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The Association of Educators in Radiologic Technology of the State of New York

The Blackboard

Newsletter

President's Message

Greetings fellow educators,

The last two years have flown by in a blink. One of our past presidents informed how quickly time would pass and that once I got comfortable being President my term would be over. Truer words were never spoken. One of the issues that I have been following very closely is, how do we, as educators, continue to improve our skills in this ever-changing, highly technological field?

One thing we can do is encourage our students (as well as ourselves) to engage in the practice of mindfulness. Mindfulness is simply being 100% engaged in whatever activity you are doing at the time. In my opinion, one of the most heinous and unproductive ideas foisted on our students and the public at large is the concept of multi-tasking. It is virtually impossible to get excellent results from a task if we are multitasking. At least one, if not all of the tasks will suffer if we are not 100% engaged in one task at a time. Additionally, one will derive little if any joy from the task at hand if one is not fully engaged. We have all seen the erosion of concentration by our students. Besides the obvious over-reliance on "Smart Phones", I believe students today are more interested in quantity over quality and we know mAs and KVP are equally important. Numerous studies have shown that one of the ways to really become excellent regarding any subject is to be passionate about it. How can one be passionate about something if you are busy multi-tasking instead of concentrating on the task at hand?

EDITOR

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INSIDE THIS ISSUE

2016-2018 AERT Board left to right: Paulette Peterson, Peter Grumm, Zoya Vinokur, Michael Burns, Charles Drago, Frank Zaleski, Barbara Geiger, and Mary Perry.

AERT Mission

The Association of Educators in Radiologic Technology of the State of New York is committed to excellence in education and health care. We stand committed to develop and maintain standards of quality professionalism. We will serve as a leader in the advancement of the Profession of Radiological Sciences through the development and implementation of educational methods and policies.

2017 Conference Highlights

Evans Lespinasse, MS,RT(R)(M)

The annual conference of the Association of Educators in Radiologic Technology of the State of New York (AERTSNY) was educational, innovative and fun for those who attended last April. Approximately 80 medical imaging educators across the New York area came together at the beautiful Fort William Henry Hotel and Conference Center, Lake George, New York, to form new acquaintances, network and grow professionally.

The conference featured in-depth teaching and learning themes, with 11 savvy speakers, including Norman McCulloch, MA, PA, Myke Kudlas, MEd, RT(R)(QM) CHP, PMP, Angie Eaton,, Med, RT(R)(VI), Barbara Geiger, MA, CHES, RT(R)(M), Karlyn LaBate, MS, RT(R)(V)(M)(CT), Katherine N. Bolognese-Gress, MS, RT(R), Joseph A. Mamatz Jr. MAEd, RT(R), Carol Recker-Hughes, PT, PhD, Mary Jo Perry, MS, RT(R)(M)(CT) and Paulette Perterson, MS, RT(R)(M). They all came together to equip and inspire program directors, clinical coordinators, classroom, and clinical instructors to improve their teaching and learning experience. The presentations offered new materials in an organized fashion. An important component is the sharing of knowledge where attendees are first engaged in active learning discussions and later, take away this positive energy into their respective classrooms. This gathering of experts can be a game changer for educators who are looking to revitalize their approach to teaching and learning. Mr. Alexander H. Damiani, MPH, MS, of The New York State Department of Health (NYSDOH) was among the presenters who spoke on many changes relating to licensing laws, and state department policies and procedures updates. Overall, the participants walked away with a deeper connection and understanding of the issues that can be challenging; especially to teaching newbies.

The thread of continued learning in incorporating technology in the classroom, the innovative ways in which to teach today's learners, and explore best practices across the medical imaging discipline will continue annually through our annual conference. How fortunate we are, as New Yorkers to have this great opportunity offered to us locally through this professional organization. I am looking forward to the 2018 conference with great anticipation.

President's Message Cont.

A second relevant subject is the application of technology in the classroom. Today it seems as if all we educators do is race to see who can have the newest, most modern and expensive technological resources. Although, one cannot really argue with the rewards and advancements of technology in radiology, one can make a strong argument about the efficacy of using all of the advanced technology in the classroom. The United States spends more per capita for technology in the classroom for grades K -12 than any other country in the world. Unfortunately, the test scores for critical thinking do not correlate with higher test scores for children of this country. As a matter of fact, while we continue to spend more and more on technology our scores continue to drop. The countries that get the most bang for the buck in terms of educational dollars are the ones who actually invest in superior ***teacher*** training. I am not suggesting that we all become luddites and get rid of all of our computers; I am simply suggesting that we look to see how our investments can be optimally utilized- whether it be technology or teacher training.

