



Team Science

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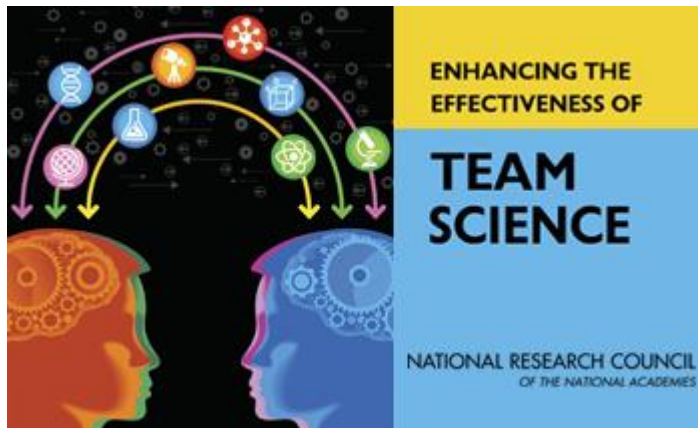
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Association for Academic Surgery
2018 Fall Courses
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Immediately prior to the ACS Clinical Congress

What Is Team Science?

“Team science is a collaborative effort to address a scientific challenge that leverages the strengths and expertise of professionals trained in different fields”



Team Science **Toolkit**
National Cancer Institute

The Increasing Dominance of Teams in Production of Knowledge

Stefan Wuchty,^{1*} Benjamin F. Jones,^{2*} Brian Uzzi^{1,2*†}

We have used 19.9 million papers over 5 decades and 2.1 million patents to demonstrate that teams increasingly dominate solo authors in the production of knowledge. Research is increasingly done in teams across nearly all fields. Teams typically produce more frequently cited research than individuals do, and this advantage has been increasing over time. Teams now also produce the exceptionally high-impact research, even where that distinction was once the domain of solo authors. These results are detailed for sciences and engineering, social sciences, arts and humanities, and patents, suggesting that the process of knowledge creation has fundamentally changed.

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Multi-University Research Teams: Shifting Impact, Geography, and Stratification in Science

Benjamin F. Jones,^{1,2*} Stefan Wuchty,^{3*†} Brian Uzzi^{1,3,4*‡}

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equipment, and to Dr. G. E. R. Deacon and the captain and officers of R.R.S. *Discovery II* for their part in making the observations.

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MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest.

A structure for nucleic acid has already been proposed by Pauling and Corey¹. They kindly made their manuscript available to us in advance of publication. Their model consists of three intertwined chains, with the phosphates near the fibre axis, and the bases on the outside. In our opinion, this structure is unsatisfactory for two reasons: (1) We believe that the material which gives the X-ray diagrams is the salt, not the free acid. Without the acidic hydrogen atoms it is not clear what forces would hold the structure together, especially as the negatively charged phosphates near the axis will repel each other. (2) Some of the van der Waals distances appear to be too small.

Another three-chain structure has also been suggested by Fraser (in the press). In his model the phosphates are on the outside and the bases on the inside, linked together by hydrogen bonds. This structure as described is rather ill-defined, and for this reason we shall not comment on it.

We wish to put forward a radically different structure for the salt of deoxyribose nucleic acid. This structure has two helical chains each coiled round the same axis (see diagram). We have made the usual chemical assumptions, namely, that each chain consists of phosphate diester groups joining β -D-deoxy-ribofuranose residues with 3',5' linkages. The two chains (but not their bases) are related by a dyad perpendicular to the fibre axis. Both chains follow right-handed helices, but owing to the dyad the sequences of the atoms in the two chains run in opposite directions. Each chain loosely resembles Furberg's² model No. 1; that is, the bases are on the inside of the helix and the phosphates on the outside. The configuration of the sugar and the atoms near it is close to Furberg's 'standard configuration', the sugar being roughly perpendicular to the attached base. There



This figure is purely diagrammatic. The two ribbons symbolize the two phosphate-sugar chains, and the horizontal rods the pairs of bases holding the chains together. The vertical line marks the fibre axis.

is a residue on each chain every 3.4 Å. in the z-direction. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 Å. The distance of a phosphorus atom from the fibre axis is 10 Å. As the phosphates are on the outside, cations have easy access to them.

The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could become more compact.

