AAOS
American Association of Orthopaedic Surgeons

May 14, 2024

Allison Oelschlaeger
Director and CMS Chief Data Officer
Office of Enterprise Data and Analytics
Centers for Medicare and Medicaid Services
Department of Health and Human Services

Submitted electronically.

Dear Director Oelschlaeger:

On behalf of over 39,000 orthopaedic surgeons and residents represented by the American Association of Orthopaedic Surgeons (AAOS), we are writing to provide feedback and suggestions in response to the Research Data Request and Access Policy Changes Request for Information. Medicare claims data is integral to our registries' ability to leverage data to help our members improve the value of care they deliver to their patients. We appreciate the opportunity to comment on these proposed changes prior to their implementation.

As you are aware, the inability for AAOS to access Medicare claims data easily, regularly, and cost-effectively as a Qualified Clinical Data Registry (QCDR) has been a significant obstacle for the research and quality improvement capacities of our registries. The Medicare Access and CHIP Reauthorization Act (MACRA) included a provision, Section 105(b) "Expanding the Availability of Medicare Data", which was supposed to have taken effect on July 1, 2016, and would have granted QCDRs access to Medicare claims data for quality improvement and studies of patient safety. It is our understanding that CMS chose to instead use an existing process to comply with Section 105(b) due to a lack of new funds for this requirement. CMS later announced that they would not adopt the directive from Congress to grant QCDRs access to Medicare claims data and asked that registries apply to become "Quasi Qualified Entities" to obtain Medicare claims data, a lengthy process which does not satisfy the requirement of MACRA.

Likewise, the Chronic Conditions Warehouse (CCW) Virtual Research Data Center (VRDC) is intended for research studies and not to meet the ongoing needs of a QCDR. **The AAOS Family of Clinical Registries are a key source of quality analysis outcomes and industry reports for device survivorship.[1] It is highly likely that, should this proposal to shift all analyses to the CCW VRDC become finalized, the costs of additional resources and the rapid shift in structure of industry partnerships will render AAOS unable to continue producing these reports that are critical to ensuring patient safety.** We hope that the suggestions made below in our response to this RFI will resolve many of the challenges caused by the current system.

1: CCW VRDC Processes/Access

[1] Please refer to the full list of AAOS Journal Publications and Presentations in Addendum A of this letter.

1. How much lead time will you need to transition your research study into the CCW VRDC? Please include details about the steps you will take, and the anticipated timeframes associated with each step.

   AAOS uses CMS data for studies and quality improvement and the volume of data to be uploaded into the VRDC would be problematic. From an analytics point of view, this is a difficult question to answer as our staff has no experience working with the VRDC and we are unsure of the time commitment it will take to learn how to use the system. We anticipate we will likely need multiple training sessions with CMS or ResDAC to reach the point where our staff is confident enough to start using the system for our analytics.

   Additionally, based upon current understanding of the VRDC and limitations related to data that can be taken out of the VRDC (including the output review process), this will severely impact all current workflow processes (in addition to analytical codes as noted below) and may require additional staff to support this new model.

   From a HIPAA perspective, we cannot simply turn over PHI to a third party. Would need to consider a sub-BAA and appropriate vendor security assessment, as well as ensure that the CCW VRDC complied with the regulatory and contractual obligations we have with our participants. We would also need to ensure that the CCW VRDC has functionality to create LDS or Deidentified data sets for research purposes since that is a limitation in our participation agreements.

   The CCW VRDC is structured for research studies, not QCDRs/quality improvement registries where we have the ability to analyze data for quality improvement purposes, and there are much tighter constraints around the type of datasets we can analyze for research purposes.

2. What hurdles or challenges do you anticipate you will have with working in the CCW VRDC?

   As mentioned above, this change will have a significant impact on workflow processes, staff allocations and analytic and research outputs. It would likely require a complete revamp of our Registry Analytics Institute. Sufficient training in how to use the system, capabilities, limitations, and timelines for review periods before the change goes into effect is a must. We also need to be able to test how our legacy reporting codes function within the VRDC before we are required to make the switch. Our primary concern is that many of the analytical codes we have used over the last several years might not function the same way in this system. As a result, they may need significant modifications requiring considerable investment in staff resources which would result in a substantial impact on operational budgets as well as delays in our ability to publish research and publications.

3. Is there specific training or assistance you will need to be successful in the CCW VRDC? If possible, please indicate the level of training needed and on which tools.

