SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS SOCCA

INTERCHANGE

Society of Critical Care Anesthesiologists Newsletter Volume 31 | Issue 1 | March 2020

PRESIDENT'S MESSAGE

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Colleagues,

This is being written as COVID-19 unfolds in the United States, and I hope you are safe and secure. My submission is actually overdue owing to local involvement in disaster preparedness and response planning, and I know many of you are in similar positions within your institutions. This should serve to remind us, as well as our professional colleagues and administrative partners, of the broad skill sets we bring to the table. These skill sets not only include clinical care but the ability to build teams, make decisions, and effectively communicate.

Our membership numbers continue to slowly increase, and we believe that we have a plan to increase member retention that will be associated with ongoing growth of the society. Volunteerism is strong, and we continue to prioritize opportunities for our members to contribute. The most recent example is SOCCA's partnership with Anesthesia Toolbox to develop critical care educational content on their collaborative educational platform. This effort, coordinated by Dr. Jason Brainard, will identify needed areas of content and match this content with SOCCA volunteers who will develop this content and then provide editorial oversight. The content is peer reviewed and recognized as such for academic purposes. For those interested in participating in the modified Delphi process to determine topics, content development or editorial efforts, please reach out via the volunteer link (socca.org/get-involved/) or send a note to Vivian Abalama (vabalama@iars.org). Over the next several years, the plan is to incorporate this into SOCCA's growing educational content alongside selected Annual Meeting presentations and professional development resources.

The Annual Meeting and Board Review courses promise to be an excellent opportunity to learn and network. This year, more than 300 abstracts were submitted, which is an all-time record. Registrations for the meeting are also ahead of historical rates. SOCCA attendees can claim up to 17.5 CME credit hours toward their ABA MOCA 2.0 Part II requirement for attending the 2020 SOCCA Annual Meeting and SOCCA, IARS, and AUA Aligned Meeting Day (May 15 and 16, 2020 respectively). Of these CME hours, 7 will contribute to the patient safety component. This patient safety CME component will be an ongoing feature of our educational offerings.

Several activities in the research arena are important to know. SOCCA members will receive a survey inquiring about interest and local resources available to support research. Our goal is to develop a research consortium that is able to identify areas of

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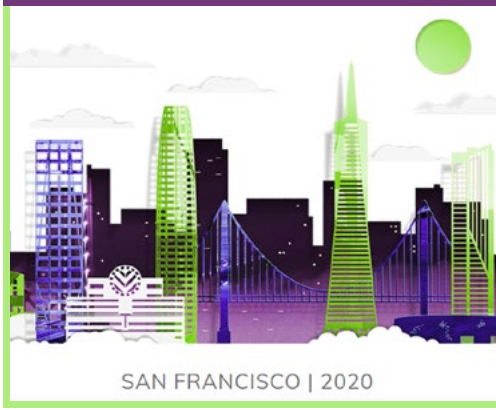
JOIN US in San Francisco for the IARS, AUA and SOCCA Annual Meetings, May 14 – 18, 2020



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ANNOUNCEMENT

IARS-AUA-SOCCA Statement on Coronavirus Disease (COVID-19)

Updated March 9, 2020

As of today, the IARS, AUA and SOCCA 2020 Annual Meetings are scheduled to take place as planned May 14-18, 2020 in San Francisco, California. We want to assure everyone planning to attend the meetings that their health, safety, and security are our top priority. We are taking the COVID-19 threat seriously and are considering all options with attendee welfare in mind. We are also weighing the options with respect to canceling the meeting, should that course of action become necessary.

The IARS, AUA and SOCCA are tracking the travel restrictions issued by the U.S. Government and local government agencies, as well as travel restrictions imposed by academic institutions and employers. We are also tracking information and guidance from the U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

We will provide further updates as they become available and as events warrant. Colleagues who have questions in the meantime can contact the IARS Meetings Department staff, by email to meetings@iars.org.

How we are preparing

- Enhancing communications — IARS, AUA and SOCCA will communicate any change in status of the meeting through email and on the meeting websites.
- Adhering to all guidance and recommended safety measures issued by the WHO, CDC, The San Francisco Department of Public Health, San Francisco International Airport and local health organizations, including CDC's health care protocols for management of COVID-19 by state and local health departments and WHO's recently released Key Planning Recommendations for Mass Gatherings in the Context of the Current COVID-19 Outbreak.
- Actively encouraging attendees to take common-sense precautions and follow CDC guidelines to prevent the spread of illness.
- Considering options for alternate methods of content presentation in the event the meeting is cancelled.

COMMITTEE REPORT

Education Committee Update

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This time of the year the SOCCA Education Committee turns its focus toward the final planning of the Annual Meeting in San Francisco. This year the meeting will comprise up to three days of content beginning with a new board review course on Thursday, May 14; followed by the dedicated SOCCA day on Friday, May 15; and finally aligned SOCCA-IARS content on Saturday, May 16.

For the first time, SOCCA will offer a dedicated board review course immediately prior to the Annual Meeting. The addition of a board review course highlights the inception of a broader educational approach by SOCCA. Practically speaking, the board review day will not only provide valuable education for individuals preparing for the board exam, but also an opportunity for junior faculty to speak at a national level. By dovetailing the course with the SOCCA meeting day, trainees and junior faculty will also be able to easily participate in the meeting itself.

We are looking forward to a SOCCA Annual Meeting that again features four distinct education sessions covering a variety of topics. We were fortunate to recruit an outstanding lineup of speakers who are true experts on the topics they will present. In addition to the core education sessions, we are happy to share that we received a record number of abstract submissions. The selected abstracts will be presented during two distinct poster sessions on the day of the Annual Meeting, culminating in the presentation of the Young Investigator Award for the best abstract submitted to SOCCA.

The IARS Annual Meeting will start the day after our meeting, Saturday, May 16. We are again proud to present a number of exciting aligned sessions that feature critical care anesthesiology experts presenting on critical care-related topics to the greater anesthesiology community attending the IARS. Attendance at the aligned day is included in the SOCCA Annual Meeting registration fee.

At the time of the SOCCA Annual Meeting, planning for next year's meeting begins. The SOCCA Education Committee has changed substantially over the past two years. From a small group dedicated to plan the SOCCA Annual Meeting, we have evolved to a strong committee with now 16 members. We are fortunate to have a diverse group of national experts working together to broaden our educational portfolio and striving to maintain our high-quality meeting structure and content.

PRESIDENT'S MESSAGE *continued from the cover*

common interest and develop an approach to investigate clinically important questions pertinent to our membership. Other societies are able to foster such work, and we believe that we have the talent and drive to advance this over the next several years. However, in order to be most successful, we need to pool all the interested individuals and programs. Please consider participating in the survey. We recognize the real issue of survey fatigue and aim to only request participation in surveys that provide meaningful information and that will influence SOCCA activities.

