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# Implementation of Physiological Scoring to Determine Discharge Readiness for Patients Undergoing Otolaryngology Head and Neck Procedures

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**Purpose:** *This quality improvement project examined whether the use of a validated physiological scoring protocol to determine discharge readiness for surgical procedures proximal to the airway would decrease the time at which discharge criteria were met and postanesthesia care unit (PACU) length of stay.*
**Design:** *An observational pre-post design compared preimplementation recovery times to postimplementation recovery times.*
**Methods:** *PACU nurses were trained to use two physiological scoring protocols to determine when patients met discharge criteria and to document when discharge criteria were met.*
**Findings:** *During the postimplementation period, there was a significant decrease in the time it took patients to meet PACU discharge criteria when using the physiological scoring protocols compared with the preimplementation group ($P < .001$).*
**Conclusions:** *These results suggest that physiological scoring protocols are safe and appropriate to determine discharge readiness for patients who have surgery proximal to the airway.*

**Keywords:** *physiologic criteria, assessment, postanesthesia care unit, discharge, PACU length of stay, airway.*
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**THE POSTANESTHESIA CARE UNIT** (PACU) has been the preferred location for patients to recover from anesthesia since the department was formally recognized in 1923.[1] The PACU is a high-acuity recovery unit where nurse-to-patient ratios are lower, and nurses can more closely monitor and assess patients until they have fully recovered from anesthesia. Because of the high-acuity status of the PACU, PACU time costs are ranked among the most costly of hospital departments averaging $4 to $8 per minute.[2,3] Currently, there is no gold standard for determining PACU discharge readiness. This lack of standardization allows for

variations in discharge policies among facilities and patient populations. Some facilities determine a patient's readiness for discharge by using time-based criteria, whereas others determine discharge readiness based on variables such as vital signs and pain or a more comprehensive physiological assessment-based criteria. Specific patient populations, such as those who have surgery proximal to the airway, may also have different discharge requirements because of the location of the surgical procedure. Surgical procedures proximal to the airway were chosen because of the theoretical concern for airway complications such as airway obstruction and hematoma formation, which motivates surgeons to require prolonged monitoring of these patients for an arbitrary period. Low-acuity patients who have recovered from anesthesia often occupy PACU beds resulting in unnecessary PACU stays and increased costs for patients and hospitals. Furthermore, when the PACU is at maximum capacity, beds are not available for patients whose surgery and anesthetic are complete and are ready for transfer from the operating room. This leads to additional problems, including delayed surgical cases and frustration to all parties including surgeons, nurses, patients, and their families.[4]

As hospitals seek cost-savings measures in response to emphasis on quality cost-effective care, there is the opportunity for the PACU to adapt and increase efficiency while maintaining patient safety. The purpose of this quality improvement (QI) project was to determine the applicability of implementing evidence-based physiological discharge readiness measures to determine PACU discharge readiness for surgical procedures proximal to the airway.

## Literature Review and Synthesis

Discharge from the PACU has traditionally been in accordance with time-based or physiological-based discharge criteria. More recent PACU practice is to determine discharge readiness according to an objective predetermined physiological criteria. Studies that compared the time to physiological criteria report that PACU discharge based on a physiological scoring system results in shorter PACU times without compromising patient safety.[1,5-11] This also allows more efficient utilization of the PACU and the ability for patients to be discharged once they have adequately recovered from anesthesia.[5] Time-based discharge criteria require patients to stay in the PACU for a predetermined period based on surgical procedure regardless of the patient's recovery status.[1]

Physiological assessment protocols are simple, objective, and clinically based, which allow for patients to recover from anesthesia on an individualized basis.[1] The Modified Aldrete Score (MAS)[12] and Richmond Agitation Sedation Scale (RASS)[13] are both physiological assessment-based protocols used to determine a patient's recovery status after anesthesia. Many facilities have used the Aldrete scoring system or an MAS system to determine discharge readiness.[1,5-10,14-16] The MAS is commonly paired with other assessment variables such as the RASS for a more comprehensive assessment. The MAS discharge protocol evaluates patient activity, respirations, circulation, level of consciousness (LOC), and oxygen saturation to determine when the patient is fit for discharge from the PACU.[6] The RASS is a scale used in the PACU to measure the patient's level of sedation and awareness after anesthesia.[16] The RASS ranges from −5 (unarousable to voice or physical stimulation) to +4 (combative and violent). The most appropriate RASS score for a patient considered to be ready for discharge is between −1 (awakens to voice for greater than 10 seconds) to +1 (anxious but not aggressive).

