



# INTERFACE

SOCIETY FOR TECHNOLOGY IN ANESTHESIA

11512 ALLEGINGIE PARKWAY • RICHMOND, VA 23235 • (804) 378-4959 • (804) 379-1386 FAX

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## STA Committees Make Plans

Members of STA committees have an opportunity to meet in person two times per year, at the annual STA meeting and at the ASA meeting. The Education and National Database Committees met during the recent ASA meeting and submitted the following reports to the membership.

### Education Committee

The first item reviewed by this committee was the plans for the upcoming STA annual meeting. Organizational details were discussed including the type of scientific papers which would

*continued on page 4*

### STA Elections in Progress

Elections are currently in progress for the offices of President, President-Elect, Secretary, Treasurer, and Board member. As required by the Bylaws, a list of nominations was mailed to all members of the Society in early December. Any five members were eligible to make additional nominations by December 31, 1992. No additional nominations were made and ballots were mailed to the membership on January 4, 1993. In order for a ballot to be counted, it must be received at the STA National Office by February 1, 1993.

The ballots will be tabulated by the National Office and the results will be announced at the Annual Meeting in New Orleans, Louisiana during the STA Business Meeting on Wednesday, February 17, 1993. (See slate of candidates on page 12.)

## Critical Issues Relating Standards for Technology to Patient Safety

Jerry M. Calkins, MD, PhD

From the beginning of the formation of the Anesthesia Patient Safety Foundation (APSF), an expressed mission has been to define the relationship of technology utilization to patient safety. Towards that end, the Committee on Technology was created. This committee was charged with the review of the influence of technology on patient safety during the practice of anesthesia and the identification of key areas in the application of technology where changes might be expected to increase patient safety.

The initial objective for the committee was the encouragement of developing specific guidelines for the utilization of specific patient monitoring. This activity, in mutual support with other organizations, subsequently led to the adoption of monitoring standards by the American Society of Anesthesiologists. These are now included in the recognized standards of care. With the adoption of these monitoring standards, the committee agreed that their highest priority for change lay in areas related to Standards. This has led to the development of a report entitled Critical Issues Relating Standards for Technology to Patient Safety.

**■ "The current regulatory and medical-legal environment does not foster improved safety."**

The current regulatory and medical-legal environment is not felt to be ideal for fostering improved safety. Five areas were identified in the committee report that could impact upon safety: Rationales, Construction versus Performance Standards, Modularity, Maintenance, and Obsolescence. Other issues which require urgent attention are also identified in the report. Among them are the Anesthetic Work Station, Ergonomics, and Alarm Systems. It is hoped that these areas will be the subject of future reports.

It is not the role of APSF to become involved in writing either standards of practice guidelines. However, APSF does feel that it can play an important

*continued on page 6*

### INSIDE THIS ISSUE:

- ◆ STA '93 Conference Program
- ◆ FDA Seeks Comment on Anesthesia Machine Checklist
- ◆ CPRI Moves Ahead
- ◆ AMIA Attractive Forum for STA Members

## Technology Abstracts Continue to be Major Group at ASA

One hundred twenty-six abstracts were presented in the Equipment and Monitoring sessions at the American Society of Anesthesiologists meeting in New Orleans. This represents more than 10% of the total number of abstracts presented. As usual, the topics were quite varied and it is impossible to discuss all the excellent studies in this newsletter. The following are some notable abstracts. Complete listings have been published in *Anesthesiology* 1992;77(3A):A464-A590.

**1. Wheeler DS et.al. A method for quantification of venous air embolism using expired nitrogen analysis in a canine model. A466.**

Conventional methods of detecting venous air embolism monitor for the presence of air embolism but do not attempt to quantify the volume of the embolism. This study analyzed expired nitrogen measured by Raman spectroscopy to calculate the cumulative embolus volume. The calculated volumes were said to correlate well with injected volumes although statistical analysis was not presented.

**2. Bowie et. al. Rebreathing reduces arterial to end-tidal CO<sub>2</sub> gradient. A471.**

The gradient between arterial and end-tidal CO<sub>2</sub> during controlled ventilation limits the utility of capnography as a means to assess the adequacy of ventilation. These authors found that when using a Bain circuit, the arterial to end-tidal CO<sub>2</sub> gradient could be reduced by allowing the patient to rebreathe CO<sub>2</sub>. Normocapnia was maintained by increasing the expired minute volume. The authors concluded that intentional rebreathing improves the reliability of capnography as an estimator of arterial CO<sub>2</sub> content.

**3. Volgyesi et al. Can pulse oximeter sensors be used to estimate cardiac output by dye dilution? A475.**

Convenient, accurate non-invasive measurement of cardiac output remains an elusive goal. These authors used a pulse oximeter sensor to detect peripheral dye concentrations after injection of Cardio-green dye. Cardiac output was manipulated pharmacologically in rabbits and both standard and oximeter sensor dye dilution curves were obtained. Excellent correlation was found between the two curves ( $r=0.934$ ) suggesting that cardiac output measurement may be possible using ordinary pulse oximeter sensors.

**4. Kainuma et. al. Continuous urine oxygen tension monitoring during cardiac anesthesia. A482.**

Acute renal failure is a serious complication associated with cardio-pulmonary bypass (CPB) and urine volume is not a good predictor of this complication. This study evaluated whether urine oxygen tension (PuO<sub>2</sub>) might be a better predictor since it should reflect oxygen delivery to the renal tubular cells. PuO<sub>2</sub> was found to decrease during CPB but did not uniformly increase again when CPB was discontinued. A relationship was found between peak postoperative serum creatinine concentration and whether or not PuO<sub>2</sub> increased after CPB. This non-invasive monitor may be an early indicator of the risk for renal damage during CPB.

