

4th Friday Preceptor Development Introduction to Research

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Natalie E. Freeman, PhD
Director of Research LMU DCOM, Knoxville
Natalie.freeman@lmunet.edu

Disclosure

I have no financial disclosures.

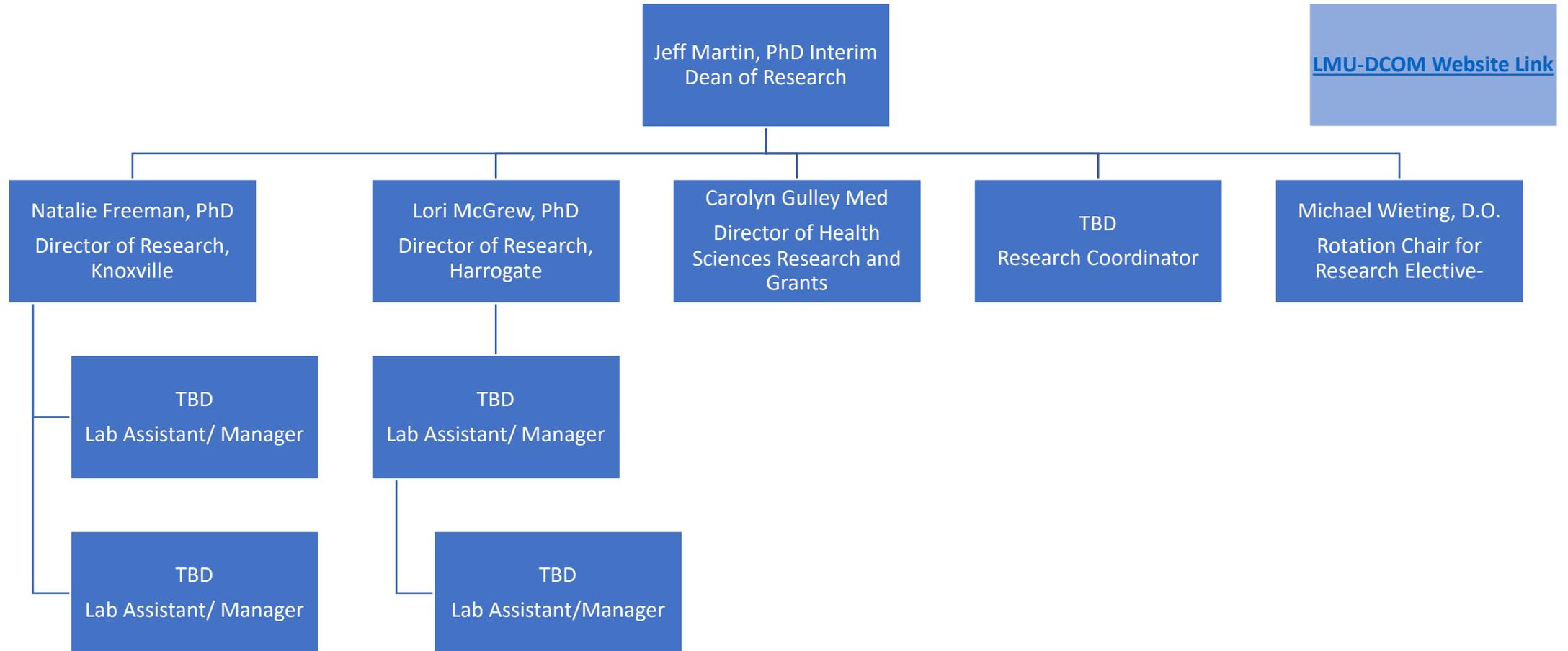
Objectives: Introduction to how preceptors and students can conduct research.

- Brief Description: Introduction to processes for conducting research such as Student Research Forms, CITI Training, Institutional Review Board, and Publications.
- Overall Goal: How to properly conduct research with medical students/residents and examples of projects within the hospital and/or clinic.
 - At the end of the educational activity, participants will be able to follow a process for conducting research with students including case studies and retrospective reviews.
 - At the end of the educational activity, participants will be able to understand processes for Student Forms, IRB and CITI training for conducting research with students.