Finally, one of the very best things we can do to ensure that we are keeping up with this constantly advancing field is to attend our annual conference. On many occasions, I have utilized new ideas gleaned from some of our wonderful presenters in my classroom or on the clinical floor. Additionally, the interactions among my peers has provided me with invaluable information on a variety of subjects. I think most of us can discredit the adage "You can't teach an old dog new tricks." I am certainly not implying we are a group of old dogs; I am saying that we are humble enough to admit we can learn a great deal from our colleagues, regardless, of their age and experience. We should endeavor to utilize this tremendous resource -each other- whenever possible, both during and outside of the conference.

Our annual conference is coming up, and for all of you who do attend, I appreciate it more than you will know. It has come to my attention that many institutions have cut back severely on reimbursement for these conferences, making them somewhat cost prohibitive. I am hoping one of the topics we can informally discuss in the upcoming meeting is how we can get administrators to provide better financial support for their staff to attend conferences for continued professional growth and development. I believe it is of the utmost importance for sponsoring institutions to understand how crucial these enhancement activities are for our programs.

"The United States spends more per capita for technology in the classroom for grades K-12 than any other country in the world. Unfortunately, the test scores for critical thinking do not correlate with higher test scores for children of this country."

On a personal note, I would like to thank all of the people who have mentored and supported me during my time on the board. All of you have been so helpful and inspiring. I certainly would have not taken this job without some pushing and prodding. I hoped, however, that I would be guided and supported along the way. As a matter of fact, the level of support, caring and respect I received have been way beyond anything I could have imagined. I thank you all.

Mike

Innovative Methods of Teaching

Anthony DeVito, MA, RT(R)

As Chair of the Educational Advisory Committee, I was charged by the AERT President, Mr. Mike Burns, to provide some information on new or innovative methods of teaching. As it so happens, I serve on several committees at New York City College of Technology (City Tech) that are also involved in exploring methods of teaching and learning. I am more than happy to share the information below and recommend the following book titles that are easily adoptable in medical imaging education. Hopefully, new and/or seasoned educators will find the information useful.

How Learning Works: 7 Research-Based Principles for Smart Teaching. Susan A. Ambrose. ISBN 978-0-470-48410-4

This book discusses effective teaching styles for all types of learners. The author outlines detailed learning perspectives such as cognitive, developmental, and social psychology; educational research; anthropology; demographics; and organizational behavior.

At City Tech, my group is assigned to "plug in" one or two of the above-mentioned styles to a course or even just one course section. In my case, I chose an upper level clinical internship course to concentrate on student's ability to develop metacognitive skills. As you may be aware, 'Subject Mastery' requires the development of competence, integration of practical skills, and knowing just when to apply these skills.

As the co-clinical coordinator of Radiologic Technology at City Tech, one of my biggest concerns and responsibilities is to insure that the second-year students are *transferring the knowledge* they learned from prior clinical rotations to their current ones. This transferring of knowledge can be easily evaluated by the numerous learning categories on a radiography student's clinical competency form.

Teach Students How To Learn: Saundra Yancy McGuire. ISBN 978-1-62036-316-4.

This book discusses strategies that can be incorporated into any course to improve student metacognition, study skills and motivation. It also demonstrates how learning strategies can improve student learning and then charges faculty to learn these various strategies. So once again the committee I'm on has asked us (faculty from various departments of the School of Professional Studies) to choose a strategy and incorporate it in a class, course section or lecture. The book ties in Bloom's Taxonomy (ink.com/~donclark/hrd/bloom.html) with an updated revised version that stresses knowledge, comprehension and evaluation. Once again my interest is to make use of these strategies in the clinical component of students' education.

