

CRITICAL CARE ALERT®

A monthly update of developments in critical care and intensive care medicine

AHC Media LLC Home Page— www.ahcmedia.com

CME for Physicians— www.cmeweb.com; CE for Nurses— www.ceweb.com



INSIDE

*Stress ulcer
prophylaxis:
Do no harm
page 66*

*Statin therapy:
Not just for
cholesterol
anymore
page 69*

*Special
Feature: Does
brushing
every day
keep VAP
away?
page 70*

Financial Disclosure:
Critical Care Alert's editor, David J. Pierson, MD, nurse planner Leslie A. Hoffman, PhD, RN, and peer reviewer William Thompson, MD, report no financial relationships to this field of study.

Do You Come to Work When You're Sick?

ABSTRACT & COMMENTARY

By David J. Pierson, MD, Editor

Synopsis: Most respondents in this survey of medical students, residents, and staff physicians reported coming to work when they had a respiratory tract infection, with staff physicians most likely to do so.

Source: Gudgeon P, et al. Do you come to work with a respiratory tract infection? *Occup Environ Med* 2009;66:424.

THIS ARTICLE REPORTS ON A QUESTIONNAIRE STUDY ADMINISTERED to medical students, residents in internal medicine and surgery, and staff physicians at the University of Toronto in the summer of 2006. The authors queried the subjects about whether they personally came to work when they had symptoms of a respiratory tract infection, and sought to determine factors that influenced whether they did so.

Gudgeon and colleagues sent their on-line survey to 1202 people, of whom 149/202 medical students (74%), 317/650 residents (49%), and 202/350 staff physicians (58%) responded. Most respondents reported having been ill with symptoms of a respiratory tract infection for 1-2 days or more. Students had, on average, 1.9 more days of illness than residents, who in turn reported 0.9 more illness days than staff physicians, rates that were significantly different. In all three groups, participants reported coming to work when they were sick. Sixty percent of staff physicians indicated that they worked more than 80% of the time when they were sick with a respiratory tract infection; the corresponding proportions of residents and medical students who worked while ill were 51% and 48%, respectively.

Reasons given for staying home from work when ill were similar among the three groups: feeling too sick to work, being concerned about transmitting illness to others, and having obvious symptoms of a respiratory tract infection. However, reasons offered for coming to work despite the illness varied among the groups. Medical students cited extrinsic factors such as a requirement that they produce

EDITOR

David J. Pierson, MD
Professor, Pulmonary and
Critical Care Medicine
Harborview Medical Center
University of Washington,
Seattle

ASSOCIATE EDITORS

Saadia R. Akhtar, MD, MSc
Idaho Pulmonary Associates,
Boise

Kay Ball, RN, PhD, CNOR, FAAN
Perioperative Consultant/
Educator,
K&D Medical
Lewis Center, OH

**Stephen W. Crawford, MD,
CPHRM**
Medical Director, CIGNA LIFE-
SOURCE Transplant Network,
Bloomfield, CT

Dean R. Hess, PhD, RRT
Respiratory Care
Massachusetts General Hospital
Department of Anesthesiology
Harvard Medical School, Boston

Leslie A. Hoffman, PhD, RN
Department of Acute/
Tertiary Care
School of Nursing
University of Pittsburgh

Ruth M. Kleinpell, PhD, RN
Director, Center for Clinical
Research and Scholarship,
Rush University Medical Center;
Professor, Rush University
College of Nursing, Chicago

Andrew M. Luks, MD
Pulmonary and Critical
Care Medicine,
University of Washington,
Seattle

James E. McFeely, MD
Medical Director Critical Care
Units, Alta Bates Summit
Medical Center
Berkeley, CA

Grant E. O'Keefe, MD
Department of Surgery
Harborview Medical Center
University of Washington,
Seattle

Richard J. Wall, MD, MPH
Pulmonary Critical Care & Sleep
Disorders Medicine, Southlake
Clinic, Valley Medical Center
Renton, WA

PEER REVIEWER

William Thompson, MD
Associate Professor of Medicine
University of Washington
Seattle

VOLUME 17 • NUMBER 9 • DECEMBER 2009 • PAGES 65-72

CRITICAL CARE ALERT IS AVAILABLE ONLINE!
www.ahcmedia.com

a note from a physician to be released from duties, and difficulty obtaining such notes to satisfy university requirements. In contrast, staff physicians most often invoked intrinsic factors such as concern for delivering patient care; this was especially true for surgeons, who cited concerns about having to reschedule procedures.

To explore possible factors influencing the decision to stay home or come to work while ill, the authors asked whether the respondents believed in the legitimacy of a colleague's sick day. Substantially fewer students and residents (45% and 49%, respectively) than staff physicians (79%; $P < 0.001$) agreed that the absence was justified. Residents were also more likely to feel annoyed by the absence of a colleague than were medical students or staff physicians. Surgical residents and staff were more likely to come to work when ill than were their internal medicine colleagues (78% vs 50%; $P < 0.001$); surgeons also reported a higher threshold for staying home than did the internists, and were less willing to cover a colleague's workload because of illness.