Finally, the Communication Committee is working to refine the ways in which we both keep the membership updated and highlight the accomplishments of our members. For example, the Burchardi Award was presented at the SCCM Congress in Orlando to Neal Cohen, MD, MPH, MS, FCCM, School of Medicine Vice Dean and Professor of Clinical Anesthesia at the University of California, San Francisco. The Burchardi award is jointly sponsored by SOCCA and the SCCM Anesthesiology Section and is named after Hilmar Burchardi, MD, a pioneer in critical care medicine. Over the coming months we will develop a unified communication strategy and integrate the SOCCA website, blog, e-mail, and social media outlets. As the society continues to grow both in numbers and activity, we look forward to sharing these exciting developments with our members.

Be well, and I hope to see you in San Francisco.

Dan

COMMITTEE REPORT

Communication Committee Update

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Chair, SOCCA Communications Committee
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With two months of 2020 already behind us, the Communication Committee is collaborating with the Board of Directors and SOCCA's other committees to create a unified communication strategy moving forward. This is an exciting time for SOCCA: membership is on the rise, the inaugural SOCCA board review course is forthcoming in conjunction with the Annual Meeting, and a clinical trials group is beginning to coalesce. SOCCA's committees are working to develop online resources for members, including coronavirus preparedness materials and (coming soon) leadership development reading. Meanwhile, members are engaged in impactful clinical, research, leadership, and educational activities on a large scale. The Communication Committee's focus must shift to not only inform the membership of SOCCA happenings but also amplify both the ways in which SOCCA provides value to its members and the accomplishments of its membership. To that end, the committee is developing a two-pronged approach to information dissemination relying both on regularly scheduled content releases across multiple platforms and a distributed model for the curation of ad-hoc announcements.

This issue of *Interchange* again highlights topics that are of interest to the membership, including both developments internal to the Society and the perspectives of members on both emerging and established challenges for clinicians and patients alike. Emerging infectious threats, namely *Candida auris* and coronavirus disease 2019 (i.e., 2019 novel coronavirus), share certain commonalities, such as the heightened potential for nosocomial transmission and the need for screening and facility-specific contingency planning. Professional society trade publications, like *Interchange*, have historically offered a timelier mechanism to disseminate information compared to traditional biomedical publications, such as major journals. As publishers of major journals evolve to remain relevant amidst an increasingly competitive landscape while meeting the ever-growing demands of an information-hungry and connected medical readership, *Interchange* will likewise need to evolve. Accordingly, we anticipate Interchange gradually shifting toward a timely online blog format with quarterly aggregation into our traditional newsletter format.

On a strongly related note, the Communication Committee is currently seeking Society members who are interested in contributing by joining the committee itself to develop an integrated communication strategy, authoring or curating content for *Interchange*, and/or helping to champion and amplify the Society and its membership through social media and other outlets. Ensuring that these efforts remain valuable, relevant, current, and representative of the membership's diversity is of the utmost importance. Please do not hesitate to reach out if you are interested in contributing.

FEATURED ARTICLE

Developments Concerning Coronavirus Disease 2019 (COVID-2019)

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Media attention concerning the outbreak of a novel coronavirus in December of 2019 has steadily increased over preceding weeks, and at the time of writing there is early evidence of community spread in the United States. The World Health Organization (WHO) has declared the coronavirus disease 2019 (COVID-2019) outbreak to be a Public Health Emergency of International Concern, and significant efforts are underway to better understand the disease's clinical features, transmissibility, and potential treatment options. Simultaneously, organizations with purviews ranging from international to hyperlocal are faced with decisions concerning optimal approaches to patient screening, diagnosis, exposure mitigation, and resource allocation. The potential for severe respiratory failure prompting need for intensive care has come to the attention of critical care physicians worldwide, and optimal preparatory steps can be better informed by reviewing our current state of understanding. As an important note, and similar to any new disease, the global healthcare community's conception of COVID-2019 is in a rapid state of flux. Over the coming weeks to months, gaps in understanding will gradually close, and current understandings will be retrospectively recognized as misunderstandings.

What is a coronavirus?

Broadly speaking, coronaviruses (CoVs) are large, enveloped single-stranded RNA viruses with the potential for zoonosis. CoVs lead to respiratory infection in humans, which can range in severity – based on the pathogenicity of the causative virus and frailty of the host – from the common cold to life-threatening acute respiratory distress syndrome (ARDS).

Has the nomenclature surrounding this particular CoV changed?

As with any new disease, some time was required to establish a definitive nomenclature. The CoV itself, previously termed 2019 novel coronavirus (2019-nCOV) has more recently been named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). The resulting infection and clinical disease state has also been recently termed COVID-2019.

Have we seen coronavirus outbreaks before?

Both the Severe Acute Respiratory Syndrome (SARS) epidemic circa 2002–2003 and Middle East Respiratory Syndrome (MERS) epidemic circa 2012–2013 highlight the potential impacts of a CoV outbreak. (To again draw a parallel, MERS was originally termed novel coronavirus 2012.) While CoVs, broadly speaking, may be pathogens of little clinical consequence, MERS-CoV and SARS-CoV were associated with significant worldwide morbidity and mortality. As suggested by the name SARS-CoV-2, the virus itself appears closely related to SARS-CoV with about 80% genetic similarity and the same cell entry receptor (i.e., angiotensin converting enzyme 2 [ACE2] receptors). SARS-related CoV (SARSr-CoV) was previously identified by the WHO as a potential cause of future epidemics.

Are lessons from SARS and MERS applicable to COVID-2019?

There appear to both similarities to, and differences from, SARS and MERS. As with prior CoV outbreaks, an animal reservoir has again been implicated. In SARS and MERS, as with other respiratory infections, hosts with risk factors such as advanced age, numerous comorbid conditions, and/or severe comorbid disease were more likely to develop frank ARDS and succumb to the disease. Evidence suggests that the same may be true for COVID-2019. Early clinical data about COVID-2019 supported human-human transmission, and in SARS and MERS viral shedding from symptomatic patients was a significant contributor to hospital environmental contamination

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and nosocomial transmission, including that to healthcare workers. With SARS-CoV infection, it has been posited that high ACE2 receptor density in the lower airways may account for the predominantly lower respiratory symptomatology and delayed viral shedding. However, a recent study of SARS-CoV-2 upper respiratory viral loads has suggested that viral shedding patterns may more closely resemble those of patients infected with influenza than SARS-CoV, as viral loads in asymptomatic patients were similar to those in symptomatic patients. Additional evidence continues to mount suggesting the potential for transmissibility by asymptomatic carriers. As reviewed below, isolation, environmental decontamination, and personal protective equipment (PPE) are important to mitigate these risks.