The original Aldrete scoring system was developed in 1979.[8] The Aldrete scoring system was revised in 1995 to include the assessment of oxygen saturation and has since been used in combination with other physiological parameters, such as pain, nausea, and vomiting.[6] In addition to reporting a decrease in the length of stay (LOS) when using a predetermined discharge criteria, Brown et al[7] also reported that there was no increase in patient adverse events when using the MAS. Therefore, following the discharge criteria and staying a shorter time in the PACU did not negatively impact patient outcomes. Moncel et al[9] determined discharge criteria with a physiological scoring system, similar to the MAS, among digestive, urologic, orthopaedic, otorhinolaryngologic, plastic, neurologic, and endoscopic procedures. The surgical procedures included in the study by Moncel et al[9] included surgical procedures near the airway, which demonstrates successful application

of a physiological scoring system in this patient population. A shorter PACU LOS contributes to a more efficient use of PACU resources, decreases operating room hold times, and decreases PACU discharge delays.[7]

Predetermined discharge criteria are shown to increase efficiency and decrease PACU LOS, yet establishing which parameters will be used to assess and determine patient readiness for discharge is essential. Two studies[14,17] were conducted to determine which physiological parameters were essential to include in all-inclusive discharge criteria. An international Delphi study was conducted by Phillips et al,[17] which included three surveys completed at different periods to determine what would be considered essential components of assessment before discharge from the PACU. Essential variables determined by consensus included respiratory status, LOC, vital signs, pain, nausea, vomiting, urinary retention/urine output, cardiac status, surgical bleeding, end-tidal carbon dioxide, coordination, and functional status. A systematic review of eight studies was conducted by Phillips et al[14] to determine which variables were identified as essential in evaluation of patient's readiness for discharge from the PACU. The eight studies differed in type of surgery, anesthetic medications used, and disposition after PACU discharge. The most common variables assessed before PACU discharge were pain, LOC, vital signs, nausea, and vomiting.[14]

## Methods

### *Study Design and Sample*

This QI project was an observational pre-post design in which recovery care complete (RCC) times from a preimplementation period were compared with that of a postimplementation period. At this facility, the RCC time is the time when a patient meets discharge criteria. Once the patient has met all discharge criteria, the nurse is to document the RCC time in the computer charting system. Surgical procedures proximal to the airway were grouped into three categories: endotracheal, extratracheal, and *other*. Endotracheal procedures were those that occurred on or within the trachea (ie, direct laryngoscopies, vocal cord surgeries, and bronchoscopies). Extratracheal procedures were surgical procedures occurring outside and around the trachea (ie, anterior cervical discectomy and fusion, thyroid, and parathyroid surgeries). The *other* category included those procedures that did not occur around the trachea, yet still may have affected the patency of the airway (ie, parotid surgical procedures, nasal surgery, and tonsillectomies). The categorizing of patients was intended to ensure that a similar number of patients from each category was included in the sample.

A convenience sample of 169 adult postsurgical patients with surgical procedures proximal to the airway were included in this project. There were a total of 85 patients in the preimplementation group: 25 endotracheal, 35 extratracheal, and 25 *other*. There were a total of 84 patients in the postimplementation period: 25 endotracheal, 34 extratracheal, and 25 *other*. Patients included in the convenience sample were at least of 18 years, having one of the aforementioned surgical procedures, and English speakers. Patients with a history of significant postoperative complications, those with significant intraoperative complications, those who remained intubated in the PACU, and those transferred directly to the intensive care unit were not included in the sample.

### *Organizational Setting*

The setting for this QI project was a 938-bed tertiary care academic level one trauma center, which is part of a large academic system located in the Southeast United States. In 2016, the hospital performed approximately 3,400 surgical procedures proximal to the airway. The PACU at this institution includes Phase I and Phase II levels of care. Phase I PACU has 36 beds and is intended for postsurgical patients who are less recovered from anesthesia and require more direct nursing care and attention from the PACU nurses. Phase II PACU has nine beds and is intended for postsurgical patients who are more alert, have further recovered from anesthesia, and require less intensive PACU nursing care. Patients are discharged from either Phase I or Phase II PACU and transferred to either an inpatient unit, a 23-hour observation unit, or a home according to their individual level of care requirements.

