

SAFE PRACTICES *in Patient Care*

Helping to promote a culture of safety

Inadvertent feeding tube placement into the lung results in patient discomfort, increased morbidity (and potential mortality), delayed enteral feeding, increased length of stay, all of which results in increased healthcare costs. Currently, at most institutions, clinicians place feeding tubes at the bedside followed by abdominal radiograph confirmation, and in more difficult cases, fluoroscopy is used. The Medical Intensive Care Unit (MICU) at the University of Virginia had previously developed and tested a procedure using a capnograph to detect end-tidal CO₂ during gastric tube insertion. Subsequently, they extended the work by testing the efficacy of a colorimetric CO₂ detector as an accurate substitute for the capnograph. In this issue of *Safe Practices*, Suzi Burns describes the University of Virginia study and how it changed the standard of practice at her institution.

Recognizing that health care errors seriously harm one in every 10 patients around the world, the World Health Organization (WHO) has designated the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the Joint Commission International (JCI) as the world's first WHO Collaborating Centre dedicated solely to patient safety. This action is aimed at reducing the unacceptably high numbers of serious medical injuries around the world each day. *Safe Practices* interviewed Peter Angood, MD, and Laura Botwinick, co-directors of JCI Center for Patient Safety, about the mandate and direction of this relatively new US-based agency and the WHO/JCI initiative.

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Keeping patients safe: Assuring that feeding tubes stay out of the lung

by *Suzanne M. Burns RN, MSN, RRT, ACNP, CCRN, FAAN, FCCM, FAANP*

Keeping patients safe during blind bedside gastric tube placement (i.e., avoiding serious complications such as infusion of feeding solutions into the lung and pneumothorax) is a goal of procedures and policies developed for the technique. Despite the prevalence of gastric tube placement, especially in critical care, no definitive bedside confirmatory method has been determined. Instead a number of techniques have been described and include traditional methods such as auscultation following injection of an air bolus, placement of the end of the tube in water to check for bubbling, and pH and bilirubin testing.¹⁻⁸ While many practitioners still use chest or abdominal radiographs to confirm placement of the tubes, the films may be misread, especially if the person reading the film is not practised. Fluoroscopy or endoscopy, although generally considered the gold standards for accurate tube placement, are expensive and time consuming.⁹⁻¹¹

Other methods to improve the safety of gastric tube placement have been suggested. Marderstein et al created a specialized placement team and used a protocol.¹² They report a significant reduction in procedure-related pneumothorax (from 39% to 9%, $p < 0.05$) using the method.

Other investigators have suggested the use of capnography or colorimetric CO₂ sensing devices for gastric-tube placement as a means of increasing safety.¹³⁻¹⁶ The rationale is straightforward and logical. Because the two types of technology both identify the presence of CO₂, a positive reading is consistent with airway or lung cannulation.

Unfortunately the studies are small in number and have been performed mostly with mechanically ventilated patients.

Capnography and colorimetric CO₂ sensing devices

In an effort to decrease the incidence of lung placement of blindly inserted gastric tubes, our adult medical intensive care unit (MICU) sought to improve our assessment technique by using capnography during placement. We reasoned that when gastric tubes were inadvertently placed in the airway or lungs, a CO₂ reading and/or waveform might be detected. To that end we developed and tested a procedure using an end-tidal carbon dioxide device (i.e., capnograph) during tube placement.¹⁷ Our hypothesis was that the capnograph could detect CO₂ during the procedure, thus identifying airway cannulation.

The study, described in detail elsewhere,¹⁷ used a portable hand-held capnograph (Tidal Wave Model 610, Novamatrix Medical Systems) adapted to connect with the ends of gastric tubes during placement to detect CO₂ and thus potential airway cannulation. The technique worked well in adult MICU patients and was adopted as the standard for placement of all gastric tubes in our 16-bed unit. The use of capnography did not change the actual tube placement technique but was an adjunct to improve the safety of the procedure. The unit's policy for verification of tube position also remained the same: placement of SALEM SUMP (SS) tubes was confirmed by air bolus



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The New WHO and JCAHO Patient Safety Initiative: An Interview with Dr. Peter Angood and Laura Botwinick

Recognizing that healthcare errors seriously harm one in every 10 patients around the world, the World Health Organization (WHO) is designating the Joint Commission on Accreditation of Healthcare Organizations and Joint Commission International (JCI) as the world's first WHO Collaborating Centre dedicated solely to patient safety. This action is aimed at reducing the unacceptably high numbers of serious medical injuries around the world each day.

