WORLD SOCIETY OF THE ABDOMINAL COMPARTMENT SYNDROME (WSACS)

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The World Society of the Abdominal Compartment Syndrome (WSACS) was founded in 2004. The mission of the WSACS is to promote research, foster education, and improve the survival of patients with intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) by bringing together physicians, nurses, and others from a variety of clinical disciplines to share information on effective management strategies for reducing the significant morbidity and mortality of IAH/ACS.

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The WSACS newsletter is published quarterly and provided as a service to all members. It is also available at wsacs.org. Comments and suggestions are greatly appreciated and may be emailed to: info@wsacs.org.

"All Hands on Deck!" - The Future of the WSACS

Dear Colleagues,

The Fourth World Congress on the Abdominal Compartment Syndrome (WCACS), held in Dublin, Ireland, 24-27 June 2009, was a resounding success thanks to the efforts of our past-president Professor Michael Sugrue. As described later in this newsletter, the excellent scientific programme was highlighted by a number of superb clinical studies illustrating the significant progress that has been made in improving the outcome of patients with intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS). There were also a number of basic science studies presented confirming the marked impact of the pro-inflammatory cascade on organ dysfunction and failure in patients with elevated intra-abdominal pressure. These exciting findings will no doubt have a tremendous impact upon how we manage IAH / ACS patients in the years to come. As with previous Congresses, perhaps the greatest benefit was the opportunity to learn from the experiences of others with an interest in IAH / ACS. It was a pleasure to meet and interact with many of you during these sessions. For those who were unable to join us in Dublin, you will not want to miss the Fifth WCACS which will be held in Orlando, Florida, USA, 10-13 August, 2011.

It is truly an honor to be the president of the World Society of the Abdominal Compartment Syndrome (WSACS) for the next two years. Our Society has accomplished a great deal in its first five years and it has been a great pleasure to work alongside each of you as we have accomplished this. We have published the first textbook on IAH / ACS, prepared three consensus statements standardizing definitions, recommendations, and research practices for IAH / ACS, and established the first international research working group in this field. We are currently preparing the second edition of the textbook as well as a practical "how I do it" manual on IAH / ACS. These are thus exciting times for our Society. We are far from being done however. Although we have made significant progress in educating clinicians as to the diagnosis and management of patients with IAH / ACS, the majority of physicians worldwide remain unfamiliar with these disease processes, their management, and the detrimental impact they have upon our patient's survival.

When a major task or critical event faces a ship's crew, the rallying cry "All hands on deck!" has been heard for over four centuries. This call for assistance went out to <u>all</u> members of a ship's crew as successful completion of the task at hand frequently meant the survival of all involved. The WSACS, through education and continued research, has the

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opportunity to make a significant impact upon the survival of patients worldwide. Our goal is to ensure that all physicians can recognize and appropriately manage patients with IAH / ACS. We cannot accomplish this lofty goal without your help however. The following is a brief description of the various committees within the WSACS.

Executive Committee

The Executive Committee of the WSACS consists of the president, past-president, president-elect, treasurer, secretary, Clinical Trials Working Group (CTWG) chairman, and Publications Committee chairman. In addition, there are three *ex officio* members who are elected by the general membership. **Nominations for the three *ex officio* positions on the Executive Committee are currently being accepted. All nominations must be submitted to the Nominating Committee (info@wsacs.org) by 1 November.** Those eligible for nomination must be an active member of the WSACS with demonstrated commitment to furthering the Society's goals through past scientific publications, educational activities, and/or involvement in the WSACS. Those nominated will be subjected to voting by the membership in mid-November.

Clinical Trials Working Group (CTWG)

The CTWG is the research arm and major priority of the Society. Dr. Jan De Waele, CTWG chairman, and Dieter Debergh, the newly chosen CTWG research coordinator, have done a phenomenal job as the CTWG prepares to launch a variety of clinical trials in the coming months that address key questions pertaining to IAH / ACS. The next trial will be the "Gastrointestinal Failure (GIF) Score Trial", which will be completed in October. The CTWG is still seeking sites that are interested in participating in this trial. I strongly encourage you to become involved in the CTWG as an investigator and participate in these studies. It is only through further research that our understanding of IAH / ACS can be improved and our educational efforts sustained. Additional details on research opportunities can be found elsewhere in this newsletter as well as on the WSACS website under "Research".

Publications Committee

The WSACS has made its greatest impact upon IAH / ACS education worldwide through its publications, especially the consensus definitions and recommendations statements. Both of these publications are due for revision in 2011 so that they may reflect our ever-changing understanding of the physiology and optimal management of patients with IAH / ACS. Dr. Andy Kirkpatrick, Publications Committee chairman, is preparing to organize an international committee of experts, as was done in 2004, to critically review the existing medical literature and discuss what changes are indicated in the WSACS' current definitions and recommendations statements. The revised consensus statements will be presented to the WSACS membership at the Fifth World Congress in Orlando, Florida, in 2011. If you are interested in participating in this very important aspect of the WSACS, please email **guidelines@wsacs.org**.

Scientific Programme Committee

The Scientific Programme Committee of the WSACS is charged with organizing the Fifth World Congress on the Abdominal Compartment Syndrome (WCACS), which will be at Disney's Yacht & Beach Resort at Disneyworld in Orlando, Florida, USA, 10-13 August, 2011. Building on the highly successful format of the previous WCACS meetings in Sydney, Noosa, Antwerp, and Dublin, the Scientific Programme Committee will work to make the Fifth WCACS our most successful Congress yet. The Committee will design not only the educational programme and supervise the abstract submission process, but also create a relaxing social programme. Given the venue at Disneyworld, our hope is that members will bring the entire family for a wonderful vacation as well as a stimulating educational experience.

