Transfer Of Care Guidelines Extend MH Patient Safety Efforts To ASCs

by Sharon J. Hirshey Dirksen, PhD
MHAUS Scientific Officer

Keeping up with Change: Addressing Patient Safety in the Ambulatory Setting
For more than a quarter century MHAUS has been the key resource for clinical advice and education concerning the diagnosis and treatment of MH. Our experts strive to keep up with advances in science and communicate this information to interested medical professionals and patients. In addition to keeping up with these advances, we must also stay abreast of changes in the practice of medicine, especially those changes which may affect patients with MH.

The Growth of Ambulatory Surgery Centers and Implications for MH
Over the past 20 years, there has been tremendous growth in the number of surgeries performed in the ambulatory setting, (i.e., outside a hospital environment). At present, close to half of all surgical procedures are done outside the hospital; this growth is expected to continue well into the foreseeable future. As such, exposure of patients to MH triggering agents and thus the chance for an MH event to occur within these settings also increases. MH cases which develop in an ambulatory setting carry with them increased concerns for patient safety. Often-times, these settings lack sufficient resources that are found within a hospital for the management of critically ill patients (e.g., enough personnel, access to laboratory tests, drugs); thus, patients who experience an MH episode must be transferred to a hospital for continuation of care and observation. It is this transfer process that has captured our attention and our concern. Indeed, our MH Hotline Consultants have been called to assist with cases involving the care and transfer of a suspected MH patient from an ambulatory to hospital setting. In some cases, the outcome has not been good. Further, a recent paper documented higher mortality from MH that occurs outside the hospital (Rosero et al, Anesthesiology 2009; 110:89-94).

Development of Transfer Guidelines
One of the early projects of MHAUS was a poster describing the Emergency Therapy for MH protocol (available as a large laminated poster for ease of reference in the operating room), a valuable and respected algorithm utilized nationwide to guide the care and treatment of patients experiencing MH events. However, no such tool exists to

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Malignant Hyperthermia (MH) is an inherited muscle disorder which, when triggered by potent inhalation anesthetics and succinylcholine, may cause a life-threatening crisis. The incidence of MH is low, but, if untreated, the mortality rate is high. Since the advent of the antidote drug, dantrolene sodium, and with greater awareness of the syndrome, the mortality rate has decreased. Great advances in our understanding of MH have been made since it was first recognized in the early 1960s, but the nature of the fundamental defect(s) is still unknown.

MHAUS advocates that all surgical patients undergoing general anesthesia should receive continuous temperature monitoring, that adequate supplies of dantrolene be stocked near the OR, and that thorough family histories be obtained.

The mission of MHAUS is to promote optimum care and scientific understanding of MH and related disorders.

For more information or for materials on malignant hyperthermia or MHAUS’ programs, call 607-674-7901; write MHAUS, PO Box 1069, Sherburne, NY 13460; or visit us on the Internet at www.mhaus.org.
Latest MH Death Highlights Importance Of Temperature Monitoring During Surgery

Editor’s Note: MHAUS learned of a recent MH death of a healthy young man undergoing a three-hour minor surgical procedure in a hospital. The patient’s body temperature was not being monitored during anesthesia. Although not a requirement of the American Society of Anesthesiologists, temperature monitoring is required by the American Association of Nurse Anesthetists during general anesthesia for pediatric patients. As well, MHAUS’ Professional Advisory Council recommends intra-operative temperature monitoring during all general anesthetics and major regional anesthesia lasting for more than a brief period of time. The following is an excerpt from the monthly blog of MHAUS President Henry Rosenberg, MD. To read the blog in its entirety visit www.mhaus.org/presidents-blog.

by Henry Rosenberg, MD
MHAUS President

Advances in anesthesia care over the past several decades have changed the way anesthetics are administered. Compared to even three decades ago anesthesiology has changed from an art to a science (although still a somewhat inexact science).

One of the crucial developments in anesthesiology that is responsible for the improved outcomes in anesthesia care is the exact measurement of physiologic changes. These include blood pressure, heart rate, electrocardiogram, oxygen saturation, and such respiratory parameters as depth of respiration (tidal volume), frequency and excretion of carbon dioxide and even the exact concentration of anesthetic gases

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MHAUS Receives Top Honors At AORN National Congress

MHAUS attended the Association of periOperative Registered Nurses (AORN) 57th Congress in Denver on March 13-18, where MHAUS’ new MH Mock Drill Kit (see article right) was voted the most popular product, the Emergency Therapy for MH Poster the second most popular product, and MHAUS the fifth most popular exhibitor.