   Certainly, there will be a lot of training needed by staff to learn how to use the VRDC system. Some of our concerns are:

- *From both an operational and legal perspective, uploading our data to the system may not be feasible. Operationally, we have nearly 4 million procedures. As mentioned above, legally we cannot simply turn over PHI to a third party. We would need to consider a sub-BAA and appropriate vendor security assessment and ensure that the CCW VRDC complied with the regulatory and contractual obligations we have with our participants. We would also need to ensure that the CCW VRDC has functionality to create LDS or Deidentified data sets for research purposes since that is a limitation in our participation agreements.*

- *We currently rely on a unique patient identifier provided to us by ResDAC for linking our registry data with CMS data. We receive this identifier when the physical files are shipped to us by CMS. If we are no longer going to be able to get these files from CMS, then we will need to be trained in how to create this identifier so that we may link our data.*

- *Is there anything we need to know about running statistical software like SAS and R within the VRDC that is different from running those programs in a regular programing environment? What ability is there to import existing code, or would this require re-write of existing code and models currently used?*

- *Can we store analytic datasets for specific projects within the system, and if so, how? How much storage space do we have?*

- *If all analytics were run through the CCW VRDC (requiring that dataset linking/creation be done through that platform), where/how could we store datasets? Would that all need to be through the system? If so, we may have contractual retention requirements above and beyond what CCW VRDC maintains.*

There are certainly additional training questions that we will have in the future but given that the AAOS staff has no experience with this system, we are troubled that this proposal could move forward at a hastened pace while so many questions remain unanswered.

4. Would you consider moving your research study to the CCW VRDC prior to the implementation of the new CMS policies? If so, why and when?

   There are simply too many unknowns about how all our work processes will be affected by having to use the VRDC that this would not be possible. At a minimum, the possibility of a test project must be considered if this will move forward. All of AAOS' projects depend on staff being able to link to CMS data and access all reporting output right away and without review. The only way we can know for sure what effect the VRDC requirement will have on our projects and work processes is if we can test out the system before we are required to switch to it.

5. Are there research studies that you expect to complete in 2024 or 2025? If yes, please provide the Data Use Agreement (DUA) number and expected completion date.

Yes. Nearly all our analytic projects rely on our ability to link to CMS data. The DUA number is RSCH-2018-51967. This DUA is renewed every year in April.

6. How many seats/users do you anticipate having on your research study once transitioned into the CCW VRDC?
    a. Do you anticipate using the Statistical Analysis Software (SAS) only or the full VRCD option? For information on the CCW VRDC access options, please review the *About the VRDC and Requesting Access* page identified in the announcement.

       Currently, there are 6 internal staff analysts and 3 additional external consultants who would need access to the data, thus 9 users in total. AAOS primarily uses SAS, but we also use other open-source programs, such as R and Python. It is concerning that we must incur additional costs for the full VRDC option just so that we can run our codes in these programs, particularly considering that both are open source.

    b. Will your research study require the purchase of additional space or Databricks credits?

       We do not yet have a good understanding of how storage works within the VRDC but given the size of our registry and the number of analytic datasets we save for different studies/projects, we will likely need extra space if we will be required to save our datasets within your system. This raises another concern beyond what was mentioned above. At present, it is free for us to save our data sets on local secured drives. However, if we are required to save our data within your system, this will add additional costs to our organization just for the simple task of saving datasets.

2: CCW VRDC

1. What analytic tools, program languages, or specific analytic packages and libraries are you using for your research study?

    a. Are you using any analytic tools that are not currently available in the CCW VRDC?

       Approximately 90% of our analytics are done in SAS, about 7% in R, 2% in SQL and 1% in Python. Your website states that we would need to purchase additional databricks to be able to run our R, SQL and Python code. This will be another cost hardship for our organization incurred by switching to the VRDC. Not only is it concerning that programs like R and Python are not part of the base VRDC package, but it is also curious that we have to pay extra money for an add-on package simply to be able to access programs that are, themselves, open source. While one may argue that we could convert our legacy R, SQL and Python code into SAS code to avoid the extra cost, doing so would also present a significant and burdensome undertaking on our part. It would further require significant testing and validation on our part to ensure that the new SAS code produces the same results as our legacy code in the other programs.

2. If you are using analytic tools not currently available in the CCW VRDC, please describe the workstation used to perform research (Central Processing Unit (CPU), memory, Operating System (OS), number of workstations, etc.).

