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## Neurosurgery Resident Feedback through Artificial-Intelligence

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**OBJECTIVES/GOALS:** Surgical training is constrained by duty hour limits, bias, and a trial-and-error learning process. Surgeon skill variation is a healthcare system disparity that can impact patient outcomes. Incorporating validated, standardized assessment tools and machine learning (ML) algorithms may help to standardize and reduce bias in surgeon education. **METHODS/STUDY POPULATION:** To support assessment tool and ML algorithm development, we are curating an annotated video registry of neurosurgical procedures. Point-of-view video of resident and attending neurosurgeons performing craniotomies is recorded via an eye-tracking headset. A Delphi panel of neurosurgeons will review the video and determine which represent expert versus trainee performance. Neurosurgery attendings will be interviewed to provide descriptions of craniotomies which will be used to develop an assessment rubric. A Delphi panel will determine what rubric components should be maintained. New craniotomy videos will be viewed by attendings in a blinded fashion while completing the assessment rubric. An online feedback platform is being developed allowing residents to prospectively track assessment data. **RESULTS/ANTICIPATED RESULTS:** We anticipate development of an annotated, institutional video database featuring craniotomies performed by residents and attending neurosurgeons. Using a Delphi approach, we anticipate achieving consensus on which videos reflect expert versus trainee performance. We anticipate development of a novel craniotomy assessment rubric that is both valid and reliable. Our online feedback platform will allow prospective tracking of assessment data from multiple sources and enhanced transparency in the feedback process. The video registry and assessment data will enable development of novel ML algorithms able to recognize craniotomy segments and estimate operator skill. **DISCUSSION/SIGNIFICANCE:** Building a video registry of procedures, validated assessment tools, and a prototype feedback platform enables a pipeline for ML algorithm development. Together these tools will help to standardize and optimize resident education translating to earlier operative independence, improved patient safety, and reduced bias during surgical training.

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## Pathway to Independence Award (K99/R00) Funding Trends and Prediction of Future NIH Research Project Funding

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**OBJECTIVES/GOALS:** The objective of this study was to use NIH RePORTER (Research Portfolio Online Reporting Tools) to analyze K99 funding trends and determine if R00 to R01 or R21 achievement time correlates with the future success of an early-stage NIH-funded investigator. **METHODS/STUDY POPULATION:** All award data were collected from NIH RePORTER. All K99 awards and funding data in this study were limited to All Clinical Departments (ACD). All researchers (n = 1,148) and awards (n = 2,022) were identified through

a K99 search from FY 2007 to FY 2022 across ACD. Historic trends in K99 awards and funding from NIH Fiscal Year (FY) 2007 to FY 2022 were investigated. An R00 dataset was generated from NIH RePORTER. The K99 to R00 achievement statistics from FY 2007 to FY 2022 was investigated. NIH annual datafiles for FY 2007 to FY 2021 were aggregated to generate a master datafile of all R01 (n = 395,505) and R21 awards (n = 61,766). R01 and R21 award data were linked to the researcher previously identified through the K99 search. The connection between K99/R00 awardees and subsequent R01 or R21 awards was focused on. **RESULTS/ANTICIPATED RESULTS:** From FY 2008 to FY 2022, the number of K99 awards per year increased 123.4%, from 94 to 210. Over the same period, after correcting for inflation, the NIH K99 budget increased 127.0% while the NIH program level budget increased 17.3%. For researchers who achieved their first R01 or R21 0–3 years versus 3–6 years after the start of their R00, their average funding per year since the start of the R00 phase was \$467,425 versus \$290,604, respectively (p < 0.001). In summary, NIH investment in the K99 award pathway has substantially outpaced the NIH program level budget increase, and there is a strong relationship between average funding per year since the start of the R00 phase and time from R00 to R01 or R21. **DISCUSSION/SIGNIFICANCE:** Our study offers additional evidence of the Matthew effect in science, where previous success generates future success. This analysis may be useful to clinical departments as they evaluate selecting new and retaining current biomedical scientists for independent research positions.

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## Pilot Project Awardees Productivity Award Metrics at The Alliance Idea-CTR

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**OBJECTIVES/GOALS:** Scholarly achievement metrics are essential for academic researchers since they are used for promotion and funding opportunities. Our objective was to create awareness among pilot project PIs about how these scholarly activities are evaluated and about the need for continuous auto-evaluation. **METHODS/STUDY POPULATION:** NIH-sponsored Clinical & Translational Research (CTR) infrastructure grants are a critical mechanism to increase scholarly activity. The Pilot Project Program Core (PPP) of The Alliance IDEa-CTR created a weighted metrics system to evaluate activities including presentations, publications, promotion, honors, & community service. We used the revised evidence-based medicine pyramid to develop the metric instrument. Pilot project PIs received the metric table and met quarterly with a PPP member to discuss progress. The top PIs were acknowledged during the Alliance Research Day with a platform presentation and a monetary award for research expenses or travel to scientific meetings. **RESULTS/ANTICIPATED RESULTS:** During our first 2 pilot project calls (2020–2022) the PPP funded 7 one-year pilot projects for (\$50,000 each). We had a total of 10 PIs, 2 of the projects were MPI. Seven PIs were early or new stage investigators (ESI/NSI). Using the productivity award metric we had a total of 33 presentations, 10 publications, 12 events of community service, and 2 external grant funding. These are significant outcomes considering the pandemics impact on clinical & translational research. A total of 3 awards were given, one award per

year for funding and an overall award. The activity was well received by the PIs who actively participated in the tracking of their scholarly activities using the metric. **DISCUSSION/SIGNIFICANCE:** Productivity metrics are crucial for the career development of ESI and NSI by raising awareness regarding the importance of scholarly activities in their career. This activity will help them track their productivity in an ongoing manner while becoming independent researchers.

