CRITICAL CARE ALERT®

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

Thomson American Health Consultants Home Page—http://www.ahcpub.com

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

THOMSON
AMERICAN HEALTH CONSULTANTS

INSIDE

Prediction of Medical Futility By Nurses vs Doctors

ABSTRACT & COMMENTARY

Synopsis: *Utmost caution has to be applied when future quality of life as presumed by nurses and doctors is used as an argument for withholding or withdrawing further treatment.*

Source: Frick S, et al. Medical futility: Predicting outcome of intensive care unit patients by nurses and doctors—A prospective, comparative study. *Crit Care Med*. 2003;31:456-461.

THE DECISION NOT TO PROVIDE A USELESS THERAPY REQUIRES 2 sets of value judgments.[1] First, any assertion that a therapy will be useless is a matter of probability, not certainty. Secondly, usefulness and futility are judged only relative to an end that should be focused on the unique situation and needs of the patient. Ultimately, then, the judgment that further treatment would be futile is not a conclusion. Instead, it should initiate the difficult task of discussing the situation with patients and families.[2] The study of Frick and colleagues reinforces this idea.

Frick et al carried out a study to assess the pattern of the prediction of intensive care patients' outcome with regard to survival and quality of life by nurses and doctors and, second, to compare these predictions with the quality of life reported by the surviving patients. During 1 year, all patients admitted for more than 24 hours to a 6-bed adult medical ICU in Geneva (Switzerland) were included in the study. A prospective daily prognostic judgment on the patient's eventual outcome by ICU nurses and doctors was recorded in a special questionnaire added to the patient's chart. Survival was assessed for all patients at ICU discharge, at hospital discharge, and at 6 months. Quality of life and functional status as judged by the patients were assessed by telephone interviews 6 months after ICU admission.

Data regarding 521 patients including 1932 daily judgments by nurses and doctors were analyzed. Nurses and doctors agreed in their appreciation of eventual futility of medical interventions in the vast majority of patients, but this was the case in only half of their daily judgments. The sicker the patients were, and the

VOLUME 11 • NUMBER 3 • JUNE 2003 • PAGES 25-36

longer they stayed in the ICU, the more these judgments diverged. For instance, there was a divergent opinion between nurses and doctors in 79% of patients with septic shock. Overall, nurses were more pessimistic than doctors.

On the other hand, nurses' and doctors' appreciation of their patients' future quality of life proved to be unreliable. According to Frick et al, only 15% of survivors for whom nurses and 9% for whom doctors had considered treatment eventually futile with regard to the future quality of life reported bad quality of life 6 months later. Moreover, for the 24 patients who qualified their quality of life as "bad" 6 months after ICU, treatment had been judged futile with respect to quality of life in only 8% by the nurses and 4% by doctors and as questionably futile in 25% by the nurses and in 12.5% by doctors.

COMMENT BY FRANCISCO BAIGORRI, MD, PhD

Few will dispute the claim that we do not have an adequate definition of futility, and that it is doubtful we will find one. The study of Frick et al again shows us that health care workers may misunderstand the probability of survival, and may fail to determine what quality of life is acceptable to their patients. Scores based on severity-of-illness models have been developed, but these must be used with caution when applied to individual patients rather than to populations. Moreover, the probability of survival is only one of the factors that must be considered in determining whether intensive care is an appropriate treatment for an individual patient.

The fact of the matter is that withholding and withdrawing life support have become common practice in ICUs in Western countries,[3] but there is substantial variability among individual ICUs. Most of the variability is probably related to differences in the beliefs and behavior of physicians.[4] However, physicians should exercise professional responsibility by not offering invasive interventions at the end of life that promise great harm and no benefit to the patient.

Communication is the key to resolve this dilemma—communication with patients and families and among the ICU team members. Most recent attempts to establish policies in this area have emphasized processes for discussing futility rather than the means of implementing decisions about futility.[2] We should work toward developing a culture and physical environment in the ICU that enhance communication and facilitate comfort of our patients, regardless of whether the probability for cure seems high or nonexistent.[5] It seems to me that this is a prerequisite for shared decision-making about the forgoing of life-sustaining therapy. ■

References

1. Nyman DJ, Sprung CL. End-of-life decision making in the intensive care unit. *Intensive Care Med*. 2000;26: 1414-1420.
2. Helft PR, et al. The rise and fall of the futility movement. *N Engl J Med*. 2000;343:293-296.
3. Esteban A, et al. Withdrawing and withholding life support in the intensive care unit: A Spanish prospective multi-centre observational study. *Intensive Care Med*. 2001;27:1744-1749.
4. Cook DJ, et al. Determinants in Canadian health care workers of the decision to withdraw life support from the critically ill. *JAMA*. 1995;273:703-708.
5. Truog RD, et al. Recommendations for end-of-life care in the intensive care unit: The Ethics Committee of the

Critical Care Alert, ISSN 1067-9502, is published monthly by Thomson American Health Consultants, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.

VICE PRESIDENT/GROUP PUBLISHER: Brenda Mooney.

EDITORIAL GROUP HEAD: Glen Harris.

MANAGING EDITOR: Robin Mason.

ASSISTANT MANAGING EDITOR: Robert Kimball.

SENIOR COPY EDITOR: Christie Messina.

MARKETING PRODUCT MANAGER: Schandale Kornegay.

GST Registration Number: R128870672.

Periodicals postage paid at Atlanta, GA.

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

Back issues: $38.