■ COMMENTARY

This concise (one-page) report confirms several previous studies indicating that as many as 80% of physicians come to work when they are ill. The authors use

the term "presenteeism" — in contrast to "absenteeism" — to describe this phenomenon. They point out that, like other health care workers, physicians are aware that respiratory tract infections are both easily transmitted and a serious problem, especially in the first few days of illness. They urge health care workers who are ill to either stay home or take deliberate precautions (e.g., mask, frequent hand washing, and avoidance of certain patients) to avoid infecting others. They also suggest system changes to make it easier for medical students to be absent when sick, and the development of coverage mechanisms to accommodate the workload of absent residents.

"Presenteeism" can be as big a problem during epidemic influenza or other rampant respiratory tract infection as staff absenteeism. There is no question that absence from work on the part of physicians and other health care workers causes problems for those who are not sick, but it is also important that staff not risk transmitting illness to both patients and colleagues by coming to work when they are ill. For "presenteeism" to be avoided, individual staff members have to be aware of the need to stay home if they fall ill. The system should not present barriers to staying away from work in such circumstances, and must also make the necessary plans and adjustments to continue functioning when this happens. ■

Critical Care Alert, ISSN 1067-9502, is published monthly by AHC Media LLC, 3525 Piedmont Road., NE, Building 6, Suite 400, Atlanta, GA 30305.
ASSOCIATE PUBLISHER: Coles McKagen
DIRECTOR OF MARKETING: Schandale Kornegay
SENIOR MANAGING EDITOR: Paula Cousins
GST Registration Number: R128870672.
 Periodicals Postage Paid at Atlanta, GA 30304 and at additional mailing offices.

POSTMASTER: Send address changes to *Critical Care Alert*, P.O. Box 740059, Atlanta, GA 30374.

Copyright © 2009 by AHC Media LLC. All rights reserved. No part of this newsletter may be reproduced in any form or incorporated into any information-retrieval system without the written permission of the copyright owner.

Back issues: \$40.

Missing issues will be fulfilled by customer service free of charge when contacted within one month of the missing issues date.

This is an educational publication designed to present scientific information and opinion to health professionals, to stimulate thought, and further investigation. It does not provide advice regarding medical diagnosis or treatment for any individual case. It is not intended for use by the layman.

Subscriber Information

Customer Service: 1-800-688-2421

Customer Service E-Mail Address:
 customerservice@ahcmedia.com

Editorial E-Mail Address: paula.cousins@ahcmedia.com

World Wide Web: <http://www.ahcmedia.com>

Subscription Prices

United States

1 year with free AMA Category 1 credits: \$319
 Add \$17.95 for shipping & handling.
 (Student/Resident rate: \$120)

Multiple Copies

Discounts are available for group subscriptions, multiple copies, site-licenses or electronic distribution. For pricing information, call Tria Kreutzer at 404-262-5482.

Canada

Add GST and \$30 shipping.

Elsewhere

Add \$30 shipping.

Accreditation

AHC Media LLC is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

AHC Media LLC designates this educational activity for a maximum of 25 AMA PRA Category 1 Credits™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

AHC Media LLC is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

This activity has been approved for 13.3 nursing contact hours using a 60-minute contact hour.

Provider approved by the California Board of Registered Nursing, Provider # 14749, for 13.3 Contact Hours.

This educational activity is intended for critical care physicians and nurses. It is in effect for 36 months from the date of publication.

Questions & Comments

Please call Paula Cousins, Senior Managing Editor, at (404) 262-5468.

Stress Ulcer Prophylaxis: Do No Harm

ABSTRACT & COMMENTARY

By Saadia R. Akhtar, MD, MSc

Idaho Pulmonary Associates, Boise

Dr. Akhtar reports no financial relationship to this field of study.

Synopsis: A single-center retrospective observational study found that stress ulcer prophylaxis is used in a majority of ICU patients, despite absence of risk factors for stress ulcers.

Source: Farrell CP, et al. Overuse of stress ulcer prophylaxis in the critical care setting and beyond. *J Crit Care* 2009 Aug 14; Epub ahead of print.

THIS STUDY'S PRIMARY AIM WAS TO DOCUMENT THE RISK factors for stress ulcers and the use of stress ulcer

AHC Media LLC

prophylaxis (SUP) in patients upon ICU admission, transfer to the floor, and discharge home. Retrospective chart review was performed of all patients admitted over a 4-month period to the mixed medical-surgical ICU of an academic institution. Exclusion criteria were: age < 16 years, admission diagnosis of gastrointestinal (GI) bleeding, new onset gastroesophageal reflux disease or esophagitis, allergy to H₂ antagonists, and withdrawal of care at admission. Data collected included usual demographics, admission diagnoses, and preadmission medications. Risk factors for stress ulcers were categorized as major (mechanical ventilation or coagulopathy) or minor (sepsis, severe hypotension, acute renal or hepatic failure, severe head or spinal cord trauma, history of GI bleeding, severe burn injury, prolonged major surgery, or high-dose corticosteroids). Patients were classified into four groups: presence of a major risk factor, only minor risk factors, no risk factors, or home use of acid-suppressive medications.