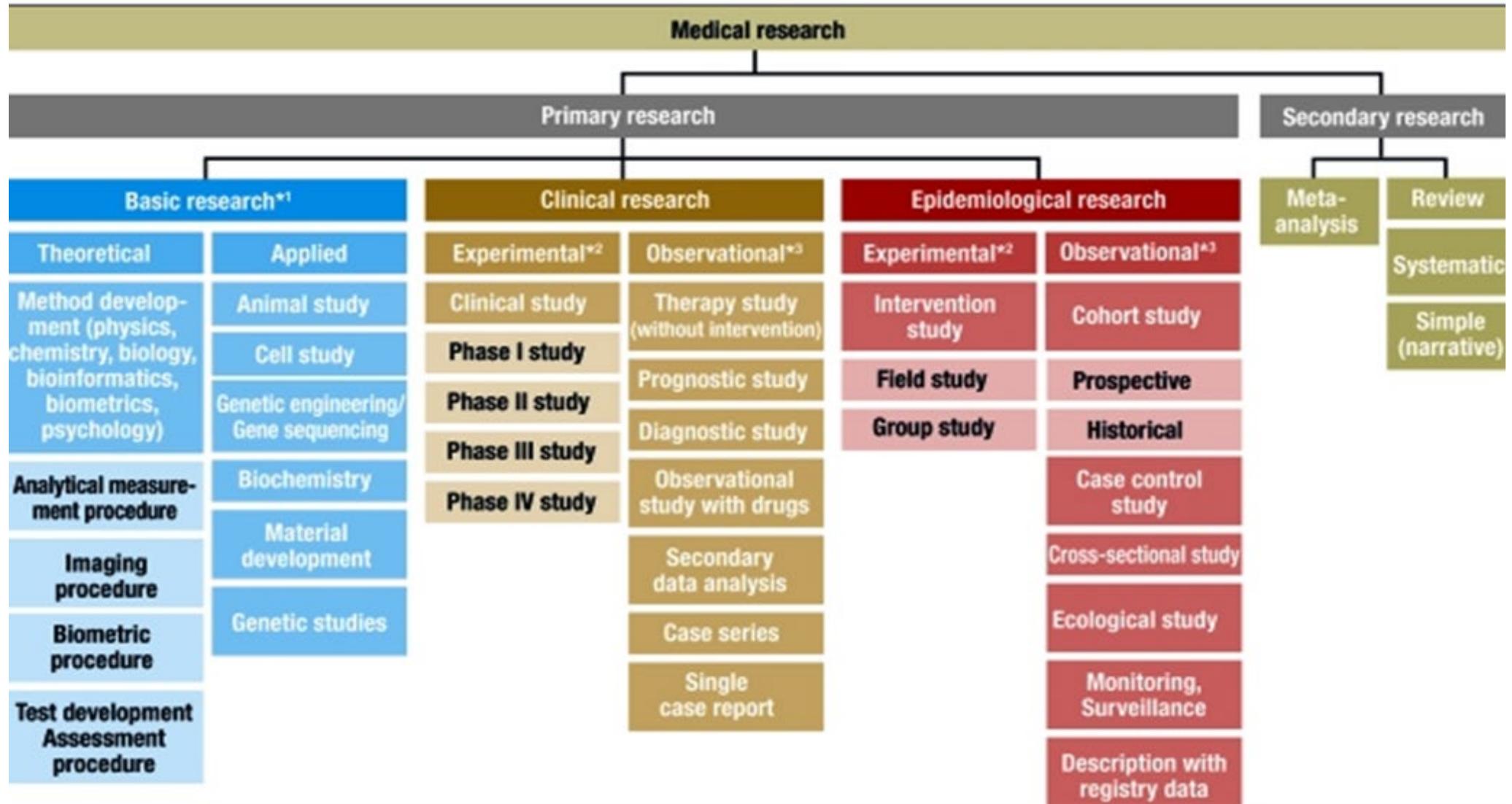
Objectives

This activity will aid in enhancing patient care with introduction to research such as case series, process improvement projects, meta-analysis, and surveys that can be performed to improve hospital LOS, turn-around times, and outcomes. Retrospective patient data reviews will enhance future patient care.