**5. Fleisher et. al. Approximate entropy (ApEn) of heart rate as a correlate of left ventricular function. A493.**

Based upon the premise that heart rate variation correlates with cardiac "health", this study applied approximate entropy, a measure of regularity, to ambulatory ECG recordings from patients with left ventricular ejection

fractions greater than (group I), and less than (group II), 35%. They found that average ApEn was significantly greater for patients in group I than group II. In addition, two patients in group I that developed myocardial ischemia during the study period were readily identified by the ApEn index. These results strengthen the notion that heart rate variability and cardiac "health" are related.

**6. Schüttler et. al. Clinical evaluation of a closed-loop dosing device for total intravenous anesthesia based on EEG depth of anesthesia monitoring. A501.**

This study evaluated the effectiveness of EEG control of a propofol infu-

*continued on page 6*

**INTERFACE** is the official newsletter of the Society for Technology in Anesthesia. The newsletter is published quarterly and mailed directly to the membership of the society. The editors invite suggestions, contributions and commentary about published items. Please send all correspondence to:

**Jeffrey M. Feldman, MD**  
Editor, STA Interface  
Department of Anesthesiology  
Albert Einstein Medical Center  
5501 Old York Road  
Philadelphia, PA 19141  
Phone: (215) 456-7979  
FAX: (215) 456-8539  
E-Mail: 74426.3015 (CompuServe)  
74426.3015@COMPUSERVE.COM (Internet)

**Reynolds Saunders, MD**  
Associate Editor, STA Interface  
Department of Anesthesiology  
Cedars-Sinai Medical Center  
8700 Beverly Blvd., Suite 8211  
Los Angeles, CA 90048  
Phone: (310) 855-5841  
FAX: (310) 854-0226  
E-Mail: 74266.2450 (CompuServe)  
74266.2450@COMPUSERVE.COM (Internet)

**Frank E. Block, Jr., MD**  
Telecommunications Editor  
Columbus, OH

**International Editors**  
**Naosuke Sugai, MD, PhD** Asia  
Tokyo, Japan

**John Zelcer, MD** Australia  
Melbourne, Australia

**André Dellermalm, MD** Europe  
Uddevalla, Sweden

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# "Human Performance and Anesthesia Technology"

1993 STA-ISCAIC Annual Meeting • February 17–19, 1993 • New Orleans, Louisiana

co-sponsored by the Anesthesia Patient Safety Foundation

## Tuesday, February 16

- 0800–1000 STA Board of Directors Meeting
- 1000–1200 Committee and Task Force Meetings
- 1400–1600 STA Board of Directors Meeting (reconvened)
- 1800–2100 Registration

## Wednesday, February 17

- 0700–1730 Registration
- 0700–0745 Continental Breakfast with Exhibits
- 0745–0815 Welcome and Introduction  
N. Ty Smith  
Alan W. Grogono  
Matthew B. Weinger
- 0815–0955 Panel: The OR Environment  
Moderator:  
Robert G. Loeb  
Ergonomics of the Anesthesia Workplace  
Robert G. Loeb  
Anthropology of the Operating Room  
Bill Gild  
The Impact of Standards and Regulations  
M. Sue Bogner  
Toward the Unified European Anesthesia Interface  
Alistair Lack

0830–1100 Spouse Continental Breakfast  
Sponsored by Via Medical Corporation

- 0955–1000 Introduction of the Scientific Program  
Paul Barash
- 1000–1030 Break with Exhibits
- 1030–1230 Poster Discussion
- 1230–1400 Lunch and APSF Presentation: Critical Issues in Enhancing the Use of Technology to Increase Patient Safety During Anesthesia  
Allen K. Ream

1400–1600 Panel: Design Issues for Future Anesthesia Technology  
Moderator:  
Jerry M. Calkins  
Automation and "The Glass Cockpit"  
TBA  
Pitfalls of Automation in Anesthesia  
Gavin N. C. Kenny  
Novel Display Systems  
Kazuyuki Ikeda  
Update on STA '92: The Anesthesia Workstation  
Jerry M. Calkins

- 1600–1615 Break with Exhibits
- 1615–1730 STA Business Meeting (Announcement of New Officers)
- 1730 Reception with Cash Bar and Exhibits

## Thursday, February 18

- 0700–1700 Registration
- 0700–0800 Continental Breakfast with Exhibits
- 0800–1000 Panel: Improving the Anesthesia Provider  
Moderator:  
David M. Gaba  
Resident Selection and Personality Issues  
M. Frances Rhonan  
Problems in Provider Education and Training  
J. S. Gravenstein  
Simulation  
Jeffrey B. Cooper
- 0830–1100 Spouse Continental Breakfast  
Sponsored by Via Medical Corporation

- 1000–1030 Break with Exhibits
- 1030–1200 Concurrent Session—Select One:  
A—Poster Discussion  
B—Workshop: Crisis Resource Management  
David M. Gaba  
Jan Ehrenwerth

- 1200–1400 Lunch and STA Distinguished Lecture:  
The Introduction of Technology in the Third World: Problems and Solutions  
Carlos Parsloe
- 1400–1545 Panel: Performance Shaping Factors  
Moderator:  
Matthew B. Weinger
- 1545–1600 Break with Exhibits
- 1600–1700 Open Discussion: Music and Reading in the OR: Help or Hindrance  
Moderator:  
Alan W. Grogono

Sleep and Fatigue: What

## We Know From Other Fields

Carl E. Englund  
Sleep and Fatigue: Studies in Medicine  
J. Lance Lichor  
Other Performance Shaping Factors  
Matthew B. Weinger