The study included 210 patients; 31 others were excluded per the predefined study criteria. Upon admission to the ICU, 87% of patients received SUP. This figure was > 95% for patients with a major risk factor and > 82% for patients with only a minor risk factor. Of the patients with no risk factors for stress ulcers, 68% received SUP. One hundred ninety patients survived to transfer out of the ICU to the ward; of those with no risk factors for stress ulcers, 60% remained on prophylaxis. One hundred eighty-five patients survived to hospital discharge; of those with no risk factors for stress ulcers, 31% were discharged home on prophylaxis. The authors performed some secondary analyses in attempt to identify potential factors (age, sex, and the previously defined major and minor risk factors for stress ulcers) more likely to be associated with use of SUP; as expected, an association was seen with ventilator-dependent respiratory failure but little other information could be garnered.

■ COMMENTARY

Use of SUP in the ICU has been part of routine practice for about two decades. Progression of untreated stress ulcers to clinically important GI bleeding clearly worsens ICU morbidity and mortality.¹ The strongest indications for SUP are mechanical ventilation > 48 hours and coagulopathy (platelet count < 50,000/m³, International Normalized Ratio > 1.5, or partial thromboplastin time > 2 times the upper limit of normal), as reported in Cook et al's large prospective multicenter observational study.² A variety of smaller (much less robust) studies suggest increased stress ulcer risk in other ICU populations including patients with sepsis,

hypotension, head or spinal cord trauma, multiple trauma, severe burns, and acute renal or hepatic failure; despite limited data, the recommendation to treat such patients with SUP is included in some expert guidelines.³ Furthermore, some experts advocate SUP for ICU patients receiving high-dose glucocorticoids (particularly in combination with other risk factors such as aspirin), those with a prior recent history of peptic ulcer disease or GI bleeding, and prolonged ICU stay (1 week or longer). Finally, there is essentially no evidence to support use of stress ulcer prophylaxis in non-ICU hospital patients.⁴

In comparing medications available for SUP, H₂ blockers have been shown to be more effective than sucralfate and both appear superior to antacids alone; it remains unclear whether proton pump inhibitors are superior or simply equivalent to H₂ blockers. Enteral nutrition may reduce the risk of stress ulceration with clinically important GI bleeding; however, it is unknown whether enteral nutrition alone gives protection equivalent to that offered by acid-suppressive agents.⁵

Farrell et al's report reiterates what has been described previously by other authors. Intensivists are appropriately treating the majority of at-risk patients with SUP; we are also unnecessarily treating a large number (more than two-thirds in this study) of other patients. This excess administration of stress gastritis prophylaxis in the ICU and non-ICU settings is not benign. Patients are placed at risk of common side effects of SUP medications (for example, altered mental status with H₂ antagonists, or diarrhea and other GI upset with proton pump inhibitors), as well as medication interactions and frank allergic reactions. There is evidence to suggest that increased nosocomial pneumonia may be seen with use of certain medications for SUP.⁶ In addition, inappropriate medication prescription poses significant economic burdens to hospitals and individuals.⁴

It behooves all of us to do no harm; Farrell et al have reminded us that we must examine our practices and use SUP only for those ICU patients expected to reap benefit. ■

References

1. Cook DJ, et al. The attributable mortality and length of intensive care unit stay of clinically important gastrointestinal bleeding in critically ill patients. *Crit Care* 2001;5:368-375.
2. Cook DJ, et al. Risk factors for gastrointestinal bleeding in critically ill patients. Canadian Critical Care Trials Group. *N Engl J Med* 1994;330:377-381.

3. Dellinger RP, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008. *Crit Care Med* 2008; 36:296-327.
4. Grube RR, May DB. Stress ulcer prophylaxis in hospitalized patients not in intensive care units. *Am J Health Syst Pharm* 2007;64:1396-1400.
5. Cook D, et al. Risk factors for clinically important upper gastrointestinal bleeding in patients requiring mechanical ventilation. Canadian Critical Care Trials Group. *Crit Care Med* 1999;27:2812-2817.
6. Kallet RH, Quinn TE. The gastrointestinal tract and ventilator-associated pneumonia. *Respir Care* 2005; 50:910-921.

Both Hyponatremia and Hypernatremia at ICU Admission Predict Poor Outcome

ABSTRACT & COMMENTARY

By David J. Pierson, MD, Editor

Synopsis: In this study of initial serum sodium values in more than 150,000 adults admitted to ICUs, both hyponatremia ($Na < 130$ mmol/L) and hypernatremia ($Na > 150$ mmol/L) were associated with substantially increased ICU and hospital mortality.

Source: Funk GC, et al. Incidence and prognosis of dysnatremias present on ICU admission. *Intensive Care Med* 2009 Oct 22; Epub ahead of print.

IN THIS STUDY USING A LARGE DATABASE OF ADULT patients admitted to 77 ICUs in Austria from 1998 through 2007, Funk and colleagues examined the association between initial values for serum sodium (either below or above the normal range of 135-145 mmol/L) and the outcomes of ICU and hospital stays. From 176,703 admissions to the ICUs contributing to the database, the authors excluded 8509 readmissions, 3292 patients < 18 years of age, and 13,416 patients who lacked a recorded hospital outcome, a valid SAPS II score, or an admission sodium value, but included data on all others. This left 151,486 patients for analysis. Considering the serum sodium value that deviated most from the predicted normal value of 140 mmol/L during the first 24 hours in the ICU, there were 26,782

patients (17.7%) with hyponatremia ($Na < 135$ mmol/L), 114,170 patients (75.4%) with normonatremia, and 10,534 patients (6.9%) with hypernatremia ($Na > 145$ mmol/L).