At City Tech's last two clinical orientations, I have had a fellow colleague, Prof. Jennett Ingrassia, present a professional

Innovative Methods of Teaching Cont.
Anthony DeVito, MA, RT(R)

development workshop to the clinical adjuncts on improving teaching styles. The goal here is to improve the teaching abilities and styles of our adjunct instructors. We believe that since the adjuncts spend more time with our students than we do, if they are trained to become better teachers/instructors, our students will become better students and eventuality be better prepared for the professional world.

"I chose an upper level clinical internship course to concentrate on student's ability to develop metacognitive skills."

Pearson Teaching Strategies Series: 50 Instructional Routines to Develop Content Literacy.
Douglass Fisher. ISBN: 13-978-013-334796-8

This book provides teachers with fifty step-by-step routines for implementing content area instructional routines to improve students' literacy skills. I just received this book, I have not had the time to really review it yet. Once my group starts implanting models from this book I will share our findings.

Conclusion:

I'm sure both hospital-sponsored and college-based programs are faced with similar educational dilemmas. How do we teach our students to become better and more efficient learners. Also, how do we as educators improve our teaching methods to deliver this goal. Speaking for myself, I have learned in a much different fashion then the way current students learn. Many of us were schooled in the traditional classroom setting where we relied on spoken words from lectures with zero visual aids, reading textbooks, and using the physical library. In comparison, today's students have multiple forms of media from e-books, pod casts, and on-line classes with twenty-four hour access to information almost anywhere in the world. It is therefore counter-productive and unfair to teach them the way we were taught and expect them to learn the way we learned.

As educators in radiologic technology, our teaching responsibilities are three-folds. We must incorporate the cognitive information presented in class; link this information to the psycho-motor domain of learning, and teach our students to reflect on their learning skills as the information is applied in the affective domain.

Using technology in the classroom can have a far greater effect than benefiting just the student population. Gulek and Demirtas (2005) reported that teachers that incorporate technology in classrooms generally have a constructivist approach to teaching. It is also suggested that the use of technology makes teachers feel more empowered in the classroom and consequently spend less time lecturing because their students are involved in critical-thinking, problem solving, active learning, and interactions with fellow students.

"Using technology in the classroom can have a far greater effect than benefiting just the student population."

Theory-Practice Gap: Why Does it Exist and How Can We Stop the Madness?—Part Two

Jennett Ingrassia, MSRS, RT(R)

In the last issue, I discussed a concept referred to as Theory-Practice Gap with a promise that I would continue with a second part of the article. As a refresher, Theory-Practice Gap can be defined as the difference between what is taught in the classroom setting, the theory, and what is experienced in the clinical learning environment, the practice. At the time, I introduced three questions: One, can educators get the practitioners to *recognize* that theory-practice gap is a major concern? Two, is trying to change the mindset of the staff radiographer the *only* method we can use to reduce the gap? Three, do we blame the *entire* problem on the practitioners? If you recall, my answers, at the time were: Not sure just yet, better not be, and can't.

In the prior article, I covered the first question by concluding that the practitioner, the staff radiographer, is expected to be part of the students' clinical education and that it is the responsibility of the educational institution to find a way to make it happen. This can be done by increasing the credibility of the classroom educator, which can be done by keeping the lines of communication open between the program and the clinical setting. The effort, here, must be made by the school, to communicate how important the technologists are to the students' education. The underlying thought here is that the technologists must somehow be made to realize that theory must be seen in practice—that students must be able to *see* and *do* things the way they were taught-- the right way.

How to go about doing the above is the answer to the second questions. Communication is also the key to the answer to my second question-- is trying to change the mindset of the staff radiographer the *only* method we can use to reduce the gap? I spoke of visibility in my last article and how important regular visits are to the site by the clinical coordinators. I often wonder how many program directors visit the clinical sites. I, personally, am a firm believer that a visit by the program director, when and if possible, can accomplish a lot. It demonstrates a sincere interest in not just the clinical education of the students, but most of all, an interest in the clinical staff who play such a huge part in educating them. Now, I know that program directors are inundated with many other responsibilities, however, a visit to a site even if only once every other year can help bridge a few barriers. By virtue of actually seeing and being in the trenches, if even for a short time, the program director can have a visual, express gratitude to the staff radiographer and more importantly, use the visit as an opportunity to express to them, how important their involvement is to the program. In addition, simple conversation to find out what is and is not working demonstrates that we really do care about them. Every program official knows that these individuals spend more time with our students than we do. Wouldn't we want to augment our teaching by increasing clinical application of the very theory taught in the classroom?