- 1600–1700 Open Discussion: Music and Reading in the OR: Help or Hindrance  
Moderator:  
Alan W. Grogono
- 1700 Adjournment
- 1900 STA Dinner
- What Can We Learn from Disasters in Other Endeavors?  
Jens Rasmussen

## Friday, February 19

- 0700–1715 Registration
- 0700–0800 Continental Breakfast with Exhibits
- 0800–1000 Panel: Technology and Medical Decision Making  
Moderator: John Zelcer  
Clinical Decision Making  
Michael Roizen  
Decision Making Models  
Alex Kirlik  
Decision Aids and Clinical Judgment  
John Zelcer  
Artificial Intelligence  
Dwayne R. Westenskow
- 0830–1100 Spouse Continental Breakfast

## Sponsored by Via Medical Corporation

- 1000–1030 Break with Exhibits
- 1030–1230 Concurrent Sessions—Select One:  
A—Poster Discussion  
B—Workshop: How to Obtain Funding for Technology in Anesthesia  
Moderator:  
Dwayne Westenskow  
Identifying a Fundable Research Topic and Defining a Hypothesis  
Jeffrey B. Cooper
- 1230–1400 Lunch  
Sponsored by Diatek

## 1400–1600 Debate: Alarms—What Do We Want When?

- Moderator:  
Frank E. Block, Jr.  
Fully Integrated Visual Alarms
- PRO:  
Yasuhiro Fukui
- CON:  
Jan E. W. Beneken  
Standardized Auditory Alarms
- PRO:  
Roy Patterson
- CON:  
Gregory L. Welyczko

## 1600–1615 Meeting Summary and Future Plans

N. Ty Smith

## 1615 Adjournment

## Committees Make Plans

*continued from page 1*

be received, and the time at which space would become available for setting up exhibits.

The committee devoted its principle effort to planning future events. Three events in particular were discussed:

1. The ASA 1993 Sunday evening dinner meeting. It was agreed that we should plan a dinner at the Smithsonian Air and Space museum. If this location can be obtained, it was further agreed that no lecture would be arranged to allow attendees to visit the exhibits. If the museum is not available, it was agreed to invite a member of the NASA space program to speak to the society and to sponsor a conventional dinner.

2. At the 1993 ASA meeting, it was agreed to plan for another Wednesday morning breakfast meeting. In view of the location of the meeting in Washington, it was agreed to invite representatives of the various regulatory bodies such as the FDA and HCFA to make presentations to the members of the society.

3. The location of the February 1994 STA meeting will be Disney World in Orlando. The theme that was suggested would take advantage of the 150th year anniversary of the introduction of nitrous oxide. The theme that was selected is "Anesthetic Gas Regulation".

4. The committee also looked ahead for the next two years and made provisional plans for the 1995 meeting to be held in Phoenix, Arizona, and for the 1996 meeting to be held in Boston. This latter meeting will celebrate the 150th year anniversary of the introduction of ether by Morton.

- A. Grogono

## International Anesthesiology Database Committee

The members of this committee are from institutions and organizations that have been involved with CPR's (computerized patient records). The motivation for this effort derives from the desire for institutions to be able to share data and thereby obtain more meaningful information for research, quality assurance and patient follow up. The European and AANA attempts to begin an international database were reviewed. Both of these attempts utilize paper forms which are completed by the anesthetist for each patient. The data from the forms is then entered manually into a computer and ultimately pooled to form a national database. Since the handwritten medical record has been shown repeatedly to be incomplete and contain unreliable information, it is difficult to believe that the handwritten quality assurance record would be a reliable source of information.

Due to the problems with handwritten records, it would seem that the use of an electronic anesthesia record is a prerequisite for actively developing a national database. This conclusion is in fact supported by complementary activities outside the anesthesia community. Significant legislative efforts are underway to mandate the use of CPR's for all providers who receive medicare reimbursement. Groups like CPRI (The Computer-based Patient Record Institute) are making significant efforts toward the introduction of CPR's across the full scope of medicine.

The first step that the committee has taken is to develop a statement supporting the adoption of the computerized patient record. This statement (see inset) was adopted in draft form by the STA board of directors. It is our hope that STA will adopt this statement as policy.

There are now six vendors of anesthesia CPR technology, all of which have the capability of producing a departmental data base. All of these companies have expressed an interest in a uniform data set of anesthesiology information and most have verbally committed to adhering to such a data set if it was adopted by an official organization like STA or the ASA. With a uniform data set and coding structure, anesthesia CPR's would be relatively interchangeable (as are anesthesia

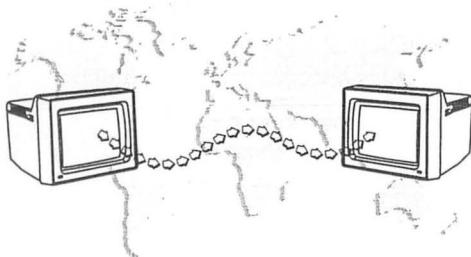
*continued on page 6*

### Draft Statement of STA Position on AIMS Accepted by Board of Directors

- Whereas information dissemination is an essential aspect toward the improvement of patient care,
- Whereas a large international electronic repository of patient information will facilitate the dissemination of this information and,
- Whereas a national effort is underway via the Institute of Medicine and other organizations to facilitate this database through the use of the computerized patient record and
- Whereas the STA Statement of Purpose is to promote the use of technology toward the improvement of quality of care
- Therefore, STA is committed to aid the development of the international electronic database of anesthesia information by the use of preoperative, intraoperative and postoperative anesthesia information management systems (AIMS).