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases

are perpendicular together in pairs hydrogen-bonded chain, so that z-co-ordinates. the other a py hydrogen bond 1 to pyrimidin pyrimidine pos

If it is assumed structure in t (that is, with figurations) it bases can bond (purine) with (purine) with c

In other words a pair, on either the other men guanine and cy single chain do way. However

formed, it follows one chain is g chain is autom

It has been of the amounts of guanine to cy for deoxyribose

It is probably with a ribose s the extra oxyg der Waals cont

The previous ribose nucleo of our structur compatible with be regarded as against more e in the following of the details d devised our str entirely on pul chemical argu

It has not pairing we hav possible copyin

Full details ditions assum of co-ordinates elsewhere.

We are much indebted to Dr. Jerry Donohue for constant advice and criticism, especially on inter-atomic distances. We have also been stimulated by a knowledge of the general nature of the unpublished experimental results and ideas of Dr. M. H. F. Wilkins, Dr. R. E. Franklin and their co-workers at

2 authors

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NATURE

King's College, London. One of us (J. D. W.) has been aided by a fellowship from the National Foundation for Infantile Paralysis.

J. D. WATSON
F. H. C. CRICK

Medical Research Council Unit for the Study of the Molecular Structure of Biological Systems, Cavendish Laboratory, Cambridge. April 2.

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Drosophila Muller F elements maintain a distinct set of genomic properties over 40 million years of evolution

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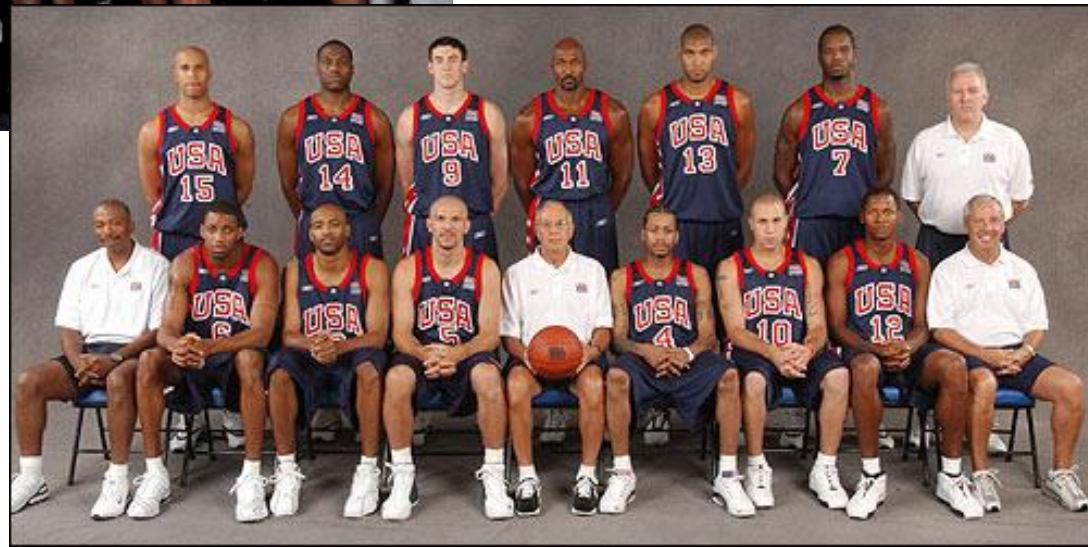
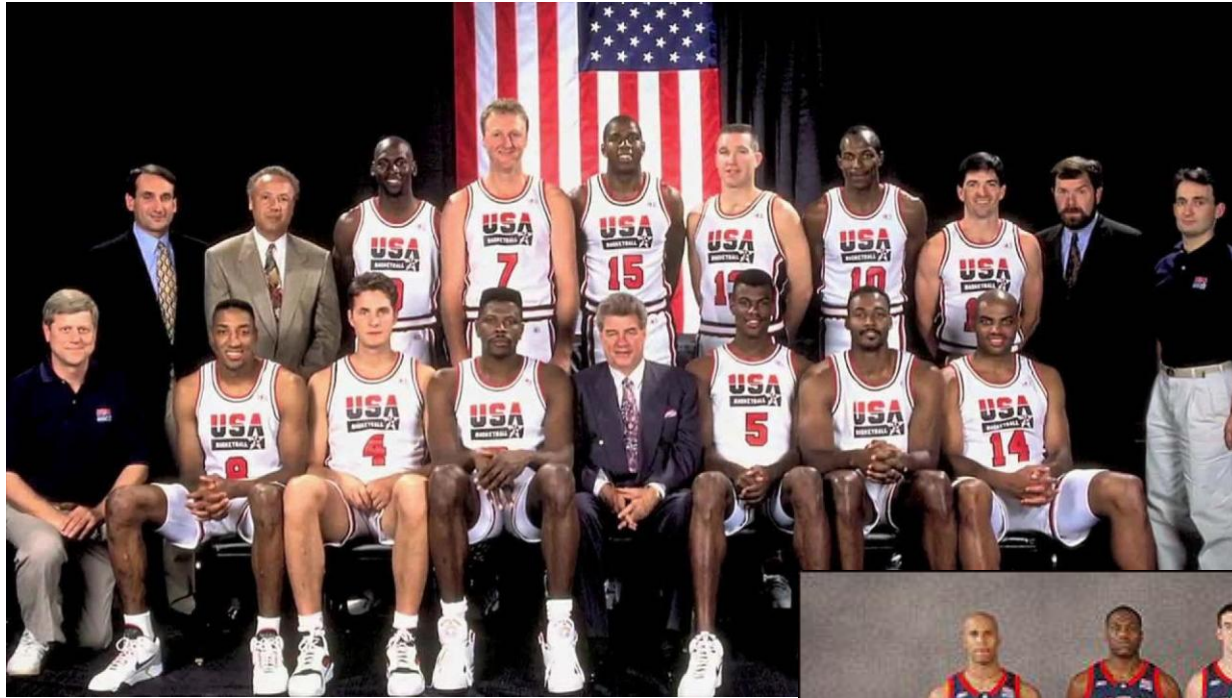
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Are Surgeons Naturally Good at Team Science?



