

## The Rotating Anode FALL 2024



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## **KSRT BOARD OF DIRECTORS**

Chair of the Board Gale Brown, EdS, RT(R)(CT) galeb@labette.edu

**President** Toni Caldwell, MHA, RT(R) mmcaldwell@aol.com

Past President Denise Orth, MS, RT(R)(M) ksrt.exsec@gmail.com

President-Elect Kelly Denton, RT(R)(M) dentonkellyann@gmail.com

Vice President Shanna Bennett, MBA-HCA, RT(R) borednkansas@att.net **Secretary-Treasurer** Jeskan McGovern, MPA, RT(R)(CT) mcgovernj@newmanu.edu

**Director at Large** Becca Glahn lynnbecca483@gmail.com

Education Co-Chairs Becky Dodge, PhD, RT(R)(T) becky.dodge@washburn.edu Dixie Copeland, RT(R)(M) dixielcopeland@gmail.com

**Professional Development Chair** Kirsten Oswald, RT(R) kirstenloswald@gmail.com

ASRT Senior Delegate Toni Caldwell, MHA, RT(R) mmcaldwell@aol.com Area Representatives, East Kirsten Oswald, RT(R) kirstenloswald@gmail.com Heidi Chermak, RT(R) hchermak@gmail.com

Area Representatives, Central Kyle Ibarra, RT(R)(MR) ibarrakb@gmail.com Harmony Ibarra, RT(R)(CT) hiradct@gmail.com

Area Representative, West Kelly Denton, RT(R)(M) dentonkellyann@gmail.com

Student Representative Bella Ostmeyer i\_ostmeyer@mail.fhsu.edu

## **KSRT COMMITTEE CHAIRS AND APPOINTMENTS**

**Bylaws** Denise Orth, MS, RT(R)(M) ksrt.exsec@gmail.com

Fellows Denise Orth, MS, RT(R)(M) ksrt.exsec@gmail.com

Legislative Toni Caldwell, MHA, RT(R) mmcaldwell@aol.com

Membership Shanna Bennett, MBA-HCA, RT(R) borednkansas@att.net

**Profess. Development Vice Chair** Tara Rohn, BS, RT(R)(CT)(MR) tkrohn@fhsu.edu Media Coordinator Jen Smith, MS, RT(R)(M)(CT) jen.smith.rtr@gmail.com

Social Media Co-Coordinator Toni Caldwell, BA, RT(R) mmcaldwell@aol.com

Nominations Vacant

Scholarship Melinda Chiroy, RT(R)(T)(CT) melindachiroy@yahoo.com

Historian Kyle Ibarra, RT(R)(MR) ibarrakb@gmail.com Editor, *The Rotating Anode* Jen Smith, MS, RT(R)(M)(CT) jen.smith.rtr@gmail.com

**Executive Secretary** Denise Orth, MS, RT(R)(M) ksrt.exsec@gmail.com

**Student Intern** Vacant

Editor: Jen Smith MS, RT(R)(M)(CT) Interested in contributing to the *Anode*? Contact: Jen Smith Email: jen.smith.rtr@gmail.com (Please put *Anode* in the subject line)

Official Publication of the Kansas Society of Radiologic Technologists Denise Orth, Executive Secretary 1702 Mermis Ct. Hays, KS 67601

## **EXECUTIVE COMMITTE MEETING MINUTES**

10 a.m. July 13

Benton Hall at Washburn University and via Zoom

Voting members present: Gale Brown, chair of the board; Denise Orth, immediate past president and executive secretary; and Toni Caldwell, president.

**Call to order:** Gale called the meeting to order at 10:07 a.m.

**Quorum:** Denise established a quorum.

**Approval of minutes:** Pre- and post-convention meeting. Denise moved to approve the pre- and post-convention meeting minutes and Toni seconded the motion. Motion passed.

**Financial report:** Denise presented the financial report through May 31. The report showed income of \$75,031.27 and expenses of \$69,457.38. The net worth report showed a checking account balance of \$13,003.08 and certificates of deposit worth \$45,661.38 for a total net worth of \$58,664.46. Denise moved to approve the financial report and Toni seconded. Motion passed.

#### Old business:

**CDs renewed and moved:** A threeyear CD matured and remains at the First Internet Bank of Indiana. **New business:** 

**CDs:** A CD at Sunflower Bank will mature Oct. 3. Perhaps putting it at

the same bank as others will get us a higher yield. Based upon need, the CD may be renewed at Sunflower Bank or moved to a higher yield institution.

Radiologist assistants: The legislative process for this could take 2-4 years to complete. Toni is setting up a Day on the Hill in Topeka to make legislators aware and to push RAs as professionals. She has talked with Brian Ralph and Mike Odgren, who both are RAs. Toni and our lobbying representative at Catalyst discussed options for getting a radiologist assistant bill through the state legislature. The approximate cost would be more than \$60,000. Toni is investigating whether ASRT and ARRT could help financially. The KDHE will need to certify RAs as a profession as part of the process.