Theory-Practice Gap: Why Does it Exist and How Can We Stop the Madness?—Part Two Cont.

Jennett Ingrassia, MSRS, RT(R)

Communication and conversation with the practitioner, whether by the clinical coordinator or the program director may let them feel as though they are a stakeholder, thereby making them feel just as responsible as we do for the student's education. So, the answer to the question is no, the changing the mindset of only the staff technologist is not the only method that can be used to close the gap. Perhaps those of us that are part of the educational institution need to change our mindset, as well. The program staff—clinical coordinators, and program directors can help by expressing appreciation face to face to the practitioner and communicate how essential their work is to the students' success.

Finally, the third question--do we blame the entire Theory-Practice Gap issue on the practitioner, also involves communication. However, this communication should be done through the clinical instructor. We all know that the clinical instructor is essential and vital to the clinical education component of our programs. He or she is really the liaison between the clinical setting and the educational institution, and literally, the eyes and ears of the program officials. It is important for those who are clinical coordinators to address the Theory-Practice Gap issue with the clinical instructor to make them aware of it and try to circumvent the issue whenever possible. It is not an easy thing to ask of the clinical instructor. For example, would it be prudent, in the worst case scenario of the gap, for a clinical instructor to just tell a technologist that they are not performing a procedure correctly and that, in fact, their performance is detrimental both the patient's diagnosis or the students' clinical education? Isn't that what the supervisor's role should be? Perhaps, the way to go about it, is through the back door, so to speak. As an example, maybe after identifying a common flaw in a clinical site for a particular procedure, someone from the program (clinical coordinator, clinical instructor, faculty, etc.) could offer to do an in-service for the department. Another way might be to meet with the department supervisors to explain the problem and ask what "we" (meaning program and clinical setting officials) could do together to close the gap. So, the answer to this question, is that the school has to take charge of its own destiny, somehow, someway.

> " I often wonder how many program directors visit the clinical sites."

In the end, when all is said and done, it is all about communication *on a regular basis*. I believe that a once a year Advisory Board Meeting just isn't enough simply because it does not reach enough of those in a supervisory capacity and not nearly enough for the practitioners, the staff technologists, of the clinical learning environment.

Using 3D Print Technology in Radiologic Technology Education

Mary Jo Perry, MS, RT(R)(M)(CT)

Imagine handing a student a highly detailed replica of *The Circle of Willis* as you review the cerebral vascular anatomy of the brain. Conventional illustrations of *the Circle of Willis* as portrayed in texts cannot convey the intricacy of this vascular structure located at the bottom of the brain. The human brain is designed to handle images as dimensional and while printed illustrations help to visualize structures, an actual representation provides the greatest information and conceptualization.

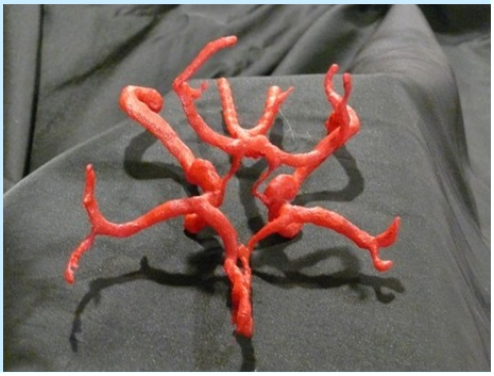
Short of using actual organs in classroom demonstrations, the emerging technology of 3 D printing enables students to work with reproductions of organs and structures that they create themselves. While it is safe to say that most of us have heard of 3D printing, in all likelihood few have actually worked with the technology.

3D Printing is defined as an additive manufacturing process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a heat sensitive material. The virtual object is given physical form by precise layering of an organoplastic material.

There are many different techniques to 3D Print an object, i.e Fused Deposition Modeling (FDM), Continuous Liquid Interface Production (CLIP), Laser Sintering (LS) and even 3D pens. For our purposes, we will focus on Fused Deposition Modeling where a model is created by heating and extruding plastic through a nozzle and pieced together layer by layer. Think of how one uses a tube filed with icing to decorate a cake and you know how a 3 D printer works.

