

Special Issue Year End Review

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"I am proud to be associated with so many people that are truly working for the benefit of our members and the MR community at large."

Charles T. Stanley B.S., R.T. (R)(CT)(MR), CIIP
SMRT President

Mission and Vision

Paul Thornton said, "Without mission, there's no purpose. Without vision, there's no destination." I am so proud to be part of an organization that has purpose and destination. This has been a fantastic year to be a part of the SMRT as we move into what our third decade brings us!

Our new Mission and Vision statements were completed in the beginning of this year and I would like to spend some time walking through them and showing how they articulate the many wonderful things accomplished and started in the past twelve months.

Vision Statement

"The Section for Magnetic Resonance Technologists (SMRT) strives to be the leading professional organization in the medical imaging community providing education, professional advice and support for magnetic resonance (MR) technologists and radiographers throughout the world. The SMRT operates as a section of the International Society for Magnetic Resonance in Medicine (ISMRM) and aims to promote a high level of professionalism in the field of MR technology and radiography."

The destination, the preferred future, the mountain top... strives, provides, aims. These are big words, action words; a call to arms for the leadership. I am proud to say

that I witnessed that leadership all around me this past year. [Julia Lowe](#) did a fantastic job as President. Numerous conference calls, emails, text messages, etc ... all used to keep us on track and accomplish the goals of her term. Julia oversaw work accomplished by every single committee of the SMRT. From Bylaws revision regarding membership approval, streamlining of communication between the Executive Committee and Policy Board, and developing a rubric used in our leadership nomination process, Julia clearly set her presidency in line with the Vision of the SMRT.

Mission Statement

"Enable MR technologists and radiographers around the world to achieve professional excellence through the provision of high quality education."

In May of this year we met in Montréal, Canada and experienced a world-class educational event. Attendees from around the world benefitted from the joint leadership of [Carol Lee](#) – 2011 Program Chair and [Maryann Blaine](#) – 2011 Education Chair. The meeting was very well organized with a number of special 20-year anniversary touches (Thanks Carol!) and the Educational content was rated as outstanding by the attendees. For the upcoming 2012 Annual Meeting in Melbourne, [Glenn Cahoon](#) – 2012 Program Chair and [Rosemary Fisher](#) – 2012 Education Chair, have been hard at

work for months to diligently shape the program into another world-class educational event. In addition to our annual meeting, there have been a significant number of Regional Educational Seminars held literally around the world in the past year. Please be sure to read about them in *Signals News Online* and in this issue. Lastly, no mention of MR education would be complete without mention of the continued efforts of our *Educational Seminars* Home Studies Editor, [Anne Marie Sawyer](#). Anne oversaw the release this year of high quality printed Home Studies and for the first time ever, video Home Studies! Anne is rightfully quite excited about the potential reach and outreach of providing CE credits in this format and I am enthusiastic about the impact these studies can have throughout the world.

"Support and promote world-wide communication of current and emerging clinical and research information in the field of magnetic resonance and provide a forum for its dissemination."

At any given time thousands of people have access to the most dynamic source of MR information anywhere in the world. Of course I am talking about the MR list serve that is maintained by the SMRT. This list has continued to grow the past year as it is recognized as a trusted source of information from things as mundane as what color scrubs are worn at your hospital to significant discussions among thought leaders about MRI safety. There exists no other forum that provides the breadth and depth of information that is available on the list. The SMRT has also recognized that social media has fundamentally changed the way some people communicate and as such has provided other avenues for information flow. There now exists an "official" SMRT Facebook page and many of the local chapters have them as well.

"Develop relevant and accessible member services and resources to enhance professional development."

The SMRT has worked extremely hard to build on our successes and provide new

value to our members. [Sally Moran](#) has worked with numerous people to update the look and functionality of our website (www.ismrm.org/smrt/). If you haven't checked it out in a long time you would be astonished at the layout and usability compared to before. It has been updated to make the most relevant information the first thing to be seen when going to the website. Some of the most notable things are more real-time information being provided by [Julie Strandt-Peay](#), Editor, with *Signals News Online* as well as previous issues of *Signals* newsletter being more readily available.

Relevant and accessible are terms that can mean so many different things to different people. However one area where there seems to be little ambiguity amongst our members is how these terms apply to educational content delivery. A global organization demands a global outreach and it is recognized that online content delivery is imperative to the survival of our organization as the "leading professional organization...providing education...throughout the world." Now with our new website, at any time day or night, on any continent, a member can access the 2011 SMRT Annual Meeting complete with quizzes to earn credit hours. Even more exciting, as I mentioned earlier [Anne Marie Sawyer](#) has moved the Home Studies into video format. This will again allow any member, anywhere in the world, instantaneous access to fresh new exclusive educational content. Relevant and accessible indeed!

"Provide informed advice and support to its global membership to enable the SMRT to work with local, regional, and federal agencies, and organizations, to accomplish the above objectives."

The SMRT has a long history of working with other organizations to ensure our voice is heard in the field of health care. From being part of the Alliance for Quality Medical Imaging and Radiation Therapy standing in support of the CARE Bill, to working jointly with the ASRT to develop curriculum guide-

lines, the SMRT has placed value in collaborating with others to achieve common goals. This year has been no different as I am committed in my goals as President to achieve an even higher level of collaborative efforts with others. Some of the exciting things that have happened recently:

- We continue working with the Alliance for CARE Bill passage;
- We have sent an SMRT representative to the Canadian Association of Medical Radiation Technologists to explore ways to provide SMRT education resources to Canadian MRI radiographers;
- We continue to be heavily involved in developing RSNA Associated Sciences lectures as Cindy Comeau has attended planning meetings and I have continued to serve as speaker or moderator;
- We have developed a collaborative work group with the Society for Nuclear Medicine Technologists to provide consistent education for technologists in the emerging field of MR-PET;
- We have sent representatives to an FDA public meeting regarding MRI Safety; and
- We have expanded efforts in the UK to gain CPD approval for educational content provided by the SMRT.

I hope this brief whirlwind tour of the application of our Mission and Vision statement helps provide an insight into the vast amount of effort that continues to be expended within the SMRT. I am proud to be associated with so many people that are truly working for the benefit of our members and the MR community at large. I know that my small efforts alone can accomplish so little yet combined with others can have an impact. I encourage each and every one of you to get involved, stay involved, and look for new ways to provide value to this profession that we call ours.

Thank you and Happy Holidays! 



Editor's Letter

Julie Strandt-Peay
B.S.M., R.T. (R)(MR), FSMRT
Editor, Signals

"If you are a member of the SMRT you can be proud to be associated with the dedicated professionals serving you."

Dear Readers,

Welcome to the annual "Year in Review" issue of Signals. In spite of turmoil, natural disasters and economic uncertainty across the globe, the SMRT has remained a steady, constant, excellent source for the educational and professional needs of the practicing MR Technologist and Radiographer. If you are a member of the SMRT you can be proud to be associated with the dedicated professionals serving you. If you are not yet a member, you will want to consider joining to be among the leaders in the MR field.

Leadership is evidenced by the message of President, [Charles Stanley](#) who takes us through the vision and mission statements of the SMRT. Articulated in time for the 25th anniversary, these statements illustrate the goals and intentions of the SMRT. Membership activities are chaired this year by [Scott Dunn](#) and are listed in the article on page six.

The 2012 Annual Meeting plans are well underway as reported by Program Committee Chair, [Glenn Cahoon](#).

Traveling to Melbourne, Australia will require planning so begin now to ensure you don't miss out on an excellent opportunity for learning and meeting with colleagues from around the world. The preliminary program agenda is included for your consideration on page five. Education Committee Chair, [Rosemary Fisher](#) invites you to submit an abstract of your work for consideration at the meeting. Technologists' papers and posters are a unique learning experience

and a fantastic way to share your work with your MR colleagues.