As you can see, there are a variety of opportunities for involvement in the WSACS. I strongly encourage each of you to become involved in the Society and consider how you will help us achieve our goals. The next two years will be crucial ones for our Society. If we are to expand our impact upon IAH / ACS patients and their survival, we will need all of your help. **It is truly time for "all hands on deck!"**

Should you have any questions regarding the WSACS or your involvement in the Society, please do not hesitate to contact me (**info@wsacs.org**).

Sincerely,

Michael L Cheatham, MD, FACS, FCCM
2009-2011 President, WSACS

HIGHLIGHTS OF THE FOURTH WORLD CONGRESS ON THE ABDOMINAL COMPARTMENT SYNDROME - 24-27 JUNE, 2009 - DUBLIN, IRELAND

Overview of the Fourth WCACS

Michael Sugrue, MD—Past President

The Fourth WCACS was held over 4 days and attracted 363 Registrants from 45 countries around the world to Ireland. Our international faculty of 37 were regarded as world leaders in the field of medicine, surgery, intensive care, anesthesia and nursing. The meeting started with executive faculty and Clinical Trials Working Group meetings, held in the Royal College of Physicians in Kildare Street, moving to our opening reception in the Royal College of Surgeons at St Stephen's Green. Our scientific programme commenced on Thursday, 25th June 2009. The style of the meeting, which drew much praise, was short, sharp and interactive, mixing scientific presentations with key note deliveries, case scenarios and mini papers.

In addition, there were breakfast and lunch sessions with strong interactive components coupled with a mock trial, debates, videos and workshops. The scientific programme received very positive reviews. The meeting utilized some novel techniques to ensure talks did not go over time; in fact, only one talk went over time and that person was removed from the podium.

In addition to an exciting scientific programme, our delegates and their partners were treated to some of the best social attributes Dublin had to offer with an evening in Jameson's Distillery followed by a Gala dinner at Dublin Castle. A visit to the Long Library and the Book of Kells in Trinity was extremely well received.

Top Ten Countries Represented at the Fourth WCACS

Country	Delegates
United States	49
Australia	36
The Netherlands	34
Ireland	34
United Kingdom	27
Belgium	24
Greece	18
Sweden	13
Germany	10
Switzerland	9
Portugal	8

The World Congress scientific abstracts were published in the Acta Clinica Belgica. The World Journal of Surgery issue ran a specific issue in June 2009 on the Abdominal Compartment Syndrome (ACS).

Crowning off a stellar performance was the humour of Dr. Blair Munford whose calendar was commissioned to alert time watchers in 2010 to the Abdominal Compartment Syndrome. Blair's calendar will be published in the forthcoming newsletters of the WSACS.

Finally, in a scientific presentation at the meeting Dr. Michael Cheatham, incoming president of the WSACS, identified that the Society's website (www.wsacs.org) has now sustained nearly 3 million hits.

Again the Society's Presidential Gown raised many eyebrows. The gown was a donation from a registrant from Uzbekistan who had no money and paid his registration fee at the 3rd World Congress in Antwerp with the gown. Adding to the WSACS memorabilia, outgoing President Mr. Michael Sugrue presented Dr. Michael Cheatham with a bell in memory of the time keeping that took place at Trinity College. This bell will be used at future WCACS meetings.

In summary, the Fourth World Congress was a momentous scientific and social success, and a revelation of the inherent wealth of talent and beauty that Ireland possesses. The WSACS has a bright and entertaining future.

NOMINATIONS FOR WSACS EXECUTIVE COMMITTEE

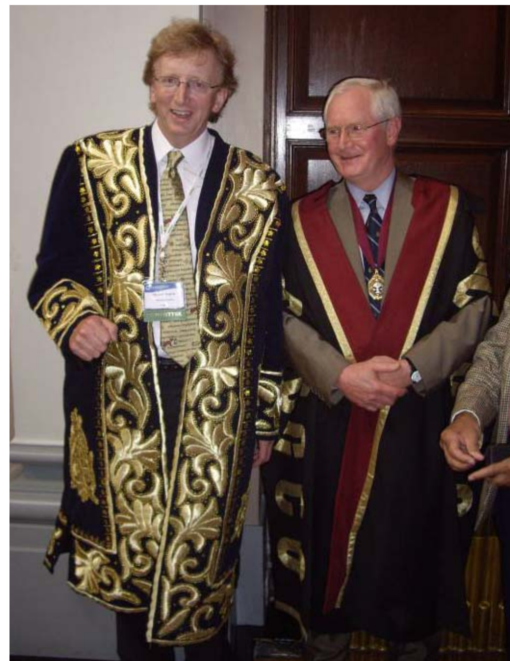
DEADLINE: 1 NOVEMBER 2009

Nominations are currently being accepted for the three *ex officio* positions on the WSACS Executive Committee. Those eligible for nomination must be an active WSACS member in good standing with a demonstrated commitment to the Society's goals through past scientific publications, educational activities, and/or involvement in the WSACS. WSACS members may be nominated by forwarding the member's name to the Nominating Committee at info@wsacs.org. In your email, please indicate the nominee's qualifications for the position and why you feel they should be elected. Nominees will be contacted to confirm their willingness to accept the nomination. A general election by the WSACS membership will be held in mid-November.

HIGHLIGHTS OF THE FOURTH WORLD CONGRESS ON THE ABDOMINAL COMPARTMENT SYNDROME - 24-27 JUNE, 2009—DUBLIN, IRELAND

Opening Ceremony, Royal College of Surgeons

The Opening Ceremony and Welcome Reception of the Fifth Congress on the Abdominal Compartment Syndrome (WCACS) was held at the Royal College of Surgeons (RCSI) in Dublin. Presided over by President Michael Sugrue and Professor Frank Keane, President of the RCSI, WSACS members enjoyed catching up with old friends from previous Congresses and were entertained by harpist Annette Griffin.