**ASRT House of Delegates:** The Be Seen publicity campaign is huge. We need to push this at our state level. Toni, Gale, and Denise each went to chapter meetings to learn about current issues. Remote scanning currently is being done for many modalities.

#### Announcements:

The next meeting will be at 9:30 Oct. 26.

**Adjournment:** Gale adjourned the meeting at 10:33 a.m.

#### RENEWAL VOTE FOR CERTIFICATE OF DEPOSIT

June 3 Via email

Denise emailed board members on May 28 that there is a CD with First Internet Bank which will mature on June 3. If we decide to stay at this bank, then she doesn't need to do anything and the CD automatically will roll over to the current 36-month rate. If the board wants to move it to Sunflower Bank, then she will need to know by May 31.

The current balance is \$7,661.38. This is a 36-month CD with a current interest rate of 0.80%.

The rates at First Internet Bank as of that day were: 12 months – 5.12%, 18 months – 4.86%, 24 months – 4.65%, and 36 months – 4.50%. Sunflower Bank is still issuing 9-month CDs at 4.45%.

A motion was made by Toni via text message to renew the CD at First Internet Bank for 12 months at 5.12%. The motion passed June 3.

**BOARD OF DIRECTORS MEETING MINUTES** 

10:30 a.m. July 13

Benton Hall at Washburn University and via Zoom

Voting members present: Gale Brown, chair of the board; Denise Orth, immediate past president and executive secretary; Toni Caldwell, president and legislative chair; Kelly Denton, president-elect and western area representative; Jeskan McGovern, secretary-treasurer; Bella Ostmeyer, student representative; Becky Dodge, education co-chair; Kyle and Harmony Ibarra, central area co-representatives; Kirsten Oswald, professional development chair and eastern area co-representative; Heidi Chermak, eastern area co-representative; Tara Rohn, professional development vice chair.

**Non-voting members president:** Jen Smith, media chair and *Rotating Anode* editor; Arrica Braun, professional development committee; Dixie Copeland, education co-chair.

**Call to order:** Toni called the meeting to order at 10:42 a.m.

**Quorum:** Jeskan established a quorum.

**Orientation:** Toni reminded all members to review their position descriptions and the bylaws. This information is included on the KSRT Google Drive. Policy and procedures also are on Google Drive, which includes a timeline of important events that are due throughout the year.

Consent agenda:

Denise Orth, immediate past president and bylaws chair: As the Bylaws Chair, I am not anticipating any changes to the ASRT bylaws this year. If there are changes then I will review our bylaws to make sure we are in compliance. I also have been preparing for the ASRT House of Delegates and look forward to representing our society. **Fellows chair:** The new Fellow application was sent to Jen to include on the website. I also am work-

#### **Continued from Page 4**

ing on a set of guidelines for the committee to use. Executive secretary: These past years have been a pleasure and honor to serve the society and board of directors in this role. As I finish out the next two years on the board, I feel it is time to pass the baton to the next executive secretary. At the end of the 2025 convention, I will step down and will be available to assist the new executive secretary through the transition. All past presidents are eligible for this position. Please let any member of the executive committee know of your intent to take on this role. These members are Gale Brown, Toni Caldwell, and Denise Orth.

Toni Caldwell, president, legislative chair, and ASRT senior delegate: I spoke with Cara about a KSRT video, have a meeting coming up with Catalyst lobbyists, spoke with ARRT and ASRT about RA legislation, sent in the election report to ASRT, attended the ASRT House of Delegates, sent board members dates for meetings, spoke with Brian Ralph and Mike Odgren about RA legislation, and responded to an email from the governor's office about the Board of Healing Arts Rad Council position.

Jeskan McGovern, secretary-treasurer: Convention meeting minutes were documented and posted to the KSRT Google Drive. Documentation of the KSRT vote to renew the CD with First Internet Bank was posted to the KSRT Google Drive.

Becky Dodge and Dixie Copeland, education co-chairs: The 2024 convention, the Education Committee has received final convention 2024 numbers.

Income

Registration: \$6,850 Raffle: \$232 Sponsor/Vendor: \$7,515 Starter cash: \$185 Drury Inn reimbursement: \$3,615.38 **Total:** \$18,397.38 **Expenses** Booklet/Postage: \$324.53

Booklet/Postage: \$324.53 Registration refund: \$170.70 Hotel rooms: \$816.16 Raffle: \$96.29 Catering: \$7,980.15 Starter cash: \$185 Draping: \$1,311.50 **Total:** \$10,884.33 **Net profit:** \$7,513.05

They also continue to plan the 2025 convention, which will be April 3-5 at the Hilton Garden Inn in Manhattan, including finalizing the hotel contract, updating the speaker form, setting deadlines, and brainstorming themes for the convention. They need suggestions for a service project. For the 2026 convention, they are discussing locations and checking the spring break dates for all the radiology educational programs.

Jeskan motioned to accept the consent agenda. Kirsten seconded the motion.