Highlights of the 2011 Annual Meeting in Montréal, Canada are included in a photo gallery. Those outstanding individuals who were recognized this year with awards are shown. For much more information about the Montreal meeting, please see the special meeting issue of Signals on the SMRT website.

Along with the President-Elect and the Policy Board Members, the Chair of the External Relations Committee serves a three year term. Newly elected Chair, [Cindy Comeau](#) gives us an overview of the many activities involved with this committee. She has shared a fact sheet identifying the Certification, Licensing and Accreditation in the United States for MR Technologists. As a Past President, Cindy will represent the SMRT well. Outside of North America, [Titti Owman](#) of Sweden will represent the society as she strives to make the educational and professional offerings of the SMRT known throughout Europe.

One of the sustaining activities of the SMRT is the willingness of Radiographers and MR Technologists to provide Regional Educational Seminars. Current Chair, [Betsy Sestina](#) provides us with encouragement to host a seminar in our area. The report by President-Elect, [Vera Miller](#) illustrates nicely the typical format for a Regional Seminar.

Besides the regional seminars, several areas have started Local Chapters

to provide more frequent, ongoing educational programs. [Carol Lee](#) has been active in Local Chapters and now is Chair of that committee. She shares her thoughts and persuades us to consider starting a chapter of our own. [Cindy Comeau](#) files a report from the New York/New Jersey, USA Chapter that held a successful day long educational course.

As mentioned by [Charles Stanley](#) in his President's message, the Educational Seminars Home Study program has continued to evolve. [Anne Marie Sawyer](#) had been instrumental in bringing the continuing education material from hard copy to electronic to video!

A regular contributor to Signals and to the MRI Technologist list serve is MRI Safety expert [Frank Shellock](#). He shares information in this issue about heating during the MRI exam.

The SMRT has made great strides this past year to become more responsive to the educational needs of the MR community by improvements to the website and by providing an increasing number of seminars and workshops. You are advised to make checking out the SMRT website a habit in your daily practice to keep up with scheduled events and deadlines for submissions as well as news and updates. As always, your ideas, suggestions and comments are welcome.

Happy Reading! 



2012 Annual Meeting: An Invitation from the Program Chair

Glenn Cahoon, B.App.Sc. Dipp.Ed., M.App.Sc.
Chair, 2012 Program Committee

"This comprehensive program has been developed to highlight practical imaging techniques and solutions, as well as challenges in our ever changing field."

2012 will be a milestone year for the SMRT as our society celebrates 21 years of MR education. This is a time to both reflect on the history of the SMRT and to look to the future of our profession. By providing a forum for MR technologists and radiographers throughout the world to share their ideas and their knowledge, the SMRT has become the leading organisation in MR education. The pinnacle of this endeavour has been the Annual Meeting which has grown in recent years to become the premier MR meeting for MR technologists and radiographers.

We plan to celebrate our 21st year with a first class program delivered by an

esteemed faculty led by our special guest and long term friend, Professor [Michael Moseley](#). Joining him will be Professor [Mark Haacke](#), [Donald McRobbie](#), [Daniel Sodickson](#), [Mark van Buchem](#), [Diego Martin](#), [Hollis G. Potter](#), [Scott Reeder](#), and [Emanuel Kanal](#), along with many local technologists and MR educators.

Topics will include basic and advanced physics, cardiac MRI, oncology and whole body MR, musculoskeletal, pediatric imaging and advanced neurological applications. This comprehensive program has been developed to highlight practical imaging techniques and solutions, as well as challenges in our ever changing field.

As part of our 21st annual celebrations, registrants to our annual meeting will be treated to a fully catered function right on Melbourne's acclaimed waterfront. This will be a perfect opportunity for delegates to meet the presenters and intermingle with colleagues.

We are very proud of both the educational and social program we have prepared for you. Melbourne is a cosmopolitan city that excites and surprises. Once again voted the world's most livable city, we know you will feel right at home in Melbourne and we look forward to seeing you here in 2012.



Education Committee Report: Share Your Work in Melbourne!

Rosemary Fisher, R.T. (R)(CT)(MR)
Chair, 2012 Education Committee

"The poster presentations are not only a much anticipated educational forum, but an opportunity to meet and network with SMRT members."


Excitement is high for the SMRT 21st Annual Meeting coming up in Melbourne, Australia on 5 and 6, May 2012. An important part of these annual meetings are the Proffered Papers and Poster Presentations that keep us informed of the original research and other work to which our fellow members are contributing and bringing to fruition. The poster presentations are not only a much anticipated educational forum, but an opportunity to meet and network with SMRT members.

The "Call for Papers" and abstract submission is now open and will close on 16

December 2011. Practicing MR technologists, radiographers or the equivalent are invited and encouraged to submit their original work that has not been previously presented or published in any form. Abstracts will be accepted for Clinical Practice Focus and Research Focus categories. The links to find more information, such as how to write an abstract, and the abstract submission procedures can be found at: www.ismrm.org/smrt/12/Call/index.htm.

Once the submission deadline has passed, a dedicated group of SMRT volunteer

peers will start the review process. Authors will be notified of acceptance on 2 February 2012. The Poster Walking Tour and Exhibition will open the SMRT 21st Annual Meeting on the evening of 4 May 2012 with the poster authors available to discuss their work and answer questions. The awards for outstanding Papers and Posters will be presented on Sunday, 6 May 2012 during the general meeting.

I look forward to previewing the work that our dedicated, fellow professionals put forth. And I look forward to seeing you in Melbourne! 

in Collaboration with the 7th Annual SMRT ANZ Chapter Meeting
5–6 May 2012, Melbourne, Australia. Please visit www.ismrm.org/smrt/12 for program updates.

PRELIMINARY PROGRAM

SMRT Poster Walking Tour & Reception – Friday, 4 May 2012, 18:00 – 20:00

Time	Saturday, 5 May 2012 • 07:45–17:10
06:30	Registration
07:45	Welcome & Announcements Charles T. Stanley, B.S., R.T. (R)(CT)(MR), CIIP SMRT President 2011-2012 Glenn Cahoon, B.App.Sc., Dip.Ed., M.App.Sc. SMRT Program Chair 2012
	Forum 1: Physics & Technology Moderator: Barry Southers, B.R.S.T., R.T. (R)(MR)
08:00	Future Directions in MRI Michael E. Moseley, Ph.D.
08:30	Principles of Image Formation Based on Spatial Frequencies Walter Kucharczyk, FRCPC, M.D.
09:00	Multi-Transmit Technology Paul Glover, Ph.D.
09:30	Compressed Sensing Daniel K. Sodickson, M.D., Ph.D.
10:00	Break
	Forum 2: Oncology & Whole Body Imaging Moderator: Michael Macilquham, B.App.Sc., M.H.Sc. (MRI)
10:20	Multi-Parametric MRI in Tumor Assessment James Stirling, D.C.R. (R) M.Sc.
10:50	MR PET David Gilmore, M.S., CNMT, R.T. (R)(N), FSNMTS
11:20	SMRT Annual Business Meeting
12:00	Sponsor Session – Philips Healthcare
12:10	Lunch
	Forum 3: Proffered Papers – Research Focus Moderator: John Totman, M.Sc., D.C.R. (R)
12:55	Proffered Papers – Research Focus (TBA)
	Forum 4: Cardiac MRI Moderator: Cindy R. Comeau, B.S., R.T. (N)(MR), FSMRT
13:40	CMR : A Cardiologist's Perspective Michael Cheung, B.Sc. (Hons) M.B. Ch.B., MRCP (UK)
14:10	Fast CMR Techniques Jeffrey Tsao, Ph.D., M.B.A.
14:50	3T Cardiac MR Scott Reeder, M.D., Ph.D.
15:20	Break
	Forum 5: Pediatric Imaging Moderator: R. Scott Dunn, R.T. (MR)
15:40	Pediatric Bone Marrow Imaging Michael Ditchfield, M.B.B.S., M.D., FRANZCR
16:10	Pediatric Liver MRI Shreyas Vasanawala, M.D., Ph.D.
16:40	Pediatric MR Urography Erin Robbins, Dip.App.Sc.
17:10	Announcements/Close
17:30	Cocktail Reception - Alumbra

