



Research:

My path and
lessons
learned along
the way

Chemistry Basic Science Research

- **Level of training:** Summer between freshman and sophomore year of college
- **How did I find this opportunity?** Email sent to a listserv from a research-focused seminar class
- **Overall goal:** To coat nanoparticles of a particular drug inside a slowly dissolving particle in order to improve delivery of slow-release medications
- **Day-to-day activities:** Fighting with a mass spectrometer, broken pieces and clogged tubes, little guidance from my mentor
- **Rating:** 2/10





Lesson #1

Use the resources already
available to you.



Lesson #2

Every type of research is not for everybody. Find the research that fits you!

Bariatric Clinic Clinical Research

- **Level of training:** Gap year between college and medical school
- **How did I find this opportunity?** Email sent to a pre-med listserv
- **Overall goal:** To help conduct over 15 ongoing studies with patients who were considering and had already undergone bariatric surgery.
- **Day-to-day activities:** Helping patients fill out surveys and doing studies with them (there was a taste test!), occasionally proofreading manuscripts for submission, networking with medical students and surgeons in the clinic (great for rec letters!), exposure to minimally invasive surgical procedures
- **Rating:** 8/10



Curriculum Research

- **Level of training:** Summer between first and second years of medical school
- **How did I find this opportunity?** Email sent to the entire MS1 class
- **Overall goal:** To identify a problem or limitation of the current curriculum and improve it. My focus was Early Learner Clinical Experiences.
- **Day-to-day activities:** Reading evaluations from students about the current program, preparing Works-in-progress presentations to be reviewed by my peers, creating student-facing and faculty-facing guidelines for the curriculum changes to improve the experience, poster presentation at the end of the summer
- **Rating:** 7/10





Lesson #3

Research is only useful if you share it.

Global Health Database Research



- **Level of training:** Gap year between third and fourth year of medical school
- **How did I find this opportunity?** All medical students had the opportunity to apply for research tracks and a gap year
- **Overall goal:** To better understand stroke care and outcomes in a global context, focusing on low- and middle-income countries.
- **Day-to-day activities:** Attending TIGR classes to learn how to conduct database research from study design to statistical analysis, meeting with my mentor every other week to clarify the research question and then identify potential biases in analysis, gathering and organizing large amounts of data from >195 countries over a 20-year span, submitting abstracts to conferences
- **Rating:** 7/10



Lesson #4

Research is done in teams, so
find your role.

Are you the writer? The
statistician? The coordinator?
The data cleaner?





Impact of Direct Ambulance-to-CT Stroke and Language Disparities in Stroke Treatment

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Introduction

Ischemic strokes are a major cause of death and disability in the United States¹, and effective therapy is time-sensitive. While reducing the time to intervention has been a focus of improvement efforts, studies have found that delays in treatment times by ethnicity, race, and gender

at San Francisco General Hospital. A new protocol for suspected stroke, "Direct Ambulance-to-CT," uses a pre-hospital activation process to expedite ambulance-to-CT transfer to speed time to treatment (ie. IV-tPA, thrombectomy).

The protocol could result in shorter door-to-needle (DTN) times among patients. The protocol could reduce treatment delays by race, and primary language

Confirmed strokes on imaging within a normal (LSN) time of less than 60 minutes to ZSFG via ambulance were included in the intervention group (July 2016-June 2017) included in the control group (July 2017-July 2018). Patient data was abstracted from

Outcomes & Statistical Analysis

- Primary outcome: Door-to-Needle Time
- Secondary outcome: Door-to-CT Time

Student's t-test and chi-squared test were used for all descriptive analysis and the Mann-Whitney U test was used for non-normally distributed outcomes.

Results

Table 1: Patient Characteristics

	Pre-Intervention (N=95)	Post-Intervention (N=95)
Age, Mean±SD	72.0±14.0	70.1±13.1
Male, n (%)	47 (49.5%)	52 (54.7%)
Race/Ethnicity, n (%)		
White	18 (19.0%)	20 (21.1%)
Black	24 (25.3%)	15 (15.8%)
Hispanic	24 (25.3%)	26 (27.4%)
Asian	27 (28.4%)	32 (33.7%)
Native American	0 (0%)	0 (0%)
Pacific Islander/Hawaiian	0 (0%)	0 (0%)
Unknown	2 (2.1%)	0 (0%)
Primary Language, n (%)		
English	60 (63.2%)	72 (76.8%)
Spanish	13 (13.7%)	37 (39.4%)
Cantonese	17 (17.9%)	29 (30.8%)
Other	5 (5.3%)	21 (22.6%)
Declined to specify	8 (8.4%)	10 (10.5%)
Housed, n (%)	72 (76.8%)	70 (73.7%)
Medical Comorbidities, n (%)		
Hypertension	37 (39.4%)	39 (41.1%)
Hyperlipidemia	29 (30.8%)	29 (30.8%)
Diabetes	21 (22.6%)	21 (22.6%)
Atrial Fibrillation	27 (28.7%)	27 (28.7%)
Prior Stroke	35 (37.0%)	35 (37.0%)
NIH Stroke Scale, Mean±SD	10.8±7.3	10.8±7.3
Required Intubation, n (%)	6 (6.3%)	6 (6.3%)