Most patients had initial serum sodium values in the normal range. Hyponatremia was 2.5 times more common than hypernatremia. Most hyponatremic patients (78%) were classified as borderline, with $Na = 130$ - 135 mmol/L; while 15% had mild hyponatremia ($Na = 125$ - 130 mmol/L) and 7% were severe ($Na < 125$ mmol/L). Of the patients with initial sodium values that were abnormally high, 73% were borderline ($Na = 145$ - 150 mmol/L), 18% were mild ($Na = 150$ - 155 mmol/L), and 9% were severe ($Na > 155$ mmol/L). Statistical evaluation of the seven categories of admission sodium (from severe hyponatremia to severe hypernatremia) revealed a U-shaped curve with respect to hospital mortality. That is, with normonatremia taken as 1.00, odds ratios for death during the hospitalization were 1.32, 1.89, and 1.81 for borderline, mild, and severe hyponatremia, respectively, and 1.48, 2.32, and 3.62 for borderline, mild, and severe hypernatremia, respectively. Hospital mortality was 14.6% for normonatremic patients, 32.9% for mildly and 33.6% for severely hyponatremic patients, and 45.3% and 57.8% for mildly and severely hypernatremic patients, respectively. Using the initial serum sodium value as an indicator, without attempts to account for potential confounders, and compared to a mortality of roughly 15% for normonatremic patients, hospital mortality was about 33% for patients with $Na < 130$ mmol/L, and more than 50% for patients with $Na > 150$ mmol/L. Multiple regression analysis suggested that hyponatremia and hypernatremia were independent risk factors for mortality.

■ COMMENTARY

This is the largest study reported to date that associates initial derangements in serum sodium values with outcomes in critically ill patients. It does not prove that an abnormal sodium level increases mortality in and of itself, but the relationship between sodium levels and mortality persisted with all of the adjustments the authors made for patient demographics and severity of illness. It also does not say anything about the treatment of hyponatremia and hypernatremia, and specifically that optimal correction of these electrolyte abnormalities would improve the results observed here. However, in a large cohort of mixed adult ICU patients with the full spectrum of medical and surgical diagnoses, it confirms previous associations between the presence of substantially abnormal serum sodium values on ICU admission and the likelihood of in-hospital mortality. ■

Statin Therapy: Not Just for Cholesterol Anymore?

ABSTRACT & COMMENTARY

By Andrew M. Luks, MD

Pulmonary and Critical Care Medicine,
University of Washington, Seattle

Dr. Luks reports no financial relationship to this field of study.

Synopsis: *This retrospective cohort study demonstrated that statin use was associated with a reduction in mortality in patients with severe sepsis (APACHE II > 24), but had no effect on mortality in those with less severe disease.*

Source: Dobesh PP, et al. Reduction in mortality associated with statin therapy in patients with severe sepsis. *Pharmacotherapy* 2009;29:621-630.

IN ADDITION TO THEIR CHOLESTEROL-LOWERING PROPERTIES, hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase inhibitors, commonly referred to as statins, have been shown to modify inflammatory and immunologic pathways. Given the role that inflammation and immune responses play in the pathophysiology of sepsis, questions have been raised about whether these medications may have a role in the management of patients with this disorder. Building on earlier retrospective studies suggestive of a benefit in this regard,^{1,2} Dobesh and colleagues sought to determine whether statin exposure affected mortality in patients with severe sepsis.

To investigate this question, they conducted a single-center, retrospective cohort study. They reviewed data from patients 40 years or older with a confirmed diagnosis of sepsis admitted to a medical-surgical ICU over a 2-year period. Patients < 40 years of age were excluded because they were unlikely to be on statin therapy. Potential cases were identified based on ICD-9 CM codes noting the presence of infection and acute organ dysfunction. Patients from that group were then selected for inclusion in the study if they had two or more criteria for SIRS (systemic inflammatory response syndrome) within a 24-hour period. All septic patients at the institution were treated with a standard approach using a protocolized version of early goal-directed therapy. Patients were considered exposed to statins if they were receiving a statin-containing product at the time of

admission or if they were prescribed one during hospitalization. The primary outcome measure was inpatient mortality, while secondary outcomes included hospital and ICU length of stay and total hospital costs. Severity of illness was measured using APACHE II scores, and multiple potential confounding variables including age, comorbid conditions, concomitant drugs, vital signs, and laboratory values were controlled for in the statistical analysis.

A total of 188 patients (4.9% of admissions) had sepsis during the study period and were included in the analysis. Sixty (32%) of these patients were exposed to statins while the remaining 128 (68%) had no exposure. The two groups were relatively well matched, but the statin-exposed group had more hypertension, diabetes, chronic kidney disease, and coronary artery disease and the non-exposed group had more liver disease. In-hospital mortality was significantly lower in the statin-exposed group (31.7% vs 48.4%; $P = 0.04$). The mortality benefit was also observed in multivariate analysis, as the adjusted odds ratio for mortality with statin exposure was 0.42 (95% confidence interval, 0.21-0.84; $P = 0.014$). When the authors analyzed outcomes based on the severity of illness, however, a mortality benefit was only observed in those patients with APACHE II scores > 24; no significant differences were observed in those with less severe disease. Of note, even in those patients in whom statins were discontinued at the time of admission, there was a nonsignificant trend toward improved mortality compared to those with no statin exposure (27.6% vs 48.4%; $P = 0.06$). There were no differences in hospital or ICU length of stay and hospital costs between the statin-exposed and non-exposed patients.