Time	Sunday, 6 May 2012 • 07:45–17:15
07:00	Registration
07:45	Welcome & Announcements Vera K. Miller, B.S., R.T. (R)(MR) SMRT President 2012–2013 Glenn Cahoon, B.App.Sc., Dip.Ed., M.App.Sc. SMRT Program Chair 2012
	Forum 6: Musculoskeletal MRI Moderator: Colleen Hammond, R.T. (R)(MR)
08:00	Joint Replacement MRI (MARS) Hollis G. Potter, M.D.
08:30	Clinical MRI of the Elbow Richard Kijowski, M.D.
09:00	MRI of the Hand & Thumb William B. Morrison, M.D.
09:30	Spine Diffusion Lawrence Tanenbaum, M.D.
10:00	Break
	Forum 7: Neuro MRI Moderator: Ben Kennedy, B.App.Sc., MMRT
10:20	Ultra-High Field Neuro Imaging Mark A. van Buchem, M.D., Ph.D.
10:50	Susceptibility-Weighted MRI E. Mark Haacke, Ph.D.
11:20	New Frontiers in Head & Neck MRI Mitesh Gandhi, M.B.B.S., MRCP (UK) FRCR, FRANZCR
11:50	Sponsor Session – Bayer Schering
12:00	Lunch
	Forum 8: Proffered Papers – Clinical Focus Moderator: Rosemary Fisher, R.T. (R)(CT)(MR)
12:45	Proffered Papers – Clinical Focus
13:20	SMRT Awards Presentation
13:50	Sponsor Session
	Forum 9: Body MRI Moderator: Muriel Cockburn, D.C.R., B.Sc., (Hons)
14:00	MR Enterography Diego Martin, M.D., Ph.D., FRCP
14:30	Fetal MRI: Techniques & Clinical Evaluation Anne Michelle Fink, MRCP, FRCR, FRANZCR Vanessa Orchard, D.C.R., M.App.Sc.
15:30	Break
	Forum 10: MRI in a Changing Field Moderator: Wendy Strugnell, B.App.Sc., (MIT)
15:45	Exposure Limits for Time Varying Magnetic Fields Donald W. McRobbie, Ph.D.
16:15	Operational Modes for Active Implants Michael Steckner, Ph.D., M.B.A.
16:45	Safety Update: High Field MRI Emanuel Kanal, M.D., FACR
17:15	Announcements/Adjourn



Membership in the SMRT

Richard Scott Dunn, R.T. (R)(MR)
Chair, Membership Committee

*"Find answers to your most pressing questions
or learn from the expertise of a network of
colleagues working across the globe."*

*Editor's Note:
This summary of
membership is an
overview for you to learn about the SMRT. For
more information, go to the SMRT website
www.ismrm.org/smart or call the office in
Berkeley, California, USA at +1 510 841 1899.*

The Section for Magnetic Resonance Technologists (SMRT) is the leading professional organization which provides an international forum for education, information, and research in Magnetic Resonance for MR technologists and radiographers throughout the world.

The SMRT operates as a section of the International Society for Magnetic Resonance in Medicine (ISMIRM).

The objectives of the SMRT are to:

- Advance the education, training, and quality of MR technologists and Radiographers;
- Promote world-wide communication;
- Dissemination of information relevant to the field; and
- The SMRT works with other professional organizations throughout the world to accomplish these objectives.

Benefits of Membership

- Reduced fees for all accredited SMRT and ISMIRM Annual Meetings, Workshops and Regional Seminars worldwide;
- Quarterly accredited *Educational Seminar* home study articles specific for the MR technologist/radiographer; earn all of your continuing education credits electronically on the SMRT website. Complete the quarterly *Educational Seminars* and Electronic Home Studies post quiz and receive your CE Certificate of Completion all on-line;

- Full library of all printed back issues of the SMRT accredited Educational Seminars home studies are available for purchase;
- Access to Members only portion of the SMRT website to review committee information and network with colleagues;
- SMRT Continuing Education Credit Activity Report, receive an annual record of all your CE credits earned through SMRT educational programs;
- Reduced subscription rate to the ISMIRM journals: Journal of Magnetic Resonance Imaging (JMIRI) and Magnetic Resonance in Medicine (MRM);
- Online access to all past recorded SMRT and ISMIRM annual meetings and workshops; and
- Join any of the ISMIRM Study Groups for free.

Additional Advantages of Membership

- Access to international community to enhance your knowledge and share valuable innovations;
- Easy access to online CE and CPD opportunities;
- Attend the Annual meeting or one of the local Chapter meetings and grow your network;
- Connect with fellow members on the best known MRI forum in the world on the SMRT MRI Technologist List Serve; and
- Find answers to your most pressing questions or learn from the expertise of a network of colleagues working across the globe. <http://www.ismrm.org/smart>



SMRT Officers and Policy Board Members 2011-2012

Charles T. Stanley, B.S., R.T. (R)(CT)(MR), CIIP
President 2011-2012, Executive Committee Chair

Vera Miller, B.S., R.T. (R)(MR)
President-Elect

Julia B. Lowe, B.S., R.T. (R)(MR) FSMRT
Past President, Awards Committee Chair,
Nominations Committee Chair

Cindy T. Hipps, B.H.S., R.T. (R)(MR) FSMRT
Secretary

Ben Kennedy, B.App.Sc., (MIT) MMRT
Treasurer, Finance Committee Chair

Cindy R. Comeau, B.S., R.T. (N)(MR) FSMRT
External Relations Committee Chair

Michael D. Macilquham, B.App.Sc., M.H.Sc. (MRI)
Executive Member

Glenn D. Cahoon, BApp.Sc., Dip.Ed., M.App.Sc.
Program Committee Chair

Muriel Cockburn, D.C.R., B.Sc.(Hons.)

Richard Scott Dunn, R.T. (R)(MR)
Membership Committee Chair

Rosemary Fisher, R.T. (R)(CT)(MR)
Education Committee Chair

Colleen A. Hammond, R.T. (R)(MR)
By-laws Committee Chair

Carol Lee, B.S., R.T. (R)(CT)(MR)
Local Chapters Committee Chair

Kirsten J. Moffat, (MRT)

Titti Owman, R.T. (R)(CT)(MR)
External Relations, Global Relations Sub-Committee Chair

Mercedes Pereyra, M.B.A., B.S., R.T. (R)(MR)(CT)

Betsy Sestina, B.S., R.T. (R)(MR)(CT)(M)
Regionals Committee Chair

Helle Juhl Simonsen, (MRT)

Barry Southers, B.R.S.T., R.T. (R)(MR)
Education, Student Scope Sub-Committee Chair

John J. Totman, D.C.R. (R), M.Sc.
Publications Committee Chair

Julie Strandt-Peay, B.S.M., R.T. (R)(MR) FSMRT
(Ex-Officio), Publications, Signals Sub-Committee, Editor

Anne Marie Sawyer, B.S., R.T. (R)(MR) FSMRT
(Ex-Officio), Publications, Home Studies Sub-Committee, Editor

Heidi Berns, M.S., R.T. (R)(MR) FSMRT
(Ex-Officio), RCEEM Ad-Hoc Committee Chair

20th SMRT Annual Meeting Review



Celebrating 20 Years of
MR Educational Excellence



The 20th SMRT Annual Meeting was held 7–8 May 2011 in Montréal, Québec, Canada. For a complete report please see the special edition of the Signals Newsletter posted on the website: www.ismrm.org/smrt

SMRT POLICY BOARD 2011-2012: Back row: Left to right: Barry Southers, Kirsten Moffat, Mercedes Pereyra, Glenn Cahoon, Heidi Berns, Helle Juhl Simonsen, Julie Strandt-Peay. Middle Row: Left to right: Cindy Comeau, Julia Lowe, Vera Miller, Carol Lee, Betsy Sestina. Front Row: Left to right: Scott Dunn, Cindy Hipps, Anne Marie Sawyer, Charles Stanley, Muriel Cockburn, Titti Owman, John Totman. Not pictured: Rosemary Fisher, Colleen Hammond, Ben Kennedy, Michael Macilquham

SMRT 2011 Award Recipients

2011 The Crues-Kressel Award

This award is given to recognize outstanding contributions to the education of magnetic resonance technologists.



