. Because of the time required for anesthesia induction and surgical preparation, and since the patients were not brought to the OR until approximately 7:30, it is no surprise that a "7:30 start" meant that an incision occurred after 7:30.

Room turnover time was about 36 minutes in almost all the ORs. This may have been because the same housekeeping and anesthesia monitoring technician teams did the cleanup and preparation for all the ORs. The turnover time in the ophthalmology OR was probably shorter because floor washing was not performed between cases. Patient turnover time was longer for those

services that required extended induction and/or surgical preparation times.

Our data provide a set of baseline averages for service-specific ORs in a teaching academic center. What conclusions can we draw from these numbers? First, depending on one's vantage point, anesthesiologists, OR nurses, and surgeons are either all right or all wrong. Our OR nurses had patients in the room by 7:30 and therefore felt that they had accomplished their goal for the first case of the day. The surgeons were equally correct in that incision always occurred late, if by late they meant after 7:30. To get cases started earlier and avoid arguments about it, the following approach may help. First, the anesthesia, nursing, and surgical staff should agree on the earliest time that the ORs can actually be ready for patient occupancy and define that as the in-room start time. Given the variability in anesthesia induction and surgical preparation time, it is probably best to avoid estimates for expected incision times.

There is almost certainly a perceptual difference concerning turnover times. Room preparation took slightly longer than 30 minutes in almost all the ORs, but the nonoperating time for surgeons between cases was generally about an hour. If one adds surgical prep and drape time to patient turnover time, the nonoperating time becomes almost an hour and a half. To reduce this, work must be done by all parties to shorten those aspects of turnover time that are under their direct control. Thus, anesthesiologists could develop ways of reducing wake-up and induction times, OR nurses could reduce room cleanup time, and surgeons could decrease prep and drape times. As all these attempts would require special effort and perhaps more manpower and capital, one needs to ask how much time could be saved and whether it is worth the effort. At our institution, all the ORs were occupied between 7. A.M. and 5 P.M. each day, which led to calls for shorter turnover times to allow for more cases. The average number of OR turnovers per day varied between 0 and 2.2 *(Figure 4)*. Depending on the surgical service, cutting patient turnover times in half would save between 0 and 60 minutes per day, or an overall average of about 30 minutes per OR per day. Given the expense of running ORs, conserving this 30 minutes might result in some financial savings. It would not, however, provide enough additional time to perform more cases during the day.

At this institution, the results obtained in this study were used as a baseline for launching a Total Quality Management approach to OR efficiency (unpublished data). A team was created to deal specifically with morning start times. After the team agreed that the definition of start time for the first case of the day was the time that the first scheduled patient was brought to the OR, changes were made that produced reductions of in room time, anesthesia ready time, and incision time of 21, 20, and 19 minutes, respectively. A subsequent team is now attempting to improve turnover times as well.

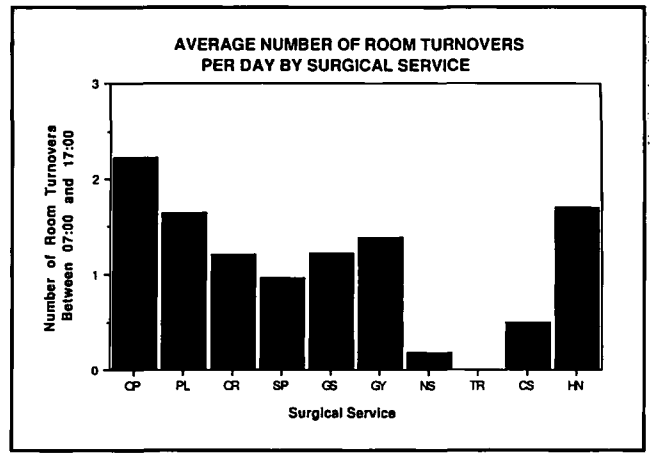


**Figure 4.** Average number of room turnovers per day between 7 A.M. (07:00) and 5 P.M. (17.00). (See Table 1 for Surgical Service abbreviations.)

To my knowledge, this study provides the first published data for start times and turnover times in a teaching hospital. For this ten-OR facility, the patients for the first surgery of the day were generally brought into the OR at the posted start time, and incision occurred between 21 and 49 minutes later. Room turnover time was generally 36 minutes, while patient turnover time was about 1 hour. Although opportunities exist to move start times earlier and shorten turnover times, common definitions for these times must be agreed on to reduce interservice arguments.

## References

1. The Governance Committee: *Re-engineering the Hospital.* Washington, D.C., The Advisory Board Co., 1992: 2–10, 27, 93–129, 167–197.
2. *Association of Anesthesia Clinical Directors Newsletter,* (San Diego, CA,) March/April 1991.