# SIGnatures

Notes from the STA Special Interest Group



**Frank E. Block, Jr., MD**

Assistant Professor of Anesthesiology  
Ohio State University

The STA bulletin board remains alive and well in the Subspecialties Section (Section 6) of the MedSIG on CompuServe. The Forum provides an opportunity for dialog on a wide range of topics. One recent topic of discussion in the Forum was some questions from a lay person about some symptoms after his surgery. He was wondering if these long-lasting effects could be attributed to anesthetic drugs. In another topic, authors were about to embark upon the creation of a "state of the art" text on "Cardiac Arrest: The Pathophysiology and Therapy of Sudden Death." They requested some

thoughts on specific subjects that people would like addressed in the text. An announcement was made of David Edsall's meeting during the ASA on standards for anesthetic database in the United States. One reader asked about a software package for teaching interpretation of fetal heart rate. Another reader asked about a section for Pain Management within the MedSIG. A recent popular thread discussed ideas about what sorts of patients required "medical clearance" for anesthesia.

A final topic on the Forum is that of the Journal of Clinical Monitoring Abstracts. This writer sought feedback on the appropriate format for the abstracts. The big news is that the abstracts for the Journal of Clinical Monitoring are now available for downloading in Section 6 of the Library. The batch for the last issue of 1992 is in the file JCM921.ASC and for the first issue or two of 1993 the file is JCM931.ASC. Several people have already downloaded these. This is an opportunity to see the abstracts before the journal issue is actually printed!

Everyone is welcome to participate in the discussions which take place in Section 6 of the MedSIG. It is NOT necessary to be a member of STA to participate. ♦

## Other files of interest in Section 6 of the Library include:

- |            |   |
|------------|---|
| WSTA.TXT   | International E-mail addresses of many people interested in technology in anesthesia. Contact Alastair Lack (CompuServe ID 100012,2245) if you wish to be included in the list. |
| 9101M.ASC  | Minutes of the STA General Business Meeting, January 1991.  |
| 9110M.ASC  | Minutes of the STA Board of Directors Meeting, October 1991.  |
| BOD921.ASC | Minutes of the STA Board of Directors Meeting, January 1992.  |
| THEATR.DOC | A draft of the proposed national British dataset for anesthesia. ("Word for Windows" format.)   |

# UPCOMING EVENTS

## 13th Medical Monitoring Technology Conference

The 13th Annual Medical Monitoring Technology Conference will be held March 22-25, 1993 in Vail, CO. For more information, contact Arlene Rogers at (614) 293-8487.

## ESCTAIC

The European Society for Computers and Technology in Anesthesia and Intensive Care will hold its annual meeting on October 6-9, 1993 in Goldegg, Austria. For information, contact Dr. Leo Moser, Anaesthesiologie, P.O. Box 30, A5014 Salzburg, Austria.

The European Society for Computers and Technology in Anesthesia and Intensive Care will hold its 1994 annual meeting in Halkidiki, Greece. Details will follow in a future issue of *INTERFACE*.

## SCAMC 17

A Symposium on Computer Applications in Medical Care will be held October 31-November 3, 1993 at the Sheraton Washington Hotel, Washington, DC. For information, contact the American Medical Informatics Association, 4915 St. Elmo Avenue, Suite 302, Bethesda, MD 20814, (301) 657-1291, FAX (301) 657-1296.

## ASA

The Annual Meeting of the American Society of Anesthesiologists will be held October 9-13 at the Washington, DC Convention Center.

## Committees Make Plans

*continued from page 4*

machines) at least in terms of fulfilling the objectives of epidemiological research and quality assurance benchmarking or certification. The progress of developing such a data base is no small challenge. Both the electronic form of the record and the organization of the data, must seamlessly merge with the rest of the medical record. Just as it would be useless to have our own units of measure for blood pressure and other vital signs, it would likewise be difficult to use our own quality assurance indicators, diagnoses, procedures, and pharmaceutical coding system.

CPRI (see accompanying article on page 8 of this issue of *Interface*) activities include development of a universal coding system. CPRI is not however in the business of developing standards. They make recommendations about the ideal characteristics of various aspects of CPRs. For example, a coding system must have codes that are unique identifiers to a given situation (as it exists now a patient may have more than one medical record number within a given institution or different institutions may use the same medical record number for different patients). Other organizations are left to develop the actual standards. An organization could be a commercial company, a medical association or other foundations.

### The ASTM Link

The ASTM (American Society for Testing and Materials) is the oldest, "most serious" and largest voluntary, not-for-profit standard setting organization with numerous committees. One committee is E31.12, which is to develop the codes and structure standards for a universal CPR. The ASTM guides committees with

1. carefully designed procedures to reach concensus and standards;

2. legal protection in the development and publications of standards.

Universal coding systems are currently being developed by the ASTM, as well as by at least two other organizations. The ASTM has not however, done extensive work in the area of developing the anesthesia data set section of the complete medical record. Therefore, it would be my suggestion that the STA and the ASTM work together to develop a code structure standard for an international anesthesia data base according to the guidelines developed by CPRI and ASTM. The E31.12 committee has offered an invitation to us to do this.

The next meeting of the STA International Data Base Committee, will be held at the annual meeting in New Orleans on February 16th, at 11:30 a.m. Both CPR manufacturers and anesthesiologists interested in this goal will attend. Specific areas of data set codes and structures will be undertaken. Formal ties with the ASTM will be implemented if approved by STA. ♦

- D. Edsall

## Critical Issues

*continued from page 1*

role in identifying topic areas that need to be addressed and included in the writing of standards and practice guidelines.