In this issue, *Safe Practices* interviews Peter Angood, MD, and Laura Botwinick, co-directors of the Joint Commission International Center for Patient Safety, about the mandate and direction of this relatively new US-based agency and the WHO/JCI initiative

What is the Joint Commission International Center for Patient Safety? What is the mission of this agency?

Laura Botwinick: The Joint Commission International Center for Patient Safety is a joint venture between the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the Joint Commission International (JCI). Many people are familiar with JCAHO. The Joint Commission International (JCI) is the name that JCAHO's wholly owned subsidiary, Joint Commission Resources (JCR), uses in the international arena. JCR is a not-for-profit organization whose mission is to disseminate information regarding quality, safety and accreditation. This organization is responsible for setting international standards and creating international accreditation programs.

The mission of the JCI Center for Patient Safety is to continuously improve safety in all healthcare settings. It focuses on work-

ing internationally to develop patient safety solutions.

Peter Angood: JCAHO is the primary accreditation agency for US healthcare. It has been focused on patient safety issues for more than a decade. It has been making changes and improvements, but despite that, occasionally you need other agencies and organizations to precipitate change. The Institute of Medicine reports served that purpose back in 1989 and 2000. The focus on patient safety has persisted since that time, and as the Joint Commission continued with this mission, it decided that it was important to form the JCI Center for Patient Safety in collaboration with Joint Commission Resources.

Laura Botwinick: The Center was established to put an umbrella over all patient-safety activity at JCI and JCAHO. JCAHO and JCI have been doing great work in the area of patient safety for over a decade and are leaders in this area. The idea for the Center was to add coordination to those efforts and to highlight, then extend those activities into solutions.

Importantly, we will work in collaboration with other leading organizations in the USA and internationally to identify solutions to patient safety problems. We will work with leading organizations in the USA and leading accrediting bodies and patient safety agencies around the world, including ministries of health and others in the World Health Organization (WHO) network, to identify patient safety problems in different regions of the world, and to identify current solutions that might be spread from one region to another, so that we might all benefit from the great work that has been done worldwide. In other words, we're going to work with these agencies to identify where gaps exist then work to develop solutions.

Peter Angood: Our primary focus is to improve patient safety in all healthcare settings. It's as simple as that.

What challenges do you face as you go forward with this mandate?

Laura Botwinick: One of our challenges will be to adapt patient safety solutions to different regions of the world — to understand how these solutions can be implemented in developing and developed countries and to adapt solutions to different cultures and healthcare settings.

Peter Angood: There's lots of good care out there, but the percentage of times that poorer outcomes are occurring is higher in healthcare than in other industries, so we need to make those improvements.

Here we are — several years after gaining recognition that healthcare doesn't necessarily guarantee quality and patient safety — getting the workforce in healthcare to recognize that improvements need to be made in the processes of care, but also getting the practitioners and the patients themselves to recognize that changes in healthcare need to occur and that these are primarily system-oriented and organizational-oriented problems and not so much issues related to an individual with bad knowledge, bad ideas or bad practices. It's really a social change that's required overall, and that's our biggest challenge.

Once practitioners and patients in hospital settings recognize that change is needed and change is important, then we'll be able to help to precipitate that change.

How will the Center benefit from past experience in the USA when implementing practical and successful patient safety strategies worldwide?

Peter Angood: The Joint Commission has over 50 years of this accreditation, survey and review process. It has been setting standards, developing measure sets, researching, managing and evaluating complex patient- and hospital-level data for that entire time. That's a long legacy of experience.

Healthcare systems in the United States and other countries, such as Mexico, Canada and the United Kingdom (UK) have fairly common problems. All of the experience that the Joint Commission has gained over time

is readily applicable and transportable to the international arena.

As well, several other initiatives are going on internationally. The UK, European Union, Canada, Australia and New Zealand are all involved or interested in patient safety efforts. Learning how to work with other agencies and initiatives is part of this process.

Will information from the Sentinel Events Database be used on the international scale as a guideline to establish initiatives in other countries?

Peter Angood: The Sentinel Events Database, for over a decade, has gathered information on the more complex and egregious events that have occurred in our accredited hospitals. The national patient safety goals are developed, in essence, through a peer review process, in part related to the Sentinel Events database but also in part through experts who provide input as to what are the topical issues in healthcare, and those goals are field-reviewed and field-tested on an annual basis. Those become focus areas for accredited hospitals in the United States. Some healthcare systems around the world take on the internal challenge of trying to meet US-based standards. They focus on those national patient safety goals as a way to improve the processes of care in their own countries.