Dream Teams



Groups vs Teams

	Groups	Teams
Members	Independent	Interdependent
Goals	Individual	Shared
Identity	Individual (me)	Shared (we)
Leadership	Often single	Shared
Products	Individual	Collective
Reward	Individual	Collective
Cohesion	None/limited	Esprit
Conflict	Reactive	Expected/proactive

Shamelessly stolen from Vasan Ramachandran, MD at BUMC

Building the Team

National Cluster-Randomized Trial of Duty-Hour Flexibility in Surgical Training

Karl Y. Bilimoria, M.D., M.S.C.I., Jeanette W. Chung, Ph.D., Larry V. Hedges, Ph.D., Allison R. Dahlke, M.P.H., Remi Love, B.S., Mark E. Cohen, Ph.D., David B. Hoyt, M.D., Anthony D. Yang, M.D., John L. Tarpley, M.D., John D. Mellinger, M.D., David M. Mahvi, M.D., Rachel R. Kelz, M.D., M.S.C.E., Clifford Y. Ko, M.D., M.S.H.S., David D. Odell, M.D., M.M.Sc., Jonah J. Stulberg, M.D., Ph.D., M.P.H., and Frank R. Lewis, M.D.

- Specialty: Sociologists, psychologists, statisticians, surgical education researchers, program directors, quality researchers, policy folks
- Stakeholder: ACS, ABS, ACGME, APDS
- Staff: Project managers, project coordinators, analysts

Assembling the Team

- Key investigators
- Advisors/Mentors
- Staff/workers
- Stakeholders



- Do your homework and check whether they are the right people
 - Smart, collaborative, and not crazy

If you are the smartest
person in the room, then
you are in the wrong room.