“...We are very proud of this distinction and enjoyed the opportunity to talk with visitors to the booth,” said MHAUS Fulfillment Administrator Fay Kellog.

See page 12 for a list of upcoming meetings that MHAUS will be attending.

Order Your MH Mock Drill Kit Today

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The MH Mock Drill Kit contains a 22-minute DVD and laminated task cards for personnel involved in an MH Code. As a bonus, the “Guide to Malignant Hyperthermia in an Anesthesia Setting” is included to help further your educational training on MH.

The MH Mock Drill Kit is available for only $150.00. This includes shipping and handling! Members get 30% Off.

Call 607-674-7901 or fax your order to 607-674-7910. Order online by visiting the MHAUS website at www.mhaus.org, or email your order to info@mhaus.org.
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guide the care and transfer of an MH patient from an ambulatory setting to a local acute care hospital. As patient safety is always our first priority, our Professional Advisory Council, Hotline Consultants and Board felt that a guideline for the transfer of care of an MH patient undergoing an MH crisis was essential in order to improve patient safety.

To that end, MHAUS joined forces with the Ambulatory Surgery Foundation (ASF). The ASF is a research and educational organization dedicated to educating ambulatory surgery centers (ASCs) on a variety of topics including patient safety, as well as to promoting the highest quality standards to guide the practice of medicine at ASCs (http://www.ascassociation.org/about/asf). Together, our two organizations worked to identify a panel of experts representing key medical specialties at critical points along the transfer continuum, including clinicians and administrators specializing in patient care at ASCs, anesthesia care providers, an emergency medicine physician, emergency medical technician, and of course, experts in MH.

Led by Dr. Marilyn Larach (Penn State University), our panel set out to identify factors that are important in the transfer process, such as the clinical condition of the patient, distance from the ASC to the nearest acute care hospital, transport resources available to the ASC, and capabilities of the receiving hospital. The hope was that, based on the factors identified, the panel members could develop an algorithm to guide the care and transfer of an MH patient in a variety of situations. However, after much consideration, our experts agreed that this approach was not feasible. There was simply too much variability among ASCs (with regard to resources and capabilities available) and between patients (with regard to clinical condition and presentation of MH) to allow for the development of a simple algorithm.

Instead, the panel members determined the most useful tool would be one which provides guidance for each ASC to develop its own Emergent MH Transfer Plan. It took some time, but the expert panel, on behalf of MHAUS and the ASF, finally succeeded in developing such a guideline.

As patient safety is always our first priority, our Professional Advisory Council, Hotline Consultants and Board felt that a guideline for the transfer of care of an MH patient undergoing an MH crisis was essential in order to improve patient safety.

Transfer Considerations
The guideline developed by the expert panel attempts to lead ASC personnel through an evaluation of issues which should be considered during the transfer of an MH patient. It advises ASC personnel to review such issues as the availability and skill level of emergency medical transport personnel, options with respect to local acute care hospitals, and the specific medical capabilities (of the transport team and receiving facilities) such as ventilator support, cardiopulmonary, and temperature monitoring.

The Emergent MH transfer plan developed by each ASC should be one which gives primary consideration to the continuation of care and treatment of the MH crisis prior to and during the transfer process. It is recommended that patient stabilization prior to transport be attempted whenever possible. However, the final decision regarding transfer must always be left to the treating clinician at the ASC; this individual must assess the patient’s condition, resources and personnel available, and according to his/her best medical judgment (with information from the receiving hospital personnel) determine how, when, and where to transfer the patient.

ASCs Must Now Do Their Part
MHAUS has long been an active force in promoting key steps to MH preparedness such as conducting educational seminars and mock MH drills, reviewing the MH Emergency Therapy protocol, and stocking an adequate supply of dantrolene (36 vials). Now that the transfer guidelines are complete, we strongly recommend that all ASCs review their existing emergency transfer plans and incorporate special considerations for suspected MH patients.

If you are a medical professional working full or part time at an ASC, we urge you to work with your colleagues to develop a specific transfer plan for an MH crisis. We would also ask that you share your plan with MHAUS and offer suggestions of additional tools you would find helpful in your MH preparedness and training efforts; with your permission we can then share your ideas with others. (If you are an MH-susceptible or a member of a family with MH, you may have surgery performed at an ASC with non-trigger agents, but make sure that a transfer plan with

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as well as several others. Knowing these parameters enables the anesthesia provider to gauge the effect of the drugs and the surgical manipulations on the patient.

