Increasing Utilization of End Tidal Carbon Dioxide Monitoring in PACU

Team Leaders: Karrie Camacho, BSN, RN, CCRN & C J. Marshak, MN, RN, CPAN
Team Members: Terry Bertignoli, BSN, RN, CPAN, CAPA; Heide Bradley, BSN, RN; Maria Centeno, BSN, RN; Vincent Trieu, BS;
& Sadeeka Al-Majid, RN, PhD

MemorialCare Orange Coast Medical Center, Fountain Valley, California

MAGNET RECOGNIZED
AMERICAN NURSES CREDENTIALING CENTER

Background

- Ventilatory compromise following general anesthesia is a serious side effect that can lead to increased morbidity and mortality.

- Oxygen saturation, measured by pulse oximetry (SpO_2), is the most commonly used method for monitoring oxygenation status in patients in the PACU.

- Patients may experience severe respiratory compromise before changes in SpO_2 are detected.

- Inadequacy of ventilation is detected **earlier**, and more **reliably**, using capnography, which allows monitoring of partial pressure of carbon dioxide during exhalation ($EtCO_2$).

- Monitoring ventilatory status in PACU patients using capnography can result in early detection and treatment of ventilatory events, by prompting the PACU nurse to intervene.

- ASPAN Practice Recommendation 2 entitled, *Components of Assessment and Management for the Perianesthesia Patient*, states that "vital signs are monitored, including $EtCO_2$ (capnography) if available and indicated"
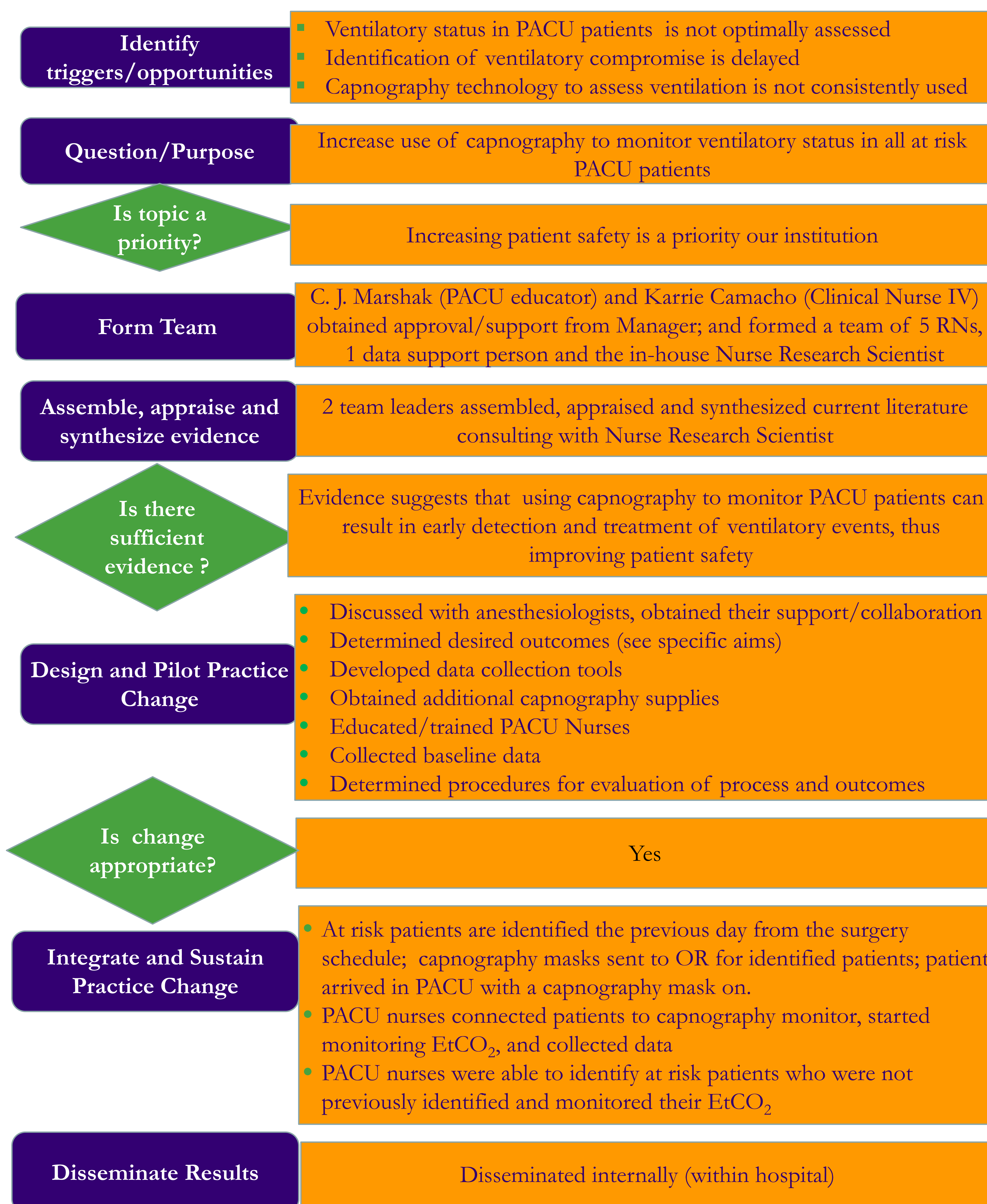
Problem