Herbert Y. Kressel, M.D. presents the Crues-Kressel Award to Cindy R. Comeau, B.S., R.T. (N)(MR) FSMRT.

2011 Honorary Member Award

This award is given to recognize extraordinary achievement and an exceptional level of service and support for the Section and mission of the SMRT.



Charles Stanley presents the Honorary Member Award to John Wilke.

Each year the SMRT membership chooses the President Elect, new Policy Board Members and the recipient of the Crues-Kressel Award. The Policy Board elects Award recipients from candidates presented by the Awards Committee.

SMRT 2011 Award Recipients

2011 Fellow of the Section Award

This award is given in recognition of significant and substantial contributions to the mission of the SMRT.



Muriel Cockburn, D.C.R., B.Sc.Hons.



Laurian Rohoman, ACR, R.T. (MR), CTIC, R.T.(R)

2011 Distinguished Service Award

This award is given to recognize outstanding contributions and extreme level of effort and service to the operation, effectiveness and good reputation of the SMRT.



Charles Stanley presents the Distinguished Service Award to Cindy Hipps.

2011 John A. Koveleski Award for Professional Development

For the first time, a special award in the memory of John A. Koveleski was presented. This award was established to honor the memory of John A. Koveleski, SMRT President 2002-2003, in recognizing the need for MR professional development of students and new entrants in the field of MR.



Amanda Golsch, JAK Professional Development Award recipient and Barry Southers, Chair of Professional Development Committee

Past SMRT Award Recipients

Crues-Kressel Award

2011	Cindy R. Comeau
2010	John Posh
2009	Cindy Hipps
2008	Maureen Ainslie
2007	No award given
2006	Maureen Hood
2005	William Faulkner
2004	Luann Culbreth
2003	Gregory Brown
2002	No award given
2001	Anne Marie Sawyer
2000	Kelly Baron
1999	Charles Deschamps
1998	Emanuel Kanal
1997	Robin Greene-Avison
1996	Carolyn Roth
1995	Christine Harris
1994	Frank Shellock
1993	Julie Strandt
1992	No award given
1991	John Crues & Herbert Kressel

Honorary Member Award

2011	John D. Wilkie
2010	William Faulkner
2009	Herbert Kressel
2008	No award given
2007	Michael Moseley
2006	Anne Marie Sawyer
2005	No award given
2004	Emanuel Kanal
2003	Frank Shellock
2002	Carolyn Roth

Distinguished Service Award

2011	Cindy T. Hipps
2010	Denise Echelard
2009	Bobbie Burrow
2008	Heidi Berns & Laurian Rohoman
2007	Julia Lowe
2006	Julie Strandt-Peay
2005	No award given
2004	Kelly Baron
2003	Richard Helsper
2002	Donna O'Brien

Fellow of the Section Award

2011	Muriel Cockburn & Laurian Rohoman
2010	Cindy Comeau & Maureen Hood
2009	Gina Greenwood & Donna O'Brien
2008	Julia Lowe
2007	Greg Brown & Cindy Hipps
2006	Maureen Ainslie & Bobbie Burrow
2005	Michael Kean & Anne Marie Sawyer
2004	Heidi Berns & Carolyn Roth
2003	Robin Greene-Avison
2002	Kelly Baron & Julie Strandt-Peay
2001	Luann Culbreth & William Faulkner



External Relations Report

Cindy R. Comeau, B.S., R.T. (N)(MR), FSMRT
Chair, External Relations Committee

"Continued communication with this organization will certainly develop into educational opportunities that will benefit all MRI professionals."

As incoming SMRT External Relations Chair I'm looking forward to representing the SMRT in important collaborations with other professional organizations. To start with, outgoing External Relations Co-Chair [Charles Stanley](#) and Past SMRT President [Julie Lowe](#) have initiated collaborations with two professional organizations which I would like to update the membership on.

The 2011 SMRT Annual Meeting held in Montréal, Canada presented a great opportunity to meet with the leadership of the Canadian Association of Medical Radiation Technologists (CAMRT). The CAMRT is Canada's national professional association and certifying body for medical radiation technologists and therapists for Canada. There are four disciplines represented among CAMRT's member-

ship: radiological technology, magnetic resonance, nuclear medicine and radiation therapy. The SMRT and CAMRT meeting held on 9 May 2011 identified some key areas of interest for collaboration. SMRT President-Elect [Vera Miller](#) represented the SMRT at the CAMRT June 2011 Conference held in Saskatoon, Saskatchewan, Canada.

The second organization involves a new hybrid imaging modality that many of you have probably have heard about which is PET/MR. Current SMRT President [Charles Stanley](#) and I attended a SMRT and SNMTS leadership meeting on 4 June 2011 at the Society of Nuclear Medicine Meeting (SNM) that took place in San Antonio, Texas, USA. This meeting resulted with the identification of a PET/MR Task Force which will consist of SMRT and SNMTS representatives. This collaboration

will ensure that the highest standards for educational training are achieved for those technologists/radiographers working with PET/MR scanners.

The SMRT leadership is very dedicated in ensuring that our profession is represented at all levels and continues to seek out new collaborations. As I take on this role, I'm looking forward to meeting many new professionals from all of these different organizations. I also look forward to working with the current SMRT Executive Committee and Policy Board members in all external relation endeavors. Did you realize that by promoting, educating and sharing information with others in and outside of our profession, we all perform external relation duties within our jobs, as perhaps without even knowing it!

FACT SHEET

MRI Technologists: Certification, Licensing and Accreditation in the United States (Informational links accessed on 10/20/2011)

Introduction:

With the momentum of the CARE Bill now in progress imaging professionals that are non-certified that are currently scanning technologists need to be aware that they will need certification to work as an allied healthcare professional in their respective modality. If they want to work as MRI technologists they will need to be certified once this legislation becomes a federal mandate. The SMRT is a strong supporter of CARE Bill and a member of the Alliance for Quality Medical Imaging and Radiation Therapy (AQMIRT). AQMIRT is a coalition of 26 national organizations representing more than a half million healthcare professionals that support the CARE bill. Current updates on the CARE Bill can be accessed at: www.asrt.org/content/GovernmentRelations/_legislativeregulatory.aspx.

Certification:

Over 25,000 MRI technologists are certified by the American Registry of Radiological Technologists® (ARRT), the world's largest credentialing organization. There are two methods by which professionals can become certified by the ARRT.

1. Primary Pathway: If you have no allied health care background—within the past five years have successfully completed an educational program that is accredited by a mechanism acceptable to the ARRT you can apply for the ARRT MRI certification exam. Before enrolling into an educational program ensure that the program has been accredited by the ARRT. Beginning on 1 January 2015, all candidates for primary pathway certification must have earned an academic degree before becoming certified. www.arrt.org/Certification

2. Post-Primary: For currently employed certified technologists, who already hold the primary ARRT certification/s (thus certified) in Radiography, Nuclear Medicine, Radiation Therapy, or Sonography can consider this path by completing the Magnetic Resonance Imaging Clinical Experience Requirements. www.arrt.org/Certification/Magnetic-Resonance-Imaging

There is a second certifying organization in the United States - The American Registry of Magnetic Resonance Imaging Technologists (ARMRIT). This organization has been gaining recognition and uses its own MRI educational schools with programs which range from one year up to two years (Associates Degree). www.armrit.org/index.shtml



Regional Educational Seminars

Betsy Sestina, B.S., R.T. (R)(MR)(CT)(M)
Chair, Regional Seminars Committee

"We all know word of mouth is the best advertisement, so please share the upcoming SMRT Regional Educational Seminar schedule with your co-workers and fellow MRI Technologists and Radiographers."