A subset of these signs is known as the vital signs that are familiar to all students in the health professions: Blood pressure, pulse, frequency of respiration and temperature. In medicine these vital signs are measured routinely, whether in the outpatient clinic or in the ICU. Not so during anesthesia. Blood pressure and pulse respiration are required measurements during all anesthetics. Body temperature is not.

For example, the American Society of Anesthesiologists’ guideline on temperature measurement during anesthesia is somewhat vague: “Every patient receiving anesthesia shall have temperature monitored when clinically significant changes in body temperature are intended, anticipated or suspected.”

What exactly does “clinically significant changes in body temperature” mean? When will such changes occur?

The Professional Advisory Council (PAC) of the MHAUS recommends intraoperative temperature monitoring during all general anesthetics and major regional anesthesia lasting for more than a brief period of time, perhaps 30 minutes, since it is hard to predict when clinically significant changes in body temperature will occur and temperature measurement is relatively non-invasive.

We at MHAUS are of course chiefly concerned about elevation of temperature as a sign of MH. We feel that it is important to be aware of temperature elevation before the patient is harmed.

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consideration given to MH exists at the facility.)

Please do your part to support the development and implementation of an Emergent MH Transfer Plan at your facility. It could save a life.

Acknowledgements
MHAUS extends deep appreciation to the expert panel members (listed below) for their work on this project. Without their hard work and perseverance, this guideline could not have been developed. In addition, many thanks go to Kathy Bryant, President of the ASC Association/ASF and Henry Rosenberg, MD, President of MHAUS, for providing support and resources for this important patient safety initiative. Finally, sincere thanks are extended to Ashleigh Phillips, ASC Association; Nicole Viera, Database Administrator, MHAUS; and Dianne Daugherity, Executive Director, MHAUS for assistance in coordinating all aspects of this project and helping to see it through to completion.

Panel Members
Kumar Belani, MD; Barbara Brandom, MD; Cheryl Fielder, RN; Marilyn Larach, MD (Project Principal Investigator); E. Jane McCarthy, CRNA, PhD; Keith Metz, MD; Tony Piccone, MD; Michael Policastro, MD, FACEP; Henry Rosenberg, MD, CPE; Debra Stinchcomb, RN, BSN, CASC; Arnie Valedon, MD; Charles Watson, MD; Mark Weber EMT-P.

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Do You Have an MH Survival Story? Tell us about it and include a before and after picture. Visit the MHAUS website at www.mhaus.org and click on “Faces of MH” in the lower left of the patient or professional section, located just above the “Facebook” link.
Oh, Canada – Canadian Contributions To Our Understanding Of MH

by Henry Rosenberg, MD
MHAUS President

Like the American Society of Anesthesiologists (ASA), the Canadian Anesthesiologists Society (CAS) holds an annual educational meeting for its members. Last June MHAUS exhibited at the Canadian meeting. This was the first time in many years that we elected to attend the Canadian meeting. Indeed, MHAUS will attend the CAS again this summer. The reasons for this are several.

For many years a Canadian Malignant Hyperthermia Association (MHA) provided information to patients and providers in Canada. However, a few years ago the association no longer had the resources to continue operation and closed. As a result many who obtained information from the MHA began to access information from MHAUS. In addition, a few of our Hotline Consultants either trained in Canada or are in active practice in that country.

There are other reasons for a close connection to Canada by MHAUS. I was once told that Dr. R. A. Gordon, Chairman of Anesthesiology at University of Toronto in the 1960s-70s, suggested the term malignant hyperthermia (or hyperpyrexia) as the name of the syndrome that was described in the early 1960s.

When the MH Registry was formed in the late 1980s, Canadian testing centers and Canadian anesthesiologists were involved in establishing the guiding principles for the Registry and contributed cases to it. Hence, the Registry was called the North American MH Registry. Although at one point there were four biopsy centers for MH in Canada, at present only two are active: one in Ottawa and the other in Toronto. Clinicians and scientists from both of those centers continue to be involved in MH research and in working with patients and anesthesiologists.

As I have written previously, MH is truly an international problem, not limited to any country or ethnic group. For example, we recently learned, from a Google search, of a death in the Philippines from MH. It has been one of my personal goals to share educational information about MH and provide support to patients and providers in all countries. Because of our close connection to Canada we thought it a good idea to reconnect with the Canadian anesthesiologists.

