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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

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