Variable adherence to the foundational principles of public health were credited both for the initial spread of SARS and its eventual containment. Steps to contain COVID-2019 have likely been informed by those lessons; however, aggressive state-supported quarantine and travel restrictions have been controversial. Basic measures, such as hand hygiene, respiratory etiquette, and staying home when sick form the foundation of public health best practice when dealing with respiratory viruses.

SARS was highly pathogenic with an estimated 20-30% of patients requiring intensive care unit admission, and of those approximately 75% required mechanical ventilation in some case series. The overall mortality rate of SARS has been estimated at about 10% amongst all infected persons, but for patients with ARDS mortality rates generally approximated those of ARDS at the time. As reviewed below, SARS-2-CoV appears more readily transmissible but potentially less fatal.

How can we screen for and recognize cases of COVID-2019?

Screening recommendations have been the subject of substantial attention and revision over the prior weeks. In the United States, the Centers for Disease Control and Prevention (CDC) provides continuously updated screening recommendations online (see Selected Resources). At the time of writing, screening recommendations are based on the combination of clinical features (i.e., symptomatology) and epidemiologic risk factors.

Early symptoms are nonspecific can include fever, dry cough, and shortness of breath anywhere between 2 and 14 days after potential exposure. Other constitutional symptoms are possible. Epidemiologic risk factors could include potential travel-related exposure or exposure to sick contacts. Travel to Hubei Province, China is considered to be highest risk followed by travel to mainland China excluding Hubei Province. South Korea, Italy, Iran, and Japan are additional areas of disease activity at the time of writing, and screening recommendations are likely to remain dynamic as the disease spreads further. Exposure to sick contacts and/or persons under investigation (PUIs) is complex and again stratified by potential severity.

How should patients with suspected or known COVID-2019 be triaged?

CDC guidelines remain dynamic and may change over time; as such, updated online recommendations should be referenced when developing local policies and procedures. Options based on symptomatology and epidemiologic risk include ordered quarantine, voluntary quarantine, isolation for evaluation or treatment in a healthcare setting, routine medical care, and home monitoring with or without oversight. Clinicians suspecting COVID-2019 should consider those individuals as PUIs and notify their facility's infection prevention team and local/state public health authorities. Early identification of a PUI is critical to prevent unrecognized and/or unprotected exposures. Plans exist to expand the capability of diagnostic testing beyond the CDC alone.

What is known about the clinical course of COVID-2019?

Information is still being gathered about COVID-2019; however, it has been argued that COVID-2019 appears to have a greater infectivity rate but lower mortality rate compared to SARS and MERS. As with any outbreak, the infection and mortality statistics are dynamic. At the time of writing, the WHO estimates that 80% of patients will have mild disease, 14% of patients will have severe disease with significant respiratory symptomatology, and 5% of patients will be critically ill. The overall mortality rate, again at the time of writing, appears to be no more than approximately 2% based on epidemiologic estimates. Care should be taken when interpreting small case series of hospitalized and/or critically ill patients as their outcomes are not representative of population-level outcomes.

The reported median incubation period ranges from approximately 4 to 7 days, but incubation periods stretching out to 14 days, and as long as 24 days, have been suggested. This potential 14 day window is reflected in the approach to screening delineated above. Initial symptomatology is variable and outlined above. As with SARS, older patients with comorbid disease appear to be at higher risk for progression to overt respiratory failure. Patients requiring hospitalization have

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variably demonstrated radiographic evidence of pneumonia, including infiltrates on plain film and ground glass on computed tomographic imaging.

What treatment options are available?

Although antiviral medications are being trialed, care is largely supportive, as with other viral respiratory pathogens. It was historically felt that non-invasive positive pressure ventilation and/or heated high flow nasal canula conferred substantial risks of aerosolization, and therefore tracheal intubation may be deemed by care teams to confer less risk. However, there is some evidence to suggest that modern systems with well-fitting interfaces do not create wide dispersion of exhaled air. Having said that, guidance from the WHO at the time of writing calls for additional caution with non-invasive respiratory support given a tendency toward treatment failure with MERS. As such, clinicians may still choose to initiate invasive positive pressure ventilation quickly. Interim guidance from the WHO for clinical management also currently carries recommendations for close attention to fluid resuscitation to avoid respiratory trespass, lung protective mechanical ventilation, and prone positioning in patients with ARDS.

What type of personal protective equipment is needed?

The CDC has released detailed guidance about infection control measures, including PPE, which are linked below. Training in the proper donning, use, and doffing of PPE should be an institutional priority when undertaking preparatory steps, and critical care leaders will need to partner with their facilities and infection prevention colleagues to ensure adequate clinician competency. Isolation measures include recommendations for airborne infection isolation rooms. Current PPE recommendations include use of a N95 (or equivalent), or better, respirator; gown; gloves; and eye protection. Relevant to anesthesiologists, the CDC also calls for caution when performing aerosol-generating procedures, such as endotracheal intubation, open suctioning, bronchoscopy, and cardiopulmonary resuscitation. A serious respiratory pandemic may limit available supplies of PPE due to both increased utilization and supply chain challenges, and the CDC has issued guidance about optimizing the supply of N95 respirators, again linked below. In a recently-published large case series, 3.8% (N=1,716/44,672) of healthcare personnel contracted COVID-2019, of which 14.8% of cases were severe or critical, and there were five reported deaths. At the time of writing, standard, contact, and airborne precautions are recommended.

Where can I find more information?

COVID-2019 has clearly demonstrated the evolving nature of biomedical information dissemination. As highlighted by the conventional press, social media played an important role in raising the level of global awareness and concern about clinical suspicion for a novel respiratory pathogen, which we now know to be SARS-CoV-2. Major biomedical publishers have accelerated their review and acceptance processes to aid in information dissemination and made content available free of charge. Twitter and other avenues for free open access medical education are also potential resources. In exchange for increased timeliness and access to information must come a measure of caution and balance. For example, under-recognition of less severe COVID-2019 cases may have initially contributed to the perception that SARS-2-CoV was highly fatal. This highlights the importance of staying current as additional developments unfold.