**Financial report:** The Drury Hotel reimbursed KSRT. Washburn and FHSU student memberships already have come in. The deposit for the hotel for the 2025 annual convention has been paid. The largest expense is still for our lobbyist who monitors issues and communicates with Toni. Harmony moved to accept the financial report. Kyle seconded the motion.

#### Old business:

Convention: Becky and Dixie brought forward some ideas for the theme for the 2025 convention. Heidi agreed to work on the logo for the convention for "Invisible Heroes Exposed." Becky discussed the fees for the convention; Jeskan moved to approve the fees and Harmony seconded. Motion passed. The vendor fee of \$150 per table will be enforced for the 2025 convention. There was discussion about whether vendors are eligible for staying for the continuing education credits. Service project ideas include something tied to Fort Riley and/or military related. The 2026 convention will be in Hays.

#### New business:

**Radiologist assistant update:** Approaching this as a "stand alone" profession. Toni has been communicating with ASRT and ARRT about funding for pushing this issue forward in Kansas. KSRT will not move forward with this legislation without financial

support from ASRT and/or ARRT. Toni requested feedback from radiologist groups in support of the profession. A Day on the Hill will be in February to promote the RA profession.

**ASRT Financial Assistance program:** The board brainstormed a list of needs that the funding could be used for. Ideas included making a KSRT promotional video, funding portions of the Day on the Hill, wireless lapel microphones, a KSRT vinyl banner, and a new laptop for Jen for the *Anode* newsletter.

**Convention:** Heidi and Jeskan will work on the idea for selling KSRT convention T-shirts.

ASRT House of Delegates: The largest issue, which was tabled, was about midlevel providers (PAs and APRNs) performing fluoro exams. The Connecticut society protested this inclusion, and the issue was tabled. Remote MR imaging and patient care technicians working directly with patients also were discussed. Gale shared how there was discussion about the different pathways technologists must advance their education. Military technologists are trying to become ARRT-registry eligible because they technically do not possess an associate's degree. ASRT currently does not support remote patient scanning. While it is ASRT's current position statement, it is not yet mentioned in the practice standards.

Vacancy for executive secretary: Denise will be stepping down as executive secretary at convention next year.

#### Other business:

Video for KSRT: This could be a jumping off point from the "Be Seen" campaign. Denise recommended getting students more involved.

#### Announcements:

**Meetings:** The fall board meeting will be Oct. 26 with executive committee at 9:30 a.m. and full board at 10. The winter meeting will be Jan. 18th with executive committee at 9:30 a.m. and full board at 10. Both meetings will be on Zoom.

**Adjournment:** Toni adjourned the meeting at 12:37 p.m.

## 2025 KSRT STUDENT COMPETITION



## **Imaging Categories:**

- Cross Table Lateral Hip
- Plantodorsal Axial Calcaneous
- Posterior Oblique L-Spine
- AP Axial Sigmoid
- Most Interesting Case

## **Rules Overview**

- Complete Online form
- Submit in JPEG Format
- Remove or Cover ALL Initials and Patient Information

## **Research Essay:**

- Complete Online Form
- Include a Title Page, an Abstract, and references in APA



## **Online Form Link:**

https://forms.gle/pt39f siMGSNCyqTU8



## **Electronic Scientific Exhibit:**

- Complete Online Form
- Choose a Topic Related to

Radiology. Exhbitit May Include Pictures or Graphics. Exhbitit must be submitted 4:3 Ratio Slide in Landscape Orientation.

## Entry Submissions Due: February 12th, 2025

FULL RULES AVAILABLE ON KSRAD.ORG

Contact the Professional Development Committee with Questions or Electronic Submissions. ksrtprofdev@gmail.com



#### KSRT RADIOGRAPH COMPETITION

The radiograph competition awards are open to members of the KSRT – students or radiologic technologists. The following rules govern the competition.

Essays, Images, and Scientific Exhibit entry forms are due by February 12<sup>th</sup>, 2025. Please use the <u>KSRT Competition Application Form</u> to submit entries. Reach out to the Professional Development Committee with any questions or issues at <u>ksrtprofdev@gmail.com</u>.

#### Categories for the 2025 Annual Convention

- General: X-Table Lateral Hip, Plantodorsal Axial Calcaneus, Posterior Oblique L-Spine
- Contrast: AP Axial Sigmoid

#### ELIGIBILITY

- Any student radiologic technologist or radiologic technologist who is a member in good standing of the KSRT is eligible to compete. A copy of the KSRT membership card must accompany the application form.
- Entry deadline for the Radiograph Competition is February 12th, 2025.

#### \*Members of the Radiograph Competition Committee, the Chair or members of the Professional Development Committee, and the Judge Assistants are not eligible to compete.