From image to object

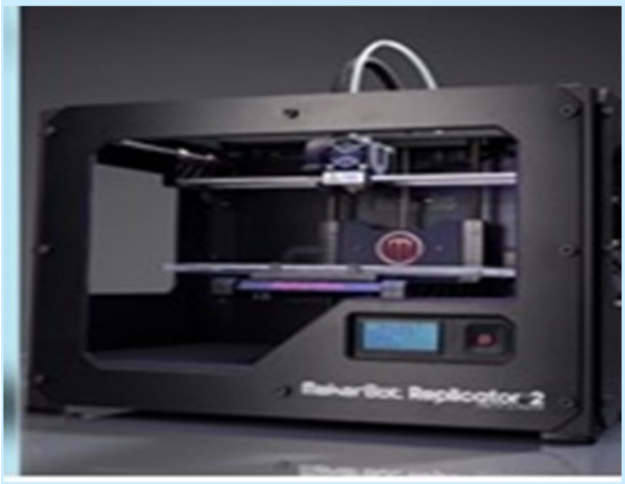
The design process begins with the use of simple software programs such as Sketchup or TinkerCad to draw out the object. The interactive nature of these programs allows users to master the basics in an hour or two. Keeping in mind the dimensional limitations of most printers, the created object file is exported to the printer and the job begins. Heated plastic is extruded from a heated nozzle as an automated precision platform moves downward for each successive layer. The thickness of the layers, the size of the object being printed, as well as the complexity of structure will dictate the time necessary for each print. As FDM materials come in a variety of colors and flexibilities, users can create complex i.e. articulated objects such as hands, feet and knees.



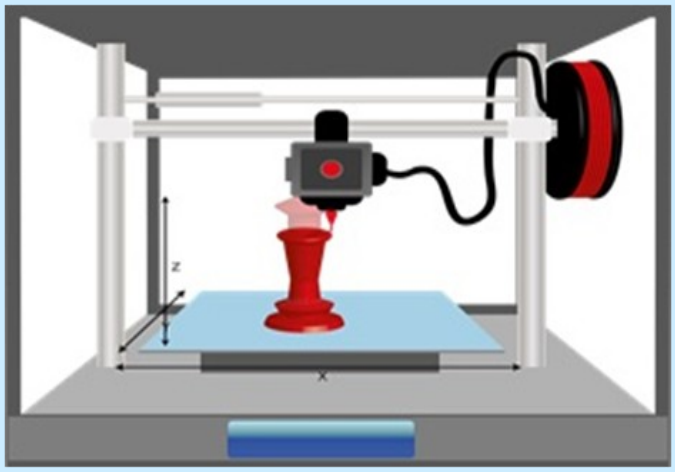
Circle of Willis representation using a Makerbot 3D printer and Tinkercad software

Using 3D Print Technology in Radiologic Technology Education Cont.

Mary Jo Perry, MS, RT(R)(M)(CT)



Markerbot printer



Print Nozzle and automated stage

The use of 3D printing in medicine continues to expand. 3D imaging is used in organ regeneration for replacement, bone replacement, prosthetic limbs and braces. Industry produces prototypes of the models that are seeking to replace and can experiment with size, composition and construction prior to the surgical procedure to reduce, surgical procedure time, rejection rates and the possible waiting time for a compatible organ to become available. This system has the ability to build complex geometric designs along with simple designs. FDM has become invaluable to sections requiring lightweight, strong and affordable plastic parts – without the need for hard tooling or machining.

Every Journey begins with the first step

St. John's University holds frequent campus wide exhibitions highlighting faculty and student research and showcasing new technologies being implemented by the school. Attending one of these events, I sat in on a presentation by Professor Gary Young of St. Johns e - studio on 3D Printing and possible areas of use. I began to think how I could possibly incorporate this into my curriculum. In particular, my Advanced Radiographic Anatomy and Procedures course was well suited to introduce 3 D print technology as it is used in medicine. The typical syllabus requires research papers or projects to fulfill the ASRT component of writing and oral communication skills. This was a novel, and exciting way of fulfilling the requirement.