   The programs that we use are available in the VRDC, but it is concerning that some of the programs we use will require us purchasing additional access/databricks for the reasons listed above.

3: Data/Project

1. Do you have data files that will need to be uploaded into the CCW VRDC to complete your research? If so, please describe the data and provide details about the files (format, size, etc.).

   If we understand the new policy correctly, we believe we will be required to upload our data to the VRDC to run our analyses. If that is the case, then yes, we will have to upload our data, which is usually in the form of SAS datasets. Across all our registries, we have nearly 4 million patient records. The analytics team typically works off quarterly snapshots of the registry, which would need to be uploaded each quarter. Each quarterly snapshot is structured as a relational database with 42 separate tables. We also create a single standard quarterly analytic dataset with common variables used for analysis, which is built from those 42 tables in the relational database.

2. Do you have project-specific code that will need to be loaded to your CCW VRDC workspace? If so, please describe and provide details about the code (format, size, volume, language, etc.).

   Yes. It is primarily SAS code, but we also have some R, SQL and Python code. Select analytic projects we conduct are repeatable, and we have standard SAS and R codes to run those reports. Other projects that are less standardized require us to write more ad-hoc codes to complete that analysis. The majority of our codes are several thousand lines in length.

3. Please estimate the amount of data storage growth per year for your DUA, including the total size of current data in your environment and amount of data imported and generated each month.

   We do not have a precise estimate but given that we work off a new snapshot each quarter, however, we suspect that we will run out of space within the VRDC often. Our registries are growing every day, so each quarter, the number of patient records will increase by roughly 100,000 to 150,000. We currently can access prior quarter snapshots should we need to modify a past study, for example when responding to peer-review comments for a journal article submission. We believe that, should this proposal be finalized, we will be forced to delete prior quarterly snapshots to conserve space within the VRDC, so as to avoid incurring costs for additional space.

4. How long does your data need to be retained for your research?

   The proposed CMS policy of retaining the data for 3 years seems reasonable. We have been considering instituting a similar policy by adding a disclaimer suggesting that primary investigators (PI) submit the

paper to a journal within three years and stating that we will delete data sets after that time. Since AAOS has not officially instituted that policy, we will occasionally receive requests to make additions to a study that was done over three years ago. However, that does not happen with enough frequency to warrant the extra resources required by continuing to store that data. Furthermore, we are continuously improving and updating our methodologies, so the PI would benefit from updating the study with newer data.

4: Data Access Fees

1. How does your organization currently cover costs related to IT infrastructure, security, software licensing, etc. when physically receiving CMS data, and what are estimates of these costs? What is the scope of anticipated cost savings your organization could realize by not paying for IT infrastructure, security, software licensing, etc. related to maintaining a physical copy of CMS data?

   At present, the monetary cost of obtaining Medicare claims data through the ResDAC process is nearly prohibitive. AAOS is anticipating that the cost of this data will escalate as the AAOS Family of Clinical Registries grows and the volume of requests increases significantly, both for additional years of claims as well as for new patients in the Registries. As it currently stands, the process costs approximately $80,000-$100,000 per year depending on the data set requested. The current costs for IT Infrastructure, Security and Licensing related to CMS data using our current processes are calculated as a subset of our overall costs for IT needs within the Academy. Moving to the VRDC would increase those costs as related to storage (data block costs), security costs (associated with vetting and documenting a new process) as well as potential infrastructure/FTE costs to ensure secure transmission of data. Specifically, the storage costs alone are currently at 1.5 Tb's (Terrabytes) at a cost of $267.86 per year (for 7 years) for a total of $1,875 over the course of 7 years. However, given the proposal to shift away from any physical data, we anticipate all the associated costs for IT will increase substantially.

2. How many people are currently associated with your research project that request access to record-level (i.e., non-aggregated) data? How do you anticipate the new policies would affect the number and team structure of researchers accessing record-level data for your project, and what would be the impact of any changes? Could some members of your project team contribute at the same level by reviewing aggregated output?

   Our analytics team requires full access to identifiable patient records. This would be required for 9 people in total. Switching to a per seat subscription model will be very cost prohibitive for us compared to the current physical file system and have a detrimental impact to the registry program's growth.

3. Could other types of lower-cost CCW VRDC access meet your needs (e.g., a viewer role that doesn't have access to any analytic tools or software)? If so, what types of roles would you need?