Selected Online Resources

SOCCA Member-Only Online Resources:
https://socca.memberclicks.net/

CDC Resource Hub:
https://www.cdc.gov/coronavirus/2019-ncov/index.html

CDC Respiratory Conservation Strategies:
https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirator-supply-strategies.html

CDC Infection Control:
https://www.cdc.gov/coronavirus/2019-nCoV/hcp/infection-control.html

WHO Resource Hub:
https://www.who.int/health-topics/coronavirus

WHO Patient Management Guidance:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/patient-management

Dynamic COVID-2019 Tracking (John's Hopkins):
https://systems.jhu.edu/research/public-health/ncov/

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FEATURED ARTICLE

Candida Auris: A Growing Menace in the Intensive Care Unit

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Worldwide, candidiasis remains the most the important and common fungal infection with crude and attributable mortality rates of 42% and 27%, respectively.[1] There has been a recent deluge of drug-resistant *Candida auris (C. auris)* infections in intensive care units (ICUs) worldwide. In the United States alone, C. auris has led to hundreds of deaths in the past three years largely concentrated in Illinois, New York and New Jersey.[2] Other outbreaks have been observed in Germany, Spain, India, and South Africa. First described in 2009, genetic analysis of *C. auris* has observed low phylogenetic diversity, suggesting a relatively recent emergence, possibly related to the indiscriminate use of antifungal medications.[3]

C. auris identification is particularly challenging, as it often remains unidentified in routine biochemical identification systems commonly employed in microbiology laboratories. Additionally, multidrug resistance is prominent. Susceptibility data have demonstrated a high resistance to fluconazole and elevated minimum inhibitory concentrations for voriconazole and amphotericin B.[4] It has been implicated in a wide variety of invasive fungal infections, but the majority have been critically ill patients undergoing invasive procedures, particularly central venous cannulation and vascular surgery.[5] Patients with underlying respiratory illness, the need for total parenteral nutrition, and postoperative drains appear at heightened risk for *C. auris* infection.[6]

As with all multidrug resistant infections, prevention should remain the mainstay of management. After identification, the Centers for Disease Control and Prevention (CDC) recommend that patients be managed in single rooms and to minimize staff who care for the patient. *C. auris* appears to be persistent on touch surfaces (up to 14 days) and has been identified on crash carts, ultrasound equipment, and bedside tables. Furthermore, the CDC suggests reassessment for colonization with *C. auris* at least every three months. Unit-specific policies have concentrated on bundles to reduce nosocomial transmission and included decolonization with chlorhexidine topical preparations, mouthwashes, and central venous catheter dressings. After identification, the site of infection should be determined to aid in antimicrobial selection. Most initial empiric treatment should begin with the administration of echinocandins, with micafungin demonstrating the highest efficacy. Reduced susceptibility has been observed with voriconazole and other triazole antifungal agents. In conclusion, emerging fungal infections remain a challenge in both diagnosis and management in the ICU, and a high level of suspicion is required to reduce the high mortality associated with *C. auris* infection.

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Recent Developments in Board Certification for Critical Care Echocardiography

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The evolution of critical care ultrasound in North America has been remarkable. Rapid technological advances have moved cardiac ultrasonography from the sole domain of cardiology and into the hands of the bedside intensivists. The increased availability of this disruptive technology, paired with an evolving appreciation of its applicability to the critically ill patient, have led to widespread adoption by intensivists across the nation. However, given the risks and consequences of misuse and misinterpretation of this technology, it became clear that both the means to recognize expertise and the establishment of competency standards were needed. With these goals in mind, the National Board of Echocardiography (NBE), in conjunction with nine other medical societies, established the Examination of Special Competence in Critical Care Echocardiography (CCEeXAM) with the inaugural examination taking place in 2019.[1] This exam is a comprehensive assessment of cardiac and non-cardiac ultrasound knowledge and image interpretation as applicable to the adult critical care population. It sets a standard for expertise in the clinical use of ultrasound in the intensive care unit. With the release of the exam, the NBE has further moved to establish formal criteria for board certification in Advanced Critical Care Echocardiography (ACCE) by establishing formal performance metrics for experience in the use of ultrasound.

Given the nascent nature of the CCEeXAM, a limited number of preparatory resources are currently available. As with most board certification examinations, an outline of the tested content is provided by the NBE and available online. Critical care societies, including the American College of Chest Physicians (ACCP) and the Society of Critical Care Medicine (SCCM), have quickly moved to provide live review courses to aid in preparation for the exam. In addition to the live course, the SCCM also provides an online self-directed review course.

Unfortunately, at this time there is a lack of available textbooks specifically geared towards the CCEeXAM, although several review textbooks specific to the tested materials are currently in production. Echocardiography review texts for graduating cardiology fellows, such as *Echocardiography Board Review* (Wiley) and *Clinical Echocardiography Review* (Wolters Kluwer Health), remain popular resources for many in preparation for the examination.[2,3] While these review books cover the majority of the CCEeXAM content outline, some of the subject matter may not be pertinent for the purposes of critical care echocardiography.

Examinees who successfully pass the written examination are granted NBE Testamur status. Physicians interested in moving on to ACCE certification need to possess a valid, unrestricted medical license and be board certified in their primary specialty. While an application for certification can be submitted at any time, the application is not reviewed by the certifying committee until the applicant has passed the CCEeXAM or the Examination of Special Competence in Adult Echocardiography (ASCeXAM). Currently, applicants who pass the ASCeXAM prior to 2020 can apply for the certification, although after 2022 the CCEeXAM will be the only permissible examination for certification. Once a candidate is certified, the certification is valid for a period of ten years from the time that the applicant passed either the CCEeXAM or the ASCeXAM.[4]

The NBE currently provides two separate certification pathways: the supervised training pathway and the practice experience pathway. The supervised training pathway requires the applicant to have successfully completed fellowship training in adult critical care medicine before applying for certification. For those completing training after December 2022, fellowship training in critical care must be obtained at an ACGME-accredited program. Additionally, the applicant must also have performed and interpreted 150 full transthoracic echocardiograms under the supervision of a qualified supervisor to fulfill the certification requirements. The NBE defines a complete critical care transthoracic echocardiogram as a point-of-care assessment that includes all obtainable elements of the transthoracic echocardiography examination. However, the exact elements

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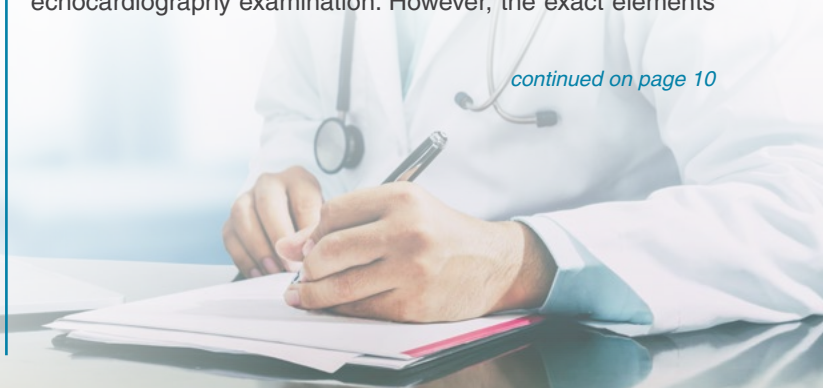

and views that constitute a complete exam are not currently specified by the NBE. Notably, limited (i.e., goal directed) examinations and those performed for purposes of education or research are not accepted for certification.[4]