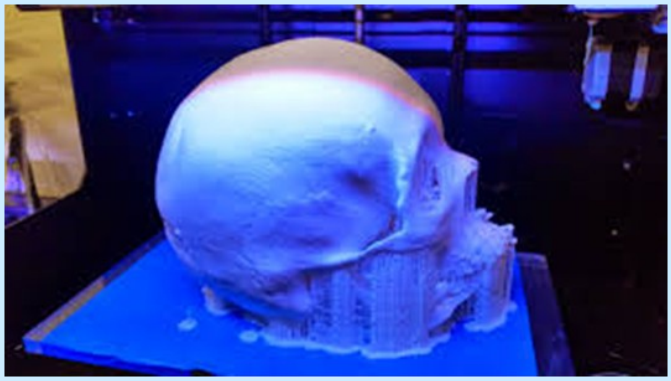
As expected, students were apprehensive at first, but thanks to Professor Young as a guest lecturer who gave a short presentation on what 3D printing was, how to go about researching anatomical models, and the various programs used, the class was quickly immersed in their new assignment. The outcomes were better than anticipated. Generally speaking, the students after a few false starts mastered the software and rapidly reached an impressive skill level in their creations.

Using 3D Print Technology in Radiologic Technology Education Cont.

Mary Jo Perry, MS, RT(R)(M)(CT)

As with most pilot projects, resources were limited. The University designated 1 printer initially for our use and each model production time to 4 hours. As there were several marketing and communication classes also working with 3D printing projects, we were fortunate to be allocated a printer for our exclusive use. Given the success of the project, the following year the Dean of Pharmacy and Health Sciences, Dr. Russell DeGates purchased several 3D printers for the College and I was given one of these printers.
In the subsequent semester, I introduced sophomore and junior students taking Human Structure and Function classes to 3D printing as well. The experiences and outcomes of this group mirrored that of the original class.

We tend to focus primarily on the hardware of 3D printing, but point in fact, without the availability of easy to use software suites, our printers would be just so much metal, gears, and circuit boards. While there are numerous programs available for free, our experience has been that Tinkercad was best suited to reproduce body structure (Tinkercad). As an alternative software, some found Sketchup to be an excellent substitute (Sketchup). Prior to actual printing, students submit their soft tissue or skeletal structure for review. I then adjust the size and produce their organ or bone on the MakerBot Printer. The students are given their project after production along with guidelines should they want to paint their object. Each student gives a 5 minute graded presentation on their results. The best projects are chosen for submission at St. John's University Student Research Project Exhibit.



3D skull manufacture

Observations and Outcomes

In my Human Structure and Function and Advanced Radiographic Anatomy and Procedures classes, I have incorporate as part of the curriculum, student projects in constructing 3D models of human anatomical structures. This encompasses skeletal as well as soft tissue organs. Students have found this project to be useful in that it allows them to move from a textbook representation to actually recreating actual structures in detail. Based on student feedback, this aspect of the course is one of the most effective tools in teaching anatomy and relating it to real world applications.

Software representation for human arm construction

Using 3D Print Technology in Radiologic Technology Education Cont.

Mary Jo Perry, MS, RT(R)(M)(CT)

Medical use of 3D printing continues to expand with actual organ growth and skeletal structures being accurately reproduced for surgical implantation. This classroom exercise forms a basis to which students become familiar with a new aspect of medicine and with simple projects may provide them the impetus to enter research fields in areas such as reconstructive surgery, biomechanics, and organ regeneration to name a few. The cost of implementation of 3D printing is quickly dropping; Printers that once cost several thousands of dollars have fallen to between $1500 and $2500; well within reach of most programs. The cost of materials also has come down, making each print for literally pennies. Programs such as Tinkercad and Sketchup are in their basic versions free for download and usable on PC and Mac platforms. In the same way we have integrated computer-based learning into our pedagogy; 3D printing will find application as well.