Dianne Daugherty, MHAUS’ executive director, staffed our exhibit booth and distributed a great deal of information and discussed the concerns about MH in Canada. One anesthesiologist informed her that in his community in Ontario, MH is a regular occurrence because of a large population of MH-susceptibles. Others expressed concern about having adequate amounts of Dantrium IV (dantrolene sodium for injection) in small of the smaller, rural hospitals and being adequately prepared to treat a crisis.

In an effort to reach out to the Anesthesiologists community, we have written letters to the Chiefs of Anesthesiology of all the hospitals in Canada telling them about our educational programs and inviting them to become members of MHAUS. Although “United States” is in our title, MH knows no boundaries.

Also attending the conference were representatives of the company that makes Dantrium for the US and Canada as well as other countries, JHP Pharmaceuticals LLC, and their distributor of Dantrium in Canada, Methapharm, Inc. These companies are relatively new and are anxious to understand the needs of the anesthesiology community in both countries as it relates to treating MH.

We hope to build on this new beginning and attend the Canadian Anesthesiologists Society meetings on a regular basis in order to help us begin to connect with MH patients and their families who live in Canada.

Those who are interested in MH should also know that Canadian anesthesiologists and scientists have made an enormous impact on the understanding of MH and informing the medical and lay community of the disorder. Beverly Britt was an anesthesiologist in Toronto in the 1960s when she became interested in the syndrome after caring for an MH patient.

She recognized how little was known about MH at the time and embarked on clinical and epidemiologic studies of the syndrome. She partnered with a well known Canadian pharmacologist, Werner Kalow (1917-2008), to develop and describe the muscle biopsy contracture test for MH. She also utilized the swine model of MH to better understand how MH might be triggered and the early signs of MH. She and her colleagues established the first biopsy center for MH testing in Toronto.

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and helped create the MHA (the Canadian equivalent of MHAUS). The very first medical conference on MH, which I was fortunate to attend, was the First International Workshop on MH held in Toronto in 1971. The papers were subsequently published in book form which became a tremendous source of information about the laboratory findings as well as the clinical signs of MH.

Beverly became an international figure for her many journal articles and books and the numerous talks and lectures on MH that she delivered all over the world. Even though she retired in 1996, the biopsy center continues its activities.

Not too many years after the first international workshop, another was held in Banff, Canada hosted by Dr. Keith Brownell of Calgary.

Other Canadian investigators contributed basic and clinical information concerning MH over the years including epidemiologic data on the prevalence of the syndrome in certain provinces of Canada.

With the dawning of the molecular genetic era in the late 1980s, Dr. David MacLennan’s laboratory at the University of Toronto raced ahead to identify the ryanodine receptor gene as causal for MH. He and his colleagues identified a key mutation in swine that predicts MH susceptibility in that species. The studies were extended to humans and led to fundamental insights into MH and the other muscle disorder associated with the ryanodine receptor gene, central core disease.

Over the years Dr. MacLennan and his collaborators have performed basic research in the structure of the ryanodine receptor and its function in normal patients and in MH patients. These studies led directly first to a molecular genetic diagnostic test in pigs in order to identify animals that would be susceptible to stress-induced MH (an economic problem for pig breeders) and then to the basis for genetic testing for MH and central core disease in humans. Obviously, many other researchers around the world have contributed to development of the current DNA test for MH, but Dr. MacLennan’s lab led the way.

A Partial List of Canadian Physicians and Scientists who Contributed to our Understanding of MH (Apologies to those inadvertently omitted.)

Greg Allen; Mychelle Bachand; Depak Bose; Beverly Britt; Keith Brownell; Charles Cattran; Daniel Chartrand; R.A. Gordon; Werner Kalow; George Karpati; Julian Loke; David MacLennan; Kevin Nolan; Rein Paasuke; Lena Patel

Dedicated Biopsy Center personnel: Wanda Frodis (Toronto), Mary Lou Crossan and Lynne McHardy (Ottawa).
MH Hotline Activity From Spring 2009

by Dr. Charles Watson

Spring 2009 was an active time for the MH Hotline. Drs. James Chapin, Jordan Miller, Marshall Millman, John Ulf Skoog, Harvey Rosenberg, Margaret Weglinski, and Cynthia Wong, serving as Hotline Consultants (HLCs), reported 70 calls from March to May 2009. These came from 29 states, Washington, D.C., and Ontario, Canada. Thirty-three were classified by the HLCs as MH-related questions, and 37 as acute episodes that raised urgent questions about management of possible Malignant Hyperthermia Crises (MHC). The range of questions and acute crisis calls that related to MH-like events greatly outnumbered those that our HLCs thought were directly associated with management of an obvious MH crisis. Review of these shows that direct access to HLCs helped clinicians and nurses who were faced with difficult, sometimes very frightening, MH-related and other patient management problems.