- Our PACU patients were not consistently monitored using capnography. In 2019, $EtCO_2$ was monitored in only 0.4% of PCAU patients
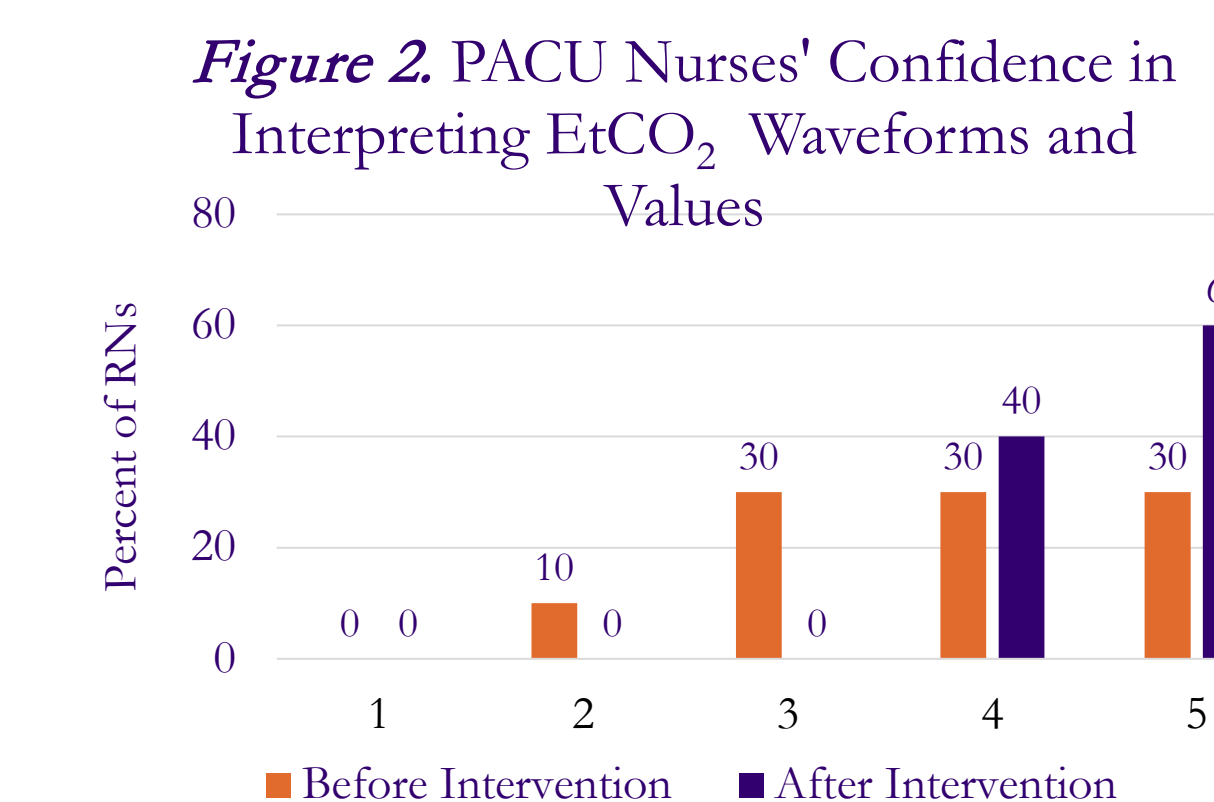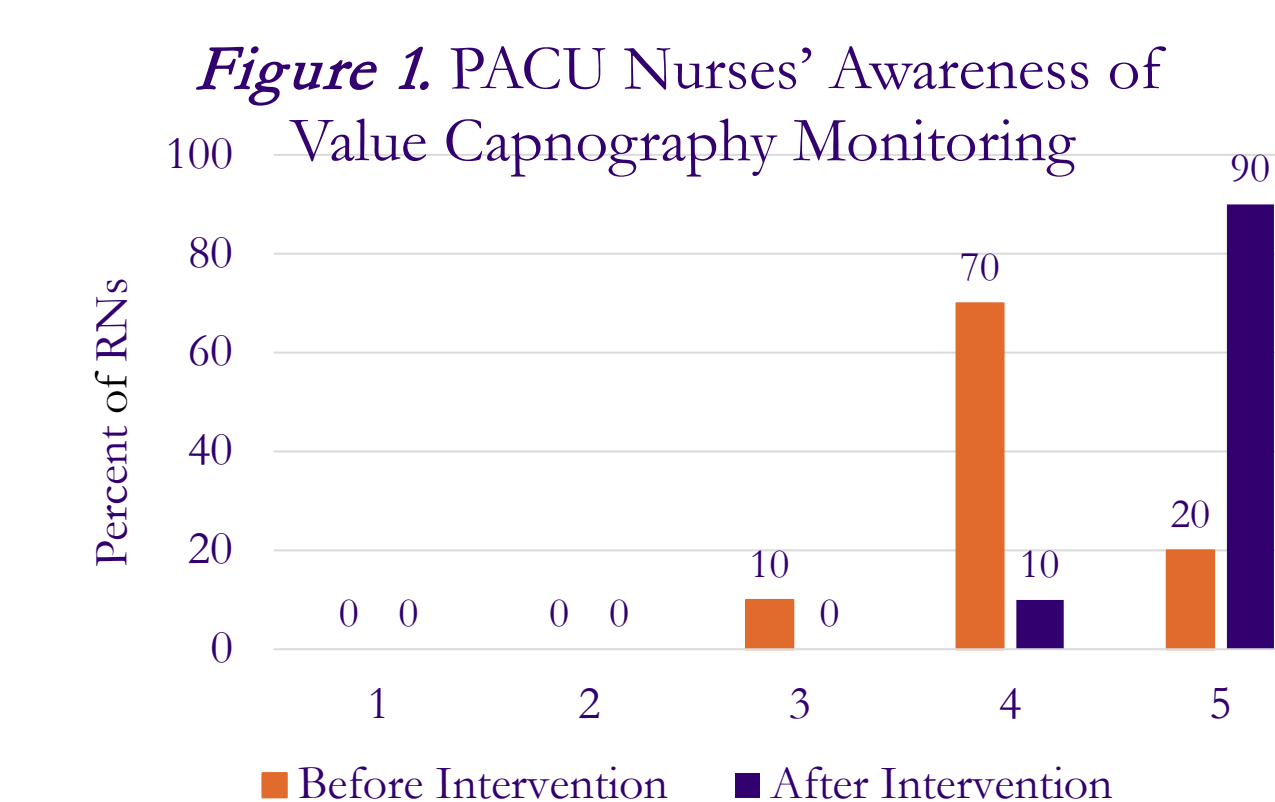
Purpose and Objectives

