Santa Barbara
Cottage Hospital

Nonin's Onyx® II Fingertip Pulse Oximeter in the Emergency Department Results In Decreased Costs, Enhanced Patient Care and Time Savings

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Abstract: *This study was designed to assess the utility of the addition of a small, all-in-one digital fingertip pulse oximeter, Onyx II by Nonin Medical, Inc, in the Emergency Department (ED).* ***Methods****: The study was conducted at a level II trauma center. All ED rooms are fully-equipped with pulse oximetry. For three months, all ED caregivers were provided an Onyx II.* ***Results****: Cost of disposable pulse oximeter sensors during the study were reduced by 48%. Overall, 76% of the caregivers indicated a time savings due to the use of Onyx II, an average savings of 26 minutes per caregiver per shift, with greater time savings noted for triage caregivers. Enhanced patient care was noted by 75% of the caregivers, attributed to quicker triage; accurate readings on a wide-range of patients (e.g. patients with low-perfusion and children); and availability of readings when monitors were not accessible or were malfunctioning. Ninety-eight percent (98%) of the caregivers found Onyx II to be easy to use. Six-months following the study period, the vast majority of caregivers continued to use Onyx II on a regular basis.*

INTRODUCTION:

Oxygen saturation monitoring through pulse oximetry (spot-check or continuous) is a standard of care in most Emergency Department (ED) settings. Multiparameter, non-invasive monitoring devices or portable equipment is often the only choice available for simple pulse oximetry spot-checks. Loss of time and inefficiencies result as caregivers search for portable equipment or over-utilize elaborate monitoring systems. Added noise from nuisance alarms and cost of disposable sensors are additional limitations to the use of these devices in the ED. We hypothesized that the addition of a small, all-in-one digital fingertip pulse oximeter, Onyx II by Nonin, in the ED would decrease overall oximetry costs without decreasing quality of patient care.

METHODS:

The study was conducted at Santa Barbara Cottage Hospital (SBCH), a level II trauma center within the Cottage Health System. SBCH has a 240-bed capacity, with a 25-bed ED. Annual ED patient volume is 1500 trauma patients and 40000 patients overall, with a 23% admission rate. ED staffing includes 64 full-time employees consisting of approximately two-thirds registered nurses (RN) and one-third patient care technicians (PCT). The patient care ratio is three to one, excluding non-urgent patients. All ED rooms are fully-equipped with state of the art multiparameter vital sign monitoring equipment which include pulse oximetry.

The fingertip pulse oximeter chosen for this study was Nonin's Onyx II because of the compact design, long battery life and proven accuracy[1,2].

The device can be carried in a pocket or attached to a stethoscope, belt or lanyard making it as unobtrusive as possible for the ED personnel who may already be required to carry a number of necessary tools.

The study was designed to assess cost-effectiveness, device durability and caregiver acceptance and satisfaction with the addition of Onyx II in a fully-equipped ED. Onyx II was to be used for routine and spot-check SpO_2 readings as the caregiver felt necessary. For three months, all ED caregivers were provided an Onyx II to carry with them, allowing pulse oximeter assessment anytime and anywhere. Training on use and care of the devices was provided to all staff. Caregivers were not required to use Onyx II, but rather were given the opportunity to use it in the course of the work shift.

Direct costs of disposable pulse oximeter sensors were collected for a three-month period prior to the study and for three months during the study to evaluate cost savings. Caregivers were surveyed throughout the three-month study period to assess durability, utility and satisfaction with Onyx II.