Questions:
The majority of calls (24) that posed questions came from anesthesiologists and CRNAs.

Late Evaluation of Unusual MH-like Events:
Fourteen calls focused on whether an intraoperative event like unexpected hypercapnea [elevation in arterial carbon dioxide caused by increased metabolic activity], fever, or muscle rigidity, or postoperative fever or evidence of muscle injury could have been (MHC). These came many hours to days after each patient was exposed to anesthesia or paralysis for intubation with MH triggering agents. Two intensive care physicians and a neurologist, for example, wanted to know if high fever, progressive rise in enzymes that signal muscle injury, and other acute symptoms in the remote postoperative period might be MHC. The HLCs who reviewed these with callers thought the sequence was too remote from administration of MH triggering agents and that the primary patient illness or probable infection was sufficient to account for these abnormal processes.

Possible MHS Patients:
Another leading cause for questions, posed by eight callers, was planning anesthesia care and assessment of MH risk or susceptibility (MHS) for patients with neuromuscular or other rare inherited diseases. In all of these the HLCs provided advice for perianesthetic management. HLCs were concerned about significant risk of MH in two settings: management of labor pain or emergent anesthesia for caesarian delivery of a pregnant patient whose husband is known to be MHS, and anesthesia care for a child with a mitochondrial muscle abnormality that’s not ordinarily associated with MHS. In the first case, the recommendation was to avoid triggering agents for the pregnant patient. The recent MHAUS consensus statement about this [http://medical.mhaus.org/index.cfm/fuseaction/Content.Display/PagePK/MHGuideLines.cfm], adopted in 2009, states, “If the pregnant woman requires non-emergent surgery at any point in the pregnancy, a non-triggering anesthetic should be employed, such as local, nerve block or epidural or spinal anesthesia as long as it is accomplished in a timely manner. If a general anesthetic is indicated, a total intravenous anesthetic is recommended, although nitrous oxide may be used with an anesthesia machine that has been prepared for an MH susceptible patient.”

Post-Operative Management:
Seven operating room, critical care, or recovery room nurses called for help with dantrolene dosing or with questions about safe preparation for management of possible MH patients. Several intensive care physicians, two surgeons, a pediatrician, an internist, and a neurologist also posed preoperative or postoperative management questions.

Five callers asked about use of various anesthetic drugs and techniques for care of patients with known MHS or close family members who were MHS. These callers were using the HLCs to carefully plan anesthesia care. One, an anesthesiologist, wanted to know if he could use an inhalational anesthetic induction for a possibly MHS child. He thought it might be safe for a brief period prior to switching to a trigger-free technique with intravenous propofol because the child had had a previously uncomplicated sevoflurane anesthetic. The fact that there has been an uneventful previous anesthetic with a MH triggering agent doesn’t prove that the child isn’t MHS. The question comes up because it is, in many ways, easier and, possibly, less traumatic for the anesthesia caregiver and the patient’s family to make a child sleepy and induce anesthesia in the “routine” fashion with an inhaled agent by mask than it is to give premedicants as shots or by another route, or start an IV. Inhaled anesthesia with a triggering agent is potentially dangerous for a MHS patient. The HLCs find it less commonly asked about than in past years. The consultant handled this question with a tactful, but firm admonition to avoid sevoflurane, an MH triggering agent, and use one of several safer alternative anesthetic approaches. She also discussed steps that could be taken to clarify whether the child is MHS or not.

Parents who are concerned about MH should know that a number of safe anesthesia approaches are possible without exposing their children to increased risk of MH. In some cases, a family genetic evaluation when a relative is known to be MHS might be helpful in clarifying the MHS risk for a related child before planned elective surgery. Referral of both the child and parents to a biopsy

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center for a complete evaluation with genetic study is now the best way to clarify the patient’s risk of MHS.

The HLCs and MHAUS continue to play an important role answering these types of questions by educating anesthesia caregivers, OR, and surgical staff about these issues in a number of ways. To list a few: the MHAUS website, HLC recommendations, and MHAUS publications like the OR and outpatient surgical center manuals, case reports, on-line teaching programs, checklists, and The Communicator are all part of getting the MH message to the extended medical community. Questions like this one about safe induction agents for a possibly MHS child who needs anesthesia confirms the importance of these communication media.