■ COMMENTARY

I must admit that I have often looked askance at residents I am supervising when they report during morning rounds that they continued many outpatient medications on admission that seemed unrelated to the patient's severe acute illness. The study by Dobesh and colleagues suggests that perhaps there are benefits to continuing one class of medications that I usually lump into this group — statins — as they may lead to improvements in mortality in patients with severe sepsis.

Continuing a previously prescribed medication, however, is a far cry from ordering statins for all of our septic patients and at present, there are still no data to support this practice. In addition to the fact that this was a relatively small, single-center study with important differences in baseline characteristics between the two groups, it must be remembered that this study, as well as the other studies that have examined the role of

statins in sepsis, used a retrospective design. As the story of estrogen-replacement therapy in postmenopausal women has well demonstrated, many therapies that looked great in retrospective analysis have subsequently not passed muster when subjected to rigorous prospective testing. Nevertheless, the data from these retrospective studies are intriguing and provide a solid rationale for proceeding with prospective, multicenter studies to further investigate the role of this widely used class of medications in a major form of critical illness.

Should prospective, multicenter trials demonstrate a benefit on mortality and other outcomes, statins could represent a useful tool for intensivists, as administering these medications once a day is substantially easier and less costly than, for example, another medication shown to be of benefit in patients with severe sepsis, recombinant human activated Protein C (APC). Unfortunately, at present, statins lack the type of prospective data that support the use of APC and we are simply left with the knowledge that by continuing these medications on admission we are at least not doing harm to our patients and may potentially provide some benefit. ■

References

1. Liappis AP, et al. The effect of statins on mortality in patients with bacteremia. *Clin Infect Dis* 2001;33: 1352-1357.
2. Schmidt H, et al. Association of statin therapy and increased survival in patients with multiple organ dysfunction syndrome. *Intensive Care Med* 2006;32: 1248-1251.

Special Feature

Does Brushing Every Day Keep VAP Away? The Impact of Oral Care on Patients in the ICU

By **Ruth M. Kleinpell, PhD, RN**

Director, Center for Clinical Research and Scholarship,
Rush University Medical Center; Professor,
Rush University College of Nursing, Chicago

Dr. Kleinpell reports no financial relationship to this field of study.

PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA (VAP) is a key area of focus for promoting quality of

care in the intensive care unit (ICU) and best patient outcomes. Use of oral care protocols in the ICU for patients receiving mechanical ventilation has become a standard of care in ICUs based in part on the results of research that have demonstrated decreased oral colonization rates and studies that suggest a potential relationship between poor oral care and increased risk of VAP.

Implications of a New Study Including Electric Toothbrushing

A recently released study from Spain has focused attention on this issue by questioning the assumption that better oral care would improve infection-related outcomes.¹ Pobo et al conducted a randomized clinical trial with 147 patients in a single medical-surgical ICU to assess the impact of the use of 0.12% chlorhexidine every 8 hours (standard group) compared to standard oral care plus the use of electric toothbrushing (toothbrushing group). The results of the study did not demonstrate a significant difference between groups in rates of VAP, mortality, antibiotic-free days, duration of mechanical ventilation, or length of stay.

In the Pobo study, consecutive intubated adult patients were randomized within 12 hours of intubation to oral care with either the 0.12% chlorhexidine oral rinse every 8 hours or oral rinse with the addition of tooth and tongue brushing every 8 hours with an electronic toothbrush. While the general study methods are described and it is indicated that nurses received training for oral care, the duration of toothbrushing is not addressed and the specific oral care protocol is not described, leaving the reader unclear as to the specific components of the toothbrushing intervention. The results of the study must therefore be interpreted with caution, especially as the study was conducted over a 30-month period and fidelity of the intervention or compliance may also have been impacted. The authors acknowledge the study limitations and cite that more frequent or intensive implementation of the intervention may have been more effective.

Effect of Oral Care on Bacterial Colonization

Dental plaque and oral flora have been implicated in the risk of colonization of the oropharynx and the development of VAP. Changes in oral health status have been demonstrated during the first several days of intubation with a decrease in salivary volume, increase in dental plaque, and changes in salivary lactoferrin.² Implementation of oral care protocols has been advocated as a strategy to target removal of dental plaque and minimize colonization and micro-aspiration of microbially rich biofilm. A number of oral care interventions have been examined, including mechanical (toothbrush-

ing) and pharmacological measures (chlorhexidine 0.12%-2%, 2% colistin, or a combination of the two) delivered via rinse, swab, gel, or paste at intervals ranging from every 2 hours to 2, 3, or 4 times a day.³ A systematic literature review of oral hygiene practices for ICU patients receiving mechanical ventilation identified 11 prospective controlled trials, 20 observational studies, and 24 descriptive reports addressing the topic, highlighting the increased focus on oral care in the ICU.⁴