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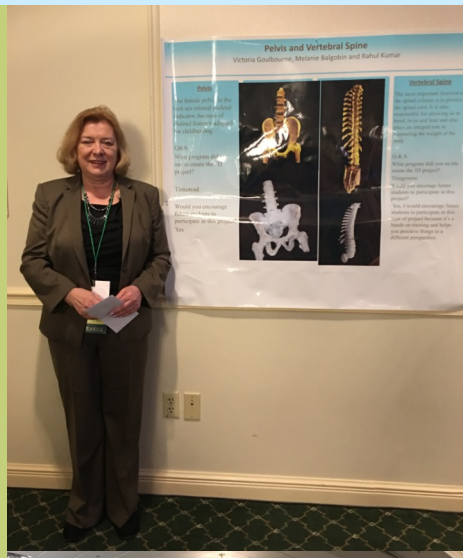
Excellence in Education Award Recipient

By Evans Lespinasse, MS, RT(R)(M)

The 2017's Excellence in Education Award was a truly special affair. It brought together the largest turn out at the conference. This award is given in order to raise attention to an educator for his/her dedication and commitment to the preparation of radiologic technology students for future service in health care. The award recognizes a teacher who exemplify excellence in teaching and mentoring.

Ms. Barbara Geiger, MA, CHES, RT(R)(M), the Program Director, Mercy Medical Center, School of Radiography in Rockville Centre, New York, received the Excellence in Education award this year. Barbara's lecture, Through the Years, presented a historical perspectives of the ever progressing radiologic examinations and image processing. Her lecture was simply inspirational. ***Congratulations Barbara,*** and best wishes for continued success!



Minor Head Trauma and Post-Concussion: A Radiology, Psychiatry and Neurobiology Challenge

Derrick Eng[1], D.O., Tiffany Crider[2], D.O., M.Ph, Janet Cordero[3], AAS, RT(R) and Subhendra N. Sarkar[3], Ph.D., CNMT, RT(R), [1]Orange Regional Medical Center, Middletown, NY; [2]HackensackUMC Palisades, North Bergen, NJ; [3]Radiologic Technology & Medical Imaging, New York City College of Technology, Brooklyn, NY.

Background

Mild or minor traumatic brain injury (mTBI) is common affecting approximately 1.2M Americans every year (1). Such patients have impaired or absent cerebral autoregulation within 48 hours of injury, still neurocognitive deficits are reported only in 10% of cases, significantly underestimating the long-term burdens associated with it (2). mTBI is defined by the Mild Traumatic Brain Injury Committee of the brain injury interdisciplinary special interest group of the American Congress of Rehabilitation Medicine (3) with 3 criteria – diminished or altered state of consciousness <30 min, post traumatic amnesia for < 24 hrs and a Glasgow Coma Scale of 13-15.

The majority of mTBI survivors recover fully within 3-4 weeks. However, a significant minority (10-20%) continue to experience symptoms for several months (subacute post-concussive disorder) and even years (chronic) (2). Hence the growing consensus is that most imaging tools do not reflect the underlying biology or the chronic neuropsychological effects of mTBI (4).

Repeated, minor blast-induced head trauma in war zones or multiple head concussions in athletics often cause fatigue, visual and speech deficits, disturbed sleep along with long-term cognitive deficits including irritability, anxiety, decline of attention, motor function and spatial memory (5). Patients with mTBI and persistent post-concussive symptoms have a high incidence of medial temporal lobe injury leading to altered hippocampal, caudate and insular perfusion (cerebral blood flow or CBF) and hence, declining cognition and motor function (6).

Radiological imaging

Routine imaging modalities like MRI or CT after mTBI do not reveal structural damage of the brain. Even when MR or CT is positive, the findings are subtle, such as petechial hemorrhage, mild edema or small contusions, considered 'minor' findings needing no neurosurgical intervention (4). Radiotracers like 99m-Technitium for HMPAO or ECD SPECT or 19-FDG for PET work well for identifying reduced brain perfusion although SPECT and PET address different microenvironments (7). These two nuclear medicine techniques are quite sensitive but have low specificity. They do not define how much is the injury and when one is ready to go back to normalcy.

"Since anterior fossa structures are more mobile compared to posterior fossa structures, undersurface of the frontal and temporal lobes undergo more frequent deformity when colliding with skull protuberances."

Minor Head Trauma and Post-Concussion: A Radiology, Psychiatry and Neurobiology Challenge Cont.

Derrick Eng[1], D.O., Tiffany Crider[2], D.O., M.Ph, Janet Cordero[3], AAS, RT(R), and Subhendra N. Sarkar[3], Ph.D., CNMT, RT(R), [1]Orange Regional Medical Center, Middletown, NY; [2]HackensackUMC Palisades, North Bergen, NJ; [3]Radiologic Technology & Medical Imaging, New York City College of Technology, Brooklyn, NY.