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@ahcpub.com

Editorial E-Mail Address: robin.mason@ahcpub.com

World Wide Web: http://www.ahcpub.com

Subscription Prices

United States

1 year *with* free AMA Category 1 credits: $279

(Student/Resident rate: $140)

Multiple Copies

1-9 additional copies: $206 each; 10 or more copies: $183 each.

Canada

Add GST and $30 shipping.

Elsewhere

Add $30 shipping.

Accreditation

Thomson American Health Consultants (AHC) designates this educational activity for a maximum of 28 hours in category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity.

Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

This CME activity was planned and produced in accordance with the ACCME Essentials.

AHC is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

AHC is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. Provider approved by the California Board of Registered Nursing, Provider Number CEP 10864, for approximately 16 contact hours.

THOMSON AMERICAN HEALTH CONSULTANTS

Questions & Comments

Please call **Robin Mason,** Managing Editor, at (404) 262-5517 or e-mail at robin.mason@ahcpub.com between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

Statement of Financial Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we disclose that Ms. Ball serves as a consultant to Steris Corp, IC Medical, and AMT-Coherent (Canada), is a stockholder of Steris and SLT, and is on the speaker's bureau of AORN. Dr. Pierson is on the speaker's bureau of GlaxoSmithKline, Boehringer-Ingelheim, 3-M, Bayer, and Astra Zeneca. Dr. Rubenfeld is a consultant to Eli Lilly and is involved in research with the National Institutes of Health. Drs. Baigorri, Durbin, Hess, Hoffman, Johnson, and O'Keefe report no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study. Drs. Crawford, Gladwin, Nanavaty, and Takezawa did not return a 2003 financial disclosure form.

Society of Critical Care Medicine. *Crit Care Med*. 2001; 29:2332-2338.

Pressure Support May Interfere with Sleep

ABSTRACT & COMMENTARY

Synopsis: *Sleep was more fragmented during ventilation with PSV than A/C in a small group of critically ill patients studied with polysomnography. In 6 of the 11 patients studied, central apneas associated with arousals developed while receiving ventilation with pressure support but not while receiving A/C with a backup rate.*

Source: Parthasarathy S, et al. Effect of ventilator mode on sleep quality in critically ill patients. *Am J Respir Crit Care Med*. 2002;166:1423-1429.

Eleven male patients requiring mechanical ventilation were studied during sleep in an ICU under 3 different ventilator conditions. Patients ranged from 49 to 90 years old and suffered from a variety of medical conditions including 6 who experienced congestive heart failure (CHF). The patients were monitored with conventional EEG, rib and abdominal motion sensors, capnography, pulse oximetry, and airway pressure tracings, and sleep patterns were manually scored during 2-hour periods of sleep under each ventilatory condition. Assist-control ventilation (A/C) was adjusted to produce a tidal volume of 8 mL/kg, and the backup rate was set at 4 breaths/min less than each patient's own rate during quiet (awake) breathing. The pressure support (PSV) level was adjusted to produce the same tidal volume (8 mL/kg), and no backup rate was used. In the third ventilatory condition, 100 mL of dead space was added during PSV.

Fragmentation of sleep was common in all patients during all modes of ventilation. Only 4 patients achieved stage 4 sleep (rapid eye movement, [REM]) during any mode, and only 1 achieved REM sleep in all modes. Arousals were the same in PSV and A/C (39 and 35/h) but actually awakenings were more common with PSV (without dead space) than with A/C (39 and 19/h). Adding dead space reduced the number of apneas and awakenings. Five of the 6 patients who developed central apneas on PSV had a diagnosis of CHF. In the 5 patients who did not develop apnea, there was no difference in arousals and awakenings between the different modes of ventilation.

Patients who exhibited the greatest difference in wakefulness during the different modes of ventilation had the lowest ventilatory rates and minute ventilations at rest. Tachypneic patients exhibited little change in wakefulness on any mode. Parthasarathy and colleagues suggest that PSV contributes to wakefulness by producing apneas, which allow more variation in the PCO_2 during sleep than with A/C with a backup rate. Since there was a slightly higher end tidal PCO_2 in the PSV alone group, it was not simply arousal caused by this high PCO_2 that accounted for the differences. Adding the additional dead space returned the patients to the A/C sleep pattern by preventing the apneas.

COMMENT BY CHARLES G. DURBIN, Jr., MD

The greatest value of this study is to emphasize the fact that sleep was not normal for any patient studied. Arousals and awakenings were frequent in all patients. Differences in quality of sleep with different ventilatory modes were most apparent in patients with CHF, a condition known to predispose to periodic breathing patterns.

I have several concerns with this study. Although patients recovering from anesthesia and on vasopressors were specifically excluded, use of sedative drugs was not mentioned in the text. There is a footnote on one of the paper's tables stating that they were all receiving sedatives, but no information about the specific drug classes or doses. There is additional information in the electronic version of this paper that may answer this question but one must pay an electronic subscription rate to gain access to it, and neither I nor my library have such a subscription. This is a very important issue as sedative drugs and narcotics can profoundly affect ventilation and sleep patterns.

Another concern with this paper is that although Parthasarathy et al state that the level of PSV was selected to produce the same 8 mL/kg tidal volume during quiet breathing as during A/C, this may not have been true. Although not statistically different, it appears that the baseline tidal volume was larger during PSV. This difference became even greater during sleep, increasing to almost twice the desired level, suggesting that more pressure was applied than was necessary initially and patients were actually actively resisting this mode of ventilation. The actual level of pressure support for each patient is not stated but the average can be inferred to be between 17 and 20 cm H_2O. It may be that simply less pressure support (ie, a more appropriate level of PSV) would have eliminated any differences seen in wakefulness.