Applicants interested in obtaining certification through the practice experience pathway must have a minimum of 750 hours of clinical experience dedicated to critical care medicine and provide suitable evidence of verification as outlined by the NBE. This pathway also requires the applicant to have personally acquired and interpreted 150 complete transthoracic echocardiograms. A subset of these studies must be reviewed by a supervisor, again as defined by the NBE, and performed during the three years prior to the application. Further requirements in this pathway include completion of a minimum of 20 hours of AMA PRA Category 1 CME Credit activities devoted to echocardiography. Notably, certification through the practice experience pathway is set to expire in 2026.[4]

The NBE certification in ACCE allows intensivists to distinguish themselves as leaders in the field of point-of-care ultrasonography. Collaboration at the regional and national levels is now needed to ensure a recognizable presence of critical care anesthesiologists in this evolving field. A natural first step in this process could be creation of a database of anesthesiologist intensivists who have gained Testamur status or full ACCE certification and are interested in serving as mentors for future aspirants.

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FEATURED ARTICLE Coronavirus Disease 2019 *continued from page 7*

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PATIENT SAFETY SERIES

Prediction of Patient Deterioration on the General Care Floor: Making the Connection with ICU Admissions & Resource Utilization

INTRODUCTION

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A late-night code blue alarm ringing through a hospital's hallways is not new to our ears. We as anesthesiologists and intensivists have been 'first responders' to these adverse events and also 'first receivers' of these patients in the ICU. This '4am' patient deterioration phenomenon may be a simple lack of appropriate surveillance systems or maybe a more complex interplay of underlying patient physiology and concurrent disease insults.[1] In this issue of the SOCCA *Interchange*, we continue our series on perioperative cardiorespiratory events outside the ICU with a look at the intricate relationship between ICU admission and resource utilization. Dr(s). Wongtangman and Eikermann answer two seemingly simple but actually challenging questions. First – which patients are likely to need ICU admission postoperatively, and how do we identify these individuals accurately ahead of time before they are sent to the floor and come back as a code 12 hours later. Second – what should we do to better allocate our limited resources to improve postoperative surveillance and upstream treatment. This discussion offers much-needed insight into issues that affect preventable ICU admissions and establishes a strong connection between our work inside the ICU, in the operating room, in the PACU, and beyond those walls. More than half of all adverse events in hospitalized patients occur outside the ICU. About 40% of patients sustaining index cardiorespiratory events on hospital floors die before they leave the hospital.[2] Needless to say, the hospital ward, though perceived as a low-acuity environment, is actually a common venue for critical events during a period in which patients are especially prone to developing clinical deterioration and life-threatening complications.[3,4] Dr(s). Wongtangman and Eikermann take us as close to a 'crystal ball' as possible and help us understand the answer to the one PACU question that is always on our mind: "Does this patient need to go to the ICU now?"

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Patient deterioration after surgery can be defined as an objective derangement in patients' clinical status (e.g. vital signs, neurological examination) combined with findings that may be more subjective (e.g. agitation, feeling unwell).[1,2] The reported incidence of postoperative deterioration within three days after surgery is nearly 30%, and the contributing mechanisms are likely multifactorial.[3,4] Undetected acute deterioration can cause serious adverse events. A recent European multi-center study demonstrated that the in-hospital mortality rate of patients undergoing non-cardiac surgery was higher than anticipated at about 4%.[5] Interestingly, 73% of patients who died in the hospital were not admitted to an intensive care unit (ICU) at any stage after surgery.[5]

This raises two questions. First, how do we identify the patients who may be treated in high resource settings, such as an ICU, without a clearly defined need, since these resources are limited, expensive, and can only be justified if they lead to better outcomes. Second, how should we triage the additional resources required for postoperative surveillance and treatment?

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Which patients should directly go to the ICU after surgery?

Without an absolute indication for ICU admission, such as mechanical ventilation, it remains unclear which patients may benefit from postoperative critical care. Several recently published studies focus on the issue of inadequate ICU admission criteria: that we treat some patients in the ICU without medical need and do not admit others who need ICU care based on objective criteria. In an observational study, Wunsch et al. examined administrative data from 7,878 Medicare patients who underwent major surgery at 162 hospitals. They found that higher rates of perioperative intensive care did not translate to reduced mortality, cost, or length of stay.[6] In contrast, routine admission to the ICU after a specific type of surgery alone caused longer hospital stays and higher costs. In an observational study of 3,530 matched patients undergoing non-cardiac surgery in a health care network in New England, our group examined whether postoperative admission to an ICU versus surgical ward affected hospital length of stay and cost. Among surgical patients with a low likelihood of postoperative ICU admission (adjusted by patient, surgical, and intraoperative factors), initial triage to an intensive care unit was associated with increased postoperative hospital length of stay and costs. By contrast, for patients with a high likelihood of postoperative ICU admission, triage from the operating room to the ICU was associated with decreased postoperative hospital length of stay and costs.[7] We concluded that straightforward, healthy patients who go to the ICU are problematic. On the contrary, the treatment of complex patients who do not get postoperatively admitted to ICU is more expensive. This supports European data indicating that patients secondarily admitted to the ICU after initial care on a ward had a higher risk of death when compared with patients directly admitted to the ICU after surgery.[8]

Based on these data, scoring systems should be used to aid decision making for postoperative bed allocation in order to place patients at their most appropriate level of care. For example, The Score for the Prediction of Postoperative Respiratory Complications (SPORC-2) is a simple prediction model for postoperative tracheal re-intubation. The score is comprised of five pre-operative variables and seven intra-operative variables, which could be used by clinicians to identify at-risk patients.[9] In addition, other scoring systems created for postoperative prediction of morbidity and mortality, such as the Portsmouth Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (P-POSSUM)[10] or the surgical agar score (SAS),[11] can be applied to aid patient allocation. Moreover, clinician scientists can use their own data to create a score for prediction of ICU admission. We have created such a model at the Massachusetts General Hospital containing 23 variables, which included patient demographics (age, sex, body mass index, Charlson Comorbidity Index, ASA physical status), surgical characteristics (principal surgical procedure, emergency status, duration of surgery, high-risk surgery, procedural complexity), intraoperative physiologic measures (estimated blood loss, duration of hypotension, median heart rate, median positive end- expiratory pressure, median plateau pressure, and median arterial oxygen saturation/fraction of inspired oxygen