In our evaluations of the database, we've found that communication is consistently the number-one problem in patient safety. Other important problems are patient assessment as well as orientation of the workforce — nurses, respiratory therapists and physicians. Those are the top three issues. However, within the database, other important areas of focus are medication-related problems, surgery-related problems, infection and disease-related problems. It's easy to focus on the operating room as a source of problems, but it is the actually the systems or processes within the operating room that contribute difficulties relating to patient safety.

Our national patient safety goals continue to address these problem areas. It gets back to human behavior and the systems that humans are working in. If the systems are working properly, then everything is a little less prone to error than it should be.

Which patient safety initiatives does the Center intend to pursue on an international scale?

Laura Botwinick: We're planning to identify from 10 to 12, and perhaps up to 20, solutions that relate to a number of patient safety issues. We are planning to introduce an array of solutions that can make a powerful impact on these areas of focus.

These solutions will specifically address what to do in relation to each problem — for example, wrong-site, wrong-person or wrong-procedure surgery. We know from JCAHO's experience with its national patient safety goals and Sentinel Event Alerts that specific information really does make a difference in resolving patient safety problems.

Will the Center introduce US solutions abroad or will other countries develop their own initiatives under the Center's guidance?

Laura Botwinick: Both. It's meant to be a sharing of information.

Do you have an example of a successful solution that was originally developed by another country that could be disseminated internationally to improve patient safety worldwide?

The National Patient Safety Agency in the United Kingdom (UK) has developed a solution that relates to the correct placement of feeding tubes. This is one of the solutions that we're considering for dissemination globally.

Are there any particular patient safety initiatives that are close to your heart?

Peter Angood: Both Laura and I resonate strongly on wanting to get patients and their families involved, help them to better understand the issues around safe healthcare, and help them to become engaged in the processes of making change occur. I think actually we owe that to the practitioners as well. A lot of changes occur in healthcare as a result of regulation and finances and fee schedules and there's a lot of reaction from healthcare administrators and practitioners, who don't always understand what's going on in their environment.

Practitioners need to be able to better understand the safety issues and change their own practice environments, so they can work better with their patients. If you look after

the patients and practitioners, there will be better, safer care.

Our Center is relatively new, and we are still in the process of prioritizing where areas of focus for solutions should be. We have a long list of 12 to 15 high-priority areas. The other focus for us is to collaborate and partner with other organizations around the world, and the example that Laura gave you is but one example of this. We focused on working with the UK's National Patient Safety Agency to help them disseminate one of their solutions more broadly.

We haven't finalized our list of priorities as yet, but it covers a variety of areas. Many are medication safety-related, some are communication-oriented, and some are infectious disease-related and surgery-oriented — along similar lines as to what you would find in our database.

The Joint Commission developed a universal protocol to avoid wrong-site surgery a few years back and we're going to be extending that into specific solutions for different countries. We're also concerned about the reconciliation of medication and the importance of making sure that occurs properly. We have strong concerns about look-alike, sound-alike medications, which is another area of focus. Believe it or not, the proper identification of patients is still an issue, as is the management of hand-offs — making sure that all of the correct information is given when patients move from one part of the hospital to another or between institutions.

What can you tell us about your affiliation with the World Health Organization.

Laura Botwinick: In August 2005, the WHO designated JCAHO and JCI as the collaborating center for patient safety solutions. That designation charges JCAHO and JCI with identifying, developing and disseminating patient safety solutions. That work is being carried out through the Center. The Center will work in collaboration with other stakeholders. In fact, the Center will have an international oversight group of experts from around the world. They will advise us on what solutions to disseminate. They will examine the details of the solutions themselves. They will advise us on how to adapt solutions.

By virtue of being a collaborating center, we're working with the WHO to utilize their communication infrastructure to connect

with WHO focal points in the 192 member countries. That will be part of our dissemination network. We're also going to use JCI's strong network, which extends into about 80 countries.

All solutions will be field-tested. That's part of the engagement of key stakeholders. Accredited organizations, ministries of health and WHO focal points will be involved in a massive field review of these solutions before they are disseminated. Then focus will be to get that information out there.