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### **Pursuit of Fellowship Funding Through Peer Review Writing Groups**

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**OBJECTIVES/GOALS:** Pursuit of independent funding by predoctoral and postdoctoral fellows requires navigating the intricate steps in preparing extramural grant applications. The Workforce Development Core of the NJ Alliance for Clinical and Translational Science (NJ ACTS) sought to evaluate an interactive grant writing group of fellows mentored by a trained coach. **METHODS/STUDY POPULATION:** Participants meet weekly for 3 months to develop components of a fellowship application for submission to NIH and private foundations. Sessions were moderated by a senior faculty member trained as a coach by the National Research Mentoring Network. Participant grant submission and review of the program were collected annually for the period of 2019 to 2021 as well as demographics for the 2022 cohort. **RESULTS/ANTICIPATED RESULTS:** Over this period, 32 predoctoral and 19 postdoctoral fellows participated in the peer review writing groups with 24 trainees currently enrolled. The peer review writing group moved to Zoom in 2020 which has enabled expansion of training to include the 3 Hub institutions and 6 additional universities. Of the 41 survey respondents, 78% submitted fellowship applications to NIH (N=28) or a non-NIH agency (N=4). Eight of these applications are currently under review or have been resubmitted for peer review. 54% of reviewed applications have been funded as NIH fellowships, diversity supplements, career grants, or non-NIH fellowships. Over 90% of participants have recommended the writing group to other trainees. **DISCUSSION/SIGNIFICANCE:** In conclusion, a weekly grant writing group of predoctoral and postdoctoral fellows is an effective means to receive peer review of fellowship application components and support submissions for extramural funding.

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### **REDCap as a Tool in Administrative Requirements for Academic Program Credentialing**

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**OBJECTIVES/GOALS:** Clinical research degree program accreditation brings value to university programs situated in competitive environments. While the requirements of accreditation can be burdensome and tedious, it remains important to program growth. The objective of this project was to assess the use of REDCap for the accreditation process to reduce that burden. **METHODS/STUDY POPULATION:** A review of credentialing requirements was conducted to identify required data and its sources. Initial course data from a small sample of courses was collected in Excel to better assess the order of the data collection process. REDCap was then used

to create a series of data collection instruments that effectively met the program evaluation data needs and customized reports for three years of course learning outcomes. The instruments were developed for its translation to other programs. Faculty, administrators, and interns participated in 2 different types of data collection activities (excel and REDCap) and evaluated the differences between the experiences. **RESULTS/ANTICIPATED RESULTS:** Data collection included 85 courses, with a range of 3-22 objectives that classified aligned assignments among 8 clinical research professional domains, 50 competencies, and 3 learning levels. Student outcomes data was also calculated and recorded. The time to complete the data collection process using the REDCap tool verses the excel spreadsheet per course was notably more efficient. User satisfaction was 100% improved using the REDCap tool with the average score of 8.5 out of a 1-10 scale. User comments supporting the REDCap process focused on improved time to complete and ease of process. **DISCUSSION/SIGNIFICANCE:** The incorporation of REDCap into data collection for program accreditation data requirements highlights the efficiency and ease of electronic data capture compared to manual entry in excel. The development of instruments makes it easy to translate to other program evaluation and accreditation needs.

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### **Regional Expansion of a TL1 Program to Serve the 5 State Washington, Wyoming, Alaska, Montana and Idaho Region**

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**OBJECTIVES/GOALS:** The ITHS TL1 program is designed to grow trainees' competence and knowledge in translational research. Our objective is to expand the program to the 5-state Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) region by establishing a TL1 cohort at Montana State University (MSU). **METHODS/STUDY POPULATION:** Interdisciplinary training at the predoctoral level is ideal for preparing the future translational workforce. At this stage in their training, they have developed disciplinary expertise but have not yet narrowed their specializations. By expanding the TL1 program to include both University of Washington (UW) and MSU we are amplifying the robust academic research networks of both institutions, particularly programs in rural health equity, rural and tribal populations, and emerging infectious diseases. Using a collaborative, online educational model we will bring together trainees in a multi directional, joint training effort utilizing existing and emerging collaborations. **RESULTS/ANTICIPATED RESULTS:** The anticipated outcome is to create a single program by bringing together a cohort of scholars from various disciplines spanning the translational science spectrum, with diverse types of research experience which enables them to learn from each other in a diverse setting. This will allow the program to more effectively grow trainee's competencies and knowledge in multidisciplinary translational research methodology, as well as build skills in team science and cross-disciplinary communication. **DISCUSSION/SIGNIFICANCE:** If successful, the ITHS TL1 program will prepare translational scientists with an awareness of diverse perspectives and contemporary research challenges. This would benefit the 5 state WWAMI region, which covers 27% of the total land mass of the US.