Once adopted by the APSF, the report will be circulated with the intention of education, as well as critique. Further, it is anticipated that a meeting will be convened sometime after the first of the year in Washington, D.C. in which the position will be presented to individuals representing various organizations who are instrumental in the standards process. Anyone interested in participating in this process is encouraged to contact either Jerry M. Calkins, Ph.D., M.D. or Allen K. Ream, M.S., M.S., M.D. ♦

## Technology Abstracts

*continued from page 2*

sion to provide total intravenous anesthesia to 28 patients. Propofol was administered to maintain the median frequency of the EEG power spectrum at 2 Hz. Alfentanil was administered using a pharmacokinetic infusion pump to maintain known therapeutic Alfentanil concentrations. The approach proved safe and reliable in this study.

### 7. León et. al. Neural network detection of esophageal intubation. A515.

Neural networks were trained and then used to analyze the pressure and flow waveforms derived from tracheal and esophageal intubations in swine. There was a high degree of discrimination suggesting that an in-line detector for endotracheal tube misplacement is possible.

### 8. Baker et.al. Analysis of the oscillometric maximum amplitude algorithm for estimating mean arterial blood pressure. A548.

The relationship between the mean arterial pressure and maximum oscillation of pressure in a partially occlusive cuff has been the basis for non-invasive oscillometric blood pressure measurement. This study demonstrated that the arterial pulse pressure and pressure pulse shape can cause the difference between mean arterial blood pressure and maximal amplitude of oscillation to be quite large raising questions about the reliability and accuracy of this widely used method of blood pressure measurement. ♦

## FDA Seeks Comment on Anesthesia Machine Checklist

**The study indicated that the checklist was not being used since many of its components were unfamiliar.**

Based upon the premise that a preanesthesia equipment check will help reduce the incidence of critical incidents in the operating room, the Food and Drug Administration (FDA) released the "Anesthesia Apparatus Checkout Recommendations" in 1986. The goal was to provide a succinct checklist that could be used by practitioners before administering an anesthetic just as pilots execute a pre-flight checklist. The utility of this checklist was subsequently tested by studying anesthesia practitioners asked to evaluate anesthesia machines that were rigged with failures that could be detected if one used the checklist effectively. The results of this study indicated that the checklist was not being used since many clinicians studied could not execute the steps in the checklist effectively.<sup>1</sup> As a result of this study, the FDA convened a group of practitioners to redesign the checklist in an effort to increase its use.

The goal of the new checklist is to present a more logical, efficient format. This new checklist is now available for commentary. The changes were published in the October 6, 1992 issue of the Federal Register (Vol. 57, No. 194, p. 46033) in an entry entitled "Draft Anesthesia Apparatus Checkout Recommendations, 1992; Availability." The comment period will end in the middle of February and based upon the comments, the final version will be published. The FDA is encouraging practitioners to obtain a copy of the new draft so that they may use it and comment upon it before the end of the comment period. They are specifically looking for feedback about how easy the checklist is to use and whether there are machine differences that make a common checklist awkward.

To obtain a copy of the checklist and/or to offer comments, write to: Jay Crowley, Engineering Consultant, FDA, 12200 Wilkins Avenue, Rockville, MD 20852, 301-443-7003, 301-443-5259 (fax).

### Reference

- March MG, Crowley JJ. An Evaluation of Anesthesiologists' Present Checkout Methods and the Validity of the FDA Checklist. *Anesthesiology*. 1991;75:724-729. ♦

- J. Feldman

This checkout, or a reasonable equivalent, should be conducted before administration of anesthesia. These recommendations are only valid for an anesthesia system that conforms to current and relevant standards and includes an ascending bellows ventilator and at least the following monitors: capnograph, pulse oximeter, oxygen analyzer, respiratory volume monitor (spirometer) and breathing system pressure monitor with high and low pressure alarms. This is a guideline which users are encouraged to modify to accommodate differences in equipment design and variations in local clinical practice. Such local modifications should have appropriate peer review. Users should refer to the operators manual for specific procedures and precautions.

### Emergency Ventilation Equipment

- Verify Backup Ventilation Equipment is Available and Functioning\*

### High Pressure System

- Check Oxygen Cylinder Supply\*

- Open O<sub>2</sub> cylinder and verify at least half full (about 1000 psi).
- Close cylinder.

- Check Central Pipeline Supplies\*

- Check that hoses are connected and pipeline gauges read 45-55 psi.

### Low Pressure System

- Check Initial Status of Low Pressure System\*

- Close flow control valves and turn vaporizers off.
- Check fill level and tighten vaporizers' filler caps.
- Remove O<sub>2</sub> monitor sensor from circuit.

- Perform Leak Check of Machine Low Pressure System\*

- Verify that the machine master switch and flow control valves are OFF.
- Attach "Suction Bulb" to common (fresh) gas outlet.
- Squeeze bulb repeatedly until fully collapsed.
- Verify bulb stays *fully* collapsed for at least 10 seconds.
- Open one vaporizer at a time and repeat 'c' and 'd' as above.
- Remove suction bulb, and reconnect fresh gas hose.

- Turn on Machine Master Switch

and all other necessary electrical equipment.\*

- Test Flowmeters\*

- Adjust flow of all gases through their full range, checking for smooth operation of floats and undamaged flowtubes.
- Attempt to create a hypoxic O<sub>2</sub>/N<sub>2</sub>O mixture and verify correct changes in flow and/or alarm.

### Breathing System

- Calibrate O<sub>2</sub> Monitor\*

- Calibrate to read 21% in room air
- Reinstall sensor in circuit and flush breathing system with O<sub>2</sub>.
- Verify that monitor now reads greater than 90%.

- Check Initial Status of Breathing System

- Set selector switch is in "Bag" mode.
- Check that breathing circuit is complete, undamaged and unobstructed.
- Verify that CO<sub>2</sub> absorbent is adequate.
- Install breathing circuit accessory equipment to be used during the case.