For example, we'll take the UK National Patient Safety Agency's solution for the correct placement of feeding tubes, field test it, modify it based on field-testing results, and then disseminate it (see sidebar).

There may be slightly different versions, for different regions of the world. They will be developed under the guidance of the Center's international oversight group and five regional advisory groups, established by JCI in the Middle East, Northern Africa, Africa, Latin America, Europe, and Asia-Pacific.

Other topics under consideration: vincristine administration errors, prevention of concentrated electrolyte solution administration errors, medical devices, mental health, suicide prevention.

How will the JCI Center for Patient Safety operate in other countries?

“For example, we’ll take the UK National Patient Safety Agency’s solution for the correct placement of feeding tubes, field test it, modify it based on field-testing results, and then disseminate it.”

Laura Botwinick

Laura Botwinick : The Center itself is a virtual entity in that the only truly designated staff are Peter, myself and our assistants. Otherwise, the work of the Center is carried out by staff within JCAHO and JCI. We will not have people on the ground in these countries, but we will work with the WHO, ministries of health, JCI-accredited hospitals and other organizations to transmit information.

How do you propose establishing information exchange programs and reporting procedures in third-world countries with radically different healthcare systems than in the United States?

Laura Botwinick: At some level, the individual institutions in those countries need to take responsibility for their own activities. That's where some of the cultural differences come into play. We can, through our Center and through our affiliation with the World Health organization, help to understand those local cultures and help to point them in the right direction as to what works in other environments. We can help them understand how systems can be changed, but it's ultimately up to the individual institutions in those countries to make the changes for themselves.

How will you evaluate the effectiveness of internationally adopted solutions?

Laura Botwinick: We are currently discussing the best way to evaluate the effectiveness and impact of these solutions, but there definitely will be an assessment. That would be the only way to understand what adjustments need to be made to make them more effective in the future.

How do you plan to help healthcare professionals in other countries to overcome the

National Patient Safety Agency (UK) issues new safety advice to NHS on reducing the harm caused by misplaced nasogastric feeding tubes

The National Patient Safety Agency (NPSA) today issued new advice to the NHS on reducing the harm caused by misplaced nasogastric feeding tubes. Nasogastric tubes are used to provide liquid nutrition to patients who have swallowing or feeding difficulties. On rare occasions, tubes can be mistakenly inserted into the lung rather than the stomach without staff, patient or the carer realizing the error. Studies have shown that conventional methods used to check the placement of nasogastric feeding tubes can be inaccurate.

At least 11 patients have died as a result of misplaced nasogastric feeding tubes between December 2002 and December 2004. A further 13 incidents involving nasogastric feeding tubes have been reported to the NPSA's National Reporting and Learning System (NRLS). Of these 13, 11 were classified as causing no harm/low harm to the patient, one moderate harm and one serious harm. The Chief Medical Officer for England, Sir Liam Donaldson, said, "Every year hundreds of thousands of patients benefit from nasogastric feeding when tubes are placed correctly and without incident by healthcare staff and carers.

Incorrect positioning is rare, but can cause serious harm. This alert is another example of the unremitting focus we are putting on patient safety, learning from things that go wrong and using that learning perhaps to save lives of future patients."

The precise number of nasogastric feeds carried out each year is not known. Data are not collected routinely. However, figures from the NHS Purchasing and Supply Agency (PASA), which distributes the feeding tubes, suggests that between 750,000 and 1,000,000 tubes are used per year. PASA distribute approximately 500,000 in the NHS though some trusts make their own purchasing arrangements.

The NPSA alert recommends the methods that should be used to confirm correct placement of the nasogastric feeding tube and asks NHS acute trusts, primary care organizations and local health boards in England and Wales to immediately review their local guidelines for this procedure. They should also carry out an individual risk assessment prior to nasogastric tube feeding, review and agree upon local action required and report

misplacement incidents via their local risk management reporting systems.

Feeding through a nasogastric tube is a relatively common procedure across all age groups who have swallowing or eating difficulties, often after operations. Thousands of these procedures are done daily without incident, providing a vital aspect of care. However, rarely, things do go wrong.

The Patient Safety Research Group at the University of Birmingham has commissioned further research to assess the existing testing methods. This will include specific work on the best methods to test positioning of the tube when used in newborn babies. The NPSA will be collaborating with the Medicines and Healthcare Products Regulatory Agency (MHRA) and industry to identify any further contributing factors.