If you enjoy getting together with old friends, seeing new places, making new friends, and learning a little something along the way, then I encourage each and every one of you reading this to find an SMRT Regional meeting in your area and attend. I promise you will not be sorry!


In the last few years, I have become more involved in the SMRT organization and the quality of educational opportunities is better now than ever. The caliber of speakers who spend their weekends helping to educate MR technologists continues to delight attendees all around the world. We have become a very international organization and what a wealth of information we have at our disposal.

There is truly no substitute for the power of real, live, expressive, passionate people to teach and help us to understand!

This year alone, we have had very successful seminars in Amsterdam, The Netherlands; Brisbane, Australia; Boston, Massachusetts, USA; Atlanta, Georgia, USA, (It was their 20th anniversary, as well); Hershey, Pennsylvania, USA; Stanford, California, USA; and Tacoma, Washington, USA. Opportunities to attend an educational seminar are ongoing and can be found on the SMRT website at www.ismrm.org/smart.

Please support these educational opportunities by attending and passing along

this information to your colleagues. We all know word of mouth is the best advertisement, so please share the upcoming SMRT Regional Educational Seminar schedule with your co-workers and fellow MRI technologists and radiographers. You will be made aware of the latest and greatest information to help optimize your everyday protocols as well as learn what is happening in our industry.

There is a great deal of help available on how to host a Regional Educational Seminar in your area of the world. To learn more on how to go about hosting a regional seminar, please feel free to contact me (betsysestina@comcast.net) or the SMRT central office. 

Editor's note: Following is a report describing one of the many regional educational seminars provided each year by the SMRT.



New England Regional

Vera Miller, B.S., R.T. (R)(MR)
SMRT President-Elect

More and more demand for MR scans will inevitably lead to pressure on the implant and device companies to factor MR safety into their designs.

The SMRT New England Regional was held on 17 September 2011 at the MCPHS- Griffin building. This auditorium is part of the Massachusetts College of Pharmacy; a unique glass triangular structure on Huntington Avenue in Boston, Massachusetts, USA. With that lovely venue and perfect weather we were able to bolster our attendance with strong on-site registration. Hurricane Irene put a damper on our initial registration but we persevered and it turned out to be a great conference!

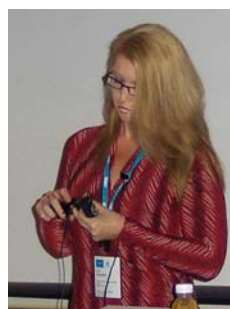
The program provided seven accredited

continuing education credits with six speakers on the agenda. *Kristan Harrington* did double duty and the attendees were able to hear her speak both on MR Conditional Cardiac Pacemakers and also Pediatric MR. Scanning patients with pacemakers has always been something we tried hard NOT to do! It's very hard to change that mindset; but Kristan

was able to help us understand the guidelines and put our minds at ease

with the new MR conditionally safe implant. We know this is the wave of the future. More and more demand for MR scans will inevitably lead to pressure on the implant and device companies to factor MR safety into their designs. We need to read the literature carefully and follow the guidelines exactly.

Another up and coming application for imaging is MR/PET.



Kristan Harrington



Frances Keech

to many MR techs and helped us to conceive the merging of the two modalities. It's been a while since we thought about radio nuclides and half lives! Frances showed some of the scanners that are FDA approved and gave us some insight about what is in the pipeline for the future.

Frances Keech

was able to make this complicated endeavor seem understandable to the audience. She explained the Nuclear Medicine aspect, which is foreign

Cloud technology may seem like an Information Technology (IT) issue to most of us, however [Charles Deschamps](#) was able to make us comprehend how it relates to the average MR technologist. We look forward to the day when a patient's prior exams are readily available to use and the IT department can accommodate the data our 3D exams take up on the server!



Charles Deschamps

Just the mention of American College of Radiology (ACR) accreditation in the USA causes most of us distress! [Dr. John Greenhalgh](#) was able to explain the process and help us realize what, and more importantly why, we need to accomplish this task. I think we will all go back to our centers with increased knowledge and confidence in the ACR process.



Walter Surrette

Cardiac MR is for some of us, not a routine process. [Walter Surrette](#) broke it down into understandable examples and showed us some interesting cases.

With a beautiful view of downtown Boston we enjoyed lunch and a raffle with prizes that varied

from gift cards to those really cool back packs from [Dr. Shellock](#). Thank you Dr. Shellock, those were a big hit!

It would be remiss of me not to mention the vendors who showed up at 7:00 am with us and set up their booths and greeted the attendees during breaks and lunch. Without their support our meeting would not be possible. We truly appreciate everything they do for us.

It was a great day and I think everyone came away a little "SMaRter" for the experience. S



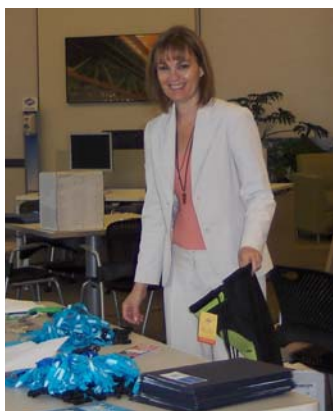
Bayer vendor greets attendees during a break.



The representative from Butler Cleaning at his booth during the morning break.



Lantheus Representative explaining benefits of their contrast to attendees prior to the start of the meeting.



President-Elect Vera Miller coordinates activities during the seminar.



Center: Walter Surrette (Cardiac speaker) chatting with MCPHS Alumni during the afternoon break.



Massachusetts College of Pharmacy, Boston, Massachusetts, USA



Chapter Chat

Carol Lee, B.S., R.T. (R)(CT)(MR)
Chair, Local Chapter Committee

"My goal this year is to encourage anyone who would like to start an SMRT Local chapter to go for it."

Editor's note: The SMRT supports the formation of Local

Chapters for the purpose of education and networking. Organizers of local meetings are encouraged to share their events in the Chapter Chat column. The current Chair, Carol Lee invites us to upcoming Chapter Meetings.

I hope you had the opportunity to attend one of the many SMRT educational seminars this past year for the opportunity to get the latest up to date MR information. I attended the Atlanta Regional Seminar hosted by one of the original SMRT Local Chapters. These quality programs make me so proud to be a part of the SMRT and grateful for the educational events and information offered to

the MRI community and MRI Technologist around the world. If you missed out on these opportunities, be sure to mark your calendar for one in 2012. Please support these educational seminars by attending and sharing this wonderful organization with your colleagues.

For more information about the SMRT visit us at: www.ismrm.org/smrt/

Do you wish you had a SMRT educational seminar near you? Do you want to be more involved with the SMRT? Start a SMRT Local Chapter or host a Regional Educational Seminar. For more

information you may contact me at: clsc@charter.net. Or go to the SMRT website: www.ismrm.org/smrt/. Also, join us on Facebook: www.facebook.com/pages/Section-for-Magnetic-Resonance-Technologists-SMRT/122846297770378. 

Editor's note: Following is a report from one of many SMRT Local Chapter meetings held during the year.

SAVE THE DATES!

10 March 2012

South Carolina Chapter Educational Seminar
Greer, South Carolina, USA

17 March 2012

5th Regional BeNeLux Chapter Educational Seminar
Belgium, Brussels, UZBrussel



Report SMRT Chapter of New York/New Jersey, USA

Cindy R. Comeau, B.S., R.T. (N)(MR), FSMRT

"We would also like to thank all the speakers who took time out of their busy schedules to participate and all of the attendees for spending their Saturday learning and advancing their knowledge."