- Perform Leak Check of the Breathing System

- Set all gas flows to zero (or minimum).
- Close APL valve and occlude Y-piece.
- Pressurize breathing system to 30 cm H<sub>2</sub>O with O<sub>2</sub> flush.
- Ensure that pressure remains at 30 cm H<sub>2</sub>O for at least 10 seconds.

*continued on page 12*

## CPRI Moves Ahead

**C**PRI (The Computer-based Patient Record Institute) held its fourth meeting on November 12, 1992. If you think medicine has trouble with alphabet soup, you need foreign language skills to decipher the dialogue at a CPRI meeting. CPRI decided that HCFA, DOD, FDA, AHCRCPR, GAO and other users of CPRs have a mish-mash of communication standards such as IEEE,

X12, NCPD, ASTM and HL7. Therefore, CPR data bases such as Snomed III, ICD-9 CM, ICD-10, HCPCS, DSM, HELP, ICPP, UMLS, and CPD information cannot be interrelated or connected to CAS, ATC, ICCS, GPI, READ, CDI, HCPCS or HCPS Drug Coding Systems.

Got it? Although it may be difficult to decipher this conglomeration of terms, it was obvious to me after one day at this meeting that developing a standardized international anesthesiology database is not a small task.

The CPRI meeting on November 12th in Baltimore, Maryland, had close to two hundred attendees with representatives from the AMA, ACP, ANA, AHA, Kaiser Permanente, IBM, VHA, Hewlett Packard, Mayo Clinic, Scott and White Clinic, 3M and other organizations. No anesthesia CPR vendor was represented and apparently only two anesthesiologists were present. This was unfortunate since there were many items discussed which related to our specialty. Work groups convened from 9:00 a.m. to 2:30 p.m. to discuss four areas of CPR concern. Each work group split into sub groups of 5 to 20 individuals to cover different topics. The major work groups activities included:

- ✓ **The Professional and Public Education Group** which is in the process of producing a one hour video presentation that will give a reasonable explanation of what CPRs can accomplish.
- ✓ **The CPR Demonstration Group** which is developing a library of literature and references that demonstrate the cost benefits or quality improvement ben-

efits that can be demonstrated by the use of CPRs. They also want to create a library of organizations involved with development, research or production of CPRs. A third objective is to describe needs that should be addressed by CPRs both on a functional and informational basis.

- ✓ **The Confidentiality/Privacy/Legislative Group** is compiling a list of related legislative efforts in various states and federally. They intend to develop principles of access to CPR data, as well as aid in the development and promotion of legislation to mandate the use of CPRs for a comprehensive medical record from birth through death. The CPR should be complete in both of breadth and longitudinal scope.
- ✓ **The Codes and Structure Group** is pursuing the goal to "promote the development of the use of standards for the Computer-Based Patient Record, messages, communications, codes and structures."

To achieve the goals of the codes and structures group, a key role of CPRI will be to serve in an advisory capacity to official standard setting organizations on the existing and emerging CPR standards. The group will attempt to

define the ideal coding structure for various medical data sets, both by reviewing existing coding structure, highlighting the deficiencies and benefits of each system, and through brainstorming sessions to come up with advanced coding systems. For example, a medical data base needs to contain pharmaceutical information. This pharmaceutical data set needs to have specific and unique codes assigned for each drug in order to maintain organization and access. There are currently thirteen coding systems used in the United States for organizing drug data. CPRI has recently reviewed these data sets and coding systems and will produce a White Paper with its recommendations. CPRI will not produce standards but will promote and support organizations who wish to come forth with such standards.

### Anesthesiology Input Needed

CPRI is a rapidly growing and remarkably well organized effort that is dominated by the medical community. Representation from the anesthesia world is needed. For example, in defining the intraoperative data to capture, the group clearly focused on the surgeon's dictated operative report as being the major and important aspect of data to be gathered from the operating room. Of course my biased point of view pointed out that if the purpose of the medical data base was to record treatments and to summarize the patient's condition, the anesthesia record might be more appropriate. This group is rapidly becoming a central player in the coming revolution of CPRs and it would benefit the anesthesia

## AMIA Attractive Forum for STA Members

The purpose of this article is to invite STA members to consider participation in the AMIA. The American Medical Informatics Association (AMIA) has a Working Group (formerly called a Professional Specialty Group, or PSG) for Anesthesiology, Critical Care, and Emergency Medicine. This Working Group also includes members from endocrinology, general and trauma surgery, human factors and biomedical engineering, decision support, informatics, and others. This diverse grouping resulted from the merger of individual specialty groups with similar interests that were too small to be visible alone.

Although this working group has not been productive to date, there seems to be renewed interest. At the SCAMC (Symposium on Computer Applications in Medical Care) meeting held in Baltimore in November, twenty-four individuals attended a working group breakfast meeting—a fourfold increase in participation over previous years. The larger participation probably reflects recognition of the increasing prominence of medical informatics and the potential contributions of computerization to acute medical practice. When possible dissolution of the group for lack of interest was proposed by the AMIA administration, those present objected that the multidisciplinary nature of the AMIA and this working group are unique and complimentary to the more specialized interests pursued



within each specialty. Therefore an ad hoc election of officers took place; Dr. Mark Poler was elected interim chair with 5 others forming a steering committee. Drs. Michael Ashman and Igal Nevo, are members of STA that have served as previous chairmen of this group.

The initial goal of this group is to reformulate its mission statement and hold a regular election for officers. The group will then try to organize a multidisciplinary panel to focus attention on the interests and existence of the working group during the AMIA sponsored SCAMC 17 to be held in Washington, DC in November 1993.

