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Early endocrine attending surgeon presence increases operating room efficiency

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ABSTRACT

Background: Preincision operating room (OR) preparation varies greatly. Cases requiring exacting preoperative setup may be more sensitive to inconsistent team members and trainees. Leadership and oversight by the surgeon may facilitate a timely start. The study hypothesized that early attending presence in the OR expedites surgery start time, improving efficiency, and decreasing cost.

Methods: Prospective data collection of endocrine surgery cases at an urban teaching hospital was performed. Time points recorded in minutes. Cost/min of OR time was $54. Patients classified as in the OR ≤10 min before attending arrival or >10 min before attending arrival.

Results: A total of 227 cases (166 thyroid, 54 parathyroid, 10 adrenal) were performed over 14 mo. Of the patients, 128 were in the OR ≤10 min before attending arrival, and 99 patients were >10 min (3 ± 3 min *versus* 35 ± 14 min, $P < 0.01$). The ≤10 min procedures started sooner after patient arrival in OR (40 ± 11 *versus* 63 ± 19, $P < 0.01$) which equated to $1202 of savings before incision. Although attending time in the OR before incision was equivalent between groups for adrenal and parathyroid, time to incision was shorter in the ≤10 min groups, saving $2416 ± 477 and $1458 ± 244, respectively ($P < 0.01$). Attending time in OR before thyroidectomy was 13 min longer in ≤10 min than >10 min ($P < 0.01$), but incisions were made 20 min sooner ($P < 0.01$) equating to $1076 ± 120 in savings.

Conclusions: Early attending presence in the OR shortens time to incision. For parathyroid and adrenal cases, this does not require additional surgeon time. In ORs without consistent teams, early attending presence in the OR improves efficiency and yields significant cost savings.

Introduction

In today's current environment of increasing health care costs and changing methodologies for reimbursement, there is great focus on improving efficiency and maximizing cost savings across all health care. In 2014, health care spending in the United States increased by 5.3%, to reach $3 trillion ($9523 per person, 17.5% of the US economy) and all evidence points to ongoing expansion in this sector. The operating room is one of the largest revenue generators for hospitals and is often a

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critical contributor to a hospital's financial success as revenue can be used to offset other costs.[1,2] Operating room (OR) costs are also increasing and have powered efforts to improve OR utilization.[3] Reliable posting of cases, thoughtful ordering of cases, appropriate OR inventory, and time estimates require both surgeon engagement as well as hospital support via appropriate staffing and stocking of the ORs. By optimal utilization of all available resources both surgeons and the health care system can work together to maximize efficiency. OR management of instrument processing, ensuring case cards are both up to date and accurate, and proactive inventory of supplies for prompt recognition and reordering of declining supplies are all the ways the hospital system can facilitate efficiency.

As surgeons, we have both the ability and the responsibility to control and influence many aspects of work flow and efficiency in the OR. Although much of this can be accomplished before the patient's arrival in the OR, continued communication and leadership by surgeons are required once the patient is in the OR. Many surgical procedures involve complex, preincision preparation, or prolonged post procedure emergence, which can represent up to 40%-45% of a patient's time in the OR.[4,5] A balance between the needs for surgical exposure, patient safety with regard to tolerance or potential injuries of positioning, and anesthesia access must be maintained. Oversight by a responsible member of the surgical team can guarantee that this optimal balance is achieved.[6,7]

Endocrine surgery cases represent procedures in which numerous preincision tasks must be done before the surgery can proceed. Patient positioning is critical to optimize exposure. Use of nerve monitoring requires both set up, as well as proper endotracheal tube placement to ensure functioning equipment.[8,9] Surgeon performed ultrasound immediately before the procedure provides the surgeon with critical anatomic detail, as well as information regarding parathyroid localization or cervical lymph node appearance to confirm the proposed operative plan.[10-13] Obtaining adequate intravenous (IV) access is requisite for serial hormone draws and/or administration of vasoactive medications as needed.[14] For these reasons, the endocrine surgery service was selected for evaluation. This study hypothesizes that early attending surgeon presence in the OR for endocrine surgery procedures will expedite incision start time, decreasing the duration of patient time in the OR before the incision, therefore improving operating room efficiency and decreasing operating room associated costs.

Methods

Prospective collection of data on all patients who underwent thyroidectomy, parathyroidectomy, or adrenalectomy by the endocrine surgery service at the main OR of a large, urban safety net hospital between June 2014 and July 2015 was performed after institutional review board approval. Cases were performed in the main operating room and by a group of five endocrine surgeons and one general surgeon. There was uniformity in practice regarding the use of intraoperative nerve monitoring with the Nerveana (Neurovision Medical, Ventura, CA), use of intraoperative parathyroid hormone measurements, and surgeon performed ultrasound. Cases performed in conjunction with another operative service were excluded from this analysis.

The Endocrine Surgery service is a teaching service consisting of three residents (a fourth year, a second year, and a noncategorical intern) which spend 2 wk to 1 mo on service at a time, with only one rotation a year. Case distribution is determined by the fourth year resident, and resident involvement with cases during their time on service is not consistent. The study hospital is not only a teaching hospital of general surgery residents, but also for anesthesia residents, medical students, physician assistant students, nursing students, certified nursing anesthetists, paramedics (in the operating room for intubation experience), and scrub technicians. A consistent operating room team is not designated for all endocrine surgical procedures, and trainees from various backgrounds may be present for any given case.

The operating room log was used to identify appropriate cases. The electronic medical record provided basic patient demographical data and details pertaining to the target organ (thyroid, parathyroid, or adrenal) and the extent of operation performed. The following time points were collected: patient arrival to operating room, attending surgeon arrival to operating room, time of incision, time of closure, and time of patient out of room. These time data were used to calculate the following: time between patient arrival and attending surgeon arrival in the operating room, time from patient arrival to incision time, and time from surgeon arrival to incision time. Additionally, turnover time for the room between cases and patient time in OR after completion of surgery were calculated. Patients were classified as in the operating room $\leq$10 min before attending arrival or >10 min before attending arrival. Cost per minute of operating room time was estimated at $54, based on data provided by the hospital administration.

Statistical analysis was completed using IBM SPSS Statistics, version 23 (Armonk, NY). Univariate analysis was performed with chi-square, Fisher exact, unpaired *t* test, one-way ANOVA, and Mann–Whitney as appropriate. All time data were measured in minutes (m). Data are presented as mean $\pm$ standard deviation or number (percentage). A *P* value $\leq$0.05 was defined as significant.

Results

Between June 2014 to July 2015, 227 endocrine procedures were performed at a large urban teaching hospital (Table 1). The mean patient age was 48 $\pm$14 y. The majority was female (89%). Thyroidectomy was the most common procedure (73%), followed by parathyroid (23%) and adrenal (4.4%). Thyroid and parathyroid procedures were occasionally jointly performed (3%). Patients were in the OR for 50 $\pm$ 18 min before the incision was made, 17 $\pm$ 18 min of which was before the arrival of the attending surgeon. The attending surgeon was present in the OR for 33 $\pm$ 15 min before the incision was made. At the completion of the case, the patient was in the OR for an additional 15 $\pm$ 13 min. Turnover time between cases was 39 $\pm$ 19 min.

When looking at all procedures, 128 patients (56%) were in the OR $\leq$10 min before attending arrival, and 99 patients