On a very sunny summer day, the SMRT Chapter of NY/NJ held its first educational Chapter Seminar at the New York University, Langone Medical Center in New York City on Saturday, 16 July 2011. With some very prestigious speakers on the agenda it was a great day of education for all of the 40 attendees! The program was approved for eight Category A credits by the SMRT.



Early morning registration

After morning registration the meeting promptly started with introductions given by NY/NJ Chapter President *Hina Jaggi* and *Dr. Michael Recht*, Radiology Chair of the NYU Langone Medical Center. The first speaker was *Dr. Sarah Milla* who shared her experience for optimizing Pediatric MRI. She gave a very personable view on how pediatric imaging is a specialty and

really requires a team effort from both radiologists and technologists. Next up was *John Waselus* from Invivo Corp. who gave a very informative presentation on the role of "MRI in Guided Biopsies" in prostate cancer. During the break the attendees enjoyed refreshments in a separate adjoining room and obtained information on new contrast agents from Lantheus Medical Imaging representative, *Odu Onyeberechi*. After the break *Cindy Comeau* spoke on "Key Elements in Performing a Cardiac MRI Study." She highlighted key acquisition details that should be considered when performing a cardiac MRI study. Before lunch we were honored to have *Bill Faulkner* who was



Odu Onyeberechi, our Lantheus representative who supported the meeting.

sponsored by Medtronic at the meeting. Bill provided information on scanning patients with implanted devices. He covered all of the pertinent considerations when scanning patients with devices that are listed as MRI conditional for safety.



Attendees share experiences over the lunch break.

All of the attendees were able to enjoy lunch catered by the NYU staff. After lunch Bill gave a second lecture on "Managing Patient Burns." This presentation certainly had

everyone's attention as in our everyday jobs, sometimes we forget how important safety is when scanning patients in the MRI environment. This practical information generated lots of questions from the group that he addressed to the appreciation of all. The following speaker was [Dr. Janice Sung](#) who is an expert on Breast MRI. She gave a very nice overview on what a powerful tool MRI is, in the detection of breast lesions.

During the second break we raffled off MRI Safety books donated by [Frank Shellock, Ph.D.](#) After the break, [Dr. Ricardo Otazo](#), Assistant Professor at NYU, offered a look at "Compressed Sensing." His material was very interesting and showcased the advancements that have been made in MRI image production. Our last speaker of the day was [Dr. Oded Gonen](#) who illustrated "Spectroscopy," which was very well received.

The meeting concluded with our moderator [Konstantinos Arhakis](#) Vice President-SMRT Chapter for NY/NJ, thanking everyone for their attendance and support. He also did an excellent job in promoting the educational activities that are

available by the SMRT and encouraged those who are not members to join.

The NY/NJ Chapter meeting organizers [Hina Jaggi](#) President-SMRT Chapter for NY/NJ, [Konstantinos Arhakis](#), Vice President-SMRT Chapter for NY/NJ, [Lorren Gallo](#) Secretary/Treasurer-SMRT Chapter for NY/NJ and [Cindy Comeau](#), B.S., R.T. (N)(MR) FSMRT, CME Coordinator-SMRT Chapter for NY/NJ would like to especially thank our donors which included Lantheus Medical Imaging, Medtronic, Invivo Corp., and the Institute for Magnetic Resonance Safety, Education and Research. We would also like to thank all the speakers who took time out of their busy schedules to participate and all of the attendees for spending their Saturday learning and advancing their MR knowledge. [S]



Left to right: Chapter President Hina Jaggi, Chapter Vice-President Konstantinos Arhakis with two SMRT Fellows, Bill Faulkner and Cindy Comeau!

External Relations Report continued from page 9

Licensing:

There are just handful of states that actually require state licensing in order to work as a MRI Technologist. The American Society of Radiological Technologists (ASRT) provides more information on their website at: www.asrt.org/media/pdf/govrel/doesyourstateregulate.pdf. Certifying organizations such as the ARRT and ARMRT are recognized as approved certifying bodies in most states to apply for state licensure. More info on state licensing can be found at: www.rrt.org/State-Licensing/.

Accreditation:

For all outpatient imaging facilities in the US, effective 1 January 2012, all providers that bill for CT, MRI, Nuclear Medicine and PET under part B of the Medicare Physician Fee Schedule must be accredited in order to receive technical component reimbursement from Medicare (Currently, the CMS/MIPPA mandates apply to private outpatient facilities only, NOT to hospitals). It is highly recommended that the requirements for the MRI technologist's performing the studies at your facility be reviewed. There are three approved accreditation organizations:

1. American College of Radiology (ACR)
www.acr.org/accreditation/mri.aspx
2. Intersocietal Accreditation Commission (IAC)
www.icamrl.org/icamrl/index.htm
3. The Joint Commission
www.jointcommission.org/accreditation/ahc_seeking_imaging_centers.aspx [S]



SMRT Educational Seminars Home Study Program

Anne Marie Sawyer, B.S., R.T.(R)(MR), FSMRT,
Editor

*"Exciting recent additions to accredited
home studies are the video home studies."*

For the past fourteen years, the SMRT home studies have provided our members with a convenient way to obtain continuing education (CE) credits. The credits awarded, Category A, are obtained from the SMRT acting as an approved RCEEM for the ARRT. Quarterly issues containing several articles provide up to four credits awarded through the completion of a quiz that accompanies each home study. The articles, selected by members of the SMRT Publications Committee, are obtained from peer-reviewed journals or

written specifically for the home study publication by technologists, scientists and clinicians working in the field of magnetic resonance imaging (MRI). The quiz is written and expertly reviewed by members of the publication committee, volunteers from the SMRT and ISMRM membership or selected clinicians or scientists. The topics include a variety of interests from basic physics and principles to complex clinical applications and anatomy and physiology atlases. Recent issues include "Pediatric Magnetic Resonance Imaging;" "Breast MRI: DCIS

and Skin Lesions;" and "MR Imaging Physics Tutorial." Issues are available to members in both printed and electronic format. As a method to provide an increased number of CE credits to the membership without increasing costs, electronic-only home studies are now available through the SMRT website. Exciting recent additions to accredited home studies are the video home studies. These should prove to be especially valuable to those members not able to attend SMRT annual meetings or regional seminars.

SMRT ELECTRONIC-ONLY & VIDEO HOME STUDIES

Electronic Home Studies		
Title	Category A CE & CPD Credits	Date
Safety of MRI in Patients with Cardiovascular Devices	1	September 2008
Use of Contrast Agents in MR Imaging of the Spine	1	January 2009
Techniques in Spine MR Imaging	1	June 2010
Susceptibility-Weighted MR Imaging (SWI)	1	November 2010
Video Home Studies		
Cardiac MRI Forum	2	May 2011
MR Safety Forum	2	May 2011
Emerging Technologies Forum	1	May 2011

HOME STUDY EDUCATIONAL SEMINARS ORDER FORM

Back issues of printed SMRT educational seminars are for sale to SMRT members only! www.ismrm.org/smart