Routinely, because of the location of surgeries on or around the airway such as vocal cord surgery,

direct laryngoscopies, thyroidectomies, anterior cervical discectomy and fusions, and other otorhinolaryngologic procedures, a time-based PACU discharge criteria were followed, which required a minimum 90-minute PACU stay before patients met discharge eligibility. All other patients who did not follow these time-based discharge criteria were discharged from the PACU per the MAS and RASS. Discharge criteria at this facility include RASS score, hemodynamically stable vital signs within 20% of baseline, temperature greater than 36°C, the absence of vomiting, warm and dry skin, pain scores less than or equal to 5 of 10 (pain scores less than or equal to baseline for chronic pain patients), the presence of protective reflexes (swallowing and ability to maintain patent airway), the absence of bladder distention, patency of tubes/catheters/drains, and a dry/clean dressing or a marked dressing that outlines drainage and demonstrates no further dressing saturation. The specific time frame for the time-based discharge was an arbitrary number determined by one surgeon without evidence to support the mandate. Patients at this facility are discharged from the PACU to either an inpatient unit, a 23-hour observation unit, or home. All patients receive a postoperative visit whether by phone or in person on postoperative day 1. Patients whose disposition from PACU is to an in-house location are visited by an anesthesia provider the next day. Patients discharged home from the PACU receive a phone call from a PACU nurse regarding postoperative status on postoperative day 1.

### *Intervention*

The intervention for this QI project was use of the MAS and RASS protocols (Table 1) to determine PACU discharge readiness for surgical procedures proximal to the airway. The MAS discharge criteria involve assessing patients every 15 minutes until discharge criteria are met in the following categories: vital signs, nausea/vomiting, pain, temperature, protective airway reflexes, bladder distention, drain/tube/catheter patency, and dressing status.[12] The RASS is a scale used to determine patient awareness and sedation level after anesthesia on a scale ranging from combative, violent, danger to staff (+4) to unarousable, no response to voice or physical stimulation (−5). Currently, policy requires use of the MAS and RASS for discharge of all other surgical procedures at this hospital.

### *Assessment and Measures*

Primary outcomes of this QI project included percentage of patients who met discharge criteria at or before the 90-minute airway hold and LOS in minutes until RCC time was documented. Secondary outcomes included cost and demographic comparisons between the preimplementation and postimplementation groups. Documentation of adverse events at 1 hour and 24 hours postdischarge from the PACU was also evaluated to determine if the MAS and RASS were not only applicable to this patient population, but also safe.

### *Implementation and Data Collection*

The MAS and RASS were used to determine the length of time until RCC was met during a preimplementation period. This period served as a reference period to which the postimplementation period could be compared. During the preimplementation period, the following data points were collected on 85 patients: age, gender, American Society of Anesthesiologists (ASA) classification, patient comorbidities, surgical procedure, anesthetic technique, surgical times, PACU times, and MAS and RASS scores. Patients were assessed by one provider every 15 minutes with the MAS and RASS protocols to determine when the patients actually met discharge criteria. However, even if the patients met discharge criteria before the required 90-minute hold, patients continued to follow the current method of discharge and remained in the PACU the full 90-minute LOS. This preimplementation period was used as a measure of interest to see who could have been discharged earlier than the required 90-minute hold. RCC times were also evaluated according to the current protocol. Therefore, RCC times could not be documented until the patient had been in the PACU for 90 minutes per policy. After the patient was discharged from the PACU, postoperative assessments were made 1 hour and 24 hours postdischarge to determine if the patient experienced any complications related to the surgery or anesthesia. Patients who were discharged home from the PACU received no follow-up assessments. Patients who remained in house at the 1-hour time interval but were discharged home

**Table 1. Richmond Agitation and Sedation Scale**

| Score | Term | Description |
|---|---|---|
| +4 | Combative | Overly combative, violent, and immediate danger to staff |
| +3 | Very agitated | Pulls or removes tube(s) or catheter(s), aggressive |
| +2 | Agitated | Frequent nonpurposeful movement, fights ventilator |
| +1 | Restless | Anxious, but movements not aggressively vigorous |
| 0 | Alert and calm | |
| −1 | Drowsy | Not fully alert but has sustained awakening (eye opening/eye contact) to voice (≥10 s) |
| −2 | Light sedation | Briefly awakens to voice with eye contact (< 10 s) |
| −3 | Moderate sedation | Movement or eye opening to voice (but no eye contact) |
| −4 | Deep sedation | No response to voice but movement or eye opening to physical stimulation |
| −5 | Unarousable | No response to voice or physical stimulation |

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before the 24-hour assessment interval were postoperatively assessed at the 1-hour interval only.