Did you know?? - the origins of the WSACS presidential gown

The WSACS presidential gown was the gift of a professor from Uzbekistan who accompanied his fellow who had a poster presentation at the 3rd WCACS in Antwerp, Belgium. The professor did not have the money to pay for the congress registration fee. Then WSACS president Manu Malbrain waived the registration fee, allowing the professor to attend and watch his fellow present. In gratitude, the professor gave Manu Malbrain a blue silk gown with golden embroidery, which henceforth became the official presidential gown. This is transferred to the new elected WSACS president during the official "change of dress" ceremony.

Gala Dinner

The Closing Ceremony and Gala Dinner was held in the historic St. Patrick's Hall of Dublin Castle. A superb reception and dinner was followed by entertainment from Arúna, an *a capella* choir whose melodic voices filled the candlelit hall. Normally reserved for State dinners, this was the perfect venue to conclude an excellent scientific meeting. This was an evening that will never be forgotten!

Prizes Awarded for Best Abstracts, Posters, and Presentations

During the Fifth WCACS, almost 80 oral presentations and 44 poster presentations highlighting the latest scientific findings in the area of IAH / ACS were given. While all of the presentations and posters were excellent, the following were identified to exhibit particular merit and were accorded awards by the Programme Committee.

Best Consultant Paper
Dr. Manu Malbrain
"*SOFA score corrected for intra-abdominal pressure or abdominal perfusion pressure does not allow better outcome prediction in mixed ICU patients"*

Best Resident Paper
Dr. Brian Kubiak
"Peritoneal negative pressure therapy reduces both peritoneal and systemic inflammation and prevents abdominal compartment syndrome"

Best Mini Paper Presentation
Dr. Ari Leppaniemi
"*Subcutaneous linea alba fasiotomy-Does it really work?'*

Best Resident Short Paper
Dr. Stefan Rouch
"Intra-abdominal pressures in critically ill trauma patients using a novel motility capsule

Best Poster
Dr. Brian Kubiak
"*A clinically applicable porcine model for the study of the abdominal compartment syndrome and multiple organ dysfunction syndrome"*

Best Short Paper Presentation
Dr. Edward Kimball
"*A prospective evaluation of the protocolized management of intra-abdominal hypertension and the abdominal compartment syndrome"*

Congratulations to all of the prize winners!

Proceedings of the Biannual Business Meeting

Zsolt Balogh, MD, PhD—WSACS Secretary

The third bi-annual business meeting of the WSACS membership was called to order at 1600 on 26 June, 2009. The following agenda items were discussed by the membership.

- Fourth WCACS—Dublin
  President Sugrue reported that there were 360 delegates in attendance at the Dubin meeting and acknowledged the significant financial support provided by our industry partners.
- Fifth WCACS—Orlando
  The 2011 WCACS meeting will tbe held in Orlando, Florida, at the Walt Disney World Resort. A summer meeting is planned to allow delegates to bring their families. A detailed discussion continued, recognizing that it will be difficult to identify a single time that will be optimal for all given the diversity of the membership. Further details will be forthcoming within the next month.
- WSACS Constitution
  Several motions were entertained.
  - Membership Dues
    The current Constitution stipulates that membership dues are 50 euros payable on a bi-annual cycle. President-elect Cheatham identified that there is currently no fixed date to pay dues and that this has led to difficulty in collecting dues. Of the Society's 425 members, only 240 have paid their 2007-2009 dues. Some members have not paid their dues since 2004. A motion was presented, voted upon, and accepted to amend the Constitution as follows:

    "Membership dues for active members will be fifty (50) euros annually, payable on the first day of January of each year."

    A discounted membership rate of 20 euros, granted at the discretion of the Executive Committee, was recommended for members with financial hardships.

    It was further agreed that 1) the membership of those whose dues are in arrears of more than two years will be made "Inactive" after the appropriate notification stipulated in the Constitution, and 2) dues notices will be sent to all who have not paid their dues in 2009.
  - Committee Structure
    The various committees identified in the Constitution were discussed. A motion was presented, voted upon, and accepted to reduce the number of committees to the following:
    1. Scientific / Program
    2. CTWG / Publications
    3. Executive / Nomination
    4. Guidelines / Education
  - Constitution updates
    The Constitution will be carefully reviewed and submitted for revision at the next general meeting in 2011.
- Treasurer's Report
  Treasurer Malbrain presented the Society's financial report which was reviewed and accepted by the membership.
- Clinical Trials Working Group (CTWG)
  Jan De Waele, MD, PhD, CTWG Chairman, presented an update on the current CTWG-sponsored studies. Discussion was held regarding the need for a study coordinator to assist in promoting the CTWG studies. This 0.5 full-time equivalent (FTE) position was approved for 12 months (to be reviewed and renewed by the Executive Committee as appropriate). Dieter Debergh, RN, was proposed and accepted to fill the position. Chairman De Waele will prepare a written job description. It was further proposed and accepted that the CTWG accept only unrestricted sponsorships from companies.
- Office Bearers
  Nominations for the leadership positions of the WSACS will be solicited from the general membership within the next two months. This includes nominations for the various committees outlined above. The 2009-2011 Executive Committee is as follows:

President	Michael Cheatham, MD
President-elect	Rao Ivatury, MD
Past-President	Michael Sugrue, MD
Treasurer	Manu Malbrain, MD, PhD
Secretary	Zsolt Balogh, MD, PhD
CTWG Chairman	Jan De Waele, MD, PhD

The business meeting was concluded at 1700.

WSACS MEMBERSHIP CHANGES

The World Society of the Abdominal Compartment Syndrome (WSACS) welcomes all physicians, nurses, and other allied healthcare personnel who have an interest in the diagnosis, prevention, and management of patients with intra-abdominal hypertension (IAH) and/or abdominal compartment syndrome (ACS) to become members of the Society. WSACS members receive numerous benefits as outlined below.