LMU DCOM Research Department

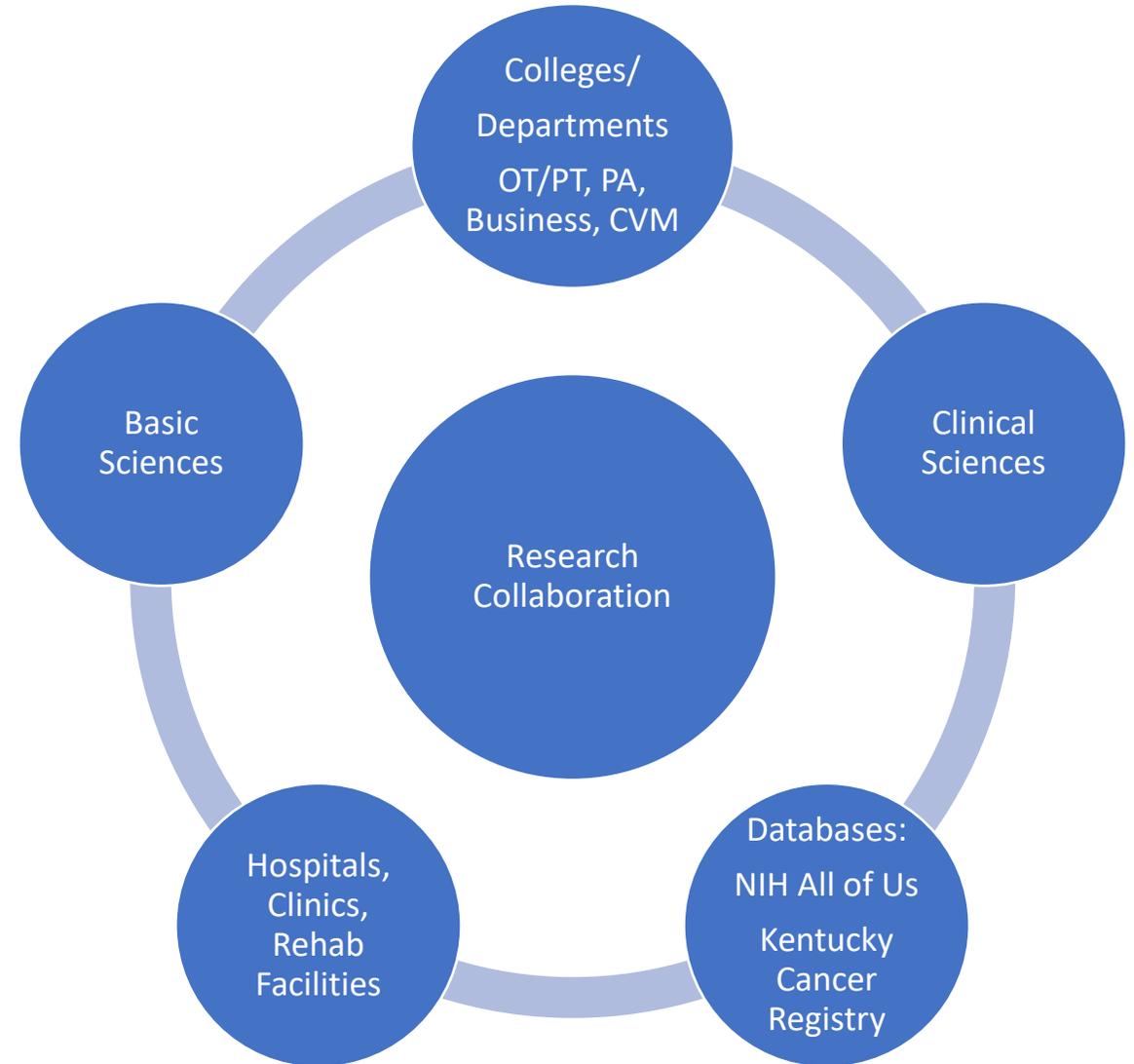


Types of Research



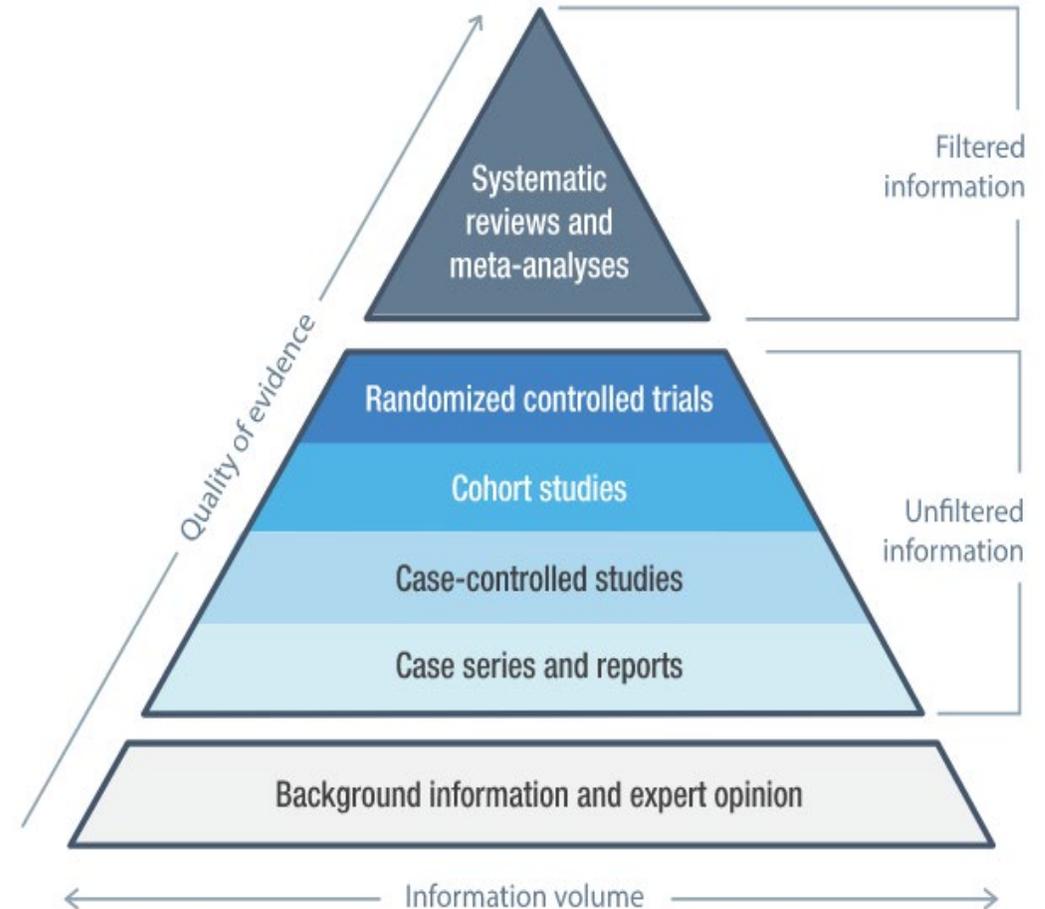
Potential Research Collaborations

- Research collaboration may give researchers the opportunity to discover new ways to approach challenges and produce creative solutions from the perspectives of complementary areas.
- Across Disciplines, Colleges, and Professions