   No. All our analysts would need access to the full range of analytical tools in the VRDC.

4. How do your anticipated CCW VRDC fees compare to the total data access fees and internal IT costs associated with your research project?

While it is difficult to anticipate a total cost comparison for using the VRDC system without additional details from CMS on the training provided, and at what cost, the anticipated cost of adding new analysts to the team would require $15,000-18,000 extra per analyst to the budget, in addition to the salary of each analyst. This is a significant sum for non-profit organizations like AAOS, which use the research from our family of clinical registries to support device surveillance and improve patient outcomes.

5. CMS is required to recoup the cost of making data available to researchers to allow the agency to continue offering this important service. Do you have suggestions for an alternative fee structure that would allow CMS to recoup fees associated with VRCD use?

   The AAOS suggests that CMS strongly consider the viability of establishing a subscription style service for real-time, continuous access to the Medicare claims data necessary for AAOS and other similar registries to access data within and beyond the VRDC. The cost of the subscription would benefit CMS by offering an annual, reliable payment that would be structured to contractually be paid over a predetermined number of years. As opposed to multiple, one-off requests for physical shipments of data from various research and clinical registry entities, this subscription fee would offer CMS the stability of funds to hire an FTE within CMS that would be tasked with efficiently handling the multiple data requests made by AAOS and similar groups.

   Instead of charging the higher, one-off fees that we currently face at an escalating rate, this subscription fee would be discounted given the contractual guarantee for multiple years and predictable requests for data from the requesting party. In the case of the VRDC, this would also assist the CMS research team in lowering the burden for troubleshooting access for researchers and would streamline the process for registry staff.

6. How many student dissertation projects does your organization expect to conduct an annual basis? Based on use, do you have suggestions for the fee structure for dissertation projects?

   We currently do not have any student interns that would require access to CMS data, although this could change in the future.

7. Would it be valuable for CMS to expand the dissemination of lower-cost limited data sets that would not require VRDC access to promote more training and research opportunities for students and other researchers?

   This may be of some value but would depend upon what elements the limited data set would contain.

5: Transition Timing

1. CMS announced plans to require all new RIF Data Use Agreement (DUA) requests to access RIF data within the CCW VRDC beginning on August 19, 2024. If 6 months of advance notice about this change is not

sufficient, how much notice would allow you to prepare for this transition? In the interim, what additional security assessments and conditions would you prioritize to address growing security and privacy risks?

Given our existing DUA, AAOS is hopeful that we can still obtain physical files in 2025 and 2026. It would be extremely cumbersome to try to make the switch in a timeline shorter than at least two years. Specifically, we are concerned that the existing codes we use within SAS, R and SQL may need to be significantly modified upon the switch to the VRDC, should that be finalized.

Considering the recent and pervasive impact of the Change Healthcare/Optum cybersecurity incident, we implore CMS and the Department of Health and Human Services (HHS) to move cautiously toward a cloud-based enterprise like the VRDC. Although there are certainly patient privacy and security concerns related to the physical shipment of data, the risks of hastily moving all research and registry entities to the VRDC cannot be overstated. With this in mind, we believe that at a minimum, at least two full years to transition is judicious.

2. To cover growing costs associated with physical data delivery, CMS is updating fees for physical delivery of CMS data beginning on August 19, 2024. If 6 months of advance notice about this change is not sufficient, how much notice would allow you to prepare for the updated data fees?

   The AAOS Registry program manages registries at varying stages of development. As previously communicated to CMS in a letter from Dr. Kevin Bozic dated April 26, 2023, the current fee structure is already nearly prohibitive and has increased to over $100,000 per year.[2] Under this new model and based upon the fee structure provided and our current understanding of the VRDC, these costs would more than double on an annual basis. This would require, at minimum, to secure other funding sources or seek alternative solutions as the program cannot currently absorb this level of cost increase. Additionally, this may severely impact current funding sources that rely on the outcomes reporting made possible by the CMS data linkage.

   Specifically, AAOS uses this data to analyze and regularly publish device-level survivorship data, thus ensuring that orthopaedic implants are performing as expected. It is important to incentivize the creation and ease of managing of QCDRs as the U.S. population ages and the health care sector moves to more value-based investments. QCDRs help with improving population health outcomes, effectiveness of care pathways and surveillance of drugs and devices. To create a sustainable future for the Medicare program, policy makers must focus on ease of access and interoperability of Medicare data to aid in decision making and quality improvement. Implementing such a short timeline for the changing fee structure would create a significant impediment to AAOS QCDRs providing this data which is critical to patient outcomes.