IMPORTANT POINTS FOR WSACS MEMBERS

1. **Be sure to update your online membership profile in order to receive WSACS emails and your membership certificate. Click on the "Members Only" link at www.wsacs.org.**
2. **Membership dues are now due annually. If you have not paid your 2009 dues, please do so through your membership profile at www.wsacs.org.**

The Society uses electronic mail to communicate with the membership and provide updates on recent advances in the treatment of IAH / ACS. To do so effectively, members are strongly encouraged to keep the Society informed of any changes in your e-mail address. To do so, please take a moment to log into your personal profile under the "Members Only" link on the WSACS website.

By the end of 2009, all active members will receive a WSACS membership certificate affixed with the seal of the Society. To ensure appropriate delivery of your membership certificate, please update your online membership profile with both your full name and mailing address.

As approved by the membership at the recent general business meeting in Dublin, membership dues are now 50 euros per year, payable on the 1st of January. 2009 membership dues notices, for those who have not paid their dues this year, will be forthcoming. Pay your dues online via credit card by clicking on the dues payment link on your membership profile page.

WSACS members receive numerous benefits including the following:

- Reduced registration fee for the Fifth World Congress on the Abdominal Compartment Syndrome (WCACS), 10-13 August, 2011, Orlando, Florida.
- 10% discount on all WSACS publications and merchandise including the textbook "Abdominal Compartment Syndrome" and Acta Clinica Belgica Proceedings of WCACS 2007 and WCACS 2009.
- Invitation to participate in WSACS sponsored clinical research trials through the Clinical Trials Working Group (CTWG).
- Online access to over 500 presentations from the 2004, 2007, and 2009 WCACS meetings.

Second meeting of the Working Group on Abdominal Problems (WGAP) during the ESICM meeting in Vienna (13 October 2009)

Earlier this year, the Working Group on Abdominal Problems (WGAP) was created within the section Postoperative Intensive Care (POIC) of the ESICM. The WGAP is an official part of the POIC section of the ESICM and is a group of members within the section of POIC. The idea is the bring members together working in the same field of scientific expertise and who wish to collaborate and exchange ideas on specific projects and methodological issues related to abdominal problems such as severe acute pancreatitis, intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), abdominal sepsis, acute gastro-intestinal failure, or acute bowel injury (in analogy to acute lung injury), polycompartment syndromes, acute hepatic failure, etc…These diseases are becoming more and more recognized as a substantial cause of morbidity and mortality in critically ill patients.

The WGAP has been working closely with the CTWG of the WSACS to sponsor research trials of mutual interest such as the Gastrointestinal Failure (GIF) Score Trial. The GIF Score Trial will take place in Mid-October in intensive care units around the world.

The WGAP will hold its next meeting on 13 October 2009 during the ESIM meeting in Vienna. The meeting will occur from 8:30 to 10:30 AM in room J 565/1 on the first floor of the Austria Center. All with an interest in abdominal problems are invited to attend.

Editorial: “Should we evolve into the World Society for the Understanding of Intra-abdominal Hypertension in Critical Illness?”

Andrew W. Kirkpatrick, MD, Calgary, Alberta

The Fourth World Congress was scientifically productive and educational, as delegates from 45 countries around the world met and discussed the challenges and opportunities related to understanding the role of abnormally increased intra-pressures on the overall health and outcomes of the critically ill. While the history, social programs, technological exhibitions and camaraderie were exceptional, the science was the sine qua non for so many interested clinicians, health care providers, and scientists congregating. What became apparent over the course of the conference is that the nature of the problem has largely evolved in centres that are familiar and anticipate the overt abdominal compartment syndrome (ACS) in their most critically ill patients. Thus, these centres less frequently observe this phenomenon, and the ACS is not the primary question they face in the daily care of the critically ill. The low-hanging fruit may therefore have been plucked.

From around the world, delegates heard the message that it is intra-abdominal hypertension (IAH) that perplexes researchers and clinicians alike. Further evidence was presented that quite modest levels of IAH influence organ function throughout the body. Prize-winning work from SUNY Upstate Medical University, from among other remarkable basic science initiatives from around the world, suggests that IAH is at least a link if not a motor for multi-system organ dysfunction. As an overview, the data provides the impetus to study whether addressing moderate IAP can influence the overall outcome of the critically ill, evidence that has not yet been proven, but which remains the highest priority for the Society. To this end, the ongoing interest in the Clinical Trials Working Group (CTWG) and the recruitment of dedicated research support are some of the most important outcomes of the Dublin meeting.

Finally, while not formally presented, most in attendance related personal, but consistent stories of a lack of general appreciation of the body of science presented. Thus, while great strides have been made, and improved outcomes related to non-randomized study and protocols discussed, patients remain at risk of the ACS if vigilance is not practiced. Thus, the interim stage of the society may be best known as the “**World Society for the Understanding of Intra-abdominal Hypertension in Critical Illness**”, yet still ensuring that no unnecessary cases of ACS occur.

Editorial: “It’s time to makes NOTES on Intra-abdominal Hypertension!”

Michael Sugrue, MD, Letterkenny, Ireland

It is only 24 years since Professor Erick Muhe performed the first laparoscopic cholecystectomy (1). Even more recent has been the development of transgastric surgery by Seifert in 2000 (2). It is widely accepted, however, that the first true Natural Orifice Transluminal Endoscopic Surgery (NOTES) was performed 5 years ago by Kalloo and colleagues from Johns Hopkins (3).

While much of NOTES has occurred in the animal laboratory, most abdominal procedures have now been completed using NOTES, including splenectomy, appendectomy, cholecystectomy, and hepatic wedge resection (4). Whiteford in 2007 has reported a transcolonic sigmoid colectomy (5).