Several studies have demonstrated a benefit of implementing oral care protocols incorporating tooth brushing and oral suctioning, including several randomized clinical trials.⁵⁻¹⁰ Toothbrushing was found to significantly reduce plaque colonization, but 0.12% chlorhexidine swab had no effect in one study,¹¹ while in two other studies, 0.2% chlorhexidine demonstrated reduced positive dental plaque cultures.^{5,12} A meta-analysis of four studies examining the impact of chlorhexidine found beneficial effects on VAP that approached statistical significance ($P = 0.07$).⁸ Additional study on the impact of oral care on oropharyngeal colonization has demonstrated the efficacy of 2% chlorhexidine/2% colistin in reducing both gram-positive and gram-negative bacteria compared to 2% chlorhexidine in reducing gram-positive bacteria.⁶

Effect of Oral Care on VAP Reduction

Several studies have demonstrated reduced rates of VAP with the use of oral care protocols, some in combination with additional focused measures such as head of bed positioning, use of specific endotracheal tubes to minimize aspiration or supraglottic secretions, and aggressive antibiotic stewardship. A randomized controlled trial in 345 neurologic ICU patients using a standardized protocol that included specified durations of toothbrushing every 8 hours, the use of laminated cards with oral care instructions along with oral assessments every 12 hours, replacement of oral Yankauer suction catheters every 24 hours, and the use of audit sheets to track compliance resulted in a significant decrease in VAP rates from 1.72% to 0.62% per 1000 ventilator-days over a 6-month period.¹⁰ A focused performance improvement project that incorporated standardized ventilator weaning, focused attention to head of bed positioning at 30° position, a standard oral care protocol, use of special endotracheal tubes with subglottic suctioning, and use of altered antibiograms resulted in a significant reduction in VAP from 2.7 per 1000 patient-days to 1 per 1000 patient-days.¹³

In addition to reduction in VAP rates, the use of oral care protocols has been linked to cost savings during

ICU hospitalization due to decreased incidence rates of VAP. Implementation of a standardized oral care protocol to assist in prevention of bacterial growth of plaque by using toothbrushing with sodium monofluorophosphate 0.7% paste and brush and subsequent application of a 0.12% chlorhexidine gluconate solution every 12 hours resulted in a 46% reduction in a surgical ICU and an associated cost savings of up to \$560,000 based on the estimated cost per VAP of \$10,000-\$40,000.¹⁴

Interpreting Evidence Related to Oral Care in the ICU

It becomes evident that the use of oral care protocols has been demonstrated to be beneficial in reducing oropharyngeal colonization. While several studies have demonstrated a relationship between oral care and reduction in VAP, additional research is needed,¹⁵ especially in terms of key factors including optimal duration of toothbrushing, frequency of oral care, and measures to ensure standardization of technique. Future studies exploring oral care interventions need to report on the specific measures incorporated, and education and training considerations in order to maximize clinical application and replication of strategies that prove to be efficacious. Targeting reduction in VAP is a recognized area of priority care for ICU patients. Interventions to improve oral care practices can improve patient safety and promote best outcomes for mechanically ventilated patients. ■

References

1. Pobo A, et al. A randomized trial of dental brushing for preventing ventilator-associated pneumonia. *Chest* 2009;136:433-439.
2. Munro CL, et al. Oral health status and development of ventilator-associated pneumonia: A descriptive study. *Am J Crit Care* 2006;15:453-460.
3. Halm MA, Armola R. Effect of oral care on bacterial colonization and ventilator-associated pneumonia. *Am J Crit Care* 2009;18:275-278.
4. Berry AM, et al. Systematic literature review of oral hygiene practices for intensive care patients receiving mechanical ventilation. *Am J Crit Care* 2007;16:552-562.
5. Fourrier F, et al; PIRAD Study Group. Effect of gingival and dental plaque antiseptic decontamination on nosocomial infections acquired in the intensive care unit: A double-blind placebo-controlled multicenter study. *Crit Care Med* 2005;33:1728-1735.
6. Koeman M, et al. Oral decontamination with chlorhexidine reduces the incidence of ventilator-associated pneumonia. *Am J Respir Crit Care Med* 2006;173:1348-1355.

7. Mori H, et al. Oral care reduces incidence of ventilator associated pneumonia in ICU populations. *Intensive Care Med* 2006;32:230-236.
8. Pineda LA, et al. Effect of oral decontamination with chlorhexidine on the incidence of nosocomial pneumonia: A meta-analysis. *Crit Care* 2006;10:R35.
9. Houston S, et al. Effectiveness of 0.12% chlorhexidine gluconate oral rinse in reducing prevalence of nosocomial pneumonia in patients undergoing heart surgery. *Am J Crit Care* 2002;11:567-570.
10. Fields LB. Oral care intervention to reduce incidence of ventilator-associated pneumonia in the neurologic intensive care unit. *J Neurosci Nurs* 2008;40:291-298.
11. Munro CL, et al. Chlorhexidine, toothbrushing, and preventing ventilator-associated pneumonia in critically ill adults. *Am J Crit Care* 2009;18:428-437.
12. Fourrier F, et al. Effects of dental plaque antiseptic decontamination on bacterial colonization and nosocomial infections in critically ill patients. *Intensive Care Med* 2000;26:1239-1247.
13. Weireter LJ, et al. Impact of a monitored program of care on incidence of ventilator-associated pneumonia: Results of a long-term performance-improvement project. *J Am Coll Surg* 2009;208:700-705.
14. Sona CS, et al. The impact of a simple, low-cost oral care protocol on ventilator-associated pneumonia rates in a surgical intensive care unit. *J Intensive Care Med* 2009;24:54-62.
15. Munro CL, Grap MJ. Oral health and care in the intensive care unit: State of the science. *Am J Crit Care* 2004;13:25-34.