#### IMAGE ELIGIBILITY

- 1. Only one radiograph per person per category is allowed.
- 2. No tomographic radiographs will be accepted.
- 3. Images must be in electronic form and submitted using the Competition Application Form.
- 4. Any identifying name or marker MUST be masked. This includes the patient's name, the technologist's name and/or initials, and the name of the institution.
- 5. Right or Left markers must be clearly visible.
- 6. All images must be actual patients and ordered by a physician.
- 7. All radiographs must be taken following the close of the prior annual meeting and **before** the deadline.
- 8. All images must be submitted as a jpg to the online application form, and follow the file naming format: LastnameFirstname\_ImageCategory.jpg.
- 9. All films must be submitted to the Professional Development Chairman by the deadline -February 12th, 2025. Any radiograph submitted after this date will be disqualified from the competition.
- 10. The online <u>Competition Application Form</u> must accompany each entry.
- 11. A copy of the KSRT membership card must accompany the application form. This card was sent via email when registering as a member by ksrt.exsec@gmail.com.

#### HOW TO COVER INITIALS

Films must have student initials on markers removed due to judging purposes. Save the radiographs into a JPG format. Once it is in a JPG format you can open the image in Microsoft Paint or another photo editing software, and proceed to black out the initials using the paintbrush.

#### MOST INTERESTING CASE

Any imaging modality can be used to:

- 1. Demonstrate a rare disease or fracture
- 2. Demonstrate a common disease or fracture
- 3. Normal variants
- 4. Any other unusual findings

Each applicant must submit a **typed synopsis** detailing the following:

- Patient history
- Diagnostic finding
- Related imaging procedures
- Justification as to why the case should be awarded the most interesting case title

#### JUDGING OF CONVENTIONAL RADIOGRAPHS

- Three judges will be selected by the Professional Development Committee. It is suggested that two of the judges be radiologic technologists and the third a radiologist.
- Judges will award each radiograph points according to the given scales and without knowledge of the scores given by the other judges. Each judge will submit their scores to the Radiograph Competition Committee. The decision of the judges will be final. There will be one winner per category no ties.
- There will be a total of 100 points possible scored by each judge for each radiograph in the following categories:
  - o <u>Technical Excellence (30 points possible)</u> detail, density, contrast, radiation protection, collimation, and clarity of anatomical part to be demonstrated compared to the overlying anatomy.
  - o <u>Positioning (60 points possible)</u> marking, alignment of the patient, centering of the anatomical part, proper demonstration of essential anatomy, evidence that proper positioning was achieved.
  - <u>Imaging Processing Excellence (10 points possible)</u> special attention to artifacts, condition of processing solutions, and anything detrimental to the finished radiograph.

#### JUDGING OF MOST INTERESTING CASE

• Three judges will rank the image(s) from 1-5. The image awarded the most points will be the winner. There will be no ties.

#### DISPLAY OF RADIOGRAPHS

• All qualified radiographs entered into the competition will be displayed to the membership during the course of the annual meeting. If this is not feasible, only the top three films in each division and category, and the recipient of the KSRT Outstanding Radiograph Award will be on display.

#### AWARDS

- A first, second, and third place prize will be awarded for each category at the Presidential Banquet during the annual meeting.
- An outstanding radiograph award is given to the highest-scoring radiograph in the competition.
- Awards will be presented at the Presidential Banquet during the annual meeting on April 4th.
- You must be in attendance at the convention and awards ceremony to accept the award.

#### KSRT ELECTRONIC SCIENTIFIC EXHIBIT

The scientific exhibit competition awards are open to members of the KSRT - students or radiologic technologists. The following rules govern the competition.

#### ELIGIBILITY

- Any student radiologic technologist or radiologic technologist who is a member in good standing of the KSRT is eligible to compete. A copy of the KSRT membership card must accompany the application form.
- Entry deadline for the Electronic Scientific Exhibit Competition is February 12th, 2025.

#### SCIENTIFIC EXHIBIT ELIGIBILITY

- Individuals may only submit one exhibit at the annual conference.
- Radiologic technologists and student radiologic technologists may not submit an exhibit entry together in either of the categories.
- The exhibit must be the original work of the individual and cannot be commercially prepared.
- Individual's name or school CANNOT be visible on the exhibit.
- All entries must be submitted as a PDF to the online application form, and follow the file naming format: LastnameFirstname\_ScientificExhibit.pdf.
- The online <u>Competition Application Form</u> must accompany each entry.
- A copy of the KSRT membership card must accompany the application form. This card was sent via email when registering as a member by ksrt.exsec@gmail.com.

#### SCIENTIFIC EXHIBIT CONTENTS AND MECHANICS

- 1. Subject Matter
  - The individual chooses the subject matter of the exhibit.
  - The exhibit should speak for itself and not need additional explanation.
  - The subject should be pertinent to the radiologic sciences and may be supplemented by charts, descriptive material, photographs, etc.
  - Exhibits should demonstrate originality of subject matter, general interest and value from both practical and educational viewpoints, and technical excellence.
  - Exhibits should not show images or markings that could identify the patient, institution, or department.
  - Exhibits should not contain excessive written descriptions.
- 2. Requirements of Exhibit

General

- The purpose of the exhibit is to present your subject matter in a readable viewer-friendly format.
- People of varying degrees of experience will view the presentation, so remember to make points as complete and brief as possible.
- Successful exhibits achieve both coverage and clarity.