With the development of the laparoscopic era, the adverse effects of intra-abdominal hypertension (IAH) were clearly recognised. NOTES requires abdominal insufflation and pneumoperitoneum. Flexible endoscopic insufflators are not as accurate or versatile in controlling IAP as are laparoscopic insufflators. Berstrom identified in a study of endoscopists that most episodes of higher IAP were not recognised (6). McGee and colleagues have attempted to aid IAP monitoring using a standard laparoscopic insufflator. They monitored both the endoscopic tip and biopsy channel which were closely correlated with real IAP.

All this begs the question? Will the industry provide the users with an adequate monitoring system to minimise the complication of intra-operative IAH. Let’s hope we all NOTE the potential for IAH and ACS.

1. Reynolds W The first laparoscopic cholecystectomy JSLS 2001:5:89-94
2. Seifert H Wehrmann T Schmitt T et al Retroperitoneal endoscopic debridement for infected pancreatic necroisis. Lancet 2000;356:653-655
3. Kalloo AN, Singh VK, Jagannath SB et al Flexible transgastric peritoneoscopy: A novel approach to diagnostic and therapeutic interventions in the peritoneal cavity Gastrointest Endosc 2004;60449-453
4. Yan SL Thompson-Fawcett M NOTES: new dimension of minimally invasive surgery ANZ J Surg 2009;79:337-343
5. Whiteford MH, Denk PM, Swanstrom LL, Feasibility of radical sigmoid colectomy performed as natural oriface transluminal endoscopic surgery (NOTES) using transanal endoscopic microsurgery. Sur Endosc 2007;21:1870-1874
6. Bergstrom M Swain P Park PO Measurement of intraperitoneal pressure and the development of a feedback control valve for regulating pressure during flexible transgastric surgery (NOTES) Gastrointest Endosc;2007;66:174-178

Literature Monitor: Recent IAH/ACS Publications

Michael L. Cheatham, MD (michael.cheatham@orlandohealth.com)
Jan De Waele, MD, PhD (jan.dewaele@ugent.be)

Classification--important step to improve management of patients with an open abdomen
Björck M, Bruhin A, Cheatham M, Hinck D, Kaplan M, Manca G, Wild T, Windsor A.
World J Surg 2009; 33(6):1154-1157.
This report proposes a classification system for patients with an open abdomen. It can be used for clinical practice as well as for research purposes. The following grading is suggested: grade 1A, clean OA without adherence between bowel and abdominal wall or fixity of the abdominal wall (lateralization); grade 1B, contaminated OA without adherence/fixity; grade 2A, clean OA developing adherence/fixity; grade 2B, contaminated OA developing adherence/fixity; grade 3, OA complicated by fistula formation; grade 4, frozen OA with adherent/fixed bowel, unable to close surgically, with or without fistula. This consensus report is a must-read for everybody involved in IAH/ACS research.

Fluid accumulation, survival and recovery of kidney function in critically ill patients with acute kidney injury
Bouchard J, Soroko SB, Chertow GM, Himmelfarb J, Ikizler TA, Paganini EP, Mehta RL
Kidney Int. 2009; 76(4):422-427. Epub 2009 May 13.
Fluid overload is associated with significantly higher mortality within 60 days of enrollment. Among dialyzed patients, survivors had significantly lower fluid accumulation when dialysis was initiated compared to non-survivors after adjustments for dialysis modality and severity score. This is another study that confirms that fluid overload was independently associated with mortality.

Open abdomen treatment following endovascular repair of ruptured abdominal aortic aneurysms
Mayer D, Rancic Z, Meier C, Pfammatter T, Veith FJ, Lachat M.
J Vasc Surg 2009; 50(1): 1-7.
This study describes the experience with open abdomen treatment after endovascular treatment of AAAA. Decompression for ACS was needed in 20 patients either primarily during the intervention (n = 14) or secondarily in the intensive care unit (n = 6). Mortality was 30%, relaparotomies were required often. Abdominal closure was possible after a median of 6 days using a standardized protocol in these patients.

Importance of abdominal compartment syndrome in Germany: a questionnaire
Otto J, Kaemmer D, Binnebösel M, Jansen M, Dembinski R, Schumpelick V, Schachtrupp A.
Anaesthesist 2009; 58(6): 607-610.
This paper reports the results of a questionnaire among German surgical and anesthesiology departments regarding IAH and ACS. The response rate was about 50%, and the majority of respondents considered IAH to be an important issue. About 25% did not measure IAP. Results are comparable to questionnaires from other countries.

Influence of volume increase on intra-abdominal pressure
Schachtrupp A.
Anaesthesist 2009; 58(5): 532-536.
This review (in German) summarizes the physiological and pathological aspects of the relationship between volume and intra-abdominal pressure (IAP).

Fluid resuscitation in adults with severe burns at risk of secondary abdominal compartment syndrome - An evidence based systematic review
Azzopardi EA, McWilliams B, Iyer S, Whitaker IS.
Burns 2009 May 26. [Epub ahead of print]
ACS is common in burn patients due to massive fluid resuscitation. This review summarizes the literature on this topic and concludes that smaller volumes should be used for resuscitation in burns patients, and that IAP should be monitored. Awareness among the burn community is considered to be an important threat.

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Literature Monitor: Recent IAH/ACS Publications

Michael L. Cheatham, MD (michael.cheatham@orlandohealth.com)
Jan De Waele, MD, PhD (jan.dewaele@ugent.be)

Temporary closure of the open abdomen: a systematic review on delayed primary fascial closure in patients with an open abdomen
Boele van Hensbroek P, Wind J, Dijkgraaf MG, Busch OR, Carel Goslings J.
World J Surg 2009; 33(2): 199-207.
The increased use of open abdomen treatment in ICU patients creates a new challenge: to achieve early fascial closure. This is a systemaic review of fascial closure rates after OAT, and the authors found that VAC treatment ant artificial burr had the highest rates of fascial closure. No comparative studies were available though.