To reproduce any part of this newsletter for promotional purposes, please contact:

Stephen Vance

Phone: (800) 688-2421, ext. 5511

Email: stephen.vance@ahcmedia.com

To obtain information and pricing on group discounts, multiple copies, site-licenses, or electronic distribution please contact:

Tria Kreutzer

Phone: (800) 688-2421, ext. 5482

Email: tria.kreutzer@ahcmedia.com

To reproduce any part of AHC newsletters for educational purposes, please contact:

The Copyright Clearance Center for permission

Email: info@copyright.com

Phone: (978) 750-8400

Address: Copyright Clearance Center
222 Rosewood Drive
Danvers, MA 01923 USA

CME / CNE Questions

33. In the study of coming to work despite having a respiratory tract infection, which group was *most* likely to do this?
 - a. Medical students
 - b. Residents
 - c. Both medical students and residents, equally
 - d. Staff physicians
 - e. There were no significant differences among these groups.
34. Risk factors for development of stress ulcers in ICU patients include:
 - a. Age > 60 years
 - b. Mechanical ventilation > 48 hours
 - c. Aspirin administration
 - d. Acute MI
 - e. All of the above
35. In retrospective analysis, exposure to statin therapy before or during admission for severe sepsis was associated with which of the following outcomes?
 - a. Decreased hospital length of stay
 - b. Decreased ICU length of stay
 - c. Decreased mortality
 - d. Increased hospital cost
 - e. Increased incidence of elevations in creatinine kinase
36. Which of the following occurred with use of oral care with 0.12% chlorhexidine and toothbrushing every 8 hours?
 - a. A decrease in antibiotic-free days
 - b. A decrease in the incidence of microbiologically documented VAP
 - c. A decrease in days of mechanical ventilation
 - d. No difference in VAP rates compared to the use of 0.12% chlorhexidine alone

Answers: 33. d, 34. b, 35. c, 36. d.

CME / CNE Objectives

After reading each issue of *Critical Care Alert*, readers will be able to do the following:

- Identify the particular clinical, legal, or scientific issues related to critical care.
- Describe how those issues affect nurses, health care workers, hospitals, or the health care industry in general.
- Cite solutions to the problems associated with those issues.

PHARMACOLOGY WATCH

Supplement to *Clinical Cardiology Alert, Clinical Oncology Alert, Critical Care Alert, Infectious Disease Alert, Internal Medicine Alert, Neurology Alert, OB/GYN Clinical Alert, Primary Care Reports, Travel Medicine Advisor.*

Insulin Regimens in Type 2 Diabetes

In this issue: Efficacy of once-daily insulin, aldosterone use in heart failure, erectile dysfunction Clinical Practice Guidelines, and FDA Actions.

Efficacy of once-daily insulin

Most type 2 diabetics, even those on oral medications, will eventually require insulin for glycemic control. A new study suggests that simple once-a-day insulin may be as effective as more complex regimens. Researchers from England evaluated 708 patients who had suboptimal hemoglobin A1c (HbA1c) levels while taking metformin and a sulfonylurea.

Patients were randomly assigned to receive biphasic insulin aspart twice daily, prandial insulin aspart three times daily, or basal insulin detemir once daily with an increase to twice daily if needed. Sulfonylurea therapy was replaced by a second type of insulin if hyperglycemia became unacceptable during the first year of this study or if HbA1c levels were $> 6.5\%$. Outcomes measures were HbA1c levels, the proportion of patients with HbA1c $\leq 6.5\%$, the rate of hypoglycemia, and weight gain. After 3 years, median HbA1c levels were similar in all 3 groups. More patients had HbA1c levels $< 6.5\%$ in the prandial and basal groups, although more than 80% of patients in the basal group required a second type of insulin. The median number of hypoglycemic events per patient per year during the trial was lowest in the basal group (1.7) compared to the the biphasic (3.0) and prandial (5.7) groups ($P < 0.001$). Weight gain was highest in the prandial group. The authors conclude that the basal or prandial insulin-based regimens added to oral therapy resulted in better HbA1c levels compared to a biphasic insulin regimen. In addition, the basal group also had fewer

hypoglycemic episodes and less weight gain. The authors state that the “results support the initial addition of a basal insulin to oral therapy, with subsequent intensification to a basal-prandial regimen...” (published at www.nejm.org Oct. 22, 2009).

