Published in final edited form as:

Ann Surg. 2018 December ; 268(6): e88–e89. doi:10.1097/SLA.0000000000002756.

The Modern Surgeon Scientist

Sandra R. DiBrito, MD, Courtenay M. Holscher, MD, Christine E. Haugen, MD, Ira L. Leeds, MD, MBA, Heidi N. Overton, MD, Kyle R. Jackson, MD, and Elizabeth A. King, MD, PhD
Department of Surgery, Johns Hopkins, University School of Medicine, Baltimore, MD

The Graduate Training Program in Clinical Investigation, (GTPCI), The Johns Hopkins, Bloomberg School of Public Health, Baltimore, MD

Elliott R. Haut, MD, PhD

Department of Surgery, Johns Hopkins, University School of Medicine, Baltimore, MD

The Graduate Training Program in Clinical Investigation, (GTPCI), The Johns Hopkins, Bloomberg School of Public Health, Baltimore, MD

Department of Anesthesia and Critical Care, Medicine, Johns Hopkins University School of Medicine, Baltimore, MD

Department of Emergency Medicine, Johns Hopkins University School of Medicine, Baltimore, MD

Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

The Armstrong Institute for Patient Safety and Quality, Johns Hopkins Medicine, Baltimore, MD, ehaut1@jhmi.edu

To the Editor:

We strongly agree with Dr. Mansukhani et al¹ in their recognition of the “lab years” during surgical residency as an underutilized time of potential development. Surgeons and trainees are uniquely poised to develop solutions to problems that we encounter in our daily practice, using an armamentarium of tools gained throughout our life-long education. We applaud the authors for recognizing that dedicated professional development time during residency allows trainees to step away from the bedside and rediscover their motivations for pursuing surgery, to replenish their emotional energy, and to come back to their clinical training reinvigorated. However, we feel that the substantial opportunities for surgeons in health services and outcomes research must be better emphasized to surgical residents, particularly in the current environment of “pay-for-performance” reimbursement. We write to describe our experience in the training of surgeon scientists at our institution, where a broader definition of the role of surgical science has been enthusiastically embraced.

In many surgical departments including our own, the surgeon scientist is alive and thriving. As a whole, we remain competitive and obsessively driven, striving to answer the “burning

questions of the day.”² There are certainly important basic science discoveries yet to be made and surgeon scientists should continue to be on the forefront of those efforts. However, the nature of many of these important questions in science and healthcare has evolved, and it is imperative that the role of the surgeon scientist must adapt and expand. Surgeons are in a prime position to identify and answer new questions through outcomes, health services, and education research. Thus, considerations of the surgical “bench” must extend to include the desk, the library, and the database. Further, armed with our findings from our work at the “bench” and bedside, surgeons must have new roles. We must increasingly engage in writing practice management guidelines,³ position papers, and congressional bills.⁴ We must continue to use our research and leadership skills in health services research centers, quality improvement collaboratives, hospital boardrooms, and on Capitol Hill, thus driving optimal care.

One of the burning questions of our day is how to best use the tools we have to effect the greatest change for our patients using the limited resources available. It is imperative that surgeons are trained to conduct meaningful human subjects, clinical, patient safety and quality, and cost effectiveness research. Many surgeons have begun to realize the usefulness of skills in these spheres, have sought funding through national programs such as the Patient-Centered Outcomes Research Institute and the Agency for Healthcare Research and Quality, and have led the way for surgical trainees to follow suit, thereby broadening the impact of surgeons on the implementation and delivery of healthcare.

Outcomes, patient safety, and education research are of increasing interest to trainees. This is not simply because they are “easier” to include in a career that balances the clinic, operating room, research, and teaching. It is because there are imperative questions to answer in these fields. How do we measure “good” care? How do we protect our patients from harm? How do we optimize surgical training to produce knowledgeable, resilient, and competent surgeons? These questions should be addressed using the scientific method, and surgeons are the best-poised to answer them. Two key factors necessary for the development of surgeon scientists in these research fields are appropriate methodological training and adequate funding.