Qty.	Vol.	CE	Home Studies Title	Qty	Vol.	CE	Home Studies Title
	1.1	3.5	Functional MRI: Capabilities and Limitations		8.1	1.0	Atlas of Knee Anatomy
	1.2	3.0	Concepts in MR Physics		8.2	2.0	Cardiovascular MRI: Update II
	2.1	3.5	Considerations in Low Field MRI		8.3	2.5	Update: Safety in MR Examinations
	2.2	3.0	Directions in Basic Cardiac Imaging		8.4	2.0	Parallel MR Imaging
	2.3	3.0	Directions in Advanced Cardiac Imaging		9.1	3.0	MRI of Breast Cancer: Update I
	2.4	1.5	The Basics of Magnetic Resonance Angiography		9.2	2.5	MR Atlas of the Shoulder
	3.1	3.0	Introduction to Spectroscopy		9.3	3.0	Exploring Magnetic Field Strengths: Challenges and Opportunities
	3.2	1.0	Renal MR Imaging		9.4	4.0	MRI of Breast Cancer: Update II
	3.3	3.0	A Primer on MR Pulse Sequences		10.1	4.0	MR Imaging of Perfusion
	3.4	2.5	Artifacts Encountered in Abdominal MRI		10.2	3.0	MR Imaging Artifacts: Appearance, Cause & Cure
	4.1	3.0	Safety Aspects in MRI		10.3	4.0	Techniques in Cardiovascular MR Imaging
	4.2	3.0	Directions in MRI of the Liver		10.4	3.0	MRI of the Brain
	4.3	2.0	MR Techniques in the Evaluation of the Uterus		11.1	4.0	Update: Musculoskeletal MRI
	4.4	3.0	Fundamental Principles for MR Imaging of the Brain		11.2	2.5	Contrast Media in MRI Examinations
	5.1	2.5	Atlas of Cranial Neuroanatomy		11.3	2.0	Head and Neck MRI at 3.0T
	5.2	2.0	MRI of the Ankle & Foot		11.4	3.0	MR Imaging of the Abdomen
	5.3	3.0	MR Imaging of the Breast		12.1	3.0	Contrast-Enhanced Musculoskeletal MR Imaging
	5.4	1.0	Diffusion-Weighted Imaging of the Brain		12.2	3.0	Neuro MRI: Principles and Protocols
	6.1	1.0	Directions in MRA of the Abdominal Aorta and Lower Extremities		12.3	2.0	MR Imaging of the Spine
	6.2	3.5	Fundamental Principles of MR Imaging of the Head, Neck, and Spine		12.4	3.0	MR Imaging of the Liver
	6.3	1.5	Advances in Interventional MRI		13.1	3.0	MR Imaging Sequences: Gradient-Recalled Echo (GRE)
	6.4	1.5	Diffusion-Weighted MR Imaging of the Pediatric Brain		13.2	3.5	Techniques in Cardiac MR Imaging
	7.1	2.0	The Role of Neuroimaging in the Diagnosis of Alzheimer's Disease		13.3	2.5	Phase Contrast MR Imaging: Techniques and Applications
	7.2	2.5	Cardiovascular MRI: Update I		13.4	2.0	MRI of Spinal Cord Lesions
	7.3	2.5	K-Space in the Clinic		14.1	3.0	Breast MRI: DCIS and Skin Lesions
	7.4	3.0	MR Imaging and Spectroscopy of the Prostate		14.2	3.5	Pediatric Magnetic Resonance Imaging
					14.3	2.5	MR Imaging Physics Tutorial

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MRI Safety: MRI & Patients with Insulin Pumps

Editor's note: The SMRT appreciates the support of MR Safety expert Frank Shellock through his regular contributions to Signals and participation on the MR Technologist List Serve. The information printed here has been previously posted on the SMRT website.



Frank G. Shellock, Ph.D., F.A.C.C., F.A.C.S.M.
Adjunct Clinical Professor of Radiology and Medicine
Keck School of Medicine, University of Southern California

Adjunct Professor of Clinical Physical Therapy
Division of Biokinesiology and Physical Therapy
School of Dentistry, University of Southern California

Director for MRI Studies of Bioimimetic MicroElectronic Systems
National Science Foundation, Engineering Research Center
University of Southern California

Institute for Magnetic Resonance Safety, Education, and Research

www.MRIsafety.com
www.IMRSER.org
www.MRIsafetybook.com

Monitoring Body Temperature During MRI

Vikram Thacker, M.S., MBA
Senior Manager, Product Marketing
Invivo MR Monitoring
Orlando, Florida, USA

(This article represents the views of its author only and does not reflect those of the International Society for Magnetic Resonance in Medicine and are not made with its authority or approval)

Introduction

Magnetic resonance imaging (MRI) has been an important diagnostic imaging modality for almost 30 years. Advancements in technology and imaging protocols have contributed to the growth of MRI applications and expanded the demographic of patient populations from neonates to high-risk patients. The use of sedation or anesthesia is necessary for certain MRI examinations, especially for pediatric or critically-ill patients (1). Importantly, the volume of pediatric patients undergoing MRI or computed tomography (CT) procedures under sedation or anesthesia has grown at an annual rate of 8% - 9% (2).

This monograph focuses on the need to monitor body temperature in patients during MRI and discusses the sites to record temperature based on efficacy and stability of the measurement, as well as the response time (i.e., the temporal resolution) during temperature fluctuations.

Monitoring Patients in the MRI Environment

Conventional monitoring equipment and accessories were not designed to operate in the harsh MRI environment that utilizes

electromagnetic fields that can adversely affect or alter the operation of these devices (3). Fortunately, various monitors and other patient support devices have been developed to perform properly during MRI procedures.

MRI healthcare professionals must consider the ethical and medico-legal ramifications of providing proper patient care that includes identifying patients that require monitoring in the MRI setting and following a proper protocol to ensure their safety by using appropriate equipment, devices, and accessories (3). The early detection and treatment of complications that may occur in high-risk, critically-ill, sedated, or anesthetized patients undergoing MRI examinations can prevent relatively minor issues from becoming life-threatening situations.

General Policies and Procedures

Monitoring during an MRI procedure is indicated whenever a patient requires observations of vital physiologic parameters due to an underlying health problem or is unable to respond or alert the MRI technologist or other healthcare professional regarding pain, respiratory problem, cardiac distress, or difficulty that might arise during the examination (3, 4). In addition, a patient should be monitored if there is a greater potential for a change in physiologic status during the MRI procedure.

Table 1 summarizes the patients that require monitoring and support during MRI procedures. Besides patient monitoring,

various support devices and accessories may be needed for use in high-risk patients to ensure safety (3, 4).

Table 1. Patients that require monitoring and support during MRI procedures.

- Physically or mentally unstable patients.
- Patients with compromised physiologic functions.
- Patients who are unable to communicate.
- Neonatal and pediatric patients.
- Sedated or anesthetized patients.
- Patients undergoing MR-guided interventional procedures.
- Patients who may have a reaction to an MRI contrast agent or medication.
- Critically-ill or high-risk patients.

Patients undergoing MRI examinations while under sedation or general anesthesia require the same standard of care as provided in operating rooms and intensive care units (ICU)(5). This includes monitoring vital physiological parameters including the electrocardiogram (ECG), oxygen saturation, blood pressure, end tidal carbon dioxide (CO₂), and body temperature (6, 7). The use of sedation or anesthesia is necessary for certain MRI examinations, especially for pediatric or critically-ill patients (3, 8). Importantly, children represent the largest group requiring sedation for MRI exams (3, 8). Sedation is used on children to minimize discomfort,

motion and anxiety during the procedure (8, 9). The American Academy of Pediatrics and the American College of Radiology have published guidelines for monitoring children and adults during sedation (8, 10). The vital signs that must be monitored include the heart rate, blood pressure, respiratory rate, and temperature (8).

Because of the widespread use of MRI contrast agents and the potential for adverse effects or idiosyncratic reactions to occur, it is prudent to have appropriate monitoring equipment and accessories readily available for the proper management and support of patients who may experience side-effects. This is emphasized because adverse events, while extremely rare, may be serious or life threatening. In addition, patients may have adverse reactions to other medications while undergoing MRI procedures.

In 1992, the Safety Committee of the Society for Magnetic Resonance Imaging published guidelines and recommendations concerning the monitoring of patients during MRI procedures (11). This information indicates that all patients undergoing MRI examinations should be visually (e.g., using a camera system) and/or verbally (e.g., intercom system) monitored, and that patients who are sedated, anesthetized, or are unable to communicate should be physiologically monitored and supported by the appropriate means.