Health Disparities Research

- **Level of training:** Gap year between third and fourth year of medical school
- **How did I find this opportunity?** My research mentor for the Global Health project connected me with junior faculty that he was helping with this project
- **Overall goal:** To see if ALL patients (regardless of race, gender, or primary language) benefitted from a change in triaging acute stroke patients in the Emergency Department
- **Day-to-day activities:** Chart review to collect patient information, organizing and cleaning data for acute stroke patients at a single Comprehensive Stroke Center, data analysis in STATA
- **Rating:** 9/10

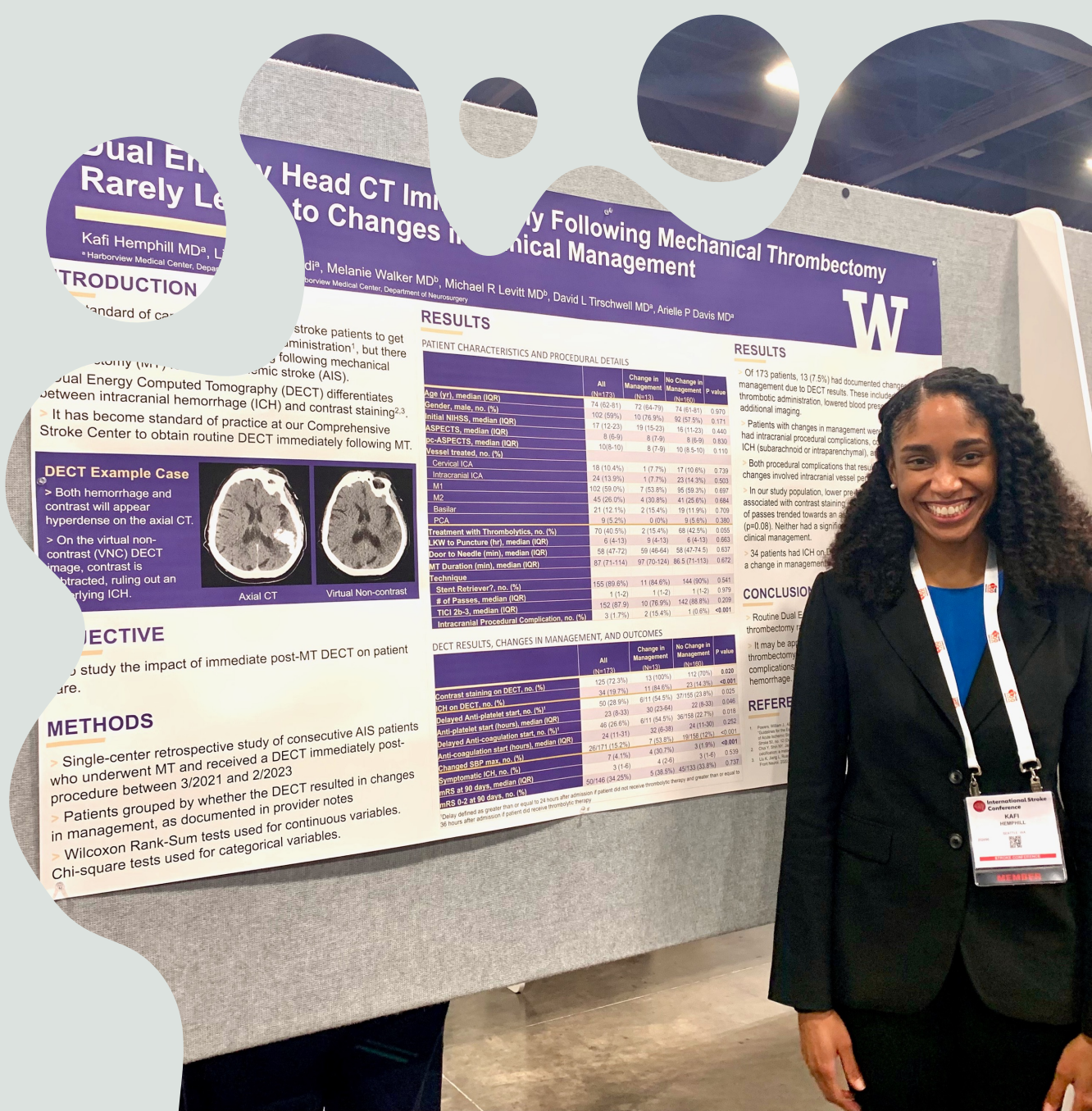
Qualitative Research

- **Level of training:** Fourth year of residency
- **How did I find this opportunity?** Residency allowed 4-6 months for research time, but I produced my own research question, found a mentor, and designed the research
- **Overall goal:** To understand how patient de-escalation teams work in Bay Area academic, public, and VA hospitals
- **Day-to-day activities:** Observation shifts with the de-escalation teams, interviews with key members of each team, literature review, chart review for outcomes of de-escalation team responses
- **Rating:** 6/10