To facilitate communication, a "listserver" on the Internet has been established by Ron Benoit of the University of Maryland Shock-Trauma center (MIEMSS). This listserver redistributes a single incoming e-mail message to all interested subscribers. A subscriber need not be a member of AMIA. Listserver postings are sent as regular e-mail to the subscribers, including those using CompuServe or other Internet gateway services. The advantage to this approach is that it eliminates the need to browse regularly forum postings, as one must do in the CompuServe fora. If you want additional information about

subscribing, please contact Dr. Poler (see below). Since the AMIA sponsors the MEDSIG Forum on CompuServe (where STA members use the Specialties subsection), this forum is also available for correspondence and discussions.

Membership in the working group is open to all AMIA members. Many of the AMIA members also belong to STA. New members are being solicited to increase the breadth and depth of this working group, and AMIA participation. A vigorous representation of anesthesiologists in a working relationship with other acute care specialists is very desirable to avoid isolationism, and to advocate mutually agreed positions for common interests of the acute care medical specialties represented. AMIA membership dues include two peer-reviewed general publications: MD Computing, and Computers and Biomedical Research. A Journal of the American Medical Informatics Association is being planned.

If you would like more information, please contact Dr. Poler (717-271-5848; fax: 717-271-5738, CompuServe: 70253,2075; via Internet: 70253.2075@COMPUSERVE.COM). If you choose to join using the enclosed membership application, please put Dr. Poler's name and membership (P019383) number in the sponsor space so that the effect of this article can be estimated. ♦

- M. Poler



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## **STA-Sponsored Activities at ASA Meeting a Success**

### **Dinner Meeting**

The STA dinner meeting was held this year at the Sheraton New Orleans on Sunday, October 18. The attendees were treated to an excellent meal in typical New Orleans tradition, and a fascinating review of aviation accidents. John K. Lauber, PhD, a member of the National Transportation Safety Board, discussed the activities of his group, the causes of a variety of aviation disasters and the lessons to be learned that can be applied to anesthesia practice.

The National Transportation Safety Board consists of five individuals, appointed by the President and confirmed by Congress to oversee the investigation of all transportation disasters. The goal of this group is to identify factors that contribute to transportation accidents and recommend actions to prevent these factors from causing future accidents.

**"With every increase in technological capabilities, there is the potential for new types of errors."**

In describing a series of accident vignettes, Dr. Lauber emphasized the role of human error as either the cause of the accidents, or a major factor in the evolution of the event. He stated that when working with technology, people tend to trust the equipment because they expect it to function properly. Although technology has provided tremendous advances, Dr. Lauber noted that with every increase in technological capabilities, there is the potential for new types of errors. The more

complex and tightly coupled the system becomes, the greater the potential for mishaps.

Much of the activity towards accident prevention in aviation mirrors the STA mission to carefully consider the benefits of technology before accepting it openly.

### **From the OR to the Space Station**

The Education Subcommittee was delighted with both the breakfast panel that was presented at the ASA and the attendance. The title selected, "Remote Anesthesia, How Close Have We Got?" attracted a lively and interested audience and provided a useful subject for the panel members to consider.

Robert Chilcoat, Ph.D., Section Director, Health Care Research and Development, BOC Group Technical Center, spoke first on "Anesthesia Delivery: How Far, How Near," and reviewed some of the problems encountered in the different sites in which we have to work. Jeffrey Cooper, Ph.D., Director of Anesthesia Technology, Department of Anesthesia, Massachusetts General Hospital, spoke on the "The Facility: Essential Requirements and Impossible Features," and emphasized the importance of maintaining the same standard for equipment and monitors in remote locations as in the operating room. He was followed by Irene Osborn, M.D., Assistant Professor, Department of Anesthesiology, Albert Einstein College of Medicine, who spoke on "Monitoring: Problems and Solutions." She emphasized the requirements for monitoring and the problems encountered for each type of monitoring equipment in different environments. Dwayne Westenskow,

Ph.D., Professor, Department of Anesthesiology, University of Utah Medical Center, spoke on "What Won't Work Where: MRI, Radiotherapy, Lithotripsy, and Tomography," and provided a useful description of how we are able to monitor people in deep space and that, in this context, the problems of monitoring human beings only a few feet

**■Dr. Cooper emphasized the importance of maintaining the same standard for equipment and monitors in remote locations as in the operating room.**

away from us are relatively minor. Finally Professor Smalhout, Chairman, Institute of Anesthesiology, University Hospital, The Netherlands, spoke on "Do We Need to See the Patient: Can We Do it All by Instruments?" Dr. Smalhout presented a most challenging and interesting vision of monitoring patients better without the requirement to see or touch the patient. In particular he outlined a number of scenarios in which the human senses are inadequate and modern monitoring methods are superior.

The current plans for the 1993 breakfast panel at the ASA are to invite members of the different regulatory agencies in Washington to discuss future changes in health care policy. ♦

# Asleep at the Wheel?

## The Role of Ambulatory EEG

**Steve Howard, MD**

Assistant Professor of Anesthesiology  
Stanford University School of Medicine

Ambulatory cassette electroencephalogram (EEG) recording was developed in the early 1970's using the same technology as the continuous ambulatory electrocardiogram (Holter monitor). Since that time, psychiatrists and neurologists have used these devices to capture data on patients/subjects in environments outside of the hospital. Anesthesiologists might find these monitors useful in investigating patients in the perioperative period. This equipment may also prove to be ideal for monitoring anesthesia practitioners during duty and non-duty periods. We may be able to understand not only the sleep patterns of patients but also those of the often fatigued physicians who care for them. In fact the Anesthesia Patient Safety Foundation has funded research (scheduled to begin in 1993) that will utilize this technology to study the sleep habits of anesthesia providers.