<u>Format</u>

- Exhibit must be digital and submitted as a PDF file. The file may not exceed 10MB. This exhibit will be displayed electronically.
- Exhibit dimensions need to be 48" x 36" with a landscape orientation.
- Use a clear, easy-to-read font style. A dark font on a light background is suggested.
- Avoid using font smaller than 24 point.

Content

- The poster display should have a title and content with commentary examples.
- Materials should convey clearly a statement of the problem, project objectives, methodology, significant outcomes, and conclusions.
- Use the AMA 11th Edition or APA 7th Edition style guide for technical presentations.
- Minimize the narrative. Use short, separate paragraphs.
- Numbered or bulleted lists can be a concise, effective way to convey a series of points.
- Material should be presented in a logical sequence.
- Your final conclusions should leave the observers focused on a concise statement of your important findings.

Visuals

- An exhibit display is a visual presentation and should include sufficient images.
- Visuals should enhance your display and should include informative captions.
- Consider the use of charts, drawings, photographs, and illustrations to add graphic impact.
- Use quality images. Copying images from the internet and pasting them to your document may result in pixelated or blurry images. Check the image's dpi prior to including it on the exhibit
- Keep the overall exhibit presentation clean and clear.

#### <u>JUDGING</u>

- The Professional Development Committee will select two or three judges who are radiologic technologists for the scientific exhibit competition. The decisions of the judges will be final and will be based on the following criteria:
  - o Professional Value—Is the project of interest and practicality to technologists and students?
  - o Educational Value- Does the project contain information enabling observation to be an educational experience?
  - o Originality of the Subject Matter- Does the project illustrate a new idea or present information in a new, innovative style?
  - o Technical Quality Is the material presented in a neat, well-organized, and creative manner?
- The following points will be awarded for each of the criteria:

Outstanding – 4 Above Average – 3 Average – 2 Below Average – 1

#### AWARDS

- A first, second, and third place prize will be awarded at the Presidential Banquet during the annual meeting.
- Exhibits with the top three point values will be awarded first, second, and third place respectively. An average of twelve or more points must be achieved to be considered for an award.
- You must be in attendance at convention to accept the award.

# SAVE I DATE

April 3-5 2025 88<sup>th</sup> Annual KSRT Convention Hilton Garden Inn (785.532.9116) 410 South 3<sup>rd</sup> Street, Manhattan, KS 66502 *Watch www.ksrad.org & the Rotating Anode for more details* 

A limited block of sleeping rooms has been secured. The 2 queen or 1 king room rate is \$122 + taxes. Complementary parking and Wi-Fi are included. Reservations may be made online using the QR code or <u>https://www.hilton.com/en/attend-my-event/mangigi-912-6c750860-3aa6-4aae-bf4d-e1d9dd573bf9/</u>. The group code is 912. The group rate cutoff date is March 6, 2025.



#### KSRT ESSAY COMPETITION

KSRT is committed to recognizing excellence in scholarly writing by radiologic technologists and student radiologic technologists. The essay competition is open to members of the KSRT. The following rules govern the competition. The following essay topics may not be used this year due to being awarded at the previous convention: Empathy in Radiology, MRI Breast Imaging and Cancer Detection, and Medical Use of Heavy Ions in Radiology.

#### ELIGIBILITY

- Any student radiologic technologist or radiologic technologist who is a member in good standing of the KSRT is eligible to compete. A copy of the KSRT membership card must accompany the application form. This card was sent via email when registering as a member by ksrt.exsec@gmail.com.
- Entry deadline for the essay competition is February 12th, 2025.

#### MANUSCRIPT PREPARATION

Submitted manuscripts must meet the following requirements:

General Information

- 1. The length of the text should not exceed 15 pages including the title page, abstract, body, bibliography, and appendix if applicable.
- 2. The original (with author information) and one copy of the manuscript (without author information) must be submitted.
- 3. The manuscript must be submitted using the online Competition Application form.

Title Page

- 1. This is a separate page, listing the title of the manuscript, author's name, author's permanent home address, and telephone number, as well as, their institution name and telephone number. The title page should be attached to **only the original copy**.
- 2. To ensure a blind review, the author's name and any other identifying information must not appear anywhere else in the manuscript.

#### Abstract

- 1. Generally should not exceed 75 words, and the abstract should summarize significant information in the text.
- 2. This is best written after the paper is complete.

References

- 1. References must follow the APA 7th Edition, AMA 11th Edition, or MLA 9th Edition style format.
- 2. All non-original artwork, drawings, and photos should be referenced on an individual page.

#### <u>JUDGING</u>

- Three judges will be selected by the Professional Development Committee. One judge must be a registered radiologic technologist and one judge should be an English professor or teacher.
- Manuscripts will be evaluated with the following criteria:
  - Originality, educational/technical value, & scholarship (65%)
    - 1. Evidence of original work performed by the author.
    - 2. Evidence of novel, unique, or unprecedented approach to the topic.
    - 3. Contributes to higher radiological standards.
    - 4. Updates, expands, or enhances existing knowledge.
    - 5. Mastery of subject matter.
    - 6. Research of literature.
  - o Organization of material and mechanics (35%)
    - 1. Is the material orderly and presented in a logical sequence?
    - 2. Are drawings or illustrations used to support or promote understanding of the text?
    - 3. Does the paper follow manuscript guidelines?
    - 4. Is the evidence of proper grammar, spelling, and punctuation?