While this paper raises some important and interesting issues related to sleep disturbances in ICU patients, many important details of the study are missing. It would be a mistake to abandon PSV in favor of A/C for presumed sleep benefits in all patients, based on these limited results. However, in those patients with CHF a backup rate may offer some benefit. ■

Practice Guidelines Reduce Unnecessary Testing in the CCU

ABSTRACT & COMMENTARY

Synopsis: *A 3-part intervention (guideline development, computerized order templates, and education) led to an overall 17% reduction in test ordering without a change in clinical outcomes.*

Source: Wang TJ, et al. A utilization management intervention to reduce unnecessary testing in the coronary care unit. *Arch Intern Med*. 2002;1652: 1885-1890.

THE ROUTINE USE OF LABORATORY AND RADIOLOGIC testing has come under increased scrutiny in recent years as a consequence of studies that suggest substantial variation in testing practice with comparable outcomes. While many studies have examined interventions to reduce test ordering, few have been conducted in the ICU, and none were found that targeted coronary care unit (CCU) patients. The study examined outcomes following an intervention designed to reduce test use in 471 patients admitted to a 15-bed CCU over a 6-month period in a large (855 bed) academic teaching hospital.

A multidisciplinary team (cardiologists, internist, medical intensivist, CCU nurses) developed guidelines using evidence-based recommendations when possible and expert opinion otherwise. The guidelines were incorporated into the CCU's computer order entry template and presented to the house staff and nursing staff by the CCU director and a cardiology fellow. House staff were encouraged, but not required, to use the guidelines. Outcomes during the 3-month intervention period (n = 225 patients) were compared with the same 3-month period during the prior year (n = 246 patients).

No significant differences were seen in patient demographics or severity of illness between the 2 periods. During the intervention period, significant reductions were noted in the ordering of all chemistry tests, with the largest ordering reductions occurring in calcium, magnesium, and phosphorus ordering (40%, 31%, and 40%, respectively). Reductions in the ordering of other tests ranged from 7% for serum chloride to 23% for serum potassium. Nonsignificant reductions were seen in the ordering of complete blood counts ($P = 0.34$), arterial blood gases ([ABGs], $P = 0.07$), and chest radiographs ($P = 0.10$). When all tests were considered together, the estimated reduction was 17% ($P < 0.001$). There were no significant differences in hospital mortality, readmission to the CCU or hospital, or days of ventilator support between the 2 groups.

■ COMMENT BY LESLIE A. HOFFMAN, PhD, RN

The basic concept underlying the use of guidelines or protocols is that routine patient management can be improved when interdisciplinary teams of clinicians use evidence-based protocols to complement their clinical judgment. In the critical care setting, patients are likely to receive a large panel of "routine" daily tests based on the assumption that they will benefit from this increased surveillance. This study examined the potential to reduce such testing through evidence-based guidelines that provided specific recommendations for when routine testing was indicated and when this testing could be eliminated.

The intervention was associated with an overall reduction in test ordering. Importantly, this reduction was not associated with a measurable change in clinical outcomes. The intervention developed by the research team was designed using a behavioral model that suggests that such interventions will be most effective if they target attitudes or knowledge (predisposing factors), reduce barriers (enabling factors), and include periodic reinforcement for all involved participants (reinforcing factors). The educational sessions targeted both the house staff and the nursing staff since, unlike the house staff, the nursing staff does not change substantially from month to month. Therefore, the nursing staff could assist in promoting use of the guidelines by questioning orders that were not consistent with recommended practice.

The study was most effective in reducing orders for chemistries. In contrast to expectations, ordering of ABGs was only modestly affected. The research team attributed this finding to the widespread (and difficult to modify) perception that every change in ventilator settings needed to be accompanied by an ABG determination.

In the critical care setting, research involving the testing of protocols has yielded several important advances, as documented by randomized, controlled clinical trials. Of these, the most notable is the consistent support of positive outcomes when protocols are used to identify

patients ready to wean from mechanical ventilation. Other examples include the reduction in mortality seen when protocols were used to achieve a lung-protective ventilatory strategy and positive outcomes when protocols are used to guide the provision of nutritional support, maintain tight glycemic control, and titrate the use of sedation and analgesia. Findings of this study support the need for continued examination of all aspects of critical care practice with the goal of identifying the approach most likely to be of benefit and eliminating practices based on tradition that have no demonstrated value. ■

Special Feature

Abdominal Compartment Syndrome

By Grant E. O'Keefe, MD

In recent years, an important manifestation of shock, resuscitation, and critical illness has become more evident in the intensive care unit. Elevated intra-abdominal pressure (intra-abdominal hypertension) leading to critical pulmonary, renal, or cardiac dysfunction has been dubbed the "abdominal compartment syndrome" (ACS). The ACS is associated with a high case-fatality rate, with death, according to most authors, almost certain if the increased pressure is not somehow relieved.[1] Increased attention to the diagnosis and earlier, aggressive treatment of ACS has been suggested to reduce the associated mortality.[2]

Our understanding and treatment based on observations from case reports and small case series have been improved by data obtained from cohort studies—leading to a reliable body of evidence regarding predisposing clinical conditions, important risk factors, and expected outcomes from ACS. Nevertheless, even the seemingly simple task of establishing consistent definitions remains a challenge. Furthermore, treatment concepts are less clearly defined because they are based upon these same observational studies. This review is meant to summarize the important clinical features of the ACS in order to provide clinicians with contemporary information to assist in diagnosis and treatment of this serious complication of critical illness.