Further information is available at <http://www.npsa.nhs.uk>

stigma of reporting medical errors in the workplace?

Laura Botwinick: We are finding that this is an important issue in different countries, and it's part of the context that really does need to be addressed as we put solutions out there. As the Center disseminates these solutions, it will also communicate the importance of having a culture that supports patient safety. We'll be talking about a just culture and educating people about how that kind of system needs to be put in place to have safer healthcare.

We talk about these macro issues with other patient safety organizations within the USA and internationally. We'll be working together to figure out how to move forward on some of these big issues, which are truly the backdrop to the successful implementation of solutions.

We're going to learn about the most effective ways to introduce new solutions with the help of people in those countries who know how best to communicate those solutions within their healthcare system.

We will absolutely include a focus on patient education and patient engagement at the Center. The role of patients' families in assuring safe patient care is one of the critical foci of the Center. We will be promoting the Joint Commission's Speak-up campaign internationally. We'll have solutions that are specifically focused on patient engagement. The Center is establishing a patient and family advisory group to advise us on the patients and their significant others roles and, as we develop solutions, how patients and their families can be involved in implementing those solutions. It's a critical component of our work.

Health literacy is another area where adaptation of solutions is key.

How do you encourage an awareness of patient safety in societies that may place a low value on human rights?

Peter Angood: You can't paint the world with one stroke of the brush. It takes a long period of time – generations – to change the ethics, morals and values that individual countries place on the value of human life. It's the equivalent of arguing democracy versus other political systems. It's a slow process of change. All we can do is to highlight the importance of safer care and a higher quality of care. Those individual countries that have

different value systems will choose what they want to do with that information.

Do you have a timetable or list of goals that you would like to achieve by the end of 2006?

Peter Angood: Our two primary focuses are on collaboration and partnering with other organizations, the development of probably a half-dozen solutions for issues in patient safety. That list has not been confirmed as yet.

We will also continue with our matrix organization strategy in the Joint Commission and JCR of trying to promote more in the way of other existing education programs and information on patient safety. We work closely with our research group, and we're expanding that focus and continue to remain tightly involved with public policy and advocacy issues. We've got a healthy agenda, but our initial focuses in this year are collaboration and the development of these solutions.

Dr. Peter Angood is Vice President of JCAHO and Chief Patient Safety Officer of the JCI Center for Patient Safety. A native of Canada, he brings 25 years of clinical experience to the Center. He received his medical degree from the University of Manitoba, Canada, and completed his training in General Surgery, Trauma and Critical Care at McGill University, Montreal, and the University of Miami/Jackson Memorial Hospital. He has worked as a surgeon at hospitals affiliated with McGill University and the University of Pennsylvania. He has held surgery faculty and hospital administrative positions at Yale University and Washington University in St. Louis. He is a Professor of Surgery, Anesthesia, and Emergency Medicine at the University of Massachusetts Medical School and the current president of the Society of Critical Care Medicine. His research has addressed clinical care, injury prevention, outcomes management, resource utilization, medical education, telemedicine technologies and the utility of simulation.

Ms. Laura Botwinick is Vice President for External Relations at JCR, and Co-Director of the JCI Center for Patient Safety. Prior to joining JCR in July 2005, she completed a one-year Fellowship with the Institute for Healthcare Improvement in Boston. While there, she completed the Clinical Effectiveness Program at Harvard School of Public Health. Prior to the fellowship, she served as Director of the Department of Board and Committee Activities at JCAHO. In this role, she managed activities of the 29-member Board and its 12 committees and the 17-member JCR Board and its 5 committees. She was charged with building and maintaining relationships with key stakeholder groups, including the JCAHO Corporate Members, Professional and Technical Advisory Committees and Liaison Network, Public Advisory Group on Health Care Quality, and the Nursing Advisory Council.

Keeping Patients Safe: — Continued

auscultation and/or aspiration of gastric contents, and small-bore (SB) feeding tube placement was verified by x-ray.

Education of staff was relatively easy but did require additional steps in the procedure for gastric tube insertion. For example, the list of supplies included those normally required for tube placement (gastric tube, water-soluble lubricant, gloves, 30-mL syringe, etc.) plus an adaptor for the capnograph and a plastic bag in which to place non-disposable portions of the set-up should the patient be in an isolation room. In addition, in-service education was provided on the use of the capnograph, its maintenance (i.e., battery charging and location), and reading and interpreting results. Since initiation of the unit's policy in 2001, complete airway, cannulation (i.e., the tube was left in the airway) has been eliminated except in a very few situations when the procedure was not followed.