#### AWARDS

- A first, second, and third place prize will be awarded.
- Awards will be presented at the Presidential Banquet during the annual meeting.
- You must be in attendance at convention and awards ceremony to accept award.

#### **MEDICAL USE OF HEAVY IONS IN RADIOTHERAPY**

By Nathanael A. Fiester, Washburn University Third-place essay

#### Abstract

Heavy Ion Radio Therapy (HIRT) uses heavy ions to treat nonresectable, invasive tumors or cancerous lesions. Using pinpoint pencil beams, the cancerous sites are treated with powerful heavy ions, typically carbon, which deliver a maximum dose of therapeutic radiation while sparing healthy surrounding tissues. High cost and limited stateside research in this field has hindered its use in the United States. Until a recent approval to build one of these heavy ion treatment facilities in Jacksonville. Florida, the chance to use HIRT to treat nonresectable, inoperable tumors has been nonexistent for cancer patients that qualify for this specialized therapy.

High atomic (Z), high-energy particles (HZE) have unique biological properties that can be recreated by scientists within clinical settings using particle accelerators. These isotopes then can be administered precisely to patients' cancer or tumor sites around high-risk areas. Because of the relative biological effects (RBE) of densely ionizing high-energy particles of radiation, this therapy method has been shown to treat inoperable tumors and some types of radio-resistant cancers more effectively than conventional radiation treatments. There are major setbacks for this type of therapy because of the high cost of maintenance and implementation, limited research on efficacy towards certain types of cancers, and lack of trained professionals to implement this specialized treatment.

Conventional radiation therapy (RT) in the United States utilizes linear accelerators for photon therapy as well as particle accelerators for proton therapy. Both are types of radiation therapy used to treat cancer patients. A radiation oncologist initially will prescribe the cancer patient a dose of radiation to be

delivered over a certain number of times (fractions). Fractions are administered on a regimented basis. A schedule for radiation treatments might be, for example, once daily for 5 days a week over 6-7 weeks. This schedule allows cancer cells to be treated regularly while also giving the patient's healthy DNA enough time to recover from potential damage caused by x-ray photon interaction. The treatment dose is measured in Gray (Gy) and varies depending on the type of cancer being treated. During the course of treatment 45 to 60 Gy could be administered to the patient with the daily dose varying from 1.8 to 2.1 Gy per fraction. New research still is needed to expand what fraction dose is best suited for more specialized types of cancers. X-rays and protons used in radiotherapy isolate and target cancers and tumorigenic cells, with the goal of inducing cellular apoptosis, or cell death, to prevent the mutated cellular replication causing the cancerous growth (Cleveland Clinic, 2022).

Structurally, X-ray photons are a single packet of light. When electrons are knocked out of their atomic valence orbits, the atom then is considered ionized. Having been released from their shell, a photon is ejected from the electron and is considered extra radiation which can encounter more healthy tissue, potentially damaging it. X-rays impart damage in the form of aberrations and single strand breaks (SSB) to DNA. SSBs, also called point lesions, occur on only one side of the DNA helix structure. The ability to repair correctly can occur, but with repeated exposures the chance to repair correctly diminishes, and normal cellular mitosis duplicates the transcribed mistakes. Enough mistakes during cell division can lead to the formation of cancer cells. These photons are highly penetrating and can absorb into the patient's body, interacting with tissues they pass through. This can

cause additional damage to adjacent, nontargeted healthy tissue along the x-ray photon's path.

Alternatively, proton radiotherapy (PRT) is generally thought to be safer to surrounding tissue than photon therapy because of the stopping distance associated with the proton particles. One division of HIRT is Carbon Ion Radiotherapy (CIRT). CIRT effectively and accurately can be given to a tumor by implementing the Bragg Peak principle (BNL, n.d.). This is when a certain dose has a calculated stopping point and the entirety of its therapeutic effects can be strategically placed at the tumor site. Further, it works to minimize irradiating superficial and deep tissue relative to the targeted lesion. Thus, PRT is more effective than photon therapy, but not as effective as CIRT at treating cancer (Lühr, et al., 2018).

To understand the significance and advancement of heavy ion particles used to treat cancer, one first must be aware of a few key principles in particle physics. Photons travel isotropically in all directions, and they travel in straight lines. These ions can interact and deflect other particles and may cause continued cascades of radiation emission in human tissue, causing sometimes-irreparable damage. Another principle to be understood is the Theory of Special Relativity, which states that as an obiect moves faster, its observed mass increases. Particles that are accelerated near the speed of light, therefore, have more mass and will cause more damage. This principle is used in Heavy Ion Radio Therapy (HIRT) to deliver higher doses of radiation traveling at near the speed of light, directed towards malignant tissue. This is done in a high-tech medical bay and can be a fantastic option for treating invasive, nonresectable, and hypoxic cancer types (Mohamad, et al., 2017).