Definitions, Clinical Presentation, and Epidemiology

In order to discuss the incidence, associated risk factors, and outcomes, it is necessary to define both intra-abdominal hypertension and ACS. Although this is a task more complicated than might be expected, acceptable definitions can be gleaned from existing literature. Intra-abdominal hypertension can be defined as an intra-abdominal pressure of ‡20 cm H_2O.[3] Other pressure thresholds, ranging from 15 to 25 cm H_2O, have been used, but there is little objective evidence from clinical studies to select one threshold over others. Resorting to experimental data, it seems that alterations in hepatic arterial, portal venous, and hepatic microcirculatory blood flow are markedly reduced when intra-abdominal pressure is increased to ‡20 cm H_2O, lending some rationale for the use of this threshold and remembering that the observations in the laboratory setting may not translate perfectly to the clinical situation.[4]

The ACS can be defined as respiratory, renal, or cardiovascular dysfunction, associated with intra-abdominal hypertension that responds to reduction of intra-abdominal pressure (most often by decompressive celiotomy).[3] This fairly restrictive definition, incorporating response to treatment (decompressive celiotomy) as part of the definition of ACS is not universally accepted, but seems appropriate. Other causes of lung, kidney, and cardiac dysfunction commonly exist (and often coexist) in these critically ill patients and will not respond to reduction of elevated intra-abdominal pressure.

The incidence of ACS reported in the literature thus varies with the definitions used and also with the nature of the cohort studied. Using the above definition, the ACS was found to be rare in a cohort of 706 consecutive trauma victims admitted to a single intensive care unit. Hong and colleagues identified a total of 15 (2%) with intra-abdominal hypertension (using a threshold definition of ‡20 mm Hg) and 6 of these (1% of the 706) developed ACS.[3] Although using a relatively liberal pressure threshold to define intra-abdominal hypertension, most of the patients with the ACS, in fact, had much higher intra-abdominal pressures (as estimated by bladder pressure), which averaged 40 mm Hg.

ACS has been most often reported in association with severe abdominal trauma. However, it has been observed and reported in conjunction with a wide range of clinical situations (*see Table*). Typically, ACS was observed after severe abdominal trauma that required celiotomy and control of intra-abdominal hemorrhage.[5,6] Observations of the ACS in cases of nontraumatic intra-abdominal catastrophes, initially postoperative hemorrhage, followed its description in critically ill patients with intra-abdominal injuries.[7] Aggressive attempts to primarily close the fascia, in the presence of marked intestinal edema or intra-abdominal packing to control

nonsurgical bleeding leads to a number of physiological alterations and the consequences of ACS.[8] More recently, the ACS has been described in the setting of intra-abdominal injuries that were initially managed nonoperatively (severe liver or kidney injuries, for example).[9] Trauma and burn victims without intra-abdominal injuries also seem to be at risk for ACS.[10-12] Taken together, severe injury, resulting in shock and associated with large volume resuscitation, regardless of the specific injuries sustained, is the most common scenario in which ACS develops.

Diagnosis of Abdominal Compartment Syndrome

A triad of clinical findings including: (1) tense, distended abdomen; (2) increased end-inspiratory (plateau) airway pressures; and (3) oliguria despite appropriate volume resuscitation, when seen together, is a reliable indicator of ACS. In the appropriate clinical situation, this triad may be sufficient to mandate surgical decompression. However, the diagnosis is often not so obvious. Additional clinical measurements, particularly those that reflect poor cardiac performance, may be helpful in making the diagnosis. Typical signs consistent with ACS are a reduced cardiac output, elevated systemic vascular resistance, and elevated pulmonary capillary wedge pressure with simultaneous low or normal calculated estimates of end-diastolic volume. The addition of corroborative findings from invasive hemodynamic monitoring may help clarify the diagnosis and direct the appropriate treatment.

Most clinicians indirectly measure intra-abdominal pressure to determine more definitively whether the observed physiologic changes are associated with intra-abdominal hypertension and therefore reflect ACS. Bladder pressure is the most widely used estimate of intra-abdominal pressure. The technique of measuring bladder pressure is well described but is presented here because of its importance in the diagnosis and management of these patients. Approximately 100 mL of saline, a clamp capable of occluding the bladder catheter drainage system, an 18-gauge needle and a pressure transducer, such as an intra-arterial catheter system and monitor, are needed.

With the patient supine, the bladder is distended with 100 mL of sterile saline, injected through the aspiration port (found in the proximal part of the bladder catheter drainage system), which is then allowed to drain until a continuous column of fluid is visible in the tubing. The tubing is then occluded and the 18-gauge needle, connected to the pressure transducer, is inserted through the aspiration port into the catheter tubing. An adequate pressure "tracing" is indicated by visible respiratory variation, which is usually less than 5-10 mm Hg. The mean pressure should be used as an estimate of the intra-abdominal pressure, although this aspect of the procedure is not well characterized. Bladder pressure measurements have been observed to correlate well with direct intraperitoneal pressure measurements under a variety of circumstances and across a wide range (5-50 mm Hg) of pressure levels. A simpler method (although not validated) involves filling the bladder with 100 mL of sterile saline and elevating the clear tubing vertically above the pubic symphysis. The height of the fluid column is measured and converted to mm Hg (1.3 cm H_2O = 1 mm Hg).

Treatment of Abdominal Compartment Syndrome

Established ACS (intra-abdominal hypertension, progressively increasing end-inspiratory airway pressures, declining urine output, and persistent shock) is treated with surgical decompression of the abdomen. This recommendation is based upon the high fatality rate reported in patients who are not decompressed, and not based upon clear evidence that decompression increases survival *per se*.[13] As indicated above, there is little objective information upon which to base decisions regarding the timing of surgery, particularly what thresholds should be used to mandate abdominal decompression. However, some recommendations can be made.