3. What other factors not addressed above should CMS consider in determining transition timing for phase 1 or phase 2?

[2] https://www.aaos.org/globalassets/advocacy/issues/aaos-medicare-claims-data-letter_april-2023.pdf

It is important not to underestimate the amount of training that staff at any organization will need to make this transition. We would appreciate having enough time before the transition so that we can test how our processes function within the VRDC before being required to switch to it. If our legacy codes that we have been successfully using for several years suddenly do not function within the VRDC, then that will significantly inhibit our ability to complete our analytic projects in a timely manner, since we will have to spend more time on troubleshooting.

We are also extremely concerned about the requirement that all statistical output be reviewed by CMS staff before we can download it. The CMS website states that the expected wait time is two days, but with the increase in volume should everyone now be required to use the VRDC, we suspect that these wait times will likely increase to significantly more than just two days. But even if we assume that CMS will be able meet this turn-around time, the VRDC requirement would at best increase project timelines by at least two days for every single analytic project we do. While this may not seem like much for a single research project, our team conducts dozens of research studies every year, with each depending on CMS linkage. Adding two days to all our projects would drastically constrain our team's ability to clear out our workflow queue in a timely manner.

AAOS is appreciative of the opportunity to respond to this Research Data Request and Access Policy Changes Request for Information. Based on our analysis, the changes proposed by CMS are intended to suit the needs of a research portal. Unfortunately, they do not address many of the concerns we have previously raised regarding the data access and associated costs for QCDRs that are focused on providing critical data and device feedback to industry and patients. **Should this proposal to shift all analyses to the CCW VRDC become finalized, particularly within the truncated timeline suggested, the costs of additional resources and rapid shift in structure of industry partnerships will have a detrimental impact on analysis of quality outcomes, patient care, and the industry reports AAOS produces for device manufacturers using our analyses. The overall shift in method and process would be a fundamental change to the way that our registries operate. Though we have attempted to account for the many means by which this rapid move would disrupt our work, we cannot overstate the concern we have that it may render it impossible for AAOS to calculate orthopaedic device survivorship accurately.**

We urge CMS to reconsider using the proposed CCW VRDC process for QCDRs and instead request that the agency create a pathway for data requests and delivery that fulfills the original directive of the MACRA Section 105(b) requirements for QCDRs to obtain Medicare claims data.

Thank you for your time and attention to the concerns and suggestions of the American Association of Orthopaedic Surgeons (AAOS). We look forward to working closely with CMS to further improve the healthcare system and enhance the care of musculoskeletal patients in the United States. Should you have questions on any of the above comments, please do not hesitate to contact Shreyasi Deb, PhD, MBA, AAOS Office of Government Relations at deb@aaos.org.

Sincerely,

Paul Tornetta III, MD, PhD, FAAOS
AAOS President

cc: Annunziato Amendola, MD, FAAOS, First Vice-President, AAOS
Wilford K. Gibson, MD, FAAOS, Second Vice-President, AAOS
Thomas E. Arend, Jr., Esq., CAE, CEO, AAOS
Nathan Glusenkamp, Chief Quality and Registries Officer, AAOS
Lori Shoaf, JD, MA, Vice-President, Office of Government Relations, AAOS