Testing a suitable device

Because of our positive experience with the use of a capnograph to detect airway placement, there was increased institutional interest in making the technique a hospital-wide standard. However, we believed that the technique first needed to be refined so that it would be more acceptable outside a critical-care unit. Our experience with the capnograph had demonstrated that, even in a confined area such as the MICU, the device could be easily misplaced (e.g., left in a room or elsewhere on the unit), could break (necessitating that we borrow a device—if available—from another critical-care unit), and was somewhat cumbersome to use, especially if the patient was in isolation. For these reasons, we believed that it would be difficult and somewhat impractical to implement a similar policy hospital-wide. Thus we sought to determine if a disposable colorimetric CO₂ device (PEDI-CAP, Nellcor Puritan Bennett) would be an equivalent method of sensing CO₂ during gastric-tube placement.

The colorimetric device was available commercially for pediatric intubation and demonstrated the presence of CO₂ by changing color when in contact with the gas. Also important was that it was small, disposable, and easy to interpret (a change from purple to yellow signified the presence of CO₂). In

Adapting the CO₂nfirm Now™ to Clinical Practice: Converting a Health System

Cheri S. Blevins, RN, BSN

Using evidence-based research to provide safe patient care is paramount to positive patient outcomes. After reviewing the results of the colorimetric CO₂ study and development of the CO₂nfirm Now™ device, our health system decided to make a practice change to enhance patient safety during the insertion of gastric tubes. We now require the use of this product during gastric tube placement.

The MICU, where this study was performed, piloted the use of this device. Staff members who participated in the study were thrilled to have a ready-to-use product. A unit-based in-service training was provided by Tyco Healthcare Kendall for MICU nursing staff before the pilot project. In the MICU, where previous practice included the use of capnography for gastric tube placement, initial evaluations described ease and convenience of use.

To promote the new safety practice throughout the health system, nurse champions were identified for all in-patient nursing units. An educational session for the nursing champions was held. The study design and results were presented to all the participants and suggestions were tailored to meet their specific needs. Additionally, along with a company representative, study team members gave hands-on instruction for appropriate use of the device. Importantly, emphasis was placed on the device's safety features.

Individual healthcare provider technique for gastric tube placement is not usurped by use of this device. It is solely an adjunct that provides an early cue to inadvertent airway cannulation. This was stressed to all who attended the learning sessions. We repeatedly reinforced that the best procedure for gastric tube insertion must be followed in addition to the procedure for use of the CO₂NFIRM™ Now® device.

After nurse champions were educated and study members were identified as resources, the task of educating physicians began. A similar strategy for educating the doctors was conducted, again emphasizing how to use the CO₂NFIRM™ to assure safety during placement versus the actual technique for gastric tube placement.

Roll out of the new protocol continues in the health system. Adaptations to application in certain practice areas continue to be made. The nurses and physicians now use the CO₂NFIRM™ device to monitor for inadvertent airway cannulation during all gastric tube placements as we continue to strive to keep our patients safe.

Keeping Patients Safe: — Continued

partnership with Tyco Healthcare Kendall, we designed a study to evaluate the PEDI-CAP. The details of the study are described elsewhere.¹⁸

Our task for this study was to assure that while we tested the PEDI-CAP device during placement we did not in any way vary from our unit's standard using the capnograph. Thus, to maintain our unit's policy, the capnograph and the PEDI-CAP device were linked in such a way as to allow simultaneous measurement of CO₂ through the capnograph and detection of CO₂ with the PEDI-CAP during placement. Prior to using the method we assured that flow through the smallest of the tubes (the small-bore [SB] tube with the stylet in place) could be sensed. We confirmed this by inserting the ends of SB tubes into five endotracheal tubes and observing simultaneous readings with the capnograph and the PEDI-CAP. We also used only adult gastric tubes already stocked in our MICU for the study. They consisted of SB feeding tubes (Tyco Healthcare Kendall) size 12 French and SALEM SUMP (SS) tubes (Bard Medical Division) sizes 14-16 French.