General Questions about Preparation:

Four calls came from hospital or outpatient surgical center nurses and an anesthesiologist. Two callers had specific questions about dantrolene or other drug stocking in the OR’s MH cart/supply. One caller wanted help preparing a training program to increase readiness for the recognition and treatment of an MH crisis by colleagues in her OR.

Dr. Weglinski answered a question posed by an anesthesiologist who is a medical director of her outpatient surgical center. The anesthesiologist wanted to know whether it was safe to share the MH crisis management equipment and dantrolene between a hospital and her adjacent, but separate, affiliated center. Sharing dantrolene between facilities is a question that comes up from time-to-time because of the cost of dantrolene and the fact that it isn’t often needed during day-to-day surgical care. Dr. Weglinski’s advice was to have a separate supply of dantrolene at the center so that it could be prepared and given in case of MH or an MH-like event with no delay.

The primary issue is immediate availability of the specific antidote for MHC, dantrolene sodium. The 5-10 minutes required to send a runner or call for supplies from an adjacent location could make a significant difference in outcome. All of our experience with the MH crisis shows that, although the presentation and drug requirements differ from patient to patient, earlier recognition and treatment improves a MH patient’s chances of avoiding major morbidity or death! Advice provided on the MHAUS website recommends that dantrolene be available within five minutes or less once the diagnosis of MH crisis is made or entertained.

Acute Evaluation and Management Consultation:

Twenty-seven anesthesiologists, four critical care nurses, two surgeons, four critical care physicians, and a CRNA called about events that had them concerned about possible MHC. Twenty-five patients were adults and 11 were children. Two urgent calls were made in the immediate pre-operative period as an anesthesiologist was planning emergency anesthesia care for possible MHS patients. Only three calls were placed during anesthesia and surgery, while 32, the majority, were either immediately post-operatively or in the late post-operative period. These were acute consultations because the urgency of a caller’s concerns often drives his or her request to the MH Hotline. Acute management of dantrolene therapy for suspected or definite MHC, or questions about whether to give dantrolene were posed by 23 of these callers.

Acute Management Assistance Calls:

HLCs reported that five calls were about patients with definite or very probable MHC. Another five were thought to be possible MHC in need of treatment as the clinical course evolved and further defined during postoperative monitoring. Twenty-six were believed to be non-MH events. These were acute infection and/or shock (4), high postoperative fevers (10), isolated jaw muscle rigidity under anesthesia (4) with high risk of muscle injury unrelated to MH, and other unknown processes. Three acute management questions were raised about patients who had significant, unexplained, muscle injury or breakdown a long time after anesthesia. One was felt to be perioperative neuroleptic-malignant syndrome [NMS], which is caused by acute and chronic therapy with potent antipsychotic and sedative drugs, not MH triggering agents. In two cases, the sequence of events suggested that perioperative warming measures that were intended to prevent anesthetic and post-operative complications from hypothermia or cold exposure in the OR actually led to overheating that subsided when warming efforts were ceased.

Example of an MH Crisis Call:

Dr. Rosenberg, serving as a volunteer HLC, fielded a call about a 7-year-old girl who underwent invasive cardiac catheterization for destruction of an abnormal cardiac conduction pathway that caused frequent, dangerous episodes of rapid heart rate. She was given a typical pediatric anesthetic with the inhaled anesthetic sevoflurane and ventilated with a breathing tube placed after paralysis provided by the depolarizing relaxant drug, succinylcholine. More than three hours later her temperature rose and warming measures were discontinued. Her heart rate also rose from 120 to 145 beats per minute and exhaled carbon dioxide levels increased progressively despite increasing mechanical ventilation. The anesthetic was changed from the MH-triggering agent, sevoflurane, to propofol and she was taken to the post-anesthetic care unit several hours later. With propofol sedation, her artificial ventilation was shown to be adequate by non-invasive and arterial blood tests but her CK muscle enzyme level rose to become >6000. Dr. Rosenberg felt that this was definitely a controlled, but significant, MH crisis and recommended immediate therapy with IV dantrolene, close postoperative monitoring, and continued dantrolene therapy for the next day, together with other supportive care. The child recovered but was noted to be weak after surgery because of her muscle injury. Fortunately, she did not develop muscle-enzyme or low oxygen continued on page 11
The Malignant Hyperthermia Association of the United States (MHAUS) is pleased to announce the availability of an award in the amount $1,500 to the author of a manuscript related to malignant hyperthermia (MH).