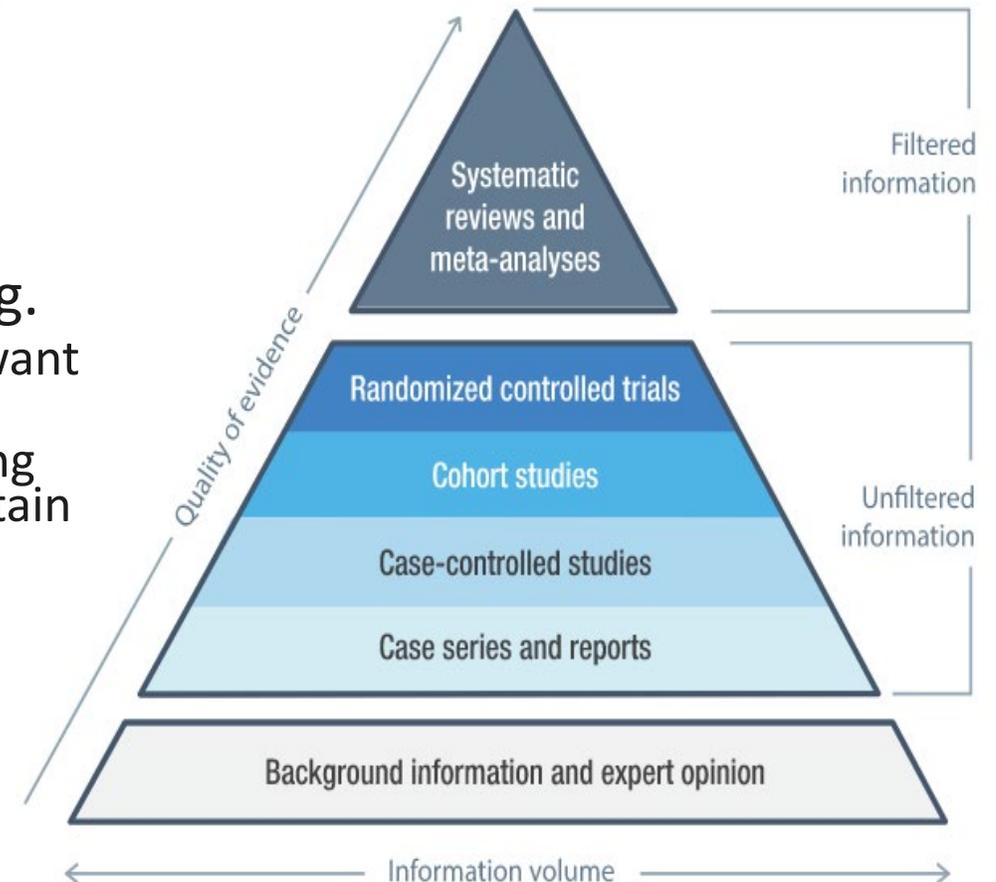
Case Report and Case Series

- Case Reports are in-depth accounts of a patient's clinical progress.
 - They typically give new knowledge about a particular disease entity and its treatment, or they describe an unusual or novel occurrence.
- Case Series involves multiple patients, retrospectively.
 - These studies are excellent for medical students to do to acquire a full educational experience because statistical calculations can also be used to get meaningful results.