After all preimplementation data were collected, educational sessions on the use of the MAS and RASS protocol were provided to PACU nursing staff in preparation for use during the postimplementation period. During the postimplementation period, the PACU nurses assessed 84 patients who met inclusion criteria on arrival to the PACU and every 15 minutes thereafter using the MAS and RASS to determine when the patient met discharge criteria. When the nurse determined the patient had met MAS and RASS discharge criteria, the nurse would document the RCC time on the data collection tool. The project manager then collected demographic data that mirrored preimplementation data points. Postoperative follow-up assessments were also conducted at the 1-hour and 24-hour time intervals after discharge from the PACU.

### *Statistical Analysis*

Descriptive statistics of frequency and percentages were calculated to determine the portion of patients who had surgery proximal to the airway that met discharge criteria at or before the mandated 90-minute PACU LOS. For evaluation of PACU RCC times at preimplementation and postimplementation, a Mann-Whitney *U* test rather than an independent *t* test was conducted because the data were not normally distributed. Patient characteristics were analyzed using a $\chi^2$ test, Fisher exact test, and independent *t* test. All statistical analyses were conducted using IBM Statistical Package for the Social Sciences software (version 24; IBM, Armonk, NY) with an alpha level of 0.05.

## Results

### *Outcome 1: Met Discharge Criteria*

During the preimplementation period, 11 of 25 (56%) patients in the endotracheal group had RCC time documented at or before the 90-minute mark. In the extratracheal group, 19 of 35 patients (54%) and in the *other* group, 16 of 25 patients (64%) had RCC times documented less than or equal to 90 minutes. During the postimplementation period, in the endotracheal group, 24 of 25 (96%) patients had a documented RCC time less than or equal to 90 minutes. In the extratracheal group, 33 of 34 patients (97%), and in the *other* group, 24 of 25 (96%) patients had RCC times documented less than or equal to 90 minutes.

### *Outcome 2: RCC Time*

When comparing data from the three groups (endotracheal, extratracheal, and *other*) at both preimplementation and postimplementation periods, there was a significant difference in RCC times in all three groups ($P < .01$). The median time to RCC time documented in the preimplementation endotracheal group was 90 minutes, with a minimum time of 54 minutes and a maximum time of 134 minutes, compared with

**Table 2. RCC Times for All Three Groups at Both Preimplementation and Postimplementation Periods**

| Surgical Category | Preimplementation | Postimplementation | Significance (*P*) |
|---|---|---|---|
| Endotracheal, *N* | 25 | 25 | .00 |
| Median (minimum, maximum) (min) | 90 (54, 134) | 1 (1, 120) | |
| Mean ± SD (min) | 90 ± 15 | 19 ± 26 | |
| Extratracheal, *N* | 35 | 34 | .00 |
| Median (minimum, maximum) (min) | 90 (49, 186) | 45 (1, 120) | |
| Mean ± SD (min) | 96 ± 28 | 41 ± 31 | |
| *Other*, *N* | 25 | 25 | .00 |
| Median (minimum, maximum) (min) | 90 (30, 204) | 15 (1, 105) | |
| Mean ± SD (minimum) | 90 ± 42 | 28 ± 6 | |

RCC, recovery care complete.

the postimplementation period with a median of 1 minute and minimum and maximum times at 1 and 120 minutes, respectively. In the extratracheal preimplementation group, the median time to RCC time was 90 minutes, with a minimum time of 49 minutes and a maximum time of 186 minutes, compared with the postimplementation group, which had a 45-minute median time and minimum and maximum times of 1 and 120 minutes, respectively. The median time for the preimplementation *other* group was 90 minutes, with a minimum time of 30 minutes and a maximum time of 204 minutes, compared with the postimplementation group with a median time of 15 minutes and minimum and maximum times of 1 and 105 minutes, respectively (Table 2).

### *Patient Characteristics*

Patient characteristics (age, gender, and ASA status), anesthetic type, and discharge location were compared between the preimplementation and postimplementation groups using $\chi^2$ tests for categorical variables and independent *t* tests for continuous variables for all three groups (endotracheal, extratracheal, and *other*).