MH is an inherited disorder of muscle, which is “triggered” by commonly used anesthetic agents and may lead to death or disability. Early diagnosis and prompt treatment is the key to reducing morbidity and mortality related to MH. MH may occur at any time during an anesthetic whether in a hospital, ambulatory surgery center or an office-based setting.

A large variety of programs have been developed by the scientific panel at MHAUS in order to increase awareness of the syndrome and its manifestations. These include procedure manuals for recognizing and treating MH, applicable to the Hospital or to the Ambulatory Surgery Center, and a variety of other publications.

In order to promote awareness of MH and its various manifestations and to encourage continued study of the syndrome, Mr. George Massik, a founding member of MHAUS, graciously supports a writers’ award. The Daniel Massik Fund at The Foundation for Jewish Philanthropies in Buffalo, NY was established by Mr. Massik in memory of his son who died from MH.

This Award will provide a stipend of $1,500 to an anesthesia resident/fellow or an anesthesiologist who is within five years of ending his/her training to attend the annual meeting of the American Society of Anesthesiologists Meeting or, in special circumstances, another meeting of similar merit.

Award Details
The Award will be given to the primary author of the best manuscript concerning, malignant hyperthermia. The format may be a case report, literature review or original study.

• The document should address a significant issue related to the problem of malignant hyperthermia.
• Those participating must currently be a resident fellow in anesthesiology or an anesthesiologist who is within five years of ending his/her training.
• The paper must be a minimum of 3 double-spaced typed pages and a maximum of 10 pages. Author’s CV should be included.
• The paper must not be in any stage of publication.
• Deadline for receipt of the manuscript in the MHAUS office is August 3, 2010.

The award will be presented at the annual MHAUS Recognition Reception at the Annual Meeting of the American Society of Anesthesiologists Meeting in San Diego October 2010.

The winner will be notified by August 31, 2010 to allow for coordination of travel plans.

For further information regarding the application process for this award, please contact the Malignant Hyperthermia Association of the United States (MHAUS), attention Gloria Artist, either via regular mail at P. O. Box 1069, Sherburne, NY 13460, via fax at 607-674-7910 or email at gloria@mhaus.org.

Massik Award Submission Deadline August 3rd
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supply-related kidney failure, nor were there other advanced complications of MHC. At his recommendation, the child and her family were referred to the MH diagnostic center at Wake Forest University for further testing, neurologic evaluation, and completion of an Adverse Metabolic Reaction to Anesthesia report.

Early Jaw Muscle Spasm, Trismus:

Three calls came from post anesthetic care units shortly following jaw muscle spasm, trismus, that was noted during general anesthesia. Two of these, from California and New York, were about an adult woman and a teenager who each had very stiff jaws following administration of the depolarizing muscle relaxant, succinylcholine, for airway management during brief surgical procedures. Neither of these patients developed signs of high metabolism and the mixed respiratory and metabolic acid-base disturbance that is seen when the metabolic demand of body muscles isn’t met during the MHC. Drs. Chapin and Weglinski, who helped the calling physicians, emphasized the need for close monitoring because MH can develop minutes to several hours following trismus under anesthesia. They also discussed patient follow-up evaluation and ways to prevent kidney injury following the more general muscle breakdown that can follow trismus, whether MH develops or not.

Dr. Jordan Miller answered a third call from Minnesota. A woman with an unknown neuromuscular problem was given a brief anesthetic for muscle biopsy because of her spasticity and lower extremity muscle contractures. Her anesthetic began with the non-triggering anesthetic induction agents, midazolam and propofol. Following this, the anesthesiologist found it was impossible to open the patient’s mouth in order to place an oral laryngeal mask airway. A small dose of the non-triggering muscle relaxant, rocuronium, resolved this problem and allowed completion of the procedure. No signs of MHC were noted, but the patient complained of pain in her legs after awakening. Dr. Miller advised that this was most likely not MH. Although he thought these events were due to the patient’s underlying disease, he was concerned that the risks of significant muscle injury or MH in the immediate post-operative period remained. Dr. Miller recommended close overnight monitoring of muscle enzyme levels, vital signs, and arterial blood gasses together with continued follow-up evaluation by a neurologist.