Addendum A

Journal Publications

1. Dislocation Rates of Primary Total Hip Arthroplasty in Patients with Prior Lumbar Spine Fusion and Lumbar Degenerative Disc Disease with and without Utilization of Dual Mobility Cups: A Joint Registry Study. Malkani AL, Nessler JM, Mullen KJ, MPH; Yep PJ, Richard L. Illgen II, MD. J Journal of the American Academy of Orthopaedic Surgeons. 2023;31:e271-e277. DOI: 10.5435/JAAOS-D-22-00767
2. Timing and Factors Associated with Total Knee Arthroplasty Infection. Engh CA, Yep PJ, Donnelly PC, Hopper RH and Mullen KJ. Journal of Arthroplasty. 2023 Jun;38(6S):S308-S313.e2. doi: 10.1016/j. arth.2023.03.054
3. Increased Revision Risk With Mobile Bearings in Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry. Vishal Hegde MD, Jamil Kendall MD, Kathryn Schabel MD, Christopher E. Pelt MD, Patrick Ye, MS, MPH, Kyle Mullen MPH, Ayushmita De PhD, Ryland Kagan MD. Journal of Arthroplasty. 2023 Jan 11;S0883-5403(23)00007-4. doi: 10.1016/j. arth.2023.01.007
4. Highlights of the 2022 American Joint Replacement Registry Annual Report. Vishal Hegde, MD, Jeffrey B. Stambough, MD, Brett R. Levine, MD, and Bryan D. Springer, MD. Arthroplasty Today. 2023 Jun; 21: 101137. doi: 10.1016/j.artd.2023.101137
5. Dual Mobility Articulation in Revision Total Hip Arthroplasty: An American Joint Replacement Registry Analysis of Patients Aged 65 years and Older. Jesse E Otero, Nathanael D Heckman, Heena Jaffri, Kyle Mullen, Susan M Odum, Jay R Lieberman, Bryan D Springer. Journal of Arthroplasty. 2023 May 23;S0883- 5403(23)00547-8. doi: 10.1016/j.arth.2023.05.023
6. Cemented Femoral Fixation in Total Hip Arthroplasty Reduces the Risk of Periprosthetic Femur Fracture in Patients 65 Years and Older: An Analysis From the American Joint Replacement Registry: Mackenzie Kelly MD, Antonia F. Chen MD, MBA b, Sean P. Ryan MD c, Zachary M. Working MD Kimberly R. Porter PhD, MPH, Ayushmita De PhD, Kyle Mullen MPH, Ryland Kagan MD. Journal of Arthroplasty. 2023 Apr 25;S0883- 5403(23)00395-9. doi: 10.1016/j.arth.2023.04.039
7. The epidemiology of antibiotic loaded bone cement and systemic antibiotic prophylactic usage in primary cemented or hybrid total knee arthroplasty among countries in Africa, Europe, North America, and Oceania: A register based descriptive international study 2010-2020. Tesfaye Hordofa Leta, Anne Marie Fenstad, Stein Håkon Låstad Lygre, Stein Atle Lie, Martin Lindberg-Larsen), Alma B Pedersen, Annette W-Dahl, Ola Rolfson, Erik Bülow, James A Ashforth, Liza N vanSteenbergen, Rob Nelissen, Dylan Harries, Richard de Steiger, Olav Lutro, Keijo T Mäkelä, Jinny Willis, Michael Charles Wyat, Christopher Frampton, Alexander Grimberg, Arnd Steinbrück, Yinan Wu, Cristiana Armaroli, Marco Molinari, Roberto Picus, Kyle Mullen, Richard Illgen, Ioan C. Stoica, Andreea Vorovenci, Dan Dragomirescu, Havard Dale, Christian Brand, Bernhard Christen, Joanne Shapiro, J. Mark Wilkinson, Richard Armstrong, Kate Wooster, Geir Hallan, Jan-Erik Gjertsen, Richard Chang, Heather A Prentice, Elizabeth Paxton, Ove Furnes. 2023 (94). Acta Orthopaedica. Doi.org/10. 2340/17453674.2023.17737
8. Increased Revision Risk With Mobile Bearings in Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry. Vishal Hegde MD, Jamil Kendall MD, Kathryn Schabel MD, Christopher E Pelt MD, Patrick Yep MPH MSP, Kyle Mullen MPH, Ayushmita De PHD, Ryland Kagan MD. Journal of Arthroplasty. 2023. July 2023. doi.org/10.1016/j.arth.2023.01.007

Conference Posters and Presentations

9. Is American Joint Replacement Registry Data Consistent with International Survivorship in Knee Arthroplasty? A Comparative Analysis. Bryan D. Springer MD, James I. Huddleston MD, Kyle Mullen MPH, Patrick Donnelly MS, Edward Caton, Keith Tucker MD. 2023 Knee Society Podium Presentation. Sept 7-9. Monterey, CA

10. Is American Joint Replacement Registry Data Consistent with International Survivorship in Hip and Knee Arthroplasty? A Comparative Analysis. Bryan D. Springer MD, James I. Huddleston MD, Kyle Mullen MPH, Patrick Donnelly MS, Edward Caton, Keith Tucker MD. Poster Presentation. 2023 AAHKS Annual Meeting. November 2-5. Gaylord, Texas. Poster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