**Table 3. Demographic Data for the Endotracheal Group at Both Preimplementation and Postimplementation Periods**

| Demographic | Preimplementation | Postimplementation | Significance (*P*) |
|---|---|---|---|
| *N* | 25 | 25 | |
| Gender: male/female | 15/10 | 17/8 | .769 |
| Age (mean years ± SD) | 62 ± 13 | 59 ±16 | .386 |
| ASA classification | | | .472 |
| 1 | 0 | 0 | |
| 2 | 4 | 2 | |
| 3 | 14 | 18 | |
| 4 | 7 | 5 | |
| Discharge location | | | .072 |
| Ambulatory | 21 | 15 | |
| 23-h observation | 0 | 1 | |
| Same-day admit | 0 | 5 | |
| Inpatient | 4 | 4 | |
| Type of anesthetic | | | .341 |
| Volatile anesthetic | 9 | 13 | |
| TIVA | 12 | 7 | |
| Volatile + infusion | 4 | 5 | |

ASA, American Society of Anesthesiologists; TIVA, total intravenous anesthetic.

**Table 4. Demographic Data for the Extratracheal Group at Both Preimplementation and Postimplementation Periods**

| Demographics | Preimplementation | Postimplementation | Significance (*P*) |
|---|---|---|---|
| *N* | 35 | 34 | |
| Gender: male/female | 12/23 | 12/22 | .99 |
| Age (mean years ± SD) | 56 ± 16 | 57 ± 13 | |
| ASA classification | | | .809 |
| 1 | 0 | 1 | .215 |
| 2 | 20 | 16 | |
| 3 | 15 | 14 | |
| 4 | 0 | 3 | |
| Discharge location | | | |
| Ambulatory | 6 | 1 | .052 |
| 23-h observation | 24 | 22 | |
| Same-day admit | 5 | 11 | |
| Type of anesthetic | | | |
| Volatile anesthetic | 25 | 6 | < .001 |
| TIVA | 4 | 11 | |
| Volatile + infusion | 6 | 17 | |

ASA, American Society of Anesthesiologists; TIVA, total intravenous anesthetic.

For the endotracheal group, preimplementation ($n$ = 25) and postimplementation ($n$ = 25) patients did not differ on gender ($P$ = .769), anesthetic type ($P$ = .341), discharge location ($P$ = .072), ASA classification ($P$ = .472), or age ($P$ = .386; Table 3).

For the extratracheal group, preimplementation ($n$ = 35) and postimplementation ($n$ = 34) patients did not differ on gender ($n$ = 0.99), discharge location ($P$ = .052), ASA classification ($P$ = .215), and age ($P$ = .809). There was a significant difference in anesthetic type ($P$ = .00). In the preimplementation group, most patients received volatile anesthetic only ($n$ = 25), whereas six patients received volatile anesthetic and an intravenous infusion of another anesthetic drug (either remifentanil, sufentanil, or propofol) and four patients received a total intravenous anesthetic. Most patients in the postimplementation group received volatile anesthetic and an infusion of another anesthetic drug (either remifentanil,

**Table 5. Demographic Data for the *Other* Group at Both Preimplementation and Postimplementation Periods**

| Demographics | Preimplementation | Postimplementation | Significance (*P*) |
|---|---|---|---|
| *N* | 25 | 25 | |
| Gender: male/female | 13/12 | 12/13 | .99 |
| Age (mean years ± SD) | 43 ± 20 | 57 ± 15 | |
| ASA classification | | | .007 |
| 1 | 2 | 1 | .502 |
| 2 | 12 | 9 | |
| 3 | 11 | 15 | |
| Discharge location | | | |
| Ambulatory | 21 | 23 | .667 |
| 23-h observation | 4 | 2 | |
| Type of anesthetic | | | |
| Volatile anesthetic | 10 | 7 | .664 |
| TIVA | 8 | 10 | |
| Volatile + infusion | 7 | 8 | |

ASA, American Society of Anesthesiologists; TIVA, total intravenous anesthetic.

sufentanil, or propofol) ($n$ = 17). Eleven patients received a total intravenous anesthetic, and six patients received volatile anesthetic only. The type of anesthetic administered to patients is based on provider preference and has little to no impact on the outcomes measured (Table 4).

For the *other* group, preimplementation ($n$ = 25) and postimplementation ($n$ = 25) patients did not differ on gender ($P$ = .99), anesthetic type ($P$ = .664), discharge location ($P$ = .667), and ASA classification ($P$ = .502). There was a significant difference in age ($P$ = .007). The preimplementation group had a mean age of 42 years, whereas the postimplementation group had a mean age of 57 years. Although there was statistical significance between the two groups, there was no clinical significance because the postimplementation group had faster RCC times despite a higher mean age (Table 5).