The impact of body position on intra-abdominal pressure measurement: a multicenter analysis
Cheatham ML, De Waele JJ, De Laet I, De Keulenaer B, Widder S, Kirkpatrick AW, Cresswell AB, Malbrain M, Bodnar Z, Mejia-Mantilla JH, Reis R, Parr M, Schulze R, Puig S; World Society of the Abdominal Compartment Syndrome (WSACS) Clinical Trials Working Group
Crit Care Med 2009;37(7): 2187-2190.
This is the second report coming from the WSACS CTWG 001 study. Head of bed elevation results in clinically significant increases in measured IAP. Consistent body positioning from one IAP measurement to the next is necessary to allow consistent trending of IAP for accurate clinical decision making.

Predefined massive transfusion protocols are associated with a reduction in organ failure and postinjury complications
Cotton BA, Au BK, Nunez TC, Gunter OL, Robertson AM, Young PP.
J Trauma 2009; 66(1): 41-48; discussion 48-49.
The use of massive transfusion protocols resulted in a lower incidence of pneumonia, pulmonary failure, open abdomens, and abdominal compartment syndrome.

Colonic ischaemia and intra-abdominal hypertension following open repair of ruptured abdominal aortic aneurysm
Djavani K, Wanhainen A, Valtysson J, Björck M.
Br J Surg 2009; 96(6): 621-627.
The patients in this study were managed with a combination of intracolonic pHi and IAP measurement. This lead to colonoscopy, neuromuscular blockade or laparotomy in the majority of them as IAH and low pHi were frequent findings. Despite the severity of illness in these patients, only 1 out of 29 died. The authors concluded that IAP is an important mechanism behind colonic hypoperfusion after rAAA repair. Monitoring IAP and timely intervention may improve outcome.

Preventing loss of domain: a management strategy for closure of the "open abdomen" during the initial hospitalization
Koss W, Ho HC, Yu M, Edwards K, Ghows M, Tan A, Takanishi DM Jr.
J Surg Educ 2009; 66(2): 89-95.
Although a planned hernia repair is considered reasonable after complications related to ACS, a technique of managing the open abdomen that prevents fascial retraction results in a high primary closure rate with an acceptable rate of short-term complications.

Abdominal complications after severe burns
Markell KW, Renz EM, White CE, Albrecht ME, Blackbourne LH, Park MS, Barillo DA, Chung KK, Kozar RA, Minei JP, Cohn SM, Herndon DN, Cancio LC, Holcomb JB, Wolf SE.
J Am Coll Surg 2009; 208(5): 940-947; discussion 947-949.
In this retrospective study, the majority of problems related to the abdomen in burn patients occurred in the first days after injury with associated abdominal compartment syndrome (32 of 51) and increased linearly to burn size. The other major intra-abdominal catastrophe was ischemic bowel later in the course. Associated mortality was 78% without obvious cause. Experts recommended more aggressive monitoring of abdominal compartment pressures and earlier operative management to improve outcomes.

Continued on page 10...

Literature Monitor: Recent IAH/ACS Publications

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Direct intra-abdominal pressure monitoring via piezoresistive pressure measurement: a technical note
Otto J, Kaemmer D, Binnebösel M, Jansen M, Dembinski R, Schumpelick V, Schachtrupp A.
BMC Surg 2009; 9:5.
The authors report their experience with a piezoresistive pressure measurement technique in patients undergoing elective abdominal surgery. These readings were comparable to IVP, but the device was considered to be too fragile for IAP measurements in the clinical setting.

Intra-abdominal pressure alterations after large pancreatic pseudocyst transcutaneous drainage
Papavramidis TS, Duros V, Michalopoulos A, Papadopoulos VN, Paramythiotis D, Harlaftis N.
BMC Gastroenterol 2009; 9(1):42.
The authors report the effect of percutaneous drainage of pancreatic pseudocysts on IAP. They found that IAP – though not very high before drainage (mean 9mmHg) was still reduced after drainage.

Eclampsia Complicated by Abdominal Compartment Syndrome
Richter CE, Saber S, Thung SF.
Am J Perinatol 2009; May 14. [Epub ahead of print]
A primigravida with eclampsia and hemolytic anemia, elevated liver enzymes, and low platelet count (HELLP syndrome) developed intra-abdominal compartment syndrome requiring a decompressive laparotomy, underlining the importance of including abdominal compartment syndrome in the differential diagnosis in pregnant women.

Abdominal compartment syndrome during hip arthroscopy
Sharma A, Sachdev H, Gomillion M.
Anaesthesia 2009; 64(5): 567-9.
The authors report a relatively unusual complication of hip arthroscopy, extravasation of irrigation fluid into the retroperitoneal and intraperitoneal cavities, resulting in abdominal compartment syndrome.

Recommendations for research from the International Conference of Experts on Intra-abdominal Hypertension and Abdominal Compartment Syndrome
De Waele JJ, Cheatham ML, Malbrain ML, Kirkpatrick AW, Sugrue M, Balogh Z, Ivatury R, De Keulenaer B, Kimball EJ.
Acta Clin Belg. 2009; 64(3):203-209
This third consensus statement from the WSACS outlines recommendations for appropriate research practices pertaining to IAH / ACS studies and their publication.

Possible Importance of Increased Intra-abdominal Pressure for the Development of Necrotizing Enterocolitis
Sukhotnik I, Riskin A, Bader D, Lieber M, Shamian B, Coran AG, Mogilner J.
Eur J Pediatr Surg. 2009 Sep 11. [Epub ahead of print]
In a comparative study of neonates with and without necrotizing enterocolitis (NEC), infants with NEC were noted to have significantly higher IAP levels, with worsening IAP correlating with the severity of the NEC.