First, elevated intra-abdominal pressures, regardless of the actual measured value, in the absence of clinical evidence of ACS should never be an indication for decompressive celiotomy. Second, based upon the observation that the first cases of ACS were described in postoperative patients in whom the abdominal fascia was closed, it is appropriate not to close the fascia in the case of moderate-to-marked visceral edema, particularly in patients requiring ongoing resuscitation—in whom the edema will increase postoperatively. This intra-operative decision is often difficult and requires the surgeon to be attentive to the presence of ongoing resuscitation needs, the patient's acid-base status and the end-inspiratory pressures needed to achieve adequate oxygenation and ventilation during any attempts to close the abdominal fascia.

Beyond these 2 recommendations of (1) when decompression is not indicated and (2) when fascial closure should be avoided to prevent ACS, it is not possible to provide precise recommendations concerning when decompression should be undertaken. The following suggestions are based upon the author's compilation of the literature and experience in treating these patients.

Table

Clinical Conditions Associated with Acute Abdominal Compartment Syndrome

- Intra-abdominal trauma with solid organ injury
- Pelvis fracture with retroperitoneal hematoma
- Severe nonabdominal trauma
- Ruptured abdominal aortic aneurysm
- Severe burns
- Sepsis
- Pancreatitis

High intrathoracic pressures, marked FiO_2, and PEEP requirements are probably not sufficient to warrant decompression. Although the elevated pressures, PEEP, and FiO_2 needs can often be dramatically decreased after decompressive celiotomy, these physiological improvements may not translate into relevant clinical benefits. Often the elevated intrathoracic pressures, as well as PEEP and FiO_2 needs, decline (relatively more gradually) after resuscitation is complete without abdominal decompression.

On the other hand, the addition of progressive renal dysfunction (oliguria, rising creatinine) despite adequate preload and ongoing resuscitation to the clinical scenario should warrant abdominal decompression. Similarly, persistent shock (elevated base deficit or arterial lactate concentration) particularly when vasopressor agents are used to supplement fluid resuscitation also warrants decompressive celiotomy. There are no airway pressure, hourly urine output, or arterial lactate concentration thresholds that indicate or contraindicate decompressive celiotomy. Finally, in the absence of rapid and progressive clinical deterioration, it seems wise to observe the patient's course for 2-4 hours (perhaps longer) before deciding to undertake decompression. This observation period should be active and must include determining whether fluid and vasoactive drug requirements are increasing or stabilizing and whether indices of shock (arterial base deficit or lactate concentrations) are improving. Until we have more comprehensive evidence upon which to base treatment decisions, these recommendations will provide a reasonable foundation upon which the decision to operate can rest.

The exact nature of the operative procedure depends on the underlying cause and extent of intestinal edema after decompression, and few authors define which physiologic derangements prompted or responded to abdominal decompression. It is important to recognize that ACS can occur in patients whose fascia has not been definitively closed, but some other technique of temporary abdominal closure has been performed. It seems that techniques including temporary skin closure or those that incorporate suturing prosthetic material to the fascia may place the patient at risk for recurrence of ACS. One strategy for managing the open abdominal wound incorporates: (1) temporary coverage of the viscera with a nonadherent material; (2) overlying absorbent dressings and suction drains; and followed by (3) an occlusive drape to prevent seepage of peritoneal fluid.[14] This approach may be less likely to result in subsequent ACS as resuscitation continues, although ACS has been described after this mode of temporary closure and critical care physicians must therefore have a continued high level of suspicion.[15]

One factor that seems common to all cases of ACS is the use of aggressive crystalloid resuscitation. However, no study has adequately assessed the role and amount of crystalloid resuscitation as a risk factor for ACS. Therefore, it is not presently appropriate to recommend or criticize any particular approach to resuscitation in order to minimize the risk or avoid the development of ACS. It is possible, however, that attempts to achieve "supranormal" resuscitation end points, such as an oxygen delivery index of ‡600 mL/min/m^2 rather than more modest end points, which do not seem to improve clinical outcomes, may contribute to ACS.[10,16]

Summary and Conclusions

It is interesting to consider whether intra-abdominal hypertension and ACS are the necessary consequences of our ability to save more critically ill patients who, in previous years, might have succumbed to their injuries and therefore not been at risk for ACS. We must, however consider whether our aggressive approach to volume resuscitation with crystalloid solutions has contributed to the emergence of this complication.[16] Interesting experimental data suggest that lactated ringer's solution activates circulating neutrophils, tissue macrophages and endothelial cells, raising the possibility that our treatment, at least in part, contributes to this serious complication of shock and reperfusion.[17] Sorting out the exact pathophysiology will be important to potentially avoiding, reducing the consequences of, and treating the ACS. Presently our clinical armamentarium involves the unsophisticated tasks of early recognition and surgical decompression of the abdomen. ■

References

1. Ivatury RR, et al. Intra-abdominal hypertension after life-threatening penetrating abdominal trauma: Prophylaxis, incidence, and clinical relevance to gastric mucosal pH and abdominal compartment syndrome. *J Trauma*. 1998;44:1016-1021.