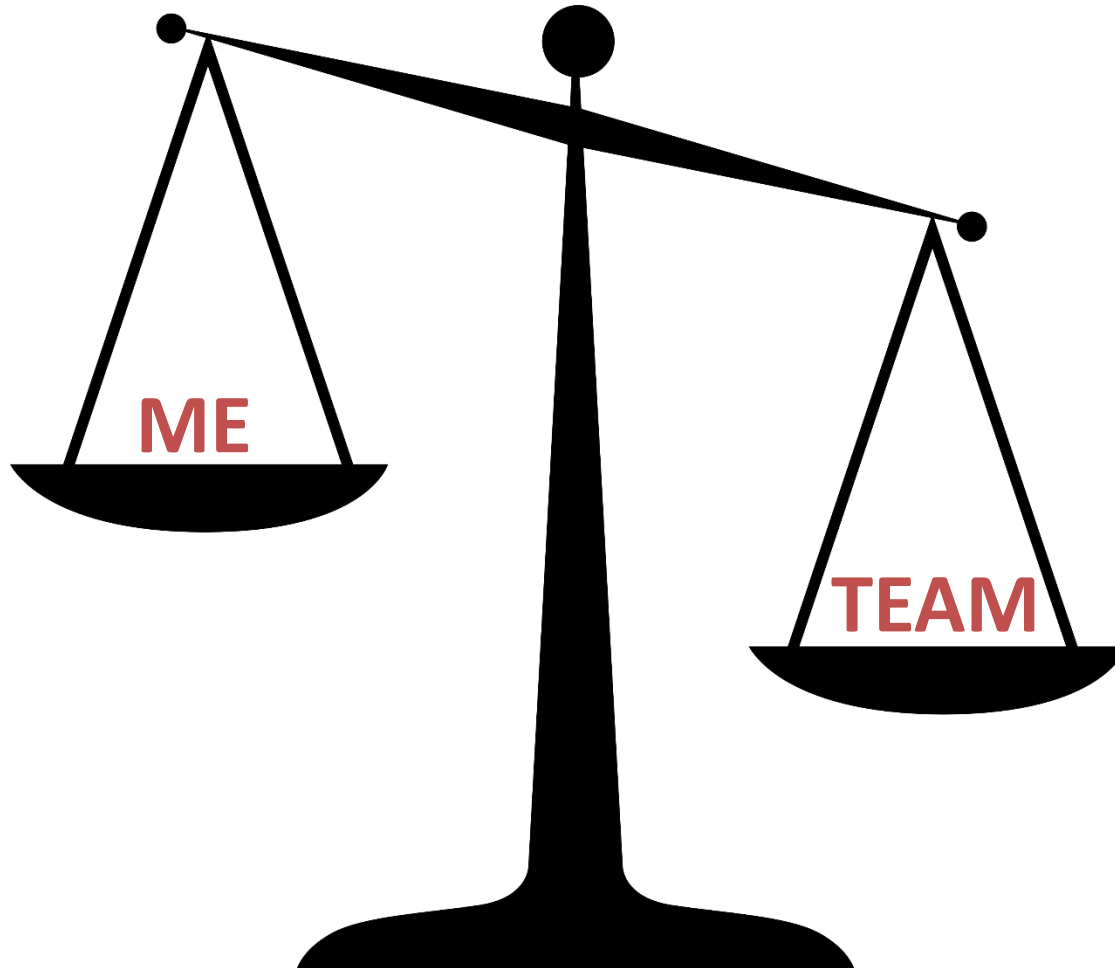
I want to be the dumbest
person in the room...

TEAM

Paradox: we know collaboration is critical, but we reward individual efforts



Be Aware and Transparent



Do not say it is “my work”