Vacuum-pack temporary abdominal wound management with delayed-closure for the management of ruptured abdominal aortic aneurysm and other abdominal vascular catastrophes: absence of graft infection in long-term survivors
Ross CB, Irwin CL, Mukherjee K, Schumacher PM, Dattilo JB, Ranval TJ, Guzman RJ, Naslund TC.
Am Surg 2009; 75(7):565-570; discussion 570-571.
In response to a common question regarding use of the open abdomen in patients with ruptured abdominal aortic aneurysm (AAA) who require prosthetic graft insertion, the authors retrospectively reviewed their experience in 23 patients with ruptured AAA who were managed with an open abdomen. No graft infections were identified with mean follow-up of 53 months.

Intra-abdominal hypertension in two adult horses
Brosnahan MM, Holbrook TC, Gilliam LL, Ritchey JW, Confer AW.
J Vet Emerg Crit Care 2009;19(2):174-10.
The authors describe the first report of two cases of secondary ACS among horses with peritonitis.

INTRA-ABDOMINAL HYPERTENSION (IAH) ASSESSMENT ALGORITHM

- *Patients should be screened for IAH/ACS risk factors upon ICU admission and with new or progressive organ failure.*
- *If two or more risk factors are present, a baseline IAP measurement should be obtained.*
- *If IAH is present, serial IAP measurements should be performed throughout the patient's critical illness.*

Patient has TWO or more risk factors for IAH/ACS upon either ICU admission or in the presence of new or progressive organ failure

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Measure patient's IAP to establish baseline pressure

IAP measurements should be:

1. Expressed in mmHg (1 mmHg = 1.36 cm H_2O)
2. Measured at end-expiration
3. Performed in the supine position
4. Zeroed at the iliac crest in the mid-axillary line
5. Performed with an instillation volume of no greater than 25 mL of saline [1 mL/kg for children up to 20 kg] (for bladder technique)
6. Measured 30-60 seconds after instillation to allow for bladder detrusor muscle relaxation (for bladder technique)
7. Measured in the absence of active abdominal muscle contractions

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Sustained IAP ≥ 12 mmHg?

- **YES** → **Patient has IAH** → **Notify patient's doctor of elevated IAP. Proceed to IAH / ACS management algorithm.**
- **NO** → **Patient does not have IAH** → **Observe patient. Recheck IAP if patient deteriorates clinically.**

Risk Factors for IAH / ACS

1. Diminished abdominal wall compliance
   - Acute respiratory failure, especially with elevated intrathoracic pressure
   - Abdominal surgery with primary fascial or tight closure
   - Major trauma / burns
   - Prone positioning, head of bed > 30 degrees
   - High body mass index (BMI), central obesity
2. Increased intra-luminal contents
   - Gastroparesis
   - Ileus
   - Colonic pseudo-obstruction
3. Increased abdominal contents
   - Hemoperitoneum / pneumoperitoneum
   - Ascites / liver dysfunction
4. Capillary leak / fluid resuscitation
   - Acidosis (pH < 7.2)
   - Hypotension
   - Hypothermia (core temperature < 33°C)
   - Polytransfusion (>10 units of blood / 24 hrs)
   - Coagulopathy (platelets < 55000 / mm^3 OR prothrombin time (PT) > 15 seconds OR partial thromboplastin time (PTT) > 2 times normal OR international standardised ratio (INR) > 1.5)
   - Massive fluid resuscitation (> 5 L / 24 hours)
   - Pancreatitis
   - Oliguria
   - Sepsis
   - Major trauma / burns
   - Damage control laparotomy

IAH Grading

Grade	IAP
Grade I	**IAP 12-15 mmHg**
Grade II	**IAP 16-20 mmHg**
Grade III	**IAP 21-25 mmHg**
Grade IV	**IAP ≥ 25 mmHg**

Abbreviations

IAH - intra-abdominal hypertension
ACS - abdominal compartment syndrome
IAP - intra-abdominal pressure

Adapted from *Intensive Care Medicine* 2006;32(11):1722-1732 & 2007;33(6):951-962

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INTRA-ABDOMINAL HYPERTENSION (IAH) / ABDOMINAL COMPARTMENT SYNDROME (ACS) MANAGEMENT ALGORITHM

Intra-Abdominal Hypertension (IAH)

Patient has IAH (IAP ≥ 12 mmHg)

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Initiate treatment to reduce IAP
Avoid excessive fluid resuscitation
Optimize organ perfusion

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IAP > 20 mmHg with new organ failure?
- YES → **Patient has ACS**
- NO → Monitor IAP with serial measurements at least every 4 hours while patient is critically ill → IAP < 12 mmHg consistently?
  - NO → back to Patient has IAH
  - YES → **IAH has resolved**: Discontinue IAP measurements and monitor patient for clinical deterioration

Medical treatment options to reduce IAP

1. Improve abdominal wall compliance
   - Sedation & analgesia
   - Neuromuscular blockade
   - Avoid head of bed > 30 degrees
2. Evacuate intra-luminal contents
   - Nasogastric decompression
   - Rectal decompression
   - Gastro-/colo-prokinetic agents
3. Evacuate abdominal fluid collections
   - Paracentesis
   - Percutaneous drainage
4. Correct positive fluid balance
   - Avoid excessive fluid resuscitation
   - Diuretics
   - Colloids / hypertonic fluids
   - Hemodialysis / ultrafiltration
5. Organ Support
   - Maintain APP ≥ 60 mmHg with vasopressors
   - Optimize ventilation, alveolar recruitment
   - Use transmural (tm) airway pressures
     - $Pplat_{tm}$ = Pplat - IAP
   - Consider using volumetric preload indices
   - If using PAOP/CVP, use transmural pressures
     - $PAOP_{tm}$ = PAOP - 0.5 * IAP
     - CVP_{tm} = CVP - 0.5 * IAP

Abdominal Compartment Syndrome (ACS)