A convenience sample of 195 gastric tube insertions (130 patients) was studied. The tubes were placed per hospital procedure with the addition of the in-line combined capnograph-PEDI-CAP apparatus. The apparatus was monitored for any change in CO₂ (capnograph) or change in color (purple to yellow on the PEDI-CAP). If any CO₂

AACN Circle of Excellence Safe Practices Award 2006: University of Virginia CO₂ Research Study

Critical care nurses and AACN chapters that have made a difference in healthcare and their communities are chosen each year to receive the AACN Circle of Excellence Recognition Awards, sponsored by AACN and our Partners with Industry corporations. These awards recognize contributions and achievements that exemplify AACN's mission, vision and ethic of care and applaud excellence. The 2006 Circle of Excellence Safe Practices Award has been given to Suzi Burns and her team at University of Virginia for their research on capnography and CO₂ sensing devices to help identify airway cannulation during feeding tube placement.



CO₂nfirm Now™ Tyco Healthcare Kendall

was sensed, the tube was withdrawn and the colorimetric device was cleared of CO₂. We did this by detaching it from the apparatus and waving it in the air until the purple color returned, denoting the absence of CO₂. Once the tube was inserted in the patient to the desired level without the apparatus sensing CO₂, the apparatus was detached, the gastric tube was given a bolus of 30 mL of air while auscultation was performed, and the apparatus was reattached to ensure that no CO₂ was present on retesting. In addition to consistency with standard gastric tube placement procedure, introducing the bolus of air was important to ensure that the tube was patent and that CO₂ could be sensed if present. Tube placement was verified per the unit's policy (as described earlier). The study demonstrated that the colorimetric CO₂ device sensed the presence of CO₂ in 100% of insertions where CO₂ was sensed by the capnograph.

Keeping patients safe

In this study a colorimetric sensing device identified the presence of CO₂ during gastric tube insertion in 100% of insertions where CO₂ was sensed by a capnograph (our unit's gold standard). However, despite the study findings, the use of either the capnograph or a colorimetric CO₂ sensing device does not obviate the need for skilled placement or verification of placement by adherence to hospital policy. There is no substitute for skill and knowledge and no procedure is absolutely failsafe! Any method using CO₂ sensing in addition to standard gastric tube placement procedure must assure that those using the technique do not rely solely on the CO₂ indicator to determine safe placement. For example, tubes can become obstructed during placement (due to kinks, secretions, etc.) and CO₂ will not be detected. Therefore, as done in our study, introducing a final

bolus of air to assure patency and performing an additional check with the CO₂ sensing device is essential.

It is also important to understand that CO₂ may be sensed if the tube is advanced very slowly and air from the lungs escapes around the endotracheal tube, or if the patient is breathing spontaneously during tube advancement. In these cases, it is important to stop tube advancement at approximately 30 cm (12 inches), to introduce a bolus of air into the colorimetric device and the gastric tube (to clear the device of CO₂ and the tube of secretions,) and to check again. Stopping at 30 cm seems reasonable, since that depth is adequate for placement in the trachea but not deep enough to be in the lungs.

A false positive may also be possible when a carbonated beverage and/or medications are consumed prior to tube placement. A history of medications and food intake would help to alleviate any confusion. If physical assessment findings do not match the reading of the colorimetric device, more definitive verification is essential.

It is our conclusion that adding CO₂ sensing (with either a capnograph or a colorimetric indicator) to the procedure for gastric tube placement greatly increases patients' safety and should be considered a standard of care. We also conclude that a colorimetric CO₂ sensing device (CO₂N-FIRM NOW™) is a reasonable and practical substitution for a capnograph and may help keep patients safe by preventing inadvertent gastric tube placement into the lung.

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Suzanne M. Burns, RN, MSN, RRT, ACNP, CCRN, FAAN, FCCM, FAANP has been awarded the nursing profession's highest honors — becoming a Fellow in the ANA, AANP and CCM — in recognition of her many years of contribution to nursing education, research and clinical practice. Her research work has focused on improving outcomes in the ICU including ventilator management, ventilator weaning, inadvertent tube placement, reducing the risk of ventilator-associated pneumonia. She has published over 100 studies in peer-reviewed journals, has written and/or contributed to over 100 books or chapters. Ms. Burns is one of the most sought-after lecturers at both national and international nursing meetings.

Cheri S. Blevins, RN, BSN, CCRN, is a graduate of the University of Virginia School of Nursing in Charlottesville, VA. She is a Clinician 4 in the medical intensive care unit and nurse educator for the University of Virginia Health System. She is a member of the AACN Research Work Group for 2005-2006 and is the secretary for the Monticello chapter of the AACN.

