and skill sets not found elsewhere. For surgeons wishing to pursue this, success is not only attainable, as these authors show, but for areas intimately tied with surgery, surgeons lead the way forward for research.

References

1. Narahari AK, Chandrabhatla AS, Baderdinni PK, Weiderhold A, Cook IO, Hawkins RB, et al. A 30-year analysis of National Institutes of Health-funded

cardiac transplantation research: surgeons lead the way. *J Thorac Cardiovasc Surg.* 2021;162:1757-65.e1.

2. Grimes DR, Bauch CT, Ioannidis JPA. Modelling science trustworthiness under publish or perish pressure. *R Soc Open Sci.* 2018;5:171511.
3. Grover A, Gorman K, Dall TM, Jonas R, Lytle B, Shemin R, et al. Shortage of cardiothoracic surgeons is likely by 2020. *Circulation.* 2009;120:488-94.
4. American Medical Association. AMA physician masterfile. Available at: <https://www.aamc.org/data-reports/workforce/interactive-data/number-people-active-physician-specialty-2017>. Accessed July 18, 2020.

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Commentary: The return on investment for cardiothoracic surgeon-scientists

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Health research informs decision making and promotes health, economic, and social prosperity. The US National Institutes of Health provides approximately \$40 billion for health research each year, the most massive public funding envelope on the planet. Agencies who directly fund health research are challenged to develop and apply appropriate methods and quality metrics to evaluate the impact of their investments. Surprisingly, there is no single best tool or indicator to measure the return on investment (ROI) for health research.

Biomedical research has resulted in unprecedented advances in cardiovascular health outcomes in the last 50 years. Without question, cardiothoracic surgeons have played an important role. Above and beyond sewing polypropylene circles, what is the ROI of a cardiac surgeon who performs research? Can a surgeon be both a

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CENTRAL MESSAGE

The impact of health research achieved by cardiothoracic surgeon-scientists is worth continued investment and increased advocacy.

productive scientist and a contributing clinician? Can surgeons make an equally substantive impact in the laboratory outside of the operating room? Should we invest in cardiac surgeons who lead a formal program of research? We need answers.

Francis Robicsek, a cardiac surgeon and innovator, once told me that surgeons should simply innovate within the operating room walls—we are “technicians.” In support of his wise perspectives, formal research methodology is sometimes not feasible for the unique problems that we face in surgery. Accordingly, the value proposition for surgical scientists remains hotly debated. An objectively measured ROI for the academic cardiothoracic surgeon remains elusive. The survival of academic cardiothoracic surgeons is threatened by external forces that conspire to keep them excessively occupied in operating suites, where the ROI for a surgeon is well-defined and indisputable.

In this issue of the *Journal*, Narahari and colleagues¹ perform a robust analysis to assess the health research impact of cardiothoracic surgeon investigators funded by the National Institutes of Health to advance the field of cardiac transplantation. As a benchmark, nonsurgical investigators in the same area of study are used to compare relative impacts. To assess the ROI, we must examine what goes in and what comes out in return. The inputs assessed encompassed a total investment of more than \$750 million across 321 grants spanning more than 3 decades. The outputs assessed were research publications, both productivity (number of publications) and their relative impact (citations to the funded publications). A comprehensive evaluation of health research ROI for the academic cardiac surgeon is finally revealed. While maintaining active clinical practices, surgical investigators were productive and produced impactful contributions that advanced the field of organ transplantation. There was no evidence that the return on

investing in surgical scientists was any less than that for similar investments in clinician-scientists who were not surgeons. This study offers an objective methodology and critical metrics to show that cardiothoracic surgeons are a good investment for health research funding. We are more than expert technicians.

These results should empower us to advocate for increased funding and protected research time for independent cardiothoracic surgical investigators. We must continue to encourage our trainees to pursue formal research training. We must promote a culture of formalized scientific discovery into our daily clinical practices. We are worth the investment.

Reference

1. Narahari AK, Mehaffey JH, Chandrabhatla AS, Baderdinni PK, Weiderhold A, Cook IO, et al. A 30-year analysis of National Institutes of Health -funded cardiac transplantation research: surgeons lead the way. *J Thorac Cardiovasc Surg*. 2021; 162:1757-65.e1.