Injuries and fatalities have occurred in association with MRI examinations. These may have been prevented with the proper use of monitoring equipment and devices (3, 4, 11). Notably, guidelines issued by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) indicate that patients receiving sedatives or anesthetics require monitoring during administration and recovery from these medications

(12). Other professional organizations similarly recommend the need to monitor certain patients using proper equipment and techniques (5, 6, 8, 9, 13).

Why Monitor Body Temperature?

In human subjects, "deep" body or core temperature is regulated between 36°C and 38°C by the hypothalamus and continuously fluctuates due to diurnal, internal, as well as external factors (14). Importantly, the regulation of body temperature is suppressed by anesthesia and generally results in the patients becoming hypothermic (15, 16). Side-effects of a decrease in body temperature can range from hypovolemia, myocardial ischemia, cardiac arrhythmia, pulmonary edema, decreased cerebral blood flow in cases of mild hypothermia, to mortality related to extreme hypothermia (17).

Additionally, some patients may experience malignant hyperthermia, which is a rare life-threatening condition that is usually triggered by exposure to certain drugs used for general anesthesia. In susceptible individuals, these drugs can induce a drastic and uncontrolled increase in skeletal muscle oxidative metabolism, which overwhelms the body's capacity to supply oxygen, remove carbon dioxide, and regulate body temperature. Malignant hyperthermia can eventually lead to circulatory collapse and death if not quickly identified and treated.

The anesthesiologist or nurse anesthetist may not be in the immediate proximity of the patient during the MRI procedure due to the design of the MR system. Therefore, it is imperative to continuously monitor the body temperature and provide real time information to the anesthesia healthcare professional. It is also important that the measurement site has clinical relevance and a relatively "fast" response time to any fluctuation in

body temperature because the anesthesiologist or nurse anesthetist is unable to visualize the discoloration of the patient skin in cases of sudden temperature changes.

Measuring Body Temperature During an MRI

The accuracy and efficacy of the measurement of body temperature has been a topic of discussion for many years (14, 18-20). Temperature measurements in human subjects is affected by, the following factors (14, 21):

- The site of measurement (e.g., skin, oral, esophagus, rectal, pulmonary artery, hypothalamus, bladder, tympanic membrane, axillary area).
- Environmental conditions (temperature and humidity).
- The measurement technique (e.g., mercury thermometer, electronic thermometer, thermistor probe or catheter, thermocouple-based probe, infrared radiation readers, fiber optic method).

The most accurate body temperature is measured at the hypothalamus, but this site is not accessible by any practical means. Therefore, a "deep" body site that directly reflects the temperature "sensed" by the hypothalamus will provide clinically relevant information (14). For examples, sites that provide high levels of accuracy and correlation to deep body temperature are pulmonary artery blood, urinary bladder, the esophagus, and rectum (18, 19, 22). However, the temporal resolution for each site varies, which can dramatically impact the ability to recognize clinically important changes that may require prompt patient management (14, 18).

When monitoring temperature during MRI, the decision on which body site to use should be based on accuracy as well

as accessibility. There may be limitations on the type of equipment available for temperature measurements in the MR system room (3, 8, 23). For example, hard wire thermistor or thermocouple-based sensors are prone to measurement errors due to electromagnetic interference (EMI) and may introduce artifacts in the MR images (3). Fiber optic sensors (i.e., fluoroptic thermometry) are optimally used to record temperatures in the MRI environment because they are safe and unaffected by EMI (3).

In the MRI setting, anesthesiologists, nurse anesthetists, and clinicians may feel that they are limited to measure "surface" temperatures, such as those in the skin, axilla, and groin. However, these temperature measurement sites are very problematic insofar as they do not properly reflect "deep" body temperature. Another option is to use minimally invasive measurement techniques to record temperature in the rectum or esophagus.

While a so-called "surface" temperature site (i.e., skin, axilla, and groin) tends to be used for temperature recordings during MRI mainly because of the ease of obtaining the measurement with currently available equipment, this method does not provide an accurate representation of body temperature and is susceptible to substantial variations and erroneous information relative to the "deep" body temperature due to the specific site

selected for temperature probe placement, patient movement, and environmental conditions (14, 19, 20)

Notably, recording skin or surface temperature during MRI can be influenced by the level of the patient's perspiration due to RF heating and the use of blankets or air circulation from the fan in the bore of the MR system. Additionally, investigations have demonstrated that peripheral vasoconstriction resulting from skin surface cooling decreases the surface temperature measurement without influencing the core or deep body temperature (24).

In contrast, core or "deep" body temperature measurements require additional set up time and are minimally invasive but provide a more accurate representation of the body temperature (14). Two of the most prevalent core temperature measurement sites used during MRI procedures are the rectum and esophagus.

Rectal temperature measurements are highly accurate and within 0.6°C of the deep body temperature (14). The main drawback to this temperature measurement site is associated with a lag or delay in the temporal response to changing body temperature due to the presence of thermal inertia from the intervening tissues (i.e., between the rectum and hypothalamus). This temporal delay may also be caused by the presence of feces and poor blood supply in the rectum

(14, 25). A clinical investigation reported that the rectal temperature substantially lagged in response to changes in body temperature (25). The lack of temporal resolution can expose the patient to a hypothermic or hyperthermic condition for an extended period without being recognized by the clinician. Also, special care must be taken when placing a rectal temperature probe in neonatal or pediatric patient to prevent perforation and infection (14, 25).

Esophageal temperature measurements provide a high level of accuracy and good temporal correlation to body temperature due to the close proximity to the aorta, a deep body site. (20). In addition to the accuracy, the temperature recorded in the esophagus is responsive to fluctuations in body temperature and readily tracks changes compared to rectal or surface temperature measurement sites (14, 25). The only caveat is that the accuracy of measuring temperature in the esophagus is directly linked to the proper positioning of the probe (14, 19). Air flow in the trachea can impact the measured temperature if the probe is not inserted deep enough into the esophagus. The recommended placement of the sensor is in the lower one-third of the esophagus for an accurate core temperature measurement (14). Table 2 presents a comparison of the measurement sites to monitor during MRI, with the advantages and disadvantages.

Table 2. Comparison of the measurement sites for temperature monitoring during MRI.

Site	Advantages	Disadvantages
Surface/Skin	Non Invasive Ease of use	Not located near major arteries and will not reflect body temperature fluctuations Accuracy affected by placement and patient movement Affected by environmental conditions
Core/Body - Rectum	Highly accurate Reflects true core temperature	Minimally invasive Response to core temperature change could be up to one hour ³
Core/Body – Esophagus	Highly accurate Reflects true core or "deep" body temperature Fast response to core temperature changes ²	Considered invasive Placement can impact accuracy

Monitoring Body Temperature During MRI: Recommendations

In consideration of the available temperature measurement sites that may be monitored during MRI, especially with regard to which site provides the most accurate information along with the best temporal resolution, the tempera-

ture of the esophagus will provide the most acceptable and clinically relevant information. Furthermore, esophageal temperature is insensitive to ambient air circulation and patient perspiration during the MRI examination and has the added benefit of fast response time to temperature fluctuations in the

body compared to the measurement of temperature in the rectum. The current availability of temperature probes and recording equipment properly designed for use in the MRI setting, permits the monitoring of body temperature in the esophagus, which provides physiologic information that is vital to patient care.

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2012

29 January–
1 February

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1–2
February

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19–22
February

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Long Beach, California, USA

10
March

SMRT South Carolina Chapter Educational Seminar
Greer, South Carolina, USA

5–6
May

SMRT 21st Annual Meeting
Melbourne, Australia

5–13
May

ISMRM 20th Annual Meeting & Exhibition
Melbourne, Australia

6–8
September

ISMRM Workshop on:
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Lund, Sweden

27–30
September

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