Fighting Disease with Electronics

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cap-ONE
ORAL NASAL EXPIRATION

cap-ONE Information
Vol.3

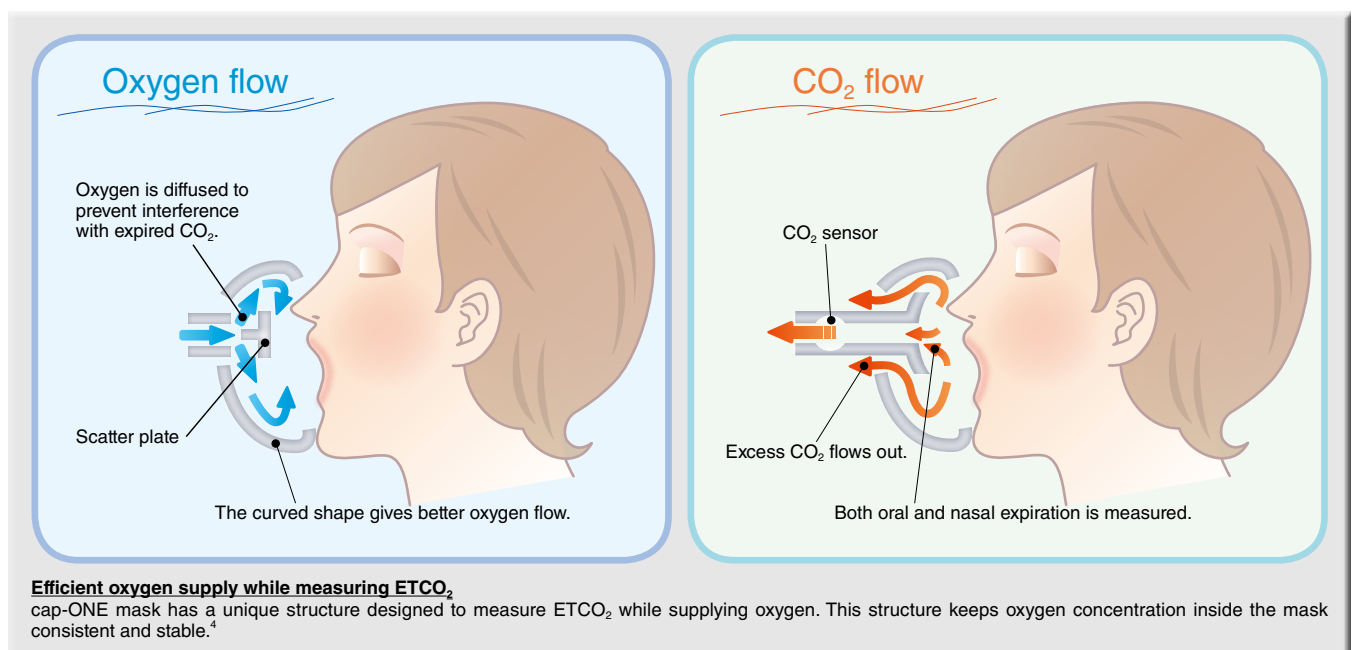# Optimal respiratory monitoring during sedation for all patients

cap-ONE mask

cap-ONE mask fits different face shapes and sizes

Patient benefits from capnography monitoring as recommended by ASA and APSF Guidelines

Currently clinical guidelines, including those of the American Society of Anesthesiologists (ASA) and Anesthesia Patient Safety Foundation (APSF), recommend capnography as one of the most reliable non-invasive methods to continuously monitor and assess the adequacy of the patient's respiratory condition during procedural sedation and analgesia.[1,2] Favorable benefits to patient's safety which may be associated with using capnography have also been shown.[3] Capnography is becoming more widely adopted as a means to detect respiratory depression and avoid serious complications in all care levels including ER, OR, ICU and recovering room.

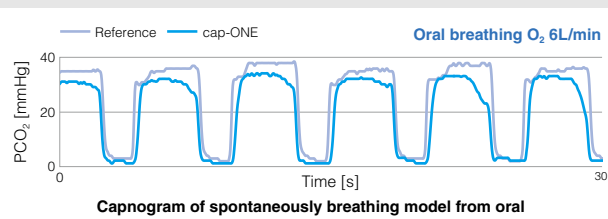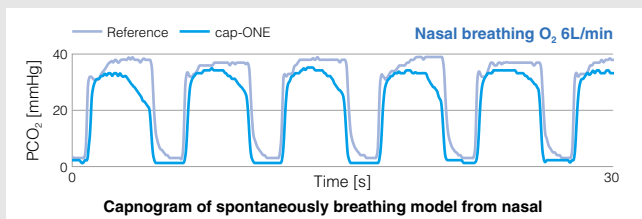## cap-ONE mask enhances patient safety

cap-ONE mask is an oxygen mask with integrated cap-ONE mainstream capnometer sensor (TG-980P, Nihon Kohden). It can measure end-tidal carbon dioxide ($ETCO_2$) while supplying oxygen thanks to a unique design which catches the exhaled gas from the nose and mouth without interference from the oxygen supply.