For HIRT to work, particle accelerators are utilized to recreate various heavy ions (HZE) for medicinal use in treating tumors or cancers. The medical particle accelerators used for heavy ion treatment of tumors have allowed scientists to recreate and isolate valuable atoms for use in treatment or fractions. Particle accelerators work primarily by smashing elements together and studying the product or the secondary radiation. The byproducts created from those atomic collisions can be studied and tested further. Scientists from all over the world have contributed to advancing this still-developing field utilizing particle accelerators. Extensive research is a must if HIRT therapy is to be utilized more in the United States. Currently, a Mayo heavy ion treatment center is being developed in Jacksonville, Florida, to help with research of other heavy ions and clinical implementation of CIRT.

Lesions too close to vital structures in the body (for example, the heart, vascular structures, liver, pancreas, or deep in the brain, neck, and spinal cord) are the prime targets of heavy ion therapy. The treatment process includes accelerating heavy ion gas particles around a cylindrical tubing encased around magnets helping increase the ion speeds to near 2/3 or 3/4 the speed of light. Magnets inside the cylinder direct and focus specific heavy ion particles for medical radiotherapy. The carbon ion then is directed away from the accelerator to the patient. The medical bays are highly specialized. Patients are laid down and then scanned with either CT, MRI, PET, or multiple modalities. Positron Emission Tomography (PET) can measure cancer sites in the body helping visualize the precise space occupied while also confirming the delivery of the dose administered before the next fraction (Parodi, et al., 2023). Patients are scanned with CT or MRI for visualizing the tumor and scanning the parameters of the growth volumetrically to get an accurate representation of the growth. Gantries rotate precisely around patients delivering exact doses of radiation to the affected area (BNL, n.d.). Comparatively, a

low dose is deposited to skin tissue during PRT and HIRT. The maximum dose is deposited in the cancer or tumor site. PRT does show elevated skin entrance dose compared to CIRT. In terms of delivery, the dose is delivered more effectively in CIRT than PRT with both utilizing their Braggs Peak, which means the stopping distance to the tumor can be adjusted so the dose is directed where it is intended and affects that tissue location. Proton radiation tracts can deviate slightly and can affect surrounding tissue moreso than CIRT (Nickoloff, 2015). In a more advanced way, the entrance skin dose in CIRT compared to PRT lowers the amount of low linear energy transfer (LET) radiation to the surface tissue while delivering the maximum killing power to the deep tumor showing its superior Relative Biological Effectiveness (RBE) in damaging cancerous cells (Mohamad, et al., 2017).

Heavy ion elements including silicon, argon, neon, iron, and carbon have been studied in the past for their medical potential. More heavy ions like fluorine, oxygen, and nitrogen will be studied more to prepare for the future. Only a few HZE ions have been shown to provide any medical benefit to treat cancers; however, new uses continually are being discovered. (Tommasino, F., Scifoni, E., & Durante, M., 2016). Currently, carbon is widely used for its RBE potential, oxygen enhancement properties, and for sparing other surrounding healthy tissues around the tumor site. The element oxygen shows promise and could be a replacement for carbon or used together for combined desired effects (Ying, et al., 2019). This therapy also could be used when traditional proton therapy would not be effective in killing radioresistant cancerous tumors. When heavy ions are targeted to tumor cells, they create concentrated tracts of double strand breaks (DSB) in DNA, severing the strand into two. Unlike lower energy ionizing radiation where single strand breaks (SSB), mutations, and aberrations are more common. DSB in DNA,

commonly seen in proton radiotherapy and HIRT, are much more difficult to repair. This leads to an increased chance of mutation in a patient's cells with continued damaged cell division. Because of the energies of HZE particles, they have a straighter path with less linear deviation when used. This means they do not scatter and ionize healthy tissues surrounding tumors (Pompos, A., Durante, M., & Choy, H., 2016).

There are a few other benefits to using heavy ion particles for radiotherapy. Quicker treatment courses called hypofractionation are used (Hypofractionated Radiotherapy -British Institute of Radiology, n.d.). Patients receive higher doses over a shorter course of treatment, sometimes reducing the overall length of a patient's therapy from 6-7 weeks to 3-5 weeks with certain cancers. This allows patients to resume their day-to-day lives sooner. Cancers surrounding blood vessels too close to major organs can be precisely targeted slice by slice. Cancers deemed inoperable can be reduced or destroyed with pinpoint pencil beams. With current technology, an algorithm referred to as respiratory gating can account for the motion caused by a patient's breathing. The thin beam is programmed to turn on and off at specific times when the subject tissue moves out of frame, minimizing radiation to healthy tissue (Osaka Heavy Ion Therapy Center, n.d.). With more facilities worldwide, patients who meet criteria for this therapy could have more access to the chance of a successful prognosis with HIRT.