- **Purpose:** to increase the use of capnography to monitor ventilatory status in at risk PACU patients.

- **Objectives:**
  1. Increase PACU nurses' awareness of value of capnography monitoring
  2. Increase nurses confidence in their ability to interpret $EtCO_2$ waveforms and values
  3. Increase the number of $EtCO_2$ monitored patients by at least 50% compared to 2019.
  4. Document the number of ventilatory events detected by capnography, and were treated, before any changes in SpO_2 were detected

Iowa Model of Evidence-Based Practice Used as a Guide

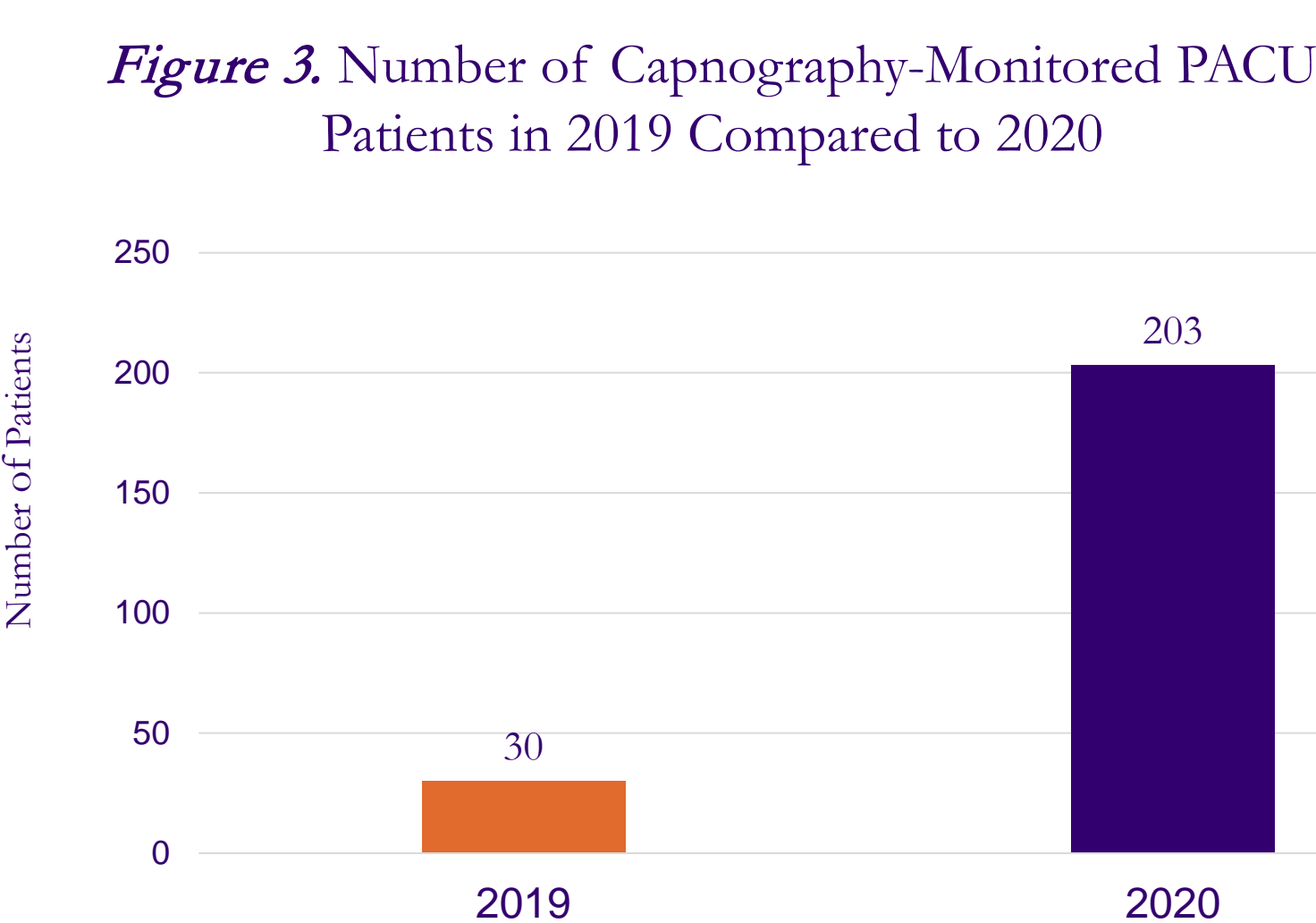|	
Identify triggers/opportunities	• Ventilatory status in PACU patients is not optimally assessed • Identification of ventilatory compromise is delayed • Capnography technology to assess ventilation is not consistently used
Question/Purpose	Increase use of capnography to monitor ventilatory status in all at risk PACU patients
Is topic a priority?	Increasing patient safety is a priority our institution
Form Team	C. J. Marshak (PACU educator) and Karrie Camacho (Clinical Nurse IV) obtained approval/support from Manager; and formed a team of 5 RNs, 1 data support person and the in-house Nurse Research Scientist
Assemble, appraise and synthesize evidence	2 team leaders assembled, appraised and synthesized current literature consulting with Nurse Research Scientist
Is there sufficient evidence?	Evidence suggests that using capnography to monitor PACU patients can result in early detection and treatment of ventilatory events, thus improving patient safety
Design and Pilot Practice Change	• Discussed with anesthesiologists, obtained their support/collaboration • Determined desired outcomes (see specific aims) • Developed data collection tools • Obtained additional capnography supplies • Educated/trained PACU Nurses • Collected baseline data • Determined procedures for evaluation of process and outcomes