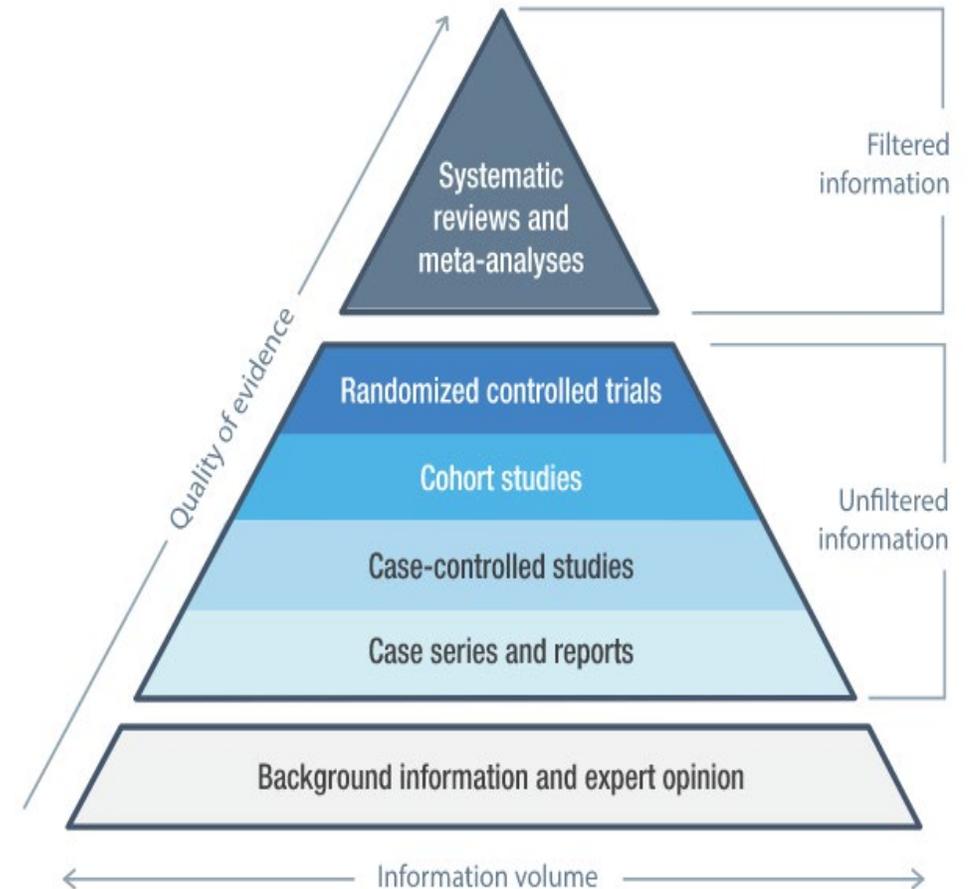
Clinical Research

- Cohort studies, case-controlled trials, and survey-based research are examples of common study designs.
- Clinical research calls for IRB approval, stringent methods, and high sample sizes, all of which necessitate devoted time and frequently financing.
 - These may act as obstacles for medical students who want to carry out this kind of study.
 - There are multiple avenues for student research funding such as the AOA, which offers students funding for certain research projects; you can learn more [here](#).
- Human subject-based research always requires authorization and institutional review before beginning.
 - We require students to follow your institution's rules before engaging in any type of research.