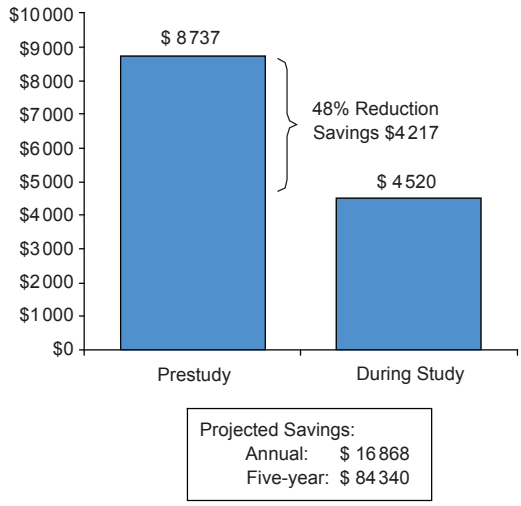
RESULTS:

Costs

Direct costs of disposable pulse oximeter sensors were significantly decreased by the addition of Onyx II in the ED. Disposable sensor costs decreased from $8737 for the three-month period prior to the study to $4520 during the three-month study. This savings of $4217, representing a 48% reduction in disposable sensor expense, was in conjunction with a higher patient census.

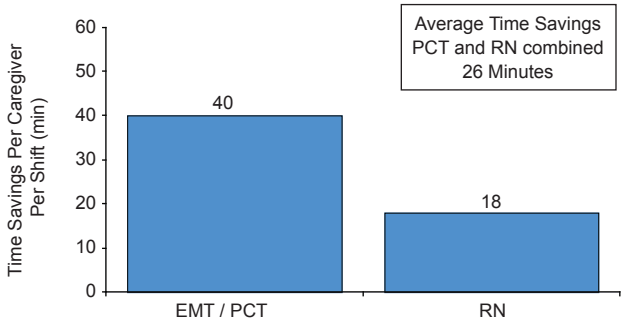
Other than the initial purchase, there were no incremental costs associated with the Onyx II. No Onyx II devices were lost or stolen during the study. As anticipated, none of the devices required service. There were no malfunctions or defects during the study or for up to six months following the study.

Figure 1: Disposable Sensor Expenses



An indirect cost-savings was noted in time. Overall, 76% of the caregivers indicated there was a time savings due to the use of Onyx II, an average savings of 26 minutes per caregiver per shift. Time saved was related to the number of readings taken per shift and was noted to be higher for triage caregivers. PCT caregivers had an average time savings of 40 minutes as compared to RNs who noted a savings of 18 minutes.

Figure 2: Average Time Savings In Minutes Per Caregiver Per Shift*



*NOTE: Includes only those caregivers (75%) who indicated a time savings.

"Onyx allows me to recheck vital signs quickly on multiple patients in the waiting room. [It is] always there [with] no need to constantly search for pulse ox equipment"

Patient Care

Enhanced patient care was noted by 75% of the caregivers as a result of having Onyx II, with no change in care noted by the remaining caregivers. Enhanced patient care was attributed to quicker triage; accurate readings for patients who could not be accurately assessed by the multiparameter monitor (e.g. patients with low-perfusion, children); and availability of readings when monitors were not accessible or were malfunctioning.

"In triage/waiting room [Onyx II provides] quicker care and quicker identification of critical patients."

The ability to monitor pulse oximetry during transfer or ambulation was also a benefit. Caregivers found the device gave quick and accurate readings.

"Very sensitive to low perfusion states and able to pick up pulse, O_2sat when the [multiparameter] monitor was not reliable."

Caregiver Acceptance and Satisfaction

The addition of Onyx II pulse oximeter device was well-received by ED caregivers. Ease of use was noted by 98% of the caregivers (72% "very easy", 26% "easy"). Individuals typically carried Onyx II in a pocket or clipped to clothing or belt (98%), allowing for easy access without unnecessary added clutter.

"[The clip on the carry case] clips conveniently to my scrubs. It never falls off!"

75% Enhanced Patient Care
98% Easy to Use
96% Would Use Again

Ninety-six percent (96%) of the caregivers would use the device again if given the opportunity. Six-months following the study period, the vast majority of caregivers continued to use Onyx II on a regular basis, stating it is "extremely helpful at triage and with all pediatrics" and in the area of ED where fewer patients require continuous monitoring.