11. Equivalent Rates of 90-day Revision for Instability Between Dual Mobility Total Hip Arthroplasty and Hemiarthroplasty for Acute Femoral Neck Fractures. Brenden A Shi. Kyle Mullen MPH, Olivia Sterling, Alexander Stavrakis MD. ePoster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

12. Does Resurfacing the Patella Increase the Risk of Extensor Mechanism Injury Within the First Two Years After Total Knee Arthroplasty? David E. DeMik, MD, PharmD; Juan David Lizcano, MD; Emily Jimenez, MPH; Jess H. Lonner, MD; Chad A. Krueger, MD. ePoster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

13. Effect of Robotic Assistance on Early Revisions and Aseptic Loosening in Cementless Total Knee
September 19-23. Boston, MA.

14. Antibiotic Laden and Non-Antibiotic Bone Cement in Primary Total Knee Arthroplasty: Does Antibiotic Laden Bone Cement Reduce Acute Periprosthetic Joint Infection? Blake O. Nourie, MD, Nicholas F. Cozzarelli, BS, Patrick Donnelly MPH, Chad A. Krueger, MD, Yale
Fillingham, MD. Presentation. 2023 Pennsylvania Orthopaedic Society. September 27-29. Philadelphia, PA. Presentation. 2023 Eastern Orthopaedic Association. October 25-28. Charleston, SC. ePoster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

15. Periprosthetic Fractures: A Rising Tide of Total Hip Arthroplasty failures noted in the American Joint Replacement Registry and the role of Cemented Stems in preventing them. Adam A Sassoon MD MS, Ayushmita PhD, Ryan D. Stancil MD, Daryl F Cannady MD, Jeremiah Taylor MD, and Emily Jimenez MPH. Podium Presentation. 2023 AAHKS Annual Meeting. November 2-5. Gaylord, Texas. ePoster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

16. Effects of Gender and Fixation on the Outcomes of Hemiarthroplasty for Femoral Neck Fracture:
Analysis of the American Joint Replacement Registry. Anna Cohen-Rosenblum MD MSc, Susan Odum PhD, Ayushmita De PhD, Kara Sarrel MD, Bryan Springer MD. 2023 Hip Society Annual Meeting. October 5-8. Durham, NC. Poster Presentation. 2024 AAOS Annual Meeting; February 12-16. San Francisco, CA.

17. Periprosthetic Fractures: A Rising Tide of Total Hip Arthroplasty failures noted in the American Joint Replacement Registry and the role of Cemented Stems in preventing them. Adam A Sassoon MD MS, Ayushmita PhD, Ryan D. Stancil MD, Daryl F Cannady MD, Jeremiah Taylor MD, and Emily Jimenez MPH. Poster Presentation. 2023 Western Orthopaedic Association. Coeur d'Alene, ID. August 2-5. Poster Presentation. 2022 12th International Congress of Arthroplasty Registries, May 13-15 in Montreal, Canada.

18. The epidemiology of antibiotic loaded bone cement and systemic antibiotic prophylactic usage in primary cemented or hybrid total knee arthroplasty among countries in Africa, Europe, North America, and Oceania: A register based descriptive international study 2010-2020. Tesfaye Hordofa Leta, Anne Marie Fenstad, Stein Håkon Låstad Lygre, Stein Atle Lie, Martin Lindberg-Larsen), Alma B Pedersen, Annette W-Dahl, Ola Rolfson, Erik Bülow, James A Ashforth, Liza N vanSteenbergen, Rob Nelissen, Dylan Harries, Richard de Steiger, Olav Lutro, Keijo T Mäkelä,

Jinny Willis, Michael Charles Wyat, Christopher Frampton, Alexander Grimberg, Arnd Steinbrück, Yinan Wu, Cristiana Armaroli, Marco Molinari, Roberto Picus, Kyle Mullen, Richard Illgen, Ioan C. Stoica, Andreea Vorovenci, Dan Dragomirescu, Havard Dale, Christian Brand, Bernhard Christen, Joanne Shapiro, J. Mark Wilkinson, Richard Armstrong, Kate Wooster, Geir Hallan, Jan-Erik Gjertsen, Richard Chang, Heather A Prentice, Elizabeth Paxton, Ove Furnes. Podium Presentation. 2022 12th International Congress of Arthroplasty Registries, May 13-15 in Montreal, Canada.