At Johns Hopkins University, the Graduate Training Program in Clinical Investigations (GTPCI) at the Bloomberg School of Public Health has been training surgeon scientists for almost 2 decades. Surgeons trained through the GTPCI have developed expertise in all aspects of clinical research- epidemiology, biostatistics, clinical trials, and systematic reviews and meta-analyses. Since 2000, 21 surgical trainees and faculty members have completed this program and earned an advanced degree, with 63% earning a PhD. Six surgical residents are currently enrolled in the program, and more are in line with applications. The trainees of the GTPCI, several of whom have authored this letter, have already contributed hundreds of original research papers to the surgical literature, with works in high-impact journals such as NEJM,⁵ BMJ,⁶ JAMA,⁷ and Annals of Surgery.^{8,9} Graduates of the GTPCI have embraced outcomes research and are leading the way for surgeons to use the power of clinical data to improve our specialty as a whole

Finally, performing good science requires funding. The research dollars provided by the National Institutes of Health, Agency for Healthcare Research and Quality, Patient-Centered Outcomes Research Institute, and foundational sources¹⁰ are just as helpful to support surgeon scientists in this realm of research as in the basic sciences. Formal training in clinical research helps provide the methodologic, statistical, and grantwriting skillset to better compete for this research funding. Intramural support is also critical to success, particularly as junior investigators start projects and gather pilot data to compete for extramural funding. A strong surgical department recognizes the value of these efforts and commits resources to early stage scientists. The professional development years are an excellent time for surgical residents to obtain this training, taking advantage of existing institutional structures (eg, GTPCI) as well as mentorship of externally funded surgeon scientists. As surgeon health services researchers advance in the ranks, taking on roles as division chiefs, department chairs, presidents, and leaders in major academic surgical societies, surgical residents have an increasing pool of mentors in the outcomes research realm.

We conclude by emphasizing that surgeons must be on the forefront of researchers answering the unresolved clinical questions that plague our patients. Gaps in contemporary treatment are painfully obvious, and opportunities for improvement, innovation, and forward progress abound. Surgeon scientists need a tool-kit to investigate these issues, whether it be at the bench with a microscope, as director of a clinical trial, or evaluating outcomes with an eye for potential bias and misinterpretation of data. We have shared our experience in training and funding surgeons, and argue that outcomes research, health services research, educational research, and clinical investigation are among the most important fields of surgical science that surgical residents can pursue during their professional development years.

REFERENCES

1. Mansukhani NA, Patti MG, Kibbe MR. Rebranding “The Lab Years” as “Professional Development” in Order to Redefine the Modern Surgeon Scientist. *Ann Surg.* 2017;266:937–938. [PubMed: 28657943]
2. Religa Z, Soderbergh S. More surgeons must start doing basic science. *Nature.* 2017;544: 393–394.
3. Seamon M, Haut E, Van Arendonk K, et al. An evidence-based approach to patient selection for emergency department thoracotomy: a practice management guideline from the Eastern Association for the Surgery of Trauma. *J Trauma Acute Care Surg.* 2015;79:159–173. [PubMed: 26091330]
4. Boyarsky BJ, Segev DL. From bench to bill: how a transplant nuance became 1 of only 57 laws passed in 2013. *Ann Surg.* 2016;263: 430–433. [PubMed: 26575282]
5. Orandi BJ, Luo X, Massie AB, et al. Survival benefit with kidney transplants from HLA-incompatible live donors. *N Engl J Med.* 2016;374:940–950. [PubMed: 26962729]
6. Streiff MB, Carolan HT, Hobson DB, et al. Lessons from the Johns Hopkins Multi-Disciplinary Venous Thromboembolism (VTE) Prevention Collaborative. *BMJ.* 2012;344: e3935. [PubMed: 22718994]
7. Muzaale AD, Massie AB, Wang M-C, et al. Risk of end-stage renal disease following live kidney donation. *JAMA.* 2014;311:579–586. [PubMed: 24519297]
8. Haut E, Kalish B, Cotton B, et al. Pre-hospital intravenous fluid administration is associated with higher mortality in trauma patients: a national trauma data bank analysis. *Ann Surg.* 2011;253:371–377. [PubMed: 21178760]

9. McAdams-DeMarco MA, King EA, Luo X, et al. Frailty, length of stay, and mortality in kidney transplant recipients: a national registry and prospective cohort study. *Ann Surg.* 2017;266: 1084–1090. [PubMed: 27655240]
10. Segev DL. Funding opportunities for outcomes research In: Dimick J, Greenberg C, eds. *Success in Academic Surgery: Health Services Research*. London: Springer; 2014.