In an accompanying editorial, Michael Roden, MD, points out that regardless of group, most subjects were accelerated to multiple doses of insulin per day. The study was sponsored by a manufacturer of insulin analogues, and only their analogue products were used in the study, whereas current consensus statements recommend regular human insulin. The editorial also points out that blood sugar control is only part of the equation with diabetics. Aggressive blood pressure control and use of statins and aspirin are equally important. Still, more studies are suggesting an early intensification of treatment with insulin may effectively reduce complications in type 2 diabetes (published at www.nejm.org Oct. 22, 2009).

For updated guidelines on the treatment of type 2 diabetes, see the recently released one-page algorithm from the American Association of Clinical Endocrinologists: www.aace.com/pub/pdf/GlycemicControlAlgorithm.pdf. ■

Aldosterone use in heart failure

Aldosterone antagonists are underused in

This supplement was written by William T. Elliott, MD, FACP, Chair, Formulary Committee, Kaiser Permanente, California Division; Assistant Clinical Professor of Medicine, University of California-San Francisco. Dr. Elliott reports no financial relationships with companies having ties to this field of study. Questions and comments, call: (404) 262-5468. E-mail: paula.cousins@ahcmedia.com.

patients with moderate-to-severe heart failure (HF) and systolic dysfunction according to a new study in the *Journal of the American Medical Association*. Aldosterone antagonists (spironolactone and eplerenone) have been shown to be very effective in the treatment of HF such that they were designated class I (useful and recommended) in the recent American College of Cardiology/American Heart Association Chronic HF Guidelines. Despite this, the drugs are underused in eligible patients.

The current study was an observational analysis of more than 43,000 patients admitted to the hospital with HF and discharged home from 241 hospitals participating in the Get With The Guidelines — HF quality improvement registry between 2005 and 2007. Among 12,565 patients eligible for aldosterone antagonist therapy, only 4087 (32.5%) received one of the drugs at discharge. There was wide variation in aldosterone antagonist usage among hospitals (0%-90.6%) and was more likely to be used in younger patients, African Americans, those with lower blood pressure, history of implantable cardioverter-defibrillator, depression, alcohol use, pacemaker implantation, and those having no history of renal insufficiency. Inappropriate use of aldosterone antagonist therapy was low. The authors conclude that use of aldosterone antagonist therapy is underutilized in HF patients, occurring in only one-third of eligible patients, although the rate of use increased gradually throughout the course of the study. They also state that use of evidence-based guidelines in hospitals may be warranted to improve treatment of HF patients (*JAMA* 2009;302:1658-1665).

Many clinicians shy away from use of aldosterone antagonists because of concerns regarding hyperkalemia, especially since many of these patients are also on ACE inhibitors or ARBs. Aldosterone inhibitor use in HF is not part of the Joint Commission/Centers for Medicare and Medicaid Services core performance measures. Regardless, aldosterone antagonists have been shown to benefit patients with HF and they are clearly underutilized. ■

Erectile dysfunction guidelines

The American College of Physicians has published a Clinical Practice Guidelines regarding hormonal testing and pharmacologic treatment of erectile dysfunction (ED) in men. The guideline recommends that clinicians initiate therapy with a PDE-5 inhibitor (sildenafil, vardenafil, or tadalafil) in men who seek treatment for ED and do not

have a contraindication such as concomitant nitrate use. They rate this a strong recommendation with high-quality evidence. The choice of a PDE-5 should be based on preference, including ease of use, cost, and adverse effects profile. The guideline does not recommend for or against routine use of hormonal blood tests or hormonal treatment in the management of patients with erectile dysfunction due to insufficient evidence to determine benefits and harm. The guideline reviewed more than 100 randomized controlled trials that showed that PDE-5 inhibitors improved successful sexual intercourse and improved erections in men with ED (*Ann Intern Med* 2009 Oct 19;). ■

FDA Actions

The FDA has authorized emergency use of IV antiviral peramivir for treatment of 2009 H1N1 influenza in hospitalized patients. The drug is not yet approved for use in this country, but was authorized in response to a request from the CDC. IV peramivir is approved only for hospitalized adult and pediatric patients for whom an IV drug is clinically appropriate because the patient is not responding to either oral or inhaled antiviral therapy, because enteral or respiratory therapy is not feasible, or in adults when a clinician judges that IV therapy is appropriate due to other circumstances. This is the first available IV antiviral available for 2009 H1N1 infections. For more information see www.cdc.gov/h1n1flu/eua/.

The FDA has approved the quadrivalent human papilloma virus (HPV) vaccine (Gardasil®) for use in boys and young men. The vaccine is approved for males ages 9-26 as 3 injections given over a 3-month period. HPV is the most common sexually transmitted disease in the United States with 1 of 500 men infected every year. Previously, the vaccine had only been approved for use in females ages 9-26 years. In related news, a recent study from the National Cancer Institute, CDC, and American Cancer Society has suggested that the vaccine is not cost-effective for women older than age 30 who undergo annual or biennial screening for cervical cancer (*Ann Intern Med* 2009;151:538-545). Similarly, a study from Harvard found that HPV vaccination for 12-year-old girls was cost-effective, but the same vaccination for 12-year-old boys was not (*BMJ* 2009 Oct. 8).

The FDA has also approved a bivalent HPV vaccine for use in females, which protects against HPV types 16 and 18. The vaccine is being marketed as a "cervical cancer vaccine" by Glaxo-SmithKline under the trade name Cevaxix®. ■