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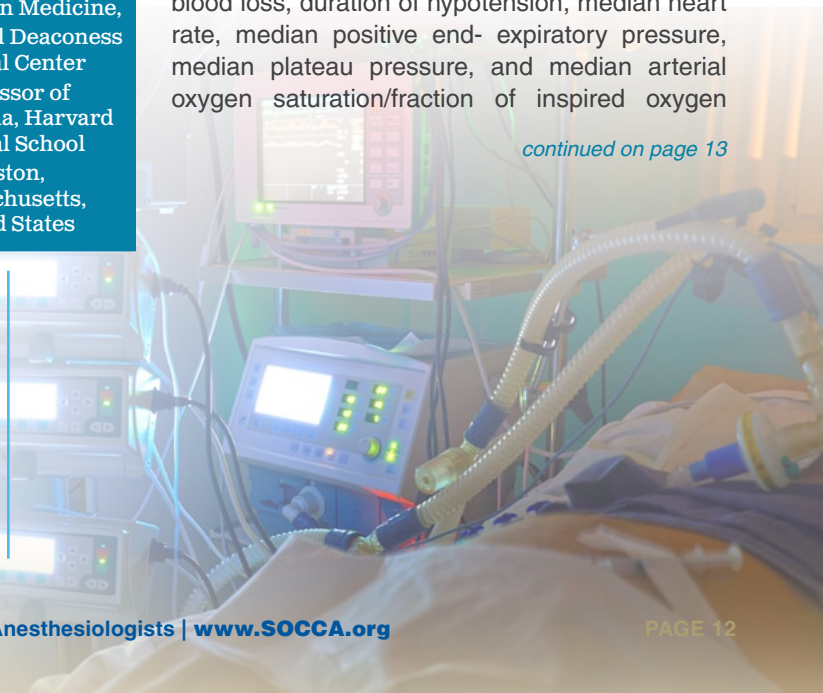

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ratio), and intraoperative drug and fluid therapy (vasopressor and neuromuscular blocking agent doses, colloid and crystalloid).[7]

In summary, to use objective criteria that include comorbidities, procedural risk factors, and vital signs for triage decreases costs and improves outcomes in patients after major surgery.

Which patients need to be screened and possibly treated postoperatively on the surgical ward

While 'clinically stable' patients are typically admitted to a general care ward after surgery, nearly half of all adverse events occur on the ward.[12] Progressive respiratory and circulatory compromise are the most common causes of deterioration – these indicators often become visible several hours before culmination in a clinically meaningful adverse event.[13,14] 'Failure to rescue,' that is death following a complication,[15] may occur when early indicators of postoperative deterioration go unrecognized. Failure to rescue can be possibly prevented using quality assurance interventions. In an observational study of 269,911 patients, the authors showed that hospitals with low and high mortality had a similar complication rates. However, the high-mortality hospital group carried higher failure to rescue rates.[16]

The American Heart Association highlights a system of appropriate surveillance to prevent in-hospital cardiac arrest as a 'first link' in the chain of survival.[17] Rapid response (i.e., medical emergency) teams provide emergency assistance to deteriorating patients and form a cornerstone of traditional patient safety systems on general care wards.[18] The classic model includes an afferent limb – that detects the event and triggers a systematic response – and the efferent limb – that provides resources to stabilize and triage the patient to a location where services meet the patient's needs.[19]

Several early warning tools have been proposed to trigger rapid response systems. These tools include the Modified Early Warning Score,[20] the National Early Warning Score,[21] and other clinical criteria for activating a medical emergency team response.[22] However, the optimal approach and alerting thresholds remain elusive. Monitoring vital signs is an essential step in detecting deteriorations in all these tools. To activate the rescue system more promptly, patient monitoring needs to be systematically improved and more intensive. To that end, various continuous monitoring systems have been introduced into the afferent limb. Isono et al. demonstrated one such approach.[23] Using four load cells placed under the bed legs, contactless respiratory measurement was achieved by capturing associated shifts in the center of gravity in human subjects in different positions such as supine; left lateral; right lateral; and 30, 45, and 60° sitting postures. Installation of such a bed sensor vital sign monitoring system could help identify patients' postoperative deterioration when integrated in a telemedicine approach (Figure 1). Its applicability to a large population at risk of postoperative deterioration is a promising

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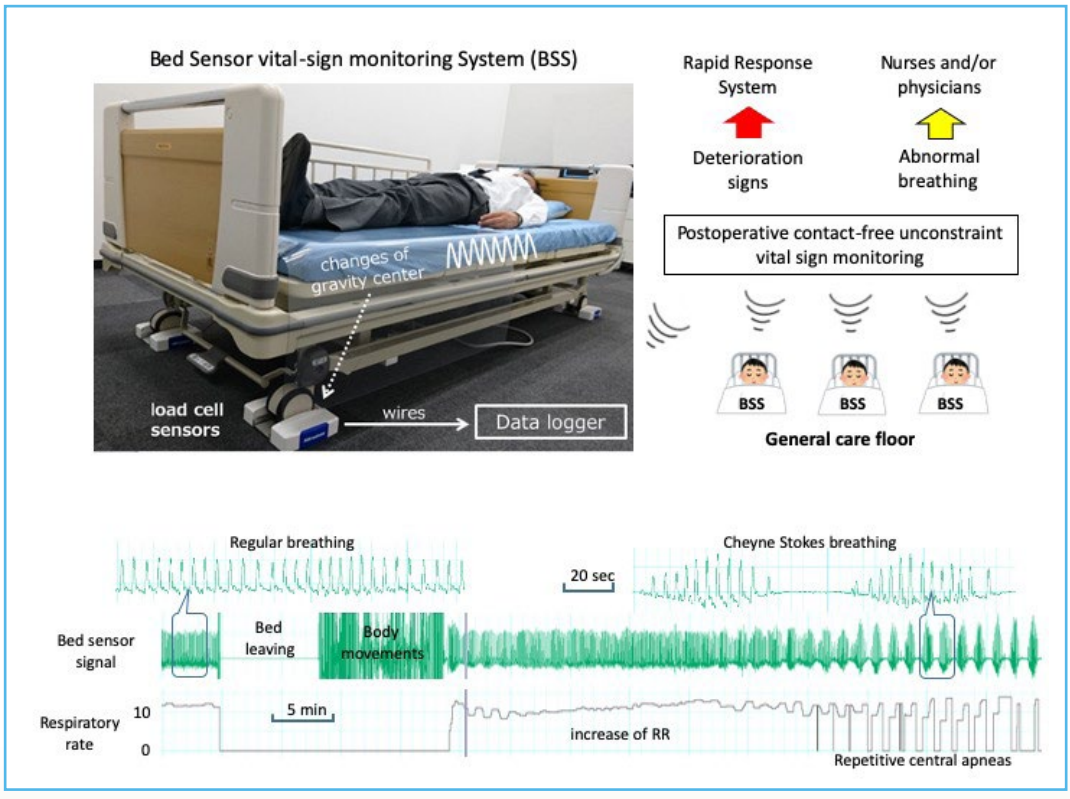

(Figure 1)

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method to improve surveillance and prevent unexpected death from acute respiratory dysfunction.[24]

In conclusion, an appropriate monitoring system should be applied to facilitate prompt detection of early warning signs, so that proper management of postoperative deterioration can be triggered. Such an approach may reduce the need for higher acuity care, reducing hospital lengths of stay and admission costs while improving survival.