IDENTIFY AND TREAT UNDERLYING ETIOLOGY FOR PATIENT'S ACS

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Does patient have Primary ACS?
- YES → Perform / revise abdominal decompression with temporary abdominal closure as needed to reduce IAP → Continue medical treatment options to reduce IAP
- NO → Patient has Secondary or Recurrent ACS → Is IAP > 25 mmHg with progressive organ failure?
  - YES → Perform / revise abdominal decompression with temporary abdominal closure as needed to reduce IAP
  - NO → Continue medical treatment options to reduce IAP

Continue medical treatment options to reduce IAP

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Measure IAP/APP at least every 4 hours while patient is critically ill

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Perform balanced resuscitation of patient preload, contractility, and afterload using crystalloid / colloid / vasoactive medications
AVOID EXCESSIVE FLUID RESUSCITATION

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Can APP be maintained ≥ 60 mmHg?
- NO → Perform / revise abdominal decompression with temporary abdominal closure as needed to reduce IAP
- YES → IAP < 12 mmHg consistently?
  - NO → Continue medical treatment options to reduce IAP
  - YES → **IAH has resolved**: Decrease frequency of IAP measurements and observe patient for deterioration

Definitions

IAH - intra-abdominal hypertension

ACS - abdominal compartment syndrome

IAP - intra-abdominal pressure

APP - abdominal perfusion pressure (MAP-IAP)

Primary ACS - A condition associated with injury or disease in the abdomino-pelvic region that frequently requires early surgical or interventional radiological intervention

Secondary ACS - ACS due to conditions that do not originate from the abdomino-pelvic region

Recurrent ACS - The condition in which ACS redevelops following previous surgical or medical treatment of primary or secondary ACS

Adapted from *Intensive Care Medicine* 2006;32(11):1722-1732 & 2007;33(6):951-962

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NON-OPERATIVE MANAGEMENT ALGORITHM

Patient has IAP $\geq$ 12 mmHg
Begin medical management to reduce IAP

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Measure IAP / APP at least every 4-6 hours or continuously.
Titrate therapy to maintain IAP $\leq$ 15 mmHg and APP $\geq$ 60 mmHg

	Evacuate intraluminal contents	Evacuate intra-abdominal space occupying lesions	Improve abdominal wall compliance	Optimize fluid adminstration	Optimize systemic / regional perfusion
Step 1	Insert nasogastric and/or rectal tube	Abdominal ultrasound to identify lesions	Ensure adequate sedation & analgesia	Avoid excessive fluid resuscitation	Goal-directed fluid resuscitation
Step 1	Initiate gastro-/colo-prokinetic agents		Remove constrictive dressings, abdominal eschars	Aim for zero to negative fluid balance by day 3	Maintain abdominal perfusion pressure (APP) $\geq$ 60 mmHg
Step 2	Minimize enteral nutrition	Abdominal computed tomography to identify lesions	Avoid prone position, head of bed > 20 degrees	Resuscitate using hypertonic fluids, colloids	Hemodynamic monitoring to guide resuscitation
Step 2	Administer enemas	Percutaneous catheter drainage	Consider reverse Trendelenberg position	Fluid removal through judicious diuresis once stable	
Step 3	Consider colonoscopic decompression	Consider surgical evacuation of lesions	Consider neuromuscular blockade	Consider hemodialysis / ultrafiltration	Vasoactive medications to keep APP $\geq$ 60 mmHg
Step 3	Discontinue enteral nutrition				

Step 4

If IAP > 25 mmHg (and/or APP < 50 mmHg) and new organ dysfunction / failure is present, patient's IAH / ACS is refractory to medical management. Strongly consider surgical abdominal decompression.

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WSACS Membership

The World Society of the Abdominal Compartment Syndrome (WSACS) welcomes all physicians, nurses, and other allied healthcare personnel who have an interest in the diagnosis, prevention, and management of patients with intra-abdominal hypertension (IAH) and/or abdominal compartment syndrome (ACS) to become WSACS members. Membership dues are a nominal 50 euros per year. To join the WSACS, go to the WSACS website (http:www.wsacs.org.) and complete the online membership application.

WSACS members receive numerous benefits including the following:

- Reduced registration fee for the World Congress of the Abdominal Compartment Syndrome (WCACS), Orlando, Florida, USA in 2011.
- Reduced cost for WSACS publications including the textbook "Abdominal Compartment Syndrome" and Acta Clinica Belgica Proceedings of WCACS 2007 and WCACS 2009
- Invitation to participate in WSACS sponsored clinical research trials through the Clinical Trials Working Group (CTWG).
- WSACS quarterly newsletter highlighting recent advances in IAH/ACS diagnosis and management.

WSACS Website & Bookstore

http://www.wsacs.org

The WSACS website serves as an educational resource for all who are interested in IAH/ACS. The website is accessed daily by physicians and nurses from around the world. The recently published consensus definitions and recommendations, IAP measurement techniques, patient oriented information, and the online Discussion Forum are all accessible through the website. Of particular use are the IAH/ACS Assessment Management algorithms (included in this newsletter) that may be downloaded and posted in your intensive care unit as well as the WSACS slide presentations that can be used to educate your staff.

For those interested in the Clinical Trials Working Group (CTWG), sample research protocols may be downloaded and potential research projects uploaded for review by the CTWG Committee.

The website also contains over 200 slides presentations from the 3rd WCACS meeting. Slide presentations from the 4th WCACS will be posted soon and will represent the current state-of-the-art for IAH / ACS diagnosis and management.

The WSACS Bookstore is now open! The textbook "Abdominal Compartment Syndrome", Acta Clinica Belgica Proceedings from 2007 & 2009, WSACS T-shirts, and WSAC buttons are all available for purchase online through the WSACS Bookstore.

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The WSACS newsletter is published quarterly for members and interested individuals. Comments and suggestions may be emailed to: info@wsacs.org.

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