2. Burch JM, et al. The abdominal compartment syndrome. *Surg Clin North Am*. 1996;76:833-842.
3. Hong JJ, et al. Prospective study of the incidence and outcome of intra-abdominal hypertension and the abdominal compartment syndrome. *Br J Surg*. 2002; 89:591-596.
4. Diebel LN, et al. Effect of increased intra-abdominal pressure on hepatic arterial, portal venous, and hepatic microcirculatory blood flow. *J Trauma*. 1992;33: 279-282.
5. Morris JA, Jr., et al. The staged celiotomy for trauma. Issues in unpacking and reconstruction. *Ann Surg*. 1993;217:576-584.
6. Chen RJ, et al. Intra-abdominal pressure monitoring as a guideline in the nonoperative management of blunt hepatic trauma. *J Trauma*. 2001;51:44-50.
7. Cullen DJ, et al. Cardiovascular, pulmonary, and renal effects of massively increased intra-abdominal pressure in critically ill patients. *Crit Care Med*. 1989; 17:118-121.
8. Meldrum DR, et al. Barney Resident Research Award. Cardiopulmonary hazards of perihepatic packing for major liver injuries. *Am J Surg*. 1995;170: 537-540.
9. Yang EY, et al. The abdominal compartment syndrome complicating nonoperative management of major blunt liver injuries: Recognition and treatment using multimodality therapy. *J Trauma*. 2002;52:982-986.
10. Balogh Z, et al. Secondary abdominal compartment syndrome is an elusive early complication of traumatic shock resuscitation. *Am J Surg*. 2002;184:538-543.
11. Hobson KG, et al. Release of abdominal compartment syndrome improves survival in patients with burn injury. *J Trauma*. 2002;53:1129-1133.
12. Biffl WL, et al. Secondary abdominal compartment syndrome is a highly lethal event. *Am J Surg*. 2001; 182:645-648.
13. Kron IL, Harman PK, Nolan SP. The measurement of intra-abdominal pressure as a criterion for abdominal re-exploration. *Ann Surg*. 1984;199:28-30.
14. Sherck J, et al. Covering the "open abdomen": A better technique. *Am Surg*. 1998;64:854-857.
15. Gracias VH, et al. Abdominal compartment syndrome in the open abdomen. *Arch Surg*. 2002;137:1298-1300.
16. McKinley BA, et al. Normal versus supranormal oxygen delivery goals in shock resuscitation: The response is the same. *J Trauma*. 2002;53:825-832.
17. Koustova E, et al. Effects of lactated Ringer's solutions on human leukocytes. *J Trauma*. 2002;52:872-878.

CME / CE Questions

12. As far as the prediction of intensive care patients' outcome is concerned, which of the following assertions is true?

a. Nurses and doctors are always agreed.
b. Disagreement between nurses and doctors was frequent with regard to their judgment of survival but not with respect to their judgment of quality of life.
c. Doctors were more pessimistic than nurses.
d. Nurses' and doctors' appreciation of their patients' future quality of life proved to be unreliable.
e. The patients judged identically by nurses and doctors had a higher SAPS II and a longer ICU stay than those judged differently.

13. Assist-control ventilation may provide superior sleep compared to pressure support ventilation in which groups of patients?

a. Patients receiving narcotic infusions
b. Patients with congestive heart failure
c. All critically ill patients requiring mechanical ventilation
d. Only in patients on high-dose vasopressors
e. Only in patients with the acute respiratory distress syndrome

14. Which of the following are part of the diagnostic criteria for abdominal compartment syndrome?

a. A tense, distended abdomen
b. Increased end-inspiratory airway pressures
c. Oliguria despite appropriate volume resuscitation
d. All of the above
e. None of the above

15. Which of the following conditions has been associated with development of abdominal compartment syndrome?

a. Severe burns
b. Sepsis
c. Pelvic fracture with retroperitoneal hematoma
d. Intra-abdominal trauma with solid organ injury
e. All of the above

Answers: 12. (d); 13. (b); 14. (d); 15. (d)

CME / CE 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.

In Future Issues:

Cardiac Troponins in Pulmonary Embolism

CRITICAL CARE Plus

EXPANDING YOUR FOCUS IN INTENSIVE CARE

Special Report: Hospitals Nationwide Preparing for SARS

CDC and WHO Advisories Change Rapidly

By Julie Crawshaw

More than 2000 cases of severe acute respiratory disease (SARS) with more than 70 deaths were reported to the World Health Organization (WHO) by April 2, 2003. Though cases have occurred in 18 countries in Asia, Europe, and North America, more than eighty-five percent have been in China and Hong Kong, Nonetheless, U.S. hospitals are preparing to handle more SARS cases here.

The WHO and the Centers for Disease Control (CDC) have both issued case definitions for SARS. WHO identifies suspected SARS cases as presenting after Feb.1, 2003 with a fever of 100.5ºF or more, cough, shortness of breath or difficulty breathing and close contact with someone already diagnosed with SARS and/or history of travel to places where SARS has been reported, both within 10 days of symptom onset.

WHO defines as probable cases those suspected cases with chest radiograph findings of pneumonia or acute respiratory distress syndrome (ARDS) or with an unexplained respiratory illness that ended in death and an autopsy that showed ARDS pathology but no identifiable cause.

The CDC defines only suspected cases and includes radiographic findings along with respiratory symptoms. Both organizations define close contact as having cared for, lived with, or had direct contact with mucus or other body fluids of a suspected case of SARS.

Proximity to Canada

Because of its proximity to Canada, where 58 SARS cases with six deaths have occurred, Carol Chenoweth, MD, medical director of infection control at the University of Michigan School of Public Health in Ann Arbor says her hospital is taking all possible readiness precautions and includes Toronto on the infectious travel list. “We’re not being overrun with cases as elsewhere, but we’ve had to come up with plans and recommendations for implementing the guidelines issued on an almost daily basis by the CDC,” Chenoweth says.