Take home message:

- It is not "safe" to routinely admit patients to the ICU without clear indication.
- It is not "safe" to admit patients to a general care ward, who would otherwise get admitted to an ICU based on established institutional processes, due to lack of bed availability.
- Use objective instruments (i.e., scores) to identify the proper level of care in patients at risk of deterioration admitted to the surgical floors.
- Leverage digital health opportunities for surveillance.
- Create and implement robust inter-professional processes to identify and treat patients who demonstrate signs and symptoms of unexpected postoperative deterioration.

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Notable Trials: 2019 in Review

Editor's Note: Jarva Chow recently reviewed notable trials from 2019 at the Anesthesia Year in Review session during SCCM's 49th Annual Congress in Orlando, Florida. Six particularly relevant trials are summarized below.

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1. Effect of Postextubation High-Flow Nasal Oxygen With Noninvasive Ventilation vs High-Flow Nasal Oxygen Alone on Reintubation Among Patients at High Risk of Extubation Failure: A Randomized Clinical Trial

Background: Both non-invasive positive pressure ventilation and high-flow nasal oxygen have been previously but separately demonstrated to reduce the risk of re-intubation.

Question: In mechanically ventilated adults at high risk for re-intubation, does the addition of non-invasive positive pressure ventilation to high-flow nasal oxygen reduce the risk of re-intubation compared to high-flow nasal oxygen alone?

Design: Multicenter, randomized controlled trial.

Interventions: In the intervention arm, when feasible, non-invasive positive pressure ventilation was continued for as long as possible with fall back to high-flow nasal oxygen at 50 liters per minute versus high-flow nasal oxygen only in the control group.

Setting and Population: Adults mechanically ventilated for more than 24 hours who underwent a successful SBT but met criteria suggestive of risk for extubation failure in 30 ICUs across France.

Outcomes and Results: Reintubation within 7 days 11.8% in the non-invasive positive pressure plus high-flow nasal oxygen group, 18.2% in the high-flow nasal oxygen only group (difference -6.4% [95% CI, -12.0 to -0.9], P=0.02).

Conclusions: The addition of non-invasive positive pressure ventilation reduces the risk of extubation failure in high-risk adults.

Points for Consideration: Non-invasive positive pressure ventilation was a frequent rescue modality in the control arm. SBT consisted of t-piece trials, which may not be consistent with typical practice in certain clinical environments.

Reference: Thille AW, Muller G, Gacouin A, Coudroy R, Decavele M, Sonneville R, et al. Effect of Postextubation High-Flow Nasal Oxygen With Noninvasive Ventilation vs High-Flow Nasal Oxygen Alone on Reintubation Among Patients at High Risk of Extubation Failure: A Randomized Clinical Trial. JAMA. 2019;322(15):1465-75.

2. Early Sedation with Dexmedetomidine in Critically Ill Patients

Background: While the ideal ICU sedative agent is unknown, some evidence exists to support dexmedetomidine as an efficacious and well-tolerated agent associated with less delirium.

Question: In mechanically ventilated adults, does primary sedation with dexmedetomidine versus other agents impact all cause 90-day mortality?

Design: Multicenter, randomized controlled trial.

Interventions: Dexmedetomidine as a sole sedative agent up to 1.5 mcg/kg/hr w/w/o adjunctive agents if sedative goals not met versus other sedation strategies (e.g., midazolam or propofol) dictated by the clinical team.

Setting and Population: Critically ill adults on mechanical ventilation for at least 12 hours and expected to remain ventilated for 48 hours in 74 ICUs across 8 countries.

Outcomes and Results: 90-day mortality 29.1% in the dexmedetomidine group, 29.1% in the usual care group (OR 1.0 [95% CI, 0.87 to 1.15], P=0.98).

Conclusions: Use of dexmedetomidine as a sole (or primary) sedative agent did not reduce 90-day mortality.

Points for Consideration: In the dexmedetomidine group, 74.5% of patients required adjunctive sedation. Dexmedetomidine was associated with serious adverse events, including bradycardia, sinus arrest, and hypotension.

Reference: Shehabi Y, Howe BD, Bellomo R, Arabi YM, Bailey M, Bass FE, et al. Early Sedation with Dexmedetomidine in Critically Ill Patients. N Engl J Med. 2019;380(26):2506-17.

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3. Early Neuromuscular Blockade in the Acute Respiratory Distress Syndrome

Background: Following publication of ACURASYS in 2010, neuromuscular blockade with cisatracurium has been incorporated in the care of patients with acute respiratory distress syndrome (ARDS).

Question: In patients with moderate to severe ARDS, does early neuromuscular blockade versus light sedation result in lower all cause 90-day mortality?

Design: Multicenter, randomized controlled trial.

Interventions: Cisatracurium 15 mg bolus with 37.5 mg/h infusion versus light sedation with RASS goal 0 to -1 (or equivalent).

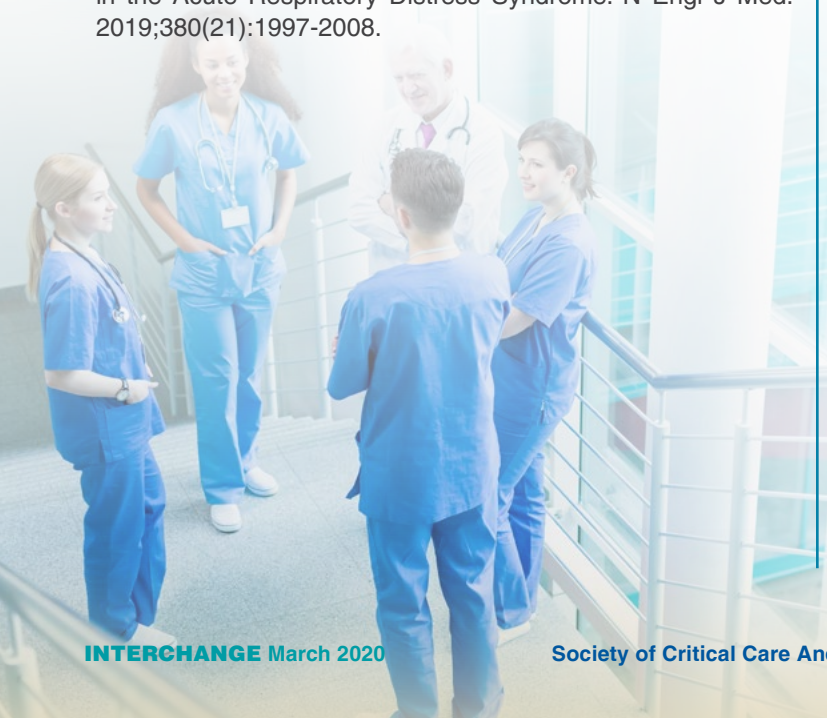
Setting and Population: Critically ill adults with ARDS and P:F ratio < 150 in 48 ICUs across the United States

Outcomes and Results: 90-day mortality 42.5% in the cisatracurium group, 42.8% in the light sedation group (difference -0.3% [95% CI -6.4 to 5.9], P=0.93).