Quality Improvement Research

- **Level of training:** First year of Fellowship
- **How did I find this opportunity?** I identified a mentor and we both produced a research question
- **Overall goal:** To determine if getting a CT scan immediately after mechanical thrombectomy for LVO patients changes management
- **Day-to-day activities:** Chart review, data organization and cleaning, statistical analysis. After the research is completed, discussion with administrators to make changes to our protocols.
- **Rating:** 10/10



Dual Energy Virtual Non-contrast Head CT Immediately Following Mechanical Thrombectomy

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INTRODUCTION

Standard of care for acute ischemic stroke patients to get 'dual energy' CT administration¹, but there is evidence that virtual non-contrast (VNC) CT following mechanical thrombectomy (MT) for large vessel occlusion (LVO) stroke (AIS) differentiates between intracranial hemorrhage (ICH) and contrast staining^{2,3}. It has become standard of practice at our Comprehensive Stroke Center to obtain routine DECT immediately following MT.

DECT Example Case

> Both hemorrhage and contrast will appear hyperdense on the axial CT.
 > On the virtual non-contrast (VNC) DECT image, contrast is subtracted, ruling out an underlying ICH.

RESULTS

PATIENT CHARACTERISTICS AND PROCEDURAL DETAILS

	All (N=173)	Change in Management (N=113)	No Change in Management (N=60)	P value
Age (yr), median (IQR)	74 (62-81)	72 (64-79)	74 (61-81)	0.970
Gender, male, no. (%)	102 (59%)	10 (76.9%)	82 (67.5%)	0.171
Initial NIHSS, median (IQR)	17 (12-23)	19 (15-23)	16 (11-23)	0.440
NIHSS-ASPECTS, median (IQR)	8 (6-9)	8 (7-9)	8 (6-9)	0.830
NIHSS-LOC, median (IQR)	10 (8-10)	8 (7-9)	10 (8.5-10)	0.110
Vessel treated, no. (%)				
Cervical ICA	18 (10.4%)	1 (7.7%)	17 (10.8%)	0.739
Intracranial ICA	24 (13.9%)	1 (7.7%)	23 (14.3%)	0.502
M1	102 (59.0%)	7 (53.8%)	95 (59.3%)	0.697
M2	45 (26.0%)	4 (30.8%)	41 (25.6%)	0.684
Basilar	21 (12.1%)	2 (15.4%)	19 (11.9%)	0.709
PCA	9 (5.2%)	0 (0%)	9 (5.8%)	0.360
Treatment with Thrombolytics, no. (%)	70 (40.5%)	2 (15.4%)	68 (42.5%)	0.055
LKW to Puncture (hr), median (IQR)	6 (4-13)	8 (4-13)	6 (4-13)	0.663
Door to Needle (min), median (IQR)	58 (47-72)	59 (46-64)	58 (47-74.5)	0.637
MT Duration (min), median (IQR)	87 (71-114)	97 (70-124)	86.5 (71-113)	0.872
Technique				
Stent Retriever ² , no. (%)	155 (89.6%)	11 (84.6%)	144 (90%)	0.541
# of Passes, median (IQR)	1 (1-2)	1 (1-2)	1 (1-2)	0.979
TICI 2b-3, median (IQR)	152 (87.9%)	10 (76.9%)	142 (88.8%)	0.206
Intracranial Procedural Complication, no. (%)	3 (1.7%)	2 (15.4%)	1 (0.8%)	<0.001

RESULTS

Of 173 patients, 13 (7.5%) had documented changes in management due to DECT results. These included thrombotic administration, lowered blood pressure, and additional imaging.

Patients with changes in management were more likely to have had intracranial procedural complications compared to those who did not (p=0.08). Neither had a significant impact on clinical management.

> 34 patients had ICH on DECT, which was a change in management.

CONCLUSION

> Routine Dual Energy CT following mechanical thrombectomy may be appropriate for patients with intracranial hemorrhage.

REFERENCES



Lesson #5

Build skills early because the further you get in training, the less protected time there is for research.



Summary



There are **MANY** different types of research. Find one that you really like!



Look for a knowledge gap in your field of interest and see if you can find a way to creatively tackle that question.



Academia encourages research, so at an academic hospital, most doctors are interested in having someone help them do research. Make sure that your goals align with theirs before you sign on.



When considering a project, look at the overarching goal AND the day-to-day realities of conducting that research.



Invest in your own research skills early, whether this is on how to design a study to avoid bias, how to choose the appropriate statistical test, or how to write in scientific prose. Some programs may even pay for you to take these classes!



Poster presentations and publications are what earn respect in research, so set this as a goal when planning out projects.