Is change appropriate?	Yes
Integrate and Sustain Practice Change	• At risk patients are identified the previous day from the surgery schedule; capnography masks sent to OR for identified patients; patient arrived in PACU with a capnography mask on. • PACU nurses connected patients to capnography monitor, started monitoring $EtCO_2$, and collected data • PACU nurses were able to identify at risk patients who were not previously identified and monitored their $EtCO_2$
Disseminate Results	Disseminated internally (within hospital)

Results

- **Specific Aims #1 & 2:** Increase nurses awareness and confidence measured using a 5-point Likert scale (1=not aware and 5= highly aware (Figures 1 & 2, respectively)

Figure 1. PACU Nurses' Awareness of Value Capnography Monitoring

Figure 2. PACU Nurses' Confidence in Interpreting $EtCO_2$ Waveforms and Values

- **Specific Aim # 3:** Increase number of $EtCO_2$ monitored patients by at least 50% compared to 2019.

Figure 3. Number of Capnography-Monitored PACU Patients in 2019 Compared to 2020

- **Specific Aim # 4:** Document number of ventilatory events detected by capnography, and treated, before any changes in SpO_2
  - During the data collection timeframe, 132 ventilatory *events* were identified and treated by PACU nurses.
  - In 95% of these events, there was no associated change in SpO_2

Implications for Practice

- Capnography is a non-invasive tool that increases safety of patients in the immediate post anesthesia phase.
- With training, PACU nurses are capable to read and interpret capnography values
- 2019-2020 Perianesthesia Nursing Standards and Practice Recommendations support the use of capnography in high risk PACU patients

MemorialCare
Orange Coast Medical Center