Discussion

Full-size, multiparameter monitoring equipment is a necessary component in the Emergency Department. One can argue that use of these devices for triage and spot-checking oxygen saturation and pulse has the potential for over-utilization. In this three-month study period, costs of disposable sensors were decreased by 48% when a reusable, fingertip device was made available in addition to the standard monitors. This decrease in disposable sensor costs was observed in conjunction with a slight patient census increase over the same time period.

In addition to direct costs of disposable sensors, there is the indirect cost of staff time to find or wait for availability of shared devices and time to attach the monitor to the patient.

The cost-savings noted must be offset by the initial start-up costs of purchasing the fingertip oximeters. We chose to supply each staff with a personal device (70 units at start-up). With this start-up model of a single device for each caregiver on staff and a suggested retail price of $395 per Onyx II, we estimate that the sensor savings would offset cost of the fingertip devices in less than two years. A more cost-sensitive model would be to equip the department to allow for one device per caregiver during a shift.

The study was conducted in a level II trauma center that has state-of-the-art equipment available in every room. We would anticipate the utility, time savings and patient care enhancement to be even greater in facilities with less equipment routinely available, such as small, rural facilities.

The greatest advantage of Onyx II was noted when a pulse oximeter was necessary in the peripheral areas of the ED – in the waiting room, during triage, in hallways and when transporting patients. This was especially true in the waiting room and triage area where staff reported faster evaluation of patients and more frequent pulse oximeter evaluations. Together, this allows for staff to address more critical patients sooner.

The size of the Onyx II allowed each caregiver to conveniently carry a device. This resulted in quick and efficient monitoring of patients. Time savings were noted by 76% of caregivers as a result of decreased search time for portable equipment and quick attachment to patients. Time saved by not having to look for equipment can be spent providing direct patient care. Onyx II is also quickly cleaned between uses.

"Picks up O_2sat when hardwired one doesn't."

Onyx II's ability to provide quick and accurate readings in a wide range of patients and settings proved valuable. Onyx II's design allows for accurate use in pediatrics and low perfusion patients. The facility continues to use the Onyx II devices on nearly all pediatric patients, regardless of the availability of the multiparameter monitors. The pediatric patients found the device interesting and less intimidating. With recommended finger size ranging from 0.3 inches to 1.0 inches (0.8 – 2.5 cm) in thickness, we found Onyx II able to accommodate the typical pediatric patient's finger without problems.

"Good for pediatric patients - less threatening and no wires."

We originally hypothesized that patient care would not be hindered. However, we were able to demonstrate a sense of enhanced patient care. In addition to the ability to have a quick and efficient reading, the fingertip device was utilized in situations in which the multiparameter devices would not be feasible. This included transportation and situations where expanded diagnostics were necessary during ambulation (e.g. "road tests"). Onyx II was utilized as a "second opinion" when the readings from the multiparameter monitor were in question.

Anecdotally, caregivers reported a confidence in Onyx II readings being more consistent with the clinical signs and symptoms of the patients. This assessment was based on caregiver assessment of clinical signs and symptoms. Similarly, Onyx II provided assessments when the multiparameter units failed to register a reading due to low perfusion or monitor malfunction.

"[I] have used [Onyx] to double check unusually low readings on room pulse ox [and it] seemed to correlate with my results"

CONCLUSION:

The addition of Nonin's Onyx II, a small, fingertip pulse oximeter, to the ED setting results in a 48% reduction in disposable sensor costs, time savings of 26 minutes per caregiver per shift and patient care enhancement. Caregivers reported satisfaction with ease of use and convenience of Onyx II.

"When you need it, you need it & these are fast and reliable."

ACKNOWLEDGEMENTS:

This project was supported by Nonin Medical, Inc. Minneapolis-based Nonin, a privately owned company specializing in the design and manufacture of physiological monitoring solutions, distributes its products to health and medical professionals in more than 125 countries and to over 90 OEM partners. Since 1986, Nonin has developed a broad product line of pulse oximeters, capnographs, sensors, accessories and software for use by medical professionals. Its industry-leading capabilities in signal processing, sensor design and an innovative combination of features not available in competitive products are the foundation of its success.

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