Conclusions: Patients with moderate to severe ARDS failed to demonstrate an improvement in mortality when treated with early neuromuscular blockade versus light sedation.

Points for Consideration: The findings of this study conflict with ACURASYS, which has led to some questioning by clinicians as to the best path forward. In the ROSE trial many patients screened met exclusion criteria as they had already received neuromuscular blockade, and prone positioning was uncommon. The question remains as to whether neuromuscular blockade may have a role in patients with profound ventilator dyssynchrony.

Reference: Moss M, Huang DT, Brower RG, Ferguson ND, Ginde AA, Gong MN, et al. Early Neuromuscular Blockade in the Acute Respiratory Distress Syndrome. N Engl J Med. 2019;380(21):1997-2008.



4. Conservative Oxygen Therapy during Mechanical Ventilation in the ICU

Background: Although ubiquitous, questions have arisen about whether excess supplemental oxygen exposure may lead to deleterious clinical outcomes in at-risk patient groups.

Question: In mechanically ventilated adults, does conservative oxygen therapy versus conventional oxygen therapy impact the number of ventilator-free days?

Design: Multicenter, randomized controlled trial.

Interventions: The intervention arm targeted the lowest possible FiO2 to achieve a SpO2 of 91-96% versus the control arm with usual oxygen therapy targeting any SaO2 > 90%.

Setting and Population: Mechanically ventilated adults expected to remain intubated for at least 48 hours in 21 ICUs across Australia and New Zealand.

Outcomes and Results: Ventilator free days 21.3 days in the conservative oxygen therapy group, 22.1 in the control group (difference -0.3% [95% CI -2.1 to 1.6]).

Conclusions: Conservative oxygen therapy versus conventional therapy does not reduce the number of ventilator-free days in critically ill adults.

Points for Consideration: A reasonable degree of clinical separation was achieved between the two groups; however, typical FiO2 in the control arm was still relatively low. A larger (i.e., N=40,000) trial has been proposed by the investigators.

Reference: Mackle D, Bellomo R, Bailey M, Beasley R, Deane A, Eastwood G, et al. Conservative Oxygen Therapy during Mechanical Ventilation in the ICU. N Engl J Med. 2019.

5. Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients With Septic Shock: The ANDROMEDA-SHOCK Randomized Clinical Trial

Background: Current guidelines recommend examination of lactate kinetics to judge the adequacy of fluid resuscitation. However, lactate kinetics are increasingly appreciated to be complex, and clinical markers of resuscitation may be equally valid.

Question: In adults with early septic shock, does resuscitation guided by peripheral perfusion (i.e., capillary refill) versus lactate improve all-cause 28-day mortality?

Design: Multicenter, randomized controlled superiority trial.

Interventions: Measurement of capillary refill every 30 minutes until normalization (i.e. ≤ 3 seconds) versus lactate measurement every 2 hours for a total of 8 hours with a goal of 20% clearance every 2 hours.

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Setting and Population: Adults with early septic shock admitted to an ICU in 28 hospitals across South and Central America.

Outcomes and Results: 28-day mortality 34.9% in the peripheral perfusion group, 43.4% in the lactate group (HR 0.75 [95% CI, 0.55 to 1.02], P=0.06).

Conclusions: No statistically significant difference in 28-day mortality demonstrated between the two trial arms.

Points for Consideration: Capillary refill may be an alternative to serial lactate measurements to guide resuscitation in septic shock. This may be particularly appealing in resource-limited environments.

Reference: Hernandez G, Ospina-Tascon GA, Damiani LP, Estenssoro E, Dubin A, Hurtado J, et al. Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients With Septic Shock: The ANDROMEDA-SHOCK Randomized Clinical Trial. JAMA. 2019;321(7):654-64.

6. Bag-Mask Ventilation During Tracheal Intubation of Critically Ill Adults

Background: Airway management in critical care settings is fraught with risk, including the potential for aspiration. Although avoidance of bag-mask ventilation after administration of sedative hypnotics w/w/o neuromuscular blocking drugs is often avoided in routine procedural settings if concern exists for aspiration, critically ill patients often cannot tolerate even brief periods of apnea.

Question: In critically ill adults requiring intubation does bag-mask ventilation between induction and intubation reduce the risk of hypoxemia?

Design: Multicenter, randomized controlled trial.

Interventions: Bag-mask ventilation with FiO2 1.0 and 10 breaths per minute with adjuncts (e.g., oral airway, two hands, PEEP) versus pre-oxygenation by bag-mask only without positive pressure ventilation.

Setting and Population: A diverse population of critically ill adults in 7 ICUs across the United States

Outcomes and Results: Lowest mean oxygen saturation 96% in the bag-mask ventilation group, 93% in the control group (mean difference 3.9 [95% CI, 1.4 to 6.5], P=0.01).

Conclusions: Patients receiving positive pressure ventilation via bag-mask demonstrated higher oxygen saturations and lower rates of severe hypoxemia (as a secondary outcome measure).

Points for Consideration: While patients demonstrated less hypoxemia, this primary outcome cannot speak to mortality or other clinically important endpoints. The trial was not adequately powered to assess for aspiration risk, and such observations would likely be subject to confounding (i.e., technique).

Reference: Casey JD, Janz DR, Russell DW, Vonderhaar DJ, Joffe AM, Dischert KM, et al. Bag-Mask Ventilation during Tracheal Intubation of Critically Ill Adults. N Engl J Med. 2019;380(9):811-21.

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Membership in SOCCA is open to all anesthesiologists who have an interest in critical care medicine; nonanesthesiologist-physicians and scientists who are active in teaching or research relating to critical care medicine; residents and fellows in approved anesthesiology programs; and full-time medical students in an accredited school of medicine.

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If you would like to contribute a review for a Fellowship Program at your institution in a future issue of the SOCCA Interchange, please contact: Vivian Abalama, IOM, CAE at vabalama@iars.org.

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