The equipment consists of scalp electrodes applied in a standard fashion to obtain either a 4 or 8-channel montage. The cables are gathered at the back of the neck and connect into a preamplifier which then inserts into a small cassette recorder which can be worn at the waist. The tape captures 24-hours of continuous EEG activity for evaluation at a later time. The current generation of ambulatory cassette recorders allow for monitoring of other physiologic parameters such as the electrooculogram (EOG) and the ECG.

Audio-video scanning systems have also been developed to review 24-hour EEG recordings via high-speed replay. Data can be played back at up to 60

times the recorded speed so that 24-hours of data can be scanned in 24 minutes. Clinically relevant portions of the recording can be slowed down and analyzed on the screen or data can be written onto chart paper by connecting a polygraph to the playback unit.

Sleep staging can be performed by automated analysis of the cassette recording. This provides important information about the subject's sleep pattern including time spent in the different stages of sleep, total sleep time, number of awakenings per recording period, etc.

There are pitfalls to ambulatory EEG recording. Although automated systems facilitate analysis of the large amount of data in a single 24 hour study, an expert physician trained in ambulatory EEG analysis is still required for interpretation. The system is quite robust but some data are inevitably lost due to artifact and electrode malfunction.

In the future, this type of monitoring should be useful in the following ways: 1) evaluation of new drugs aimed at cerebral protection; 2) evaluation and effect of new anesthetic drugs; 3) evaluation of recovery from anesthesia and its effect on sleep in the postoperative period; 4) monitoring of sleep/wake cycles of acutely ill patients in the intensive care unit setting; 5) monitoring the sleep/wake cycles of physicians. Other uses will no doubt come about as experience with the technology grows. ♦

## CPRI Moves Ahead

*continued from page 8*

community to become involved early in these issues. The anesthesia community has taken a leading role in many areas of medical care such as the setting of standards, political activism, risk management, and technological development but is conspicuously absent in the development of computerized patient records. In my opinion, this technology is the key toward total quality improvement and cost control.

One of the motivational reasons for the anesthesia community to become involved in these efforts was expressed in the introductory session of CPRI, "The policy crisis in health care is so acute, and the need for information standards so great, that there is a corresponding threat: If sufficient progress is not made through consensus groups, government agencies may mandate arbitrary and non-optimal requirements as defacto standards."

For anyone interested in shaping the future of the computer-based patient record, I encourage you to attend the March 5, 1992 meeting of CPRI at the Del Coronado Hotel in San Diego, California.

- D. Edsall

\* For an introduction to CPRI and its mission see Interface Vol. 3 #4. Information can also be obtained by writing to: Computer-Based Patient Record Institute, Inc. c/o American Health Information Management Association, 919 N. Michigan Ave., Suite 1400, Chicago, IL, 60611. ♦



*continued from page 7*

#### Scavenging System

11. Check APL Valve and Scavenging System
  - a. Pressurize breathing system to 50 cm H<sub>2</sub>O and ensure its integrity.
  - b. Open APL valve and ensure that pressure decreases.
  - c. Ensure proper scavenging connections and waste gas vacuum.
  - d. Fully open APL valve and occlude Y-piece.
  - e. Ensure absorber pressure gauge reads zero when:  
minimum O<sub>2</sub> is flowing.  
O<sub>2</sub> flush is activated.

#### Manual and Automatic Ventilation Systems

12. Test Ventilation Systems and Unidirectional Valves
  - a. Place a second breathing bag on Y-piece.
  - b. Set appropriate ventilator parameters for next patient.
  - c. Set O<sub>2</sub> flow to 250 ml/min, other gas flows to zero.
  - d. Switch to automatic ventilation (Ventilator) mode.
  - e. Turn ventilator ON and fill bellows and breathing bag with 92 flush.
  - f. Verify that during inspiration bellows delivers correct tidal volume and that during expiration bellows fills completely.
  - g. Check that volume monitor is consistent with ventilator parameters.
  - h. Check for proper action of unidirectional valves.
  - i. Exercise breathing circuit accessories to ensure proper function.
  - j. Turn ventilator OFF and switch to manual ventilation (Bag/APL) mode.
  - k. Ventilate manually and assure inflation and deflation of artificial lungs and appropriate feel of system resistance and compliance.
  - j. Remove second breathing bag from Y-piece.

Monitors
13. Check, Calibrate and/or Set Alarm Limits of all
  - a. Monitors
  - b. Capnometer
  - c. Pulse Oximeter
  - d. Oxygen Analyzer
  - e. Respiratory Volume Monitor (Spirometer)
  - f. Pressure Monitor with High and Low Airway Pressure Alarms

#### Final Position

14. Check Final Status of Machine
  - a. Vaporizers off.
  - b. APL valve open.
  - c. Selector switch to "Bag."
  - d. All flowmeters to zero (or minimum)
  - e. Patient suction level adequate.
  - f. Breathing system ready to use.

\*If an anesthetist uses the same machine in successive cases, these steps need not be repeated or may be abbreviated after the initial checkout.

## STA Slate of Candidates

As noted on page one, STA elections are currently in progress. Listed below is the slate of candidates nominated by the Nominating Committee and ratified by the Board of Directors:

<b>President</b>	Jerry M. Calkins, MD, PhD
<b>President-Elect</b>	J.S. Gravenstein, MD Kevin K. Tremper, MD, PhD
<b>Secretary</b>	Julian M. Goldman, MD Matthew B. Weinger, MD
<b>Treasurer</b>	Jan Ehrenwerth, MD Franklin L. Scamman, MD
<b>Board Member</b>	Michael L. Good, MD David M. Gaba, MD



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