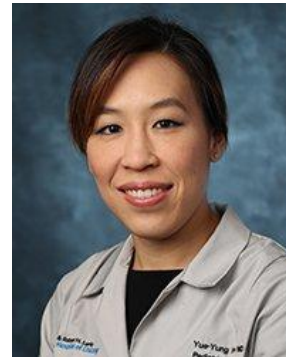




Discrimination, Harassment, and Abuse in Surgical Training



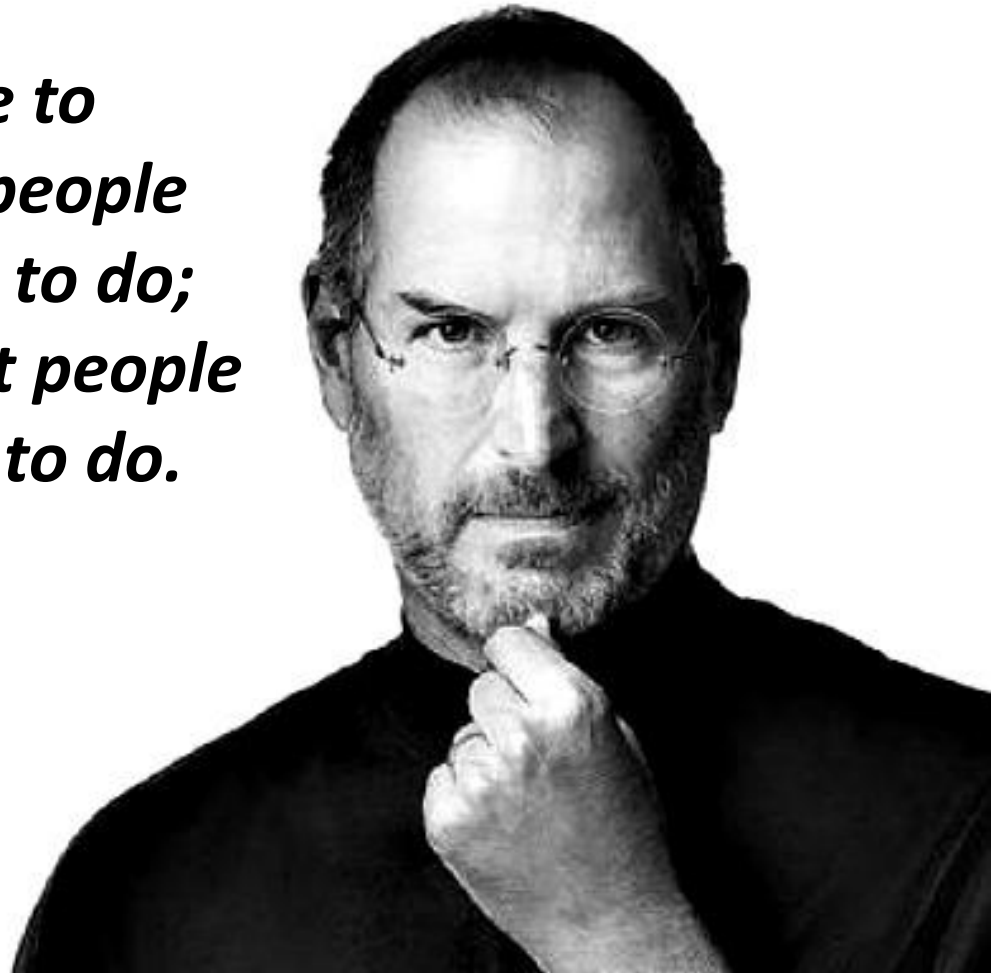
Ryan Ellis , MD MS



Yue-Yung Hu, MD MPH

It doesn't make sense to collaborate with smart people and then tell them what to do; we collaborate with smart people so they can tell us what to do.

Steve Jobs



Team Science Nirvana = “Whose Idea Was It?”



Team Science Authorship

- Decide authorship early on in the project
- Negotiate but be aware of multiple perspectives
- Remember work proportions shift during project
- There are more projects with same team
 - Alternate roles → people/teams
 - Co-first author
- Clear communication on this issue is key
 - Fair, open, transparent, flexible

Team Science Authorship Offers Opportunities

- Turn competitor into collaborator
- Build relationships
- Use your authorship tickets (with integrity)
- Develop your staff



Allison R. Dahlke, M.P.H.
Christopher M. Quinn, M.S.
Jeanette W. Chung, Ph.D.
Karl Y. Bilimoria, M.D.

In difference-in-differences analyses, the change in the use of duty hours over time was similar within both study groups. However, in the flexible-policy group, fewer trainees in year 2 than in year 1 perceived that duty hours had a negative effect with regard to time for family and friends, hobbies, health, or rest ($P<0.001$, $P<0.001$, $P=0.03$, and $P<0.001$, respectively); significant changes in the standard-policy group were not observed. In difference-in-differences analyses, the change over time in the perceived negative effect on time for hobbies, health, and rest was significantly

Team Science Authorship Conflict

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Comparison of Sentinel Lymph Node Biopsy Alone and Completion Axillary Lymph Node Dissection for Node-Positive Breast Cancer

ABSTRACT

From the Cancer Programs, American College of Surgeons; Department of Surgery; and Department of Preventive Medicine, Feinberg School of Medicine, Northwestern University, Chicago; Department of Surgery, NorthShore University HealthSystem, Evanston, IL; Department of Surgery, University of California—Los Angeles; and Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA.

Submitted August 11, 2008; accepted January 9, 2009; published online ahead of print at www.jco.org on April 13, 2009.

Supported in part by the American College of Surgeons, the Commission on Cancer, and the American Cancer Society.

Presented in part at the 94th Annual American College of Surgeons Clinical Congress, October 13-16, 2008, San Francisco, CA.

Authors' disclosures of potential conflicts of interest and author contribu-

Purpose

For women with breast cancer, the role of completion axillary lymph node dissection (ALND) after identification of nodal metastases by sentinel lymph node biopsy (SLNB) has been questioned. Our objectives were to assess national nodal evaluation practice patterns and to examine differences in recurrence and survival for SLNB alone versus SLNB with completion ALND.