19. Femoral Component Design Influences Risk of Periprosthetic Femur Fracture After Total Hip Arthroplasty: An Analysis from the American Joint Replacement Registry. Mackenzie Kelly, MD, Antonia F Chen, MD, MBA, Sean P Ryan, MD, Zachary Working, MD, Ayushmita De, PhD, Kyle Mullen, MPH, Kimberly Porter MPH, PHD, Ryland Kagan, MD. Poster Presentation. 2022 12th International Congress of Arthroplasty Registries, May 13-15 in Montreal, Canada.

20. Collared femoral stem design for total hip arthroplasty reduces risk of periprosthetic femur fracture in patients 65 years or older: An Analysis from the American Joint Replacement Registry. Mackenzie Kelly MD, Antonia F Chen MD MBA MD, Sean P Ryan MD, Zachary Working MD, Ayushmita De PhD, Kyle Mullen, MPH, Kimberly Porter MPH, PHD, Ryland Kagan, MD. Podium Presentation. 2022 12th International Congress of Arthroplasty Registries, May 13-15 in Montreal, Canada.

21. Analyzing utilization rates of premium technologies in total knee arthroplasty between safety-net hospitals and non-safety-net hospitals. Andrew G. Chapple PhD, Peter C. Krause MD, Stefan D. Sarkovich, Vinod Dasa MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

22. Demographics and Outcomes of Commercial Antibiotic Cement Usage for Infection Prophylaxis During Primary Total Knee Arthroplasty In Patients Over 65 Years Old: An American Joint Replacement Registry Study. Benjamin Ricciardi MD, Caroline Thirukumaran PhD, John G. Ginnetti MD, Kimberly Porter PhD, Nathan Kaplan MD, Thomas G. Myers MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

23. Femoral Component Design Influences Risk of Periprosthetic Femur Fracture After Total Hip Arthroplasty: An Analysis from the American Joint Replacement Registry. Antonia F. Chen MD MBA, Ayushmita De PhD, Kimberly Porter PhD, Kyle Mullen MPH, Mackenzie Kelly MD, Ryland P. Kagan MD, SeanP. Ryan MD, and Zachary M. Working MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

24. Lower Revision Risk with All-Polyethylene Tibial Components in Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry. Adam A. Sassoon MD MS, Ayushmita De PhD, Benjamin Kelley MD, Jamil Kendall MD, John Andrawis, MD, Kyle Mullen MPH, Patrick Yep, Ryland P. Kagan MD. Podium Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

25. Increased Revision Risk with Rotating Platform Bearings in Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry. Christopher E. Pelt MD, Jamil Kendall MD, Kathryn Schabel MD, Kyle Mullen MPH, Patrick Yep, Ryland P. Kagan MD, and Vishal Hegde MD. Podium Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

26. Cemented Femoral Fixation for Total Hip Arthroplasty Reduces the Risk of Periprosthetic Femur Fracture in Patients 65 Years or Older: An Analysis From the American Joint Replacement Registry. Antonia F. Chen MD MBA, Ayushmita De PhD; Kimberly Porter PhD, Kyle Mullen MPH, Mackenzie Kelly MD, Ryland P. Kagan MD, Sean P. Ryan MD, and Zachary M. Working MD. Podium Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

27. Dual Mobility Articulation in Revision Total Hip Arthroplasty: An American Joint Replacement Registry Analysis. Bryan D. Springer MD, Heena Jaffri MPH, Jay R. Lieberman MD, Jesse E. Otero MD, Kyle Mullen MPH, Nathanael D. Heckmann MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

28. Dual Mobility Outcomes in Primary Total Hip Arthroplasty: An American Joint Replacement Registry Analysis. Bryan D. Springer MD, Heena Jaffri MPH, Jay R. Lieberman MD, Jesse E. Otero, MD, Kyle Mullen MPH, Nathanael D. Heckmann MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

29. Revision Rate Following Unipolar vs. Bipolar Hemiarthroplasty. David N. Kugelman MD, Joseph X. Robin MD, Kenneth A. Egol MD, Ran Schwarzkopf MD, Roy Davidovitch MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.

30. Trends in Complications and Outcomes in Patients Aged 65 and Younger Undergoing Total Hip Arthroplasty: Data from the American Joint Replacement Registry. Akash Shah MD, David A. Cieremans MS, James D. Slover MD, Morteza Meftah MD, Ran Schwarzkopf MD. Poster Presentation. 2023 AAOS Annual Meeting; March 7-11. Las Vegas, NV.