Both SPECT and PET administer moderate amount of radiation; for a 40-slice brain imaging plan, PET or SPECT will give radiation equivalent to about 20 X-ray procedures, similar to a head CT but with a lot more physiological information. This dose is reasonable so long as the patient is not pregnant or a child. Radiation-free perfusion methods like arterial spin labeling (ASL) MRI are promising but suffer from high inter-subject variability and lower resolution than SPECT, PET, MRI or CT (8).

Physical model for minor head trauma

When there are microvascular damages in mTBI those can be well observed by susceptibility weighted MRI (loosely called brain iron detection method) that is over sensitive to hemorrhagic lesions in the frontal and temporal regions indicating local mechanical strain and microvasculature rupture (9). Skull anatomy seems to play a significant role in translating the focal injury to various points in the frontal and temporal lobes distal to the injury site. One may model it as grazing injury and shearing of inferior portions of frontal and temporal lobes by the skull base bony ridges and fasciculi during the TBI and continue with the injury in case of repeat blasts or falls after that for children, athletes, soldiers or elderly (10). Since anterior fossa structures are more mobile compared to posterior fossa structures, undersurface of the frontal and temporal lobes undergo more frequent deformity when colliding with skull protuberances. Frontal and temporal lobes are interconnected by arcuate and uncinate fasciculi that often are affected by TBI (11). This may be the primary reason for dysfunction of both lobes together for any minor head trauma and is usually revealed as loss of cerebral perfusion. Coup-contrecoup brain injury following mTBI from sphenoid ridges could explain the sleep disturbances. The inferior frontal lobe is one of the important regions involved in sleep initiation (12). Diffusion tensor imaging or DTI finds a significant number, about half of mTBI patients undergo diffusional changes (decreased Fractional Anisotropy) of the arcuate fasciculus although due to significant magnetic susceptibility in this region diffusion MRI findings are not fully reliable (11).

Molecular model for minor head trauma

mTBI produces significantly elevated levels of F_2-isoprostanes, a key biomarker of oxidative stress for mTBI (13). The blood–brain barrier consists of the microvascular endothelium, pericytes, astrocytes and neurons, out of which the endothelial changes due to reactive oxidation species (ROS) and calcium overload are best suited for perfusion imaging like SPECT, PET and ASL for regions with modest changes in CBF (9). Oxidative stress leads to altered homeostasis causing peroxidation of membrane lipids and generate excess intracellular calcium. These affect tight junction proteins and increase permeability of endothelial lining of cerebral microvasculature. Increased ROS levels affect endothelial cells and cerebral autoregulation

Minor Head Trauma and Post-Concussion: A Radiology, Psychiatry and Neurobiology Challenge Cont.

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including ATP generation that may explain fatigue after mTBI (5).

Diagnostics in near future

As MRI begins to look at this relationship, a recent fMRI work using fMRI to detect fatigue in patients with previous TBI has demonstrated altered striato-thalamic-cortical functioning in caudate and anterior thalamus (14). Hence, multimodal brain imaging utilizing a sensitive tool like nuclear SPECT and non-invasive MRI tools like fMRI and localized metabolite spectroscopy could further the understanding of chronic components post TBI while minimize radiation. The radiologic approaches so far are lacking in mechanistic understanding and sensitivity to allow treatment monitoring, thereby are of limited value for treating physicians like neurologists, psychiatrists and neurosurgeons. A large fraction of ER admissions with head trauma are children and young adults that are more sensitive to radiation induced brain damage. Hence, radiation-free high resolution arterial spin labeling (ASL) MR methods for detecting small perfusion changes (8) should be used in addition to susceptibility and diffusion MRI (11).

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Aristotle

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- The 2018 ASRT Symposium and Annual Governance & House of Delegates Meeting will be held June 21-24, at the Red Rock Casino, Resort & Spa in Las Vegas.
- The 2018 AEIRS Annual Meeting will be held July 12-13, at the historic Francis Marion Hotel in Charleston, South Carolina.
- Any member of the AERT who plan to attend any of the national meetings above, please document the highlights of the meetings and email to me for the next issue.
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