Patients and Methods

From the National Cancer Data Base (1998 to 2005), women with clinically node-negative breast cancer who underwent SLNB and who had nodal metastases were identified. Practice patterns and outcomes were examined for patients who underwent SLNB alone versus SLNB with completion ALND (median follow-up, 63 months).

Results

Of 97,314 patients, 20.8% underwent SLNB alone, and 79.2% underwent SLNB with completion ALND. In 2004 to 2005, patients were significantly more likely to undergo SLNB alone if they were older, had smaller tumors, or were treated at non-National Cancer Institute–designated cancer centers. In patients with macroscopic nodal metastases ($n = 20,075$ during 1998 to 2000), there was a nonsignificant trend toward better outcomes for completion ALND (vs SLNB alone) after analysis was adjusted for differences between the two groups: axillary recurrence (hazard ratio [HR], 0.58; 95% CI, 0.32 to 1.06) and overall survival (HR, 0.89; 95% CI, 0.76 to 1.04). In patients with microscopic nodal metastases ($n = 2,203$ during 1998 to 2000), there were no significant differences in axillary recurrence or survival for patients who underwent SLNB alone versus completion ALND.

Conclusion

Share unique resources with others

The NEW ENGLAND JOURNAL of MEDICINE

iCOMPARE

Comparative Effectiveness of Models Optimizing Patient Safety and Resident Education

ANALYSIS OF A RANDOMIZED TRIAL IN MEDICAL RESIDENCY

S.V. Desai, D.A. Asch, L.M. Bellini, K.H. Chaiyachati, M. Liu, A.L. Sternberg, J. Tonascia, A.M. Yeager, J.M. Asch, J.T. Katz, M. Basner, D.W. Bates, K.Y. Bilimoria, D.F. Dinges, O. Even-Shoshan, D.M. Shade, J.H. Silber, D.S. Small, K.G. Volpp, and J.A. Shea, for the iCOMPARE Research Group*

ABSTRACT

BACKGROUND

Concern persists that inflexible duty-hour rules in medical residency programs may adversely affect the training of physicians.

METHODS

We randomly assigned 63 internal medicine residency programs in the United States to be governed by standard duty-hour policies of the 2011 Accreditation Council for Graduate Medical Education (ACGME) or by more flexible policies that did not specify limits on shift length or mandatory time off between shifts. Measures of educational experience included observations of the activities of interns (first-year residents), surveys of trainees (both interns and residents) and faculty, and intern examination scores.

RESULTS

There were no significant between-group differences in the mean percentages of

- You can only use your stuff so much
- You still get credit
- Often leads to collaborations and friendships that last many years
- Merging data on medicine and surgery programs

Who Merits Authorship?

National Cluster-Randomized Trial of Duty-Hour Flexibility in Surgical Training

Karl Y. Bilimoria, M.D., M.S.C.I., Jeanette W. Chung, Ph.D., Larry V. Hedges, Ph.D., Allison R. Dahlke, M.P.H., Remi Love, B.S., Mark E. Cohen, Ph.D., David B. Hoyt, M.D., Anthony D. Yang, M.D., John L. Tarpley, M.D., John D. Mellinger, M.D., David M. Mahvi, M.D., Rachel R. Kelz, M.D., M.S.C.E., Clifford Y. Ko, M.D., M.S.H.S., David D. Odell, M.D., M.M.Sc., Jonah J. Stulberg, M.D., Ph.D., M.P.H., and Frank R. Lewis, M.D.

- ICMJE guidelines
- Establish criteria and roles up front

Use Acknowledgements Effectively

- IRB
- Contracting
- Project staff
- Statisticians
- Staff at stakeholders
- Surgeon Champions
- Program directors
- Program coordinators
- Important logistics folks