### *Cost Comparison*

Costs associated with PACU stay and cost comparison between the preimplementation and postimplementation periods were calculated using national averages as facility-specific information was not available. The average PACU cost per minute is between $4 and $8.[2,3] The mean RCC time for the endotracheal group was 90.24 minutes for the preimplementation group and 19.72 minutes for the postimplementation group. This is a difference of 70.52 minutes, which yields a cost difference between $282 and $564 per patient. The extratracheal group had a mean RCC time of 96.74 minutes in the preimplementation group compared with 41.97 minutes in the postimplementation group. This is a difference of 54.77 minutes and a cost difference between $219 and $438 per patient. The *other* group had mean preimplementation and postimplementation RCC times of 90.32 and 28.12 minutes, respectively. This is a time difference of 62.2 minutes and a cost difference between $248 and $497 per patient.

### *Postoperative Adverse Events*

Of the 85 patients in the preimplementation group, 35 were inpatients at the 1-hour interval and, of those, only one patient reported adverse events. The complication reported was postoperative vomiting. At the 24-hour interval, four patients were inpatients, none of whom reported further postoperative complications. The one postoperative vomiting episode was reported from a patient in the extratracheal group.

Of the 84 patients in the postimplementation group, 45 were inpatients at the 1-hour interval and only nine were inpatients at the 24-hour interval. None of the patients in the postimplementation group reported any postoperative complications.

## Discussion

The primary goal of this project was to improve PACU efficiency by using the MAS and RASS to determine discharge readiness for patients with surgeries proximal to the airway and facilitate the transfer of these patients out of the PACU. Expected benefits of this project were to improve the discharge protocol and improve PACU efficiency.

Data collected during the preimplementation and postimplementation periods of this project validated that the use of the MAS and RASS to determine PACU discharge readiness could result in a decreased recovery time in PACU and decreased costs to the patient and facility. RCC times were decreased from the preimplementation group to the postimplementation group when using the MAS and RASS. Similar results were found by Moncel et al[9] when using physiological discharge, rather than time-based discharge criteria, in pediatric patients undergoing digestive, urologic, orthopaedic, otorhinolaryngologic, plastic, neurologic, and endoscopic procedures. By decreasing the PACU LOS and improving the efficiency of the PACU, this could potentially also decrease the number of operating room holds that occur.

Safety concerns with this patient population such as airway compromise and obstruction were taken into consideration when determining discharge readiness. Neither of the two groups experienced any significant postoperative complications. In the postimplementation group, where MAS and RASS were used to determine discharge readiness, there were no complications reported at 1 hour and 24 hours after discharge from the PACU.

In the preimplementation group, the RCC time was to be documented when the patient met discharge

criteria, which included the 90-minute airway hold. Therefore, RCC times should not have been documented before 90 minutes. However, in all three groups (endotracheal, extratracheal, and *other*), there was at least one RCC time documented before the 90-minute time mark. This demonstrates the variability of charting between the PACU nurses and the need for an updated standardized policy.

## Limitations

The struggle of practice and policy change was an issue during implementation of this project. The intention was three-fold: to discharge patients in the postimplementation group from the PACU once MAS and RASS discharge criteria were met; to compare RCC times; and to compare PACU LOS. None of the patients in the postimplementation period were discharged once MAS and RASS criteria were met because of concern of a few surgeons that airway complications, albeit rare, were still a possibility. These surgeons prefer a larger data set before implementing a new process. One surgeon's resistance to policy change was based on previous poor experiences. Given there were no airway complications in 24 hours in our total sample of patients, the incidence of airway complications in the initial 90 minutes and 24 hours would be no more than 0.6% (1/[169 + 1]). Each institution must assess the risk of a rare sentinel event.

Therefore, because patients were not discharged once MAS and RASS criteria were met, this limited the comparisons to only the RCC times. Despite this limitation, RCC times were analyzed between the preimplementation and postimplementation groups in which the two groups were noted to have differences, both with statistical and clinical significance.

## Conclusion

Although there is no gold standard for PACU discharge criteria, the use of physiological assessment criteria is the most efficient and effective protocol to determine safe PACU discharge. This QI project demonstrates safe use of the MAS and RASS as discharge criteria in patients having surgery proximal to the airway regardless of admission to PACU Phase I or Phase II and plans for discharge whether to home or in house (inpatient or 23-hour observation unit). PACU costs are among the highest hospital costs. Improved PACU efficiency using the MAS and RASS allows for reduced patient and hospital costs while maintaining patient safety. The use of the MAS and RASS to determine discharge readiness allows staff to transition patients from the PACU to their designated discharge location on an individual basis according to physiological status without arbitrary holds.

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