There are some drawbacks to heavy ion therapy that have hindered development of HIRT facilities in the United States. Facilities that use heavy ion therapy take up a lot of physical space because of the required synchrotron accelerators. The size of some synchrotrons varies, 18-25 meters wide, not including the facility housing it (Verdú-Andrés, S., Amaldi, U., & Faus-Golfe, A., 2013).

**Continued on Page 16** 

#### **Continued from Page 15**

There are also incredible costs to build the accelerators, operational costs to run the facility, and costs of maintaining the complex machinery. Training for physicians and radiation oncologists currently would require travel overseas to study at international hospitals already practicing this therapy method. Radiation oncologists employed with the Mayo Clinic have been studying and training for the launch of CIRT in 2026 (Pompos, A., Durante, M., & Choy, H., 2016).

Without some private, wealthier individuals' philanthropic donations, even many big, well-funded hospitals could not support the extreme costs. The Mayo Clinic has reported that their endeavor to construct a heavy ion therapy center in Jacksonville will cost an astounding \$233 million (Record, 2022). CIRT treatment is not currently in use in the United States. This will be an exciting area but research in the United States still is needed, leading to lack of FDA approval and coverage from insurance companies. Dr. Steven Buskirk, chair of the Department of Radiation Oncology at Mayo Clinic in Florida, says carbon ion therapy use in the United States would allow for more research into the possibility of multi-modality therapy options for different cancer types (loannou, 2020).

In the final analysis, because of the high RBE of HZE ions and their low LET to surrounding tissue near the cancer site and skin, healthy tissue is spared more effectively with minimal damage while maximizing the dose to the cancer cells when HIRT is used. Damage to cancer cells is lethal and irreparable — that is the goal. Calculated Braggs Peak models delivering these cancer killing doses are fundamental to how HIRT works and shows that it is more efficient than PRT at keeping healthy tissue healthy. The high cost to build these complex, giant facilities and house the synchrotron particles accelerators requires a lot of space and is prohibitive to its widespread

use. The number of qualified radiation oncologists, dosimetrists, and knowledgeable physicians that would occupy and treat from these facilities is limited and highly specialized at this time. CIRT has been studied overseas continuously and collaborations exchanging knowledge already are happening between like-minded professionals. An exciting new field is on the horizon, a potential new modality to learn, a new area of research, new jobs, a new way to approach treating cancer, and new opportunity for individuals to make an impact fighting cancer will be here in the United States.

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KANSAS SOCIETY OF RADIOLOGIC TECHNOLOGISTS

## **Scholarship Application Checklist**

- Kansas Society of Radiologic Technologists member
  - Scholarship application
    - Essay.
- Students: Official transcript in a sealed envelope and letter of recommendation from clinical instructor or other supervising technologist.
  - Technologist: Copy of ARRT card and letter of recommendation from a radiology technology colleague.
    - All materials should be in one envelope and postmarked by Feb. 1. Mail to: Denise Orth, RT(R)(M), FKSRT KSRT Executive Secretary 1702 Mermis Ct. Hays, KS 67601

• Winners will be notified and must attend the Kansas Society of Radiologic Technologists Spring Convention to receive the scholarship.



#### KANSAS SOCIETY OF RADIOLOGIC TECHNOLOGISTS Scholarship Application Deadline is Feb. 1

#### I. Applicant Certification

I certify that I am a U.S. citizen, U.S. national or U.S. permanent resident, that this application information provided is true and correct to the best of my knowledge. I understand that any false statements made herein will void this application, and I will be ineligible for support from the KSRT Scholarship Fund. I hereby authorize the release of all information contained in this application packet as may be required to determine my eligibility for a scholarship. I hereby waive my rights to review any documents pertaining to my scholarship application once submitted.

Signature of Applicant		Date		
II. KSRT Member I am a member. Years of membership	I am	_ I am sending in my membership now		
III. Personal Information				
Mr. Ms. Name				
Last	First	MI		
Mailing Address	City	State Zip		
E-mail				
Phone ()				
ARRT Certifications	ARRT #:			
IV. Educational Information Radiologic Science Program				
Name of I Program Director	nstitution	City/State		
Email Address	Phone (	))		
Anticipated Graduation date	/ Year	GPA		
Program Type	Area/Concentration			
<ul> <li>Certificate Program</li> </ul>	<ul> <li>Medical Imaging</li> </ul>	<ul> <li>Radiation Therap</li> </ul>	у	
<ul> <li>Associate degree program</li> </ul>	<ul> <li>Nuclear Medicine</li> </ul>	<ul> <li>Sonography</li> </ul>		
○ Bachelor's program	○ Vascular	• Other		
V. Letter of recommendation				
Name:				
Position:				
Eman address:				

#### VI. Essay

Please provide a one-page typed essay describing why you deserve this scholarship. For objectivity purposes, do not include any statements that would identify your school/instructors or yourself. The essay shall be 12 point font Arial with single spacing and 1-inch margins.

Applications will not be considered if not complete. Please submit application and transcript to: Denise Orth, KSRT Executive Secretary 1702 Mermis Ct., Hays, KS 67601

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