Chenoweth’s department has written screening plans for managing the emergency room, a plan for an ambulatory care clinic, and an employee exposure plan. She and her colleagues are working with other hospitals and universities in the region to develop a coordination plan against increased SARS cases that includes considering a telephone triage system and possibly an evaluation site and designated ward as well.

Chenoweth’s emergency room uses a protocol in which the triage nurse queries every patient about recent travel destinations, and presence of a fever or cough. Patients who respond positively are immediately given a mask and put into an isolation room. From that point on every staff member who has contact wears an N95 mask, eye protection, gown and gloves.

“We’re trying to avoid the kinds of exposures other institutions have experienced,” Chenoweth says, adding that all surfaces in the isolation room are thoroughly cleaned after each potential SARS patient presents. “We’re also asking area physicians not to refer every patient with any SARS symptoms to the ER because some patients may be able to be managed at home. If they’re very ill they’re instructed to put on a mask before coming to the hospital.”

Chenoweth observes that, unfortunately, there are a number of things that still need to be sorted out with this disease. "The CDC and WHO have been working on the assumption that people aren't very contagious before they experience fever themselves," Chenoweth says, "I'm not convinced that's true, because some people may have sub-clinical infections. But if we're screening for the highest risk people then we should at least be able to isolate them."

10-Day Incubation Period Recommended

Though current data indicate that the usual incubation period for SARS is two to seven days before onset of first symptoms, a 10-day incubation-monitoring period is recommended because several reports have indicated a longer time before symptoms occur, says Robert L. Beaton, MD. Beaton is medical director for the department of emergency medicine at Moses Cone Health System, a 1,400-bed health system located in Greensboro, N.C. His facility is located near North Carolina's Furniture Market, which puts on major tradeshows for the furniture industry that attract many business people from Asia.

Though the market was running its spring show when the SARS crisis began, as of mid-April Beaton's hospital has seen several suspected but no confirmed SARS cases. The show featured numerous factory tours attended by many visitors from Southeast Asia.

"One factory worker had been exposed to travelers from Southeast Asia," Beaton says. "We called the CDC and decided that unless he had had direct contact with someone who was ill they wouldn't classify that as a SARS case."

Beaton noted that SARS is currently believed to be a mutated form of coronavirus, which can last two or three hours on surfaces before it degrades. Though some SARS cases may have occurred because the patient touched something previously touched by a SARS infected person, Beaton observes that the virus had to be transmitted to respiratory system. "Casual transmission is a frightening thought," Beaton says. "If the war weren't going on, I think SARS would have been the lead news story 24/7."

Beaton says there's no doubt that SARS has the potential to become a pandemic. But thus far the mortality rate is running somewhere 3-5% and most patients who have died had co-morbid problems. "If you infected 100 people with SARS, nine out of every 10 would just get body aches, cough, shortness of breath and a fever, then recover," Beaton says. "Most people with SARS aren't going to die from it, but it's very scary to think you could catch a cold and die."

Despite the low death rate, Beaton finds the possibility of having to add 5% more patients to already overcrowded intensive care facilities even scarier. "SRS has got my attention," Beaton says. "It's changed the way I practice-now when I pick up the chart for a patient with a fever and cough, I put on a gown and gloves immediately."

Hand Washing Still Best Preventive

Jerry McDermott, president of Technical Concepts in Northbrook, IL, the largest manufacturer of touch-free bathroom products, says his office has experienced a dramatic increase in requests for product information. The company manufactures hands-free soap dispensers, water faucets, and toilets. The CDC, McDermott notes, has reaffirmed that the best way to stop the spread is to wash your hands. Automatic soap and faucet systems encourage people to wash their hands and recent studies have shown that only 62% of people wash their hands after using the rest room.

Both the WHO and the CDC say that the most important element of infection control in the community is frequent and thorough hand washing. Other household members should use gloves if they have contact with a SARS patient's bodily fluids. Either the patient or those with whom he or she is in contact should also wear a mask. Family members and others in contact with SARS patients may leave their home as long as they themselves are asymptomatic.

Quick Staff Updates are Critical

Marie Kassai, RN, MPH, CIC is manager of infection control at the General Hospital Center at Passaic, NJ, and sits on a statewide infection control task force that now conducts weekly conference calls with the state's department of health. She says that biggest management issue with SARS is seeing that all staff members receive prompt updates for the frequently changing guidelines and recommendations from the WHO and CDC.

"The most critical piece of handling SARS is getting and keeping the current information to every staff member," Kassai says. "We've begun by with the most comprehensive infection control guidelines. As we learn more about the disease, some of these may not be necessary."

Kassai says she has had no problems with staff resistance to treating SARS patients thus far. She emphasizes that healthcare workers should be excluded from work if they develop fever and/or respiratory

symptoms within 10 days of exposure to a patient with SARS. They should remain out of work for a full 10 days after fever and respiratory symptoms have resolved.

General Hospital currently uses both contact and airborne isolation. The facility does not alert ER patients that they may be exposed to SARS but has posted signs to inform visitors that they are not to visit the patients and should notify hospital personnel right away if they have been in contact with anyone who has a respiratory illness.

Leave the Liability to the Agencies, Attorney Advises

Edward Kornreich, an attorney with the Proskauer & Rose firm in New York, encourages hospitals to stay in close touch with their local health departments and have their own legal counsel involved. "Health departments should be responsible for managing control procedures-they should be the ones restricting patients' civil liberties," Kornreich says. "You don't want the liability for that. Hospitals should be active in protecting public health but should make sure the actual limitations on freedom come from the public health authority."