We thank those who have contributed to the administration and execution of the trial: Jonathan Fryer, M.D., Anne Grace, Ph.D., Julie K. Johnson, Ph.D., Lindsey J. Kreutzer, M.P.H., Shari Meyerson, M.D., Emily S. Pavey, M.A., Sean Perry, J.D., Christopher M. Quinn, M.S., Alfred Rademaker, Ph.D., and Ravi Rajaram, M.D. (Northwestern University); Judy Shea, Ph.D. (University of Pennsylvania); Sameera Ali, M.P.H., Amy Hart, B.S., Emma Malloy, B.A., Brian Matel, B.A., Craig Miller, B.S.E.E., Lynn Modla, M.S., Ajit Sachdeva, M.D., and Lynn Zhou, Ph.D. (ACS); James Hebert, M.D. (University of Vermont); Michael Englesbe, M.D., M.P.H., and Paul Gauger, M.D. (University of Michigan); Christine V. Kinnier, M.D. (Massachusetts General Hospital); Joseph Cofer, M.D. (University of Tennessee, Chattanooga); Mitchell Posner, M.D. (University of Chicago); Eugene Foley, M.D. (University of Wisconsin); Thomas Louis, Ph.D. (Johns Hopkins); Thomas Biester, M.S., and Andrew Jones, Ph.D. (ABS); Rebecca Miller, M.S., Thomas Nasca, M.D., and John Potts, M.D. (ACGME); Margaret M. Class (Defense Health Agency); all the surgeon champions and surgical clinical reviewers at the 151 participating ACS National Surgical Quality Improvement Program hospitals; and all the program directors and program coordinators at the 117 participating general surgery residency programs (see the Supplementary Appendix).

Good team meetings

- Advance notice
- Concrete agenda
- Constructive interaction
 - Meeting
 - Listening
 - Speaking
 - Dialogue & healthy debate
- Decision making
- Action plan formulated

**team's energy
and engagement
outside formal
meetings**



Social Side of Team Science Is Critical!



- Retreats
- Teams at conferences
- Social team activities
- Regular meetings

- Communicate outside meetings

Team Science and Funding Credit

Feinberg Rises in NIH Rankings



BY ANNA WILLIAMS ON JAN 24, 2017

Northwestern University Feinberg School of Medicine rose to 16th place among U.S. medical schools in funding from the National Institutes of Health (NIH) in 2016. These rankings are reported annually by the [Blue Ridge Institute for Medical Research](#).



The Blue Ridge analysis represents grants awarded between October 1, 2015, and September 30, 2016. This year is Northwestern's highest ranking to date. It represents an increase of two spots over 2015 and five spots over 2012, when the medical school was ranked 21st in the nation.

"These prestigious NIH awards enable our scientists to pursue innovative and groundbreaking medical discoveries," said [Eric G. Neilson, MD](#), vice president for Medical Affairs and Lewis Landsberg Dean. "Northwestern's remarkable growth in research funding is yet another sign that we are a world-class destination for outstanding research and education."

Individual departments at Feinberg also ranked highly in the report: Twelve departments ranked among the top ten in their specialty for NIH funding, while an additional two ranked in the top 20:

- Public Health (Medical Social Sciences and Preventive Medicine) (1)
- Obstetrics and Gynecology (2)
- Urology (2)
- Cell and Molecular Biology (3)
- Physical Medicine and Rehabilitation (3)
- Neurology (5)
- Dermatology (6)
- Neurological Surgery (8)
- Physiology (8)
- Surgery (9)

- Money
 - Indirects follow salary
- PI, co-PIs, multi-PI
 - "Corresponding" PI
- Rankings
 - Surgery or Public Health
 - Northwestern or Lurie Children's/VA/Ability Lab
 - Corresponding PI department

Team Scientist Track

- Investigator Track
- Clinician-Educator Track
- Research Track
- **Team Scientist Track**



- Typically on multiple research teams
- Plays a key role to obtain, sustain, and implement programmatic research and elevate success of research teams
- Typically contribute as co-investigator, but potentially as a PI

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Resources

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Clinical Research Support

Data Science & Informatics

Biostatistics & Research Design

Community & Stakeholder Engagement

Team Science Resources

Chicago CTSA Shared Resources

Team Science Resources

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Northwestern

M Northwestern
Memorial HealthCare

 Ann & Robert H. Lurie
Children's Hospital of Chicago

M Northwestern Medicine
Feinberg School of Medicine

Shirley Ryan
Abilitylab

Team Science Toolkit

An interactive website to help you support, conduct and study team-based research.

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Annual SciTS Conference - May 20-23, 2019

The 2019 Science of Team Science (SciTS) conference will be hosted by Michigan State University in Lansing, Michigan. This year's conference will review the current state of knowledge in the SciTS field, highlight practical tools, resources, and strategies for enhancing team science, and discuss future directions for advancing SciTS to improve the global scientific enterprise.

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