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Upon completion of this offering the learner will be able to:

- discuss the relationship between the Joint Commission International Center for Patient Safety and WHO.
- describe the challenges for the Joint Commission International Center for Patient Safety.
- describe the role of capnography and colorimetric CO₂ sensing devices in determining placement of feeding tubes.
- list the advantages and disadvantages of using capnography for checking the placement of gastric tubes

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1. **The primary focus of the Joint Commission International Center for Patient Safety is:**
 - a) to provide accreditation to healthcare organizations worldwide
 - b) to eliminate the Joint Commission on Accreditations of Healthcare Organizations in the U.S.
 - c) to improve patient safety in all healthcare settings
 - d) all the above
2. **One challenge facing the Joint Commission International Center for Patient Safety is:**
 - a) obtaining cooperation from the JCAHO
 - b) adapting patient safety solutions to different regions of the world
 - c) the group does not feel that there will be any changes
 - d) patient safety issues are not a world wide problem
3. **The National patient safety goals are developed through a peer review process with information received from the sentinel event database, and topical issues in health.**
 - a) true
 - b) false
4. **The number one problem in patient safety is:**
 - a) accountability
 - b) infections
 - c) lack of standards
 - d) communication
5. **One role of WHO will be to:**
 - a) Conduct surveys in foreign hospitals
 - b) Develop patient safety goals on an international level
 - c) Assist with the dissemination of information
 - d) The WHO does not have a role in patient safety.
6. **A critical component of the program is the creation of a patient and family advisory group.**
 - a) true
 - b) false
7. **One of the goals the group would like to achieve in 2006 are:**
 - a) eliminate medical errors worldwide
 - b) develop 5 new national patient safety goals
 - c) focus on collaboration and partnering with other organizations
 - d) the group has not set goals for 2006
8. **Which of the following is considered a gold standard for checking the placement of feeding tubes?**
 - a) inserting the end of the tube in a glass of water and observing for bubbles
 - b) auscultation of the abdomen following the injection of air through the tube
 - c) chest or abdominal x-rays
 - d) fluroscopy or endoscopy
9. **Capnography or colorimetric CO₂ sensing devices identify the presence of:**
 - a) oxygen
 - b) water
 - c) gastric juices
 - d) CO₂
10. **The advantages of the colorimetric device is that it is small, disposable and easy to interpret.**
 - a) true
 - b) false
11. **It is safe to rely on CO₂ sensing devices as the sole method to confirm tube placement.**
 - a) true
 - b) false
12. **Which of the following is the hypothesis of the University of Virginia study ?**
 - a) Capnograph will not detect CO₂ during tube feeding placement.
 - b) Capnograph will detect CO₂ during tube feeding tube insertion, thus identifying airway cannulation.
 - c) Using capnography will require changes in the technique used to insert gastric tube.
 - d) Capnograph will detect CO₂ during tube feeding tube insertion, thus identifying airway cannulation with only certain patient populations.
13. **Additional supplies needed for gastric tube insertions with capnography include:**
 - a) an adaptor for the capnograph
 - b) plastic Bag for the non-disposable portions for patients in isolation precautions
 - c) both A&B
 - d) none of the above
14. **False positive readings can occur if:**
 - a) carbonated beverages and/or medications are consumed prior to tube placement
 - b) the patient talks during the procedure
 - c) the patient has eaten a meal prior to the tube placement
 - d) the patient swallows during insertion
15. **In addition to communication other top patient safety issues are:**
 - a) problems with assessment
 - b) orientation of the work force
 - c) medication, surgery, infections and other disease related problems
 - d) both A&B

Participant's Evaluation	Mark your answers with an X in the box next to the correct answer																															
<p>What is the highest degree you have earned (circle one) ? 1. Diploma 2. Associate 3. Bachelor's 4. Master's 5. Doctorate</p> <p>Indicate to what degree did this program meet the objectives: Using 1 = strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Strongly Disagree</th> <th style="width: 10%; text-align: center;">Strongly Agree</th> </tr> </thead> <tbody> <tr> <td>1. Discuss the relationship between the Joint Commission International Center for Patient Safety and WHO.</td> <td style="text-align: center;">1 2 3 4 5 6</td> <td></td> </tr> <tr> <td>2. Describe the challenges for the Joint Commission International Center for Patient Safety.</td> <td style="text-align: center;">1 2 3 4 5 6</td> <td></td> </tr> <tr> <td>3. 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