Generally speaking, Kornreich says that state public health authorities and the CDC have very broad authority to quarantine or isolate people who have or are suspected of having contagious diseases. The CDC's power requires a presidential proclamation that a disease is believed to be contagious and dangerous, which was issued for SARS in early April.

State law is generally at the discretion of the authorities. Even so, Kornreich says legal challenges may arise from people exposed to SARS who have no symptoms themselves and are non-compliant to isolation.

The mechanism for detaining people varies from state to state, Kornreich says, but in the face of a perceived emergency all state public health authorities have the power to take action without going to court. "Right now in virtually every state there is a statute that empowers health authorities," he says. "The concern is that many of these are antiquated, dating from the late nineteenth and early twentieth centuries."

Kornreich adds that during the 1960s and early '70s our understanding of personal liberty and individual rights vis a vis the government changed pretty dramatically, but most existing statutes do not provide for due process. Health authorities can still put a person in the hospital without a court order but proposed model legislation provides for confinement but mandates obtaining a court order within five days.

Kornreich says that if the number of SARS cases greatly increases, a legal question of whether or not hospitals can turn prospective SARS patients away may arise. "Under federal law it would be very difficult to turn away anyone eligible for Medicare," Kornreich says. "It may be that as counties react they develop central facilities that are better able to provide isolation services to these patients."

One fact Kornreich sees as critical is that SARS spread rapidly among healthcare workers in Asia. He adds that the possibility of staff resistance to caring for SARS patients is a concern because hospitals have a legal obligation to provide a safe work environment for staff.

Kornreich also says that handling SARS patients in ICUs could prove legally challenging because OSHA requirements mandate handling patients in a safe environment. If SARS patients in the ICU are not isolated then non-SARS ICU patients could be endangered, he says.

(For more information contact Carol Chenoweth at (734) 764-0000, Robert L. Beaton, MD at (336) 339-4290, Jerry McDermott at (847) 837-4100 ext. 154, Marie Kassai at (973) 365-4597, and Edward Kornreich at (212) 969-3395.)

Staffing Law Movement Spreads Nationwide

AACN cool to concept of legislating nursing numbers

THE FACT THAT CALIFORNIA'S SAFE HOSPITAL Staffing Law (AB 394) isn't getting much support from the American Association of Critical Care Nurses hasn't stopped other nursing associations that support the law from encouraging nurses throughout the country to lobby for similar staffing ratio laws. A new national group called the Healthcare Worker Alliance (HWCA) is touring the country, presenting seminars to acquaint nurses around the country with California's soon to take effect Safe Staffing law.

Teresa Wavra, RN, clinical practice specialist for AACN, says that how the law will affect nurses at bedside remains to be seen. "AACN's position is that staffing ratios depend on the needs of the patient and the competency level of the nurse," Wavra says. "Each patient has unique needs, and just conforming to a staffing ratio doesn't guarantee a level of patient care. The only means to achieve that is assessing the patient's

needs and the competency level of available nursing staff and making sure the two are a good fit."

Wavra says it's difficult to see what effects adhering to the staffing ratios as mandated by law would have, echoing AACN's position paper on the subject, which says that "appropriate staffing of patient care areas is dependent on the ability of the nurse competency and mix to meet the needs and acuity of the patient."

Enthusiastic Response

HCWA was formed by the California Nurses Association (CNA) and the United Steelworkers of America (USWA). Class instructors describe the campaign CNA waged to get the law passed, and discuss the implications for improving patient care and alleviating the current shortfall of RNs working in hospitals they believe the legislation provides.

Trande Phillips, RN, a member of the California Nurses Association board of directors, reports that response to the continuing education classes her organization offers has been enthusiastic. According to CNA spokespersons, the biggest draw for the classes has been interest in California's staffing ratio law and what steps CNA took to sponsor and secure its passage. Classes include terms for fixing patient classification systems as outlined in the California law, the prohibition for staffing based on budgetary considerations, attention to the special needs of patients, role protection and the restrictions on the use of unlicensed assistive personnel.

After the California Department of Health Services finishes reviewing and considering all testimony it received at hearings held across the state as required by law, regulations supporting the ratios will become final. California hospitals will be required to implement the ratios effective January 1, 2004.

The California law:

- Mandates nurse-to-patient ratios. Establishes minimum, specific numerical nurse-to-patient ratios for acute care, acute psychiatric and specialty hospitals.
- Assigns additional nurses based on patient acuity. Requires additional staff be added to the minimum number based upon a documented patient classification system that measures patient needs and nursing care, including severity of illness and complexity of clinical judgment.
- Controls use of unlicensed staff. Hospitals may not assign unlicensed assistive personnel to perform nursing functions—including administration of medication, venipuncture, and invasive procedures.
- Restricts unsafe floating of nursing staff. Requires orientation and demonstrated competence before assigning a nurse to a clinical area. Temporary personnel must receive the same orientation and competency determination as permanent staff.
- The Service Employees International Union (SEIU), a group of more than 110,000 nurses from every health care setting, has supported fixed staffing ratios for decades. Proposed SEIU ratios are more stringent than the state's: 1:4 rather than 1:6 on med-surg.
- The California Healthcare Association, lobbyist for the hospital industry, has proposed delaying the staffing law indefinitely and suggested ratios that some nursing associations say will undermine safe patient care, including a 1:10 nurse-to-patient ratio for med-surg that would lower existing staffing in some California hospitals.

But Kaiser Permanente, one of the nation's largest health care providers, endorses the staffing ratios proposed by the SEIU is currently working with Kaiser administrators to implement 1:4 ratios on med-surg and 1:3 on telemetry. ■