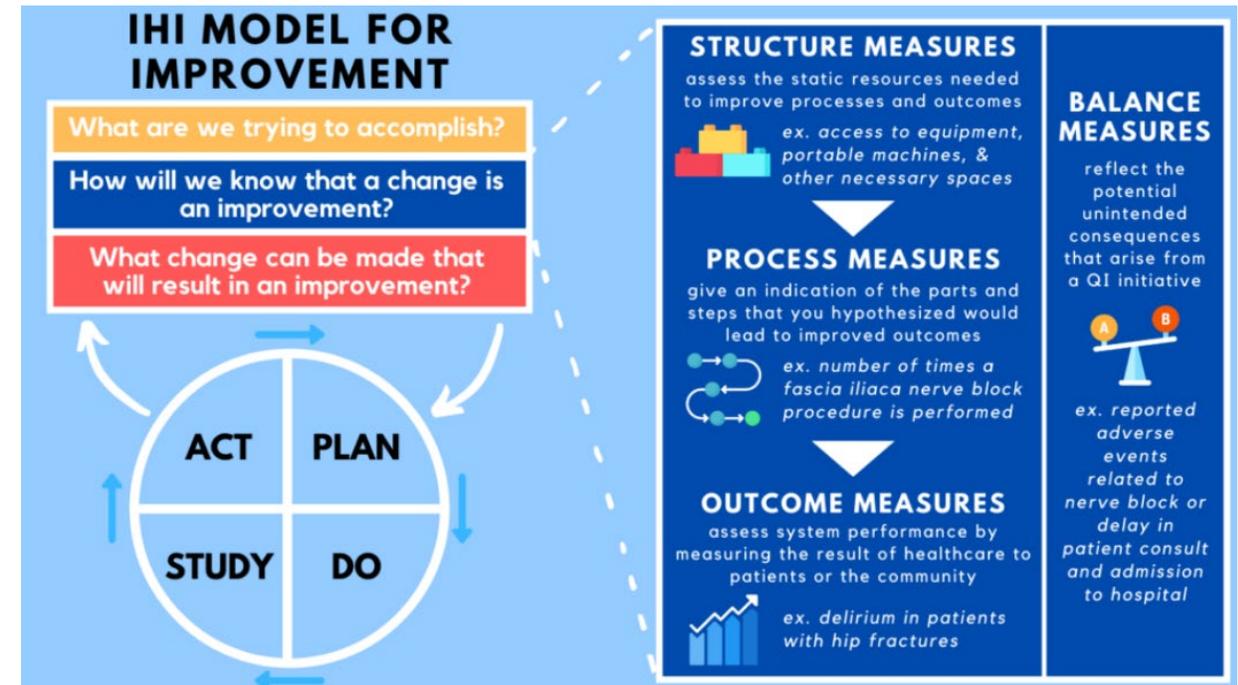
Review Articles

- A literature review is a compilation and summary of published works on an unsolved, contentious, or novel topic.
- There are various types of reviews, such as meta-analyses, systematic reviews, and traditional literature reviews, each of which offers a very high, high, or modest level of evidentiary value.
- Review articles have the potential for remote cooperation and can help you gain subject-matter expertise.
- The time required to perform the evaluation and the difficulty of publishing this kind of research are two drawbacks.



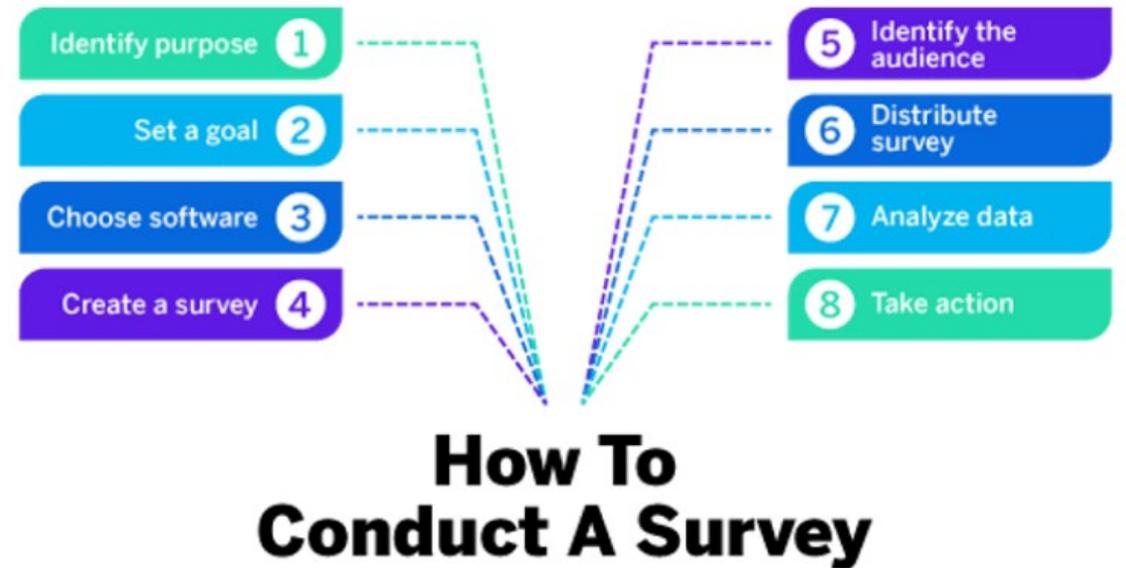
Quality/Performance Improvement

- Quality improvement is the framework used to systematically improve care.
- Quality improvement seeks to standardize processes and structure to reduce variation, achieve predictable results, and improve outcomes for patients, healthcare systems, and organizations
- Examples:
 - Reduced hospital readmissions.
 - Improved care coordination among departments.
 - Decreased medication administration errors.
 - Improved electronic medical record documentation.
 - Reduced medication-related adverse events.
 - Optimized sepsis care.



Survey Research

- Survey research is the practice of conducting research using questionnaires that researchers distribute to survey participants.
- In order to get significant study conclusions, the survey data is subsequently statistically examined.