The concerned physicians who make acute calls about trismus are impressed by this unusual and remarkable response when they see it in the OR. Trismus can be a sign of MH or another MH-like event. Many of the patients who develop rigidity during care with MH triggering anesthetic agents show evidence of muscle injury or cell death from more generalized muscle contractions and are likely to develop severe aches and pains with elevated creatine kinase (CK) muscle enzymes, rhabdomyolysis. Some have muscle diseases like muscular dystrophy. Some develop the MH crisis. Some turn out to have an unusual response, but no underlying cause can be identified. Others may have had less dramatic events in the OR but, as in three of the post-operative calls made to HLCs in this quarter, demonstrate unexpected signs of muscle injury. Immediate monitoring is important to identify and treat the MHC if it evolves. In all of these cases, close monitoring of vital signs, together with the prevention of dehydration and continued effort to ensure good blood flow to the kidneys and good urine flow from the kidneys, is key to preventing kidney failure. While the HLCs don’t always advise treatment of MHC during these calls, their advice is important. Identification of an underlying neuromuscular disease or MHS allows their physicians to make critical decisions in the future. Knowing about a problem in advance can avoid the MHC, muscle injury, and/or sudden cardiac death from arrhythmia when anesthesia and surgery are needed or acute medical illness develops later in life.

Meet This Issue’s Hotline Consultant

Charles B. Watson, MD, FCCM, graduated from the University of Maryland’s School of Medicine in Baltimore, MD, and completed anesthesia residency training at the Penn State University’s MH Hershey Medical Center and in the US Navy in Portsmouth, VA, and Bethesda, MD, with post-graduate fellowships in pediatric anesthesia and critical care medicine at George Washington University, in Washington, DC.

Following service on the faculty of the U.S. University of the Health Sciences and as Director of CCM, then Cardiac Anesthesia, and finally, Assistant Department Chairman of the Anesthesiology Department at the National Naval Medical Center, in Bethesda, Dr. Watson joined the faculty of the University of North Carolina where he worked as an anesthesiologist and intensivist at the NC Memorial Hospital and served as director of the Critical Care Division. Dr. Watson entered the private practice of Anesthesia and Critical Care in Bridgeport, CT, in 1986, and accepted a clinical faculty appointment at the University of CT in Farmington.

Dr. Watson has been the Chairman of the Department of Anesthesia at Bridgeport Hospital since 1989 and presently serves as Deputy Surgeon-In-Chief of that institution, which belongs to the Yale-New Haven Health Network. He and his wife, Masha, live in Easton, CT, and have three adult children.
MHAUS Happenings, Events and Notices

❑ **THANKS!** MHAUS is grateful for the financial support of the following State Societies of Anesthesiology: Maryland, Michigan, Ohio. Our appreciation also goes to the following state components of the American Society of PeriAnesthesia Nurses: Kansas, Missouri, and Texas. Call the MHAUS office to ask how your group can join their ranks!

❑ **MHAUS Scientific Meeting**
Join us on April 23-24, 2010, at University of Pittsburgh Medical Center (UPMC) in Pittsburgh, PA. Registration is $150. There is no cost for medical students and residents.

❑ **Upcoming Meetings**
Please stop by the MHAUS booth if you plan to attend one of these meetings: ASCA, May 19-22, Anaheim, CA; AACN-NTI, May 17-20, Washington, DC; CAS (Canada) Montreal, Quebec, June 25-29; ASA, San Diego, CA, October 16-20.

❑ **Vienna, Austria Hosts EMHG Annual Meeting**
The European Malignant Hyperthermia Group will hold its annual meeting in Vienna, Austria, on May 20-22, 2010. Registration costs 400 Euro. The fee includes: EMHG membership fee, registration fee for the meeting, guided tour of Stephansdom on Thursday afternoon, get together at Esterhazykeller on Thursday evening, and Galadinner on Friday evening in the Hotel Wilhelminenberg. For more information visit www.emhg.org.

❑ **Have You Seen The New MHAUS Video Online?**
Visitors to the MHAUS homepage are now greeted with a new video “Understanding Malignant Hyperthermia.” The eight-minute video also contains a brief synopsis of MHAUS’ 28-year history.

❑ **MH Mini-Conferences Planned For Canada**
MHAUS is planning two MH Mini-Conferences for the first time in Canada: Toronto, Sept. 11 and Ottawa, Sept. 25. The annual U.S. Mini-Conference is being planned in Oregon, Sept. 18. Look for more details in the next issue of *The Communicator.*