Oxygen flow

Oxygen is diffused to prevent interference with expired CO_2.

Scatter plate

The curved shape gives better oxygen flow.

CO_2 flow

CO_2 sensor

Excess CO_2 flows out.

Both oral and nasal expiration is measured.

Efficient oxygen supply while measuring ETCO$_2$
cap-ONE mask has a unique structure designed to measure $ETCO_2$ while supplying oxygen. This structure keeps oxygen concentration inside the mask consistent and stable.[4]

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Performance of cap-ONE mask in measuring ETCO$_2$ and supplying oxygen

Accurate ETCO$_2$ monitoring at high oxygen flow

The accuracy of non-invasive CO_2 monitoring can be influenced by several factors including oxygen flow rate, tidal volume and measurement site (oral or nasal). The performance of cap-ONE mask to measure ETCO$_2$ during oxygen administration has been evaluated using a breathing simulator (ASL5000, IngMar Medical, USA).

Capnogram of spontaneously breathing model from nasal — Nasal breathing O$_2$ 6L/min

Capnogram of spontaneously breathing model from oral — Oral breathing O$_2$ 6L/min

Simulation evaluation of CO_2 measurement performance of cap-ONE mask
As shown in the graphs above, relatively high quality capnogram was obtained by cap-ONE mask at high flow oxygen (6 L/min) in both nasal and oral simulation evaluation (tidal volume 500 ml, RR 12/min).
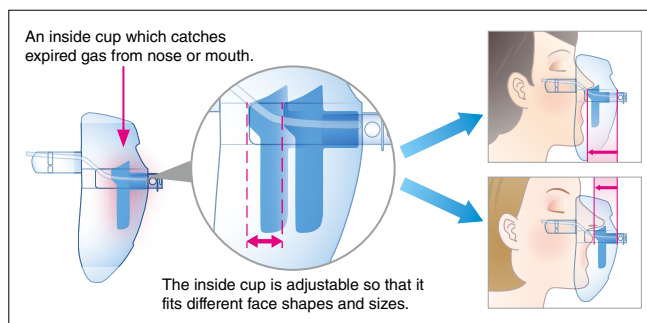
Efficient oxygenation with cap-ONE mask

The efficacy of cap-ONE mask was also evaluated using the same simulator. cap-ONE mask provided FiO$_2$ of about 40% at oxygen flow of 2 L/min. The cap-ONE mask FiO$_2$ was comparable to FiO$_2$ of conventional nasal oxygen cannula and oxygen mask.[5]

Oxygen flow [L/min]	cap-ONE mask FiO$_2$ [%]	Nasal oxygen cannula FiO$_2$ [%]	Oxygen mask FiO$_2$ [%]
2	40	28	
3	-	32	
4	45	36	
5	-	40	
6	50	44	40
7	-		50
8	55		60

cap-ONE mask suits all face shapes

A 3-D digital scan (Kinect, Microsoft, WA) was used to measure the facial features of individuals of different ages, gender and ethnicities including Asian, Hispanic, Caucasian and African American. Next, we confirmed whether gaps between the cap-ONE mask and different parts of the face such as nose, chin, and cheek are sufficiently minimal so that the mask can accurately measure CO_2 and supply oxygen for different face shapes.

An inside cup which catches expired gas from nose or mouth.

The inside cup is adjustable so that it fits different face shapes and sizes.

cap-ONE mask product line

CO$_2$ sensor kit oxygen mask

cap-ONE mask

YG-242T (V935)
infant

YG-232T (V933)
pediatric

YG-272T (V983A)
adult

YG-282T (V983C)
adult, large

References

1. Tobergte DR, Curtis S. STANDARDS FOR BASIC ANESTHETIC MONITORING. J Chem Inf Model. 2013;53(9):1689-1699.
2. Ray R. Maddox, PharmD Jarred Callura, BS Amy E. Herrin, MS Craig Henriquez P. Clinical Experience with Capnography Monitoring for PCA Patients. 2012:47-50.
3. Conway A, Douglas C, Sutherland JR. A systematic review of capnography for sedation. Anaesthesia. 2016;71(4):450-454.
4. Abe. S et al. 2010. Japanese Society of Pediatric Intensive and Critical Care. A novel method for mainstream capnometer. Presentation. November.
5. Shapiro, B. A., Kacmarek, R. M., Cane, R. D., & Hauptman, D. (1991). Clinical application of respiratory care (4th ed.). St. Louis, MO: Mosby.

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