Problems Medical Students Encounter

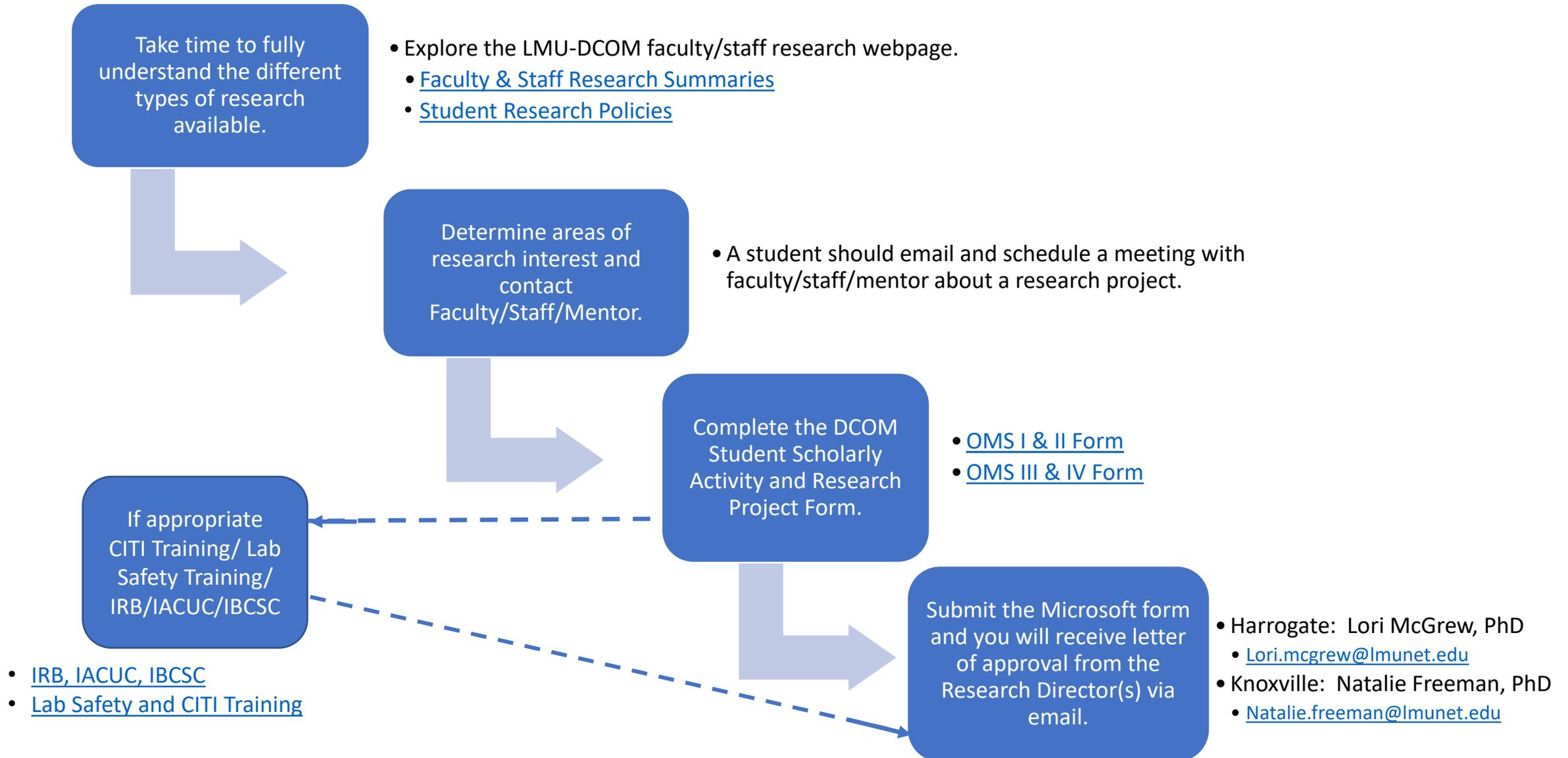
Where to begin

Formulating an idea

Choosing a mentor

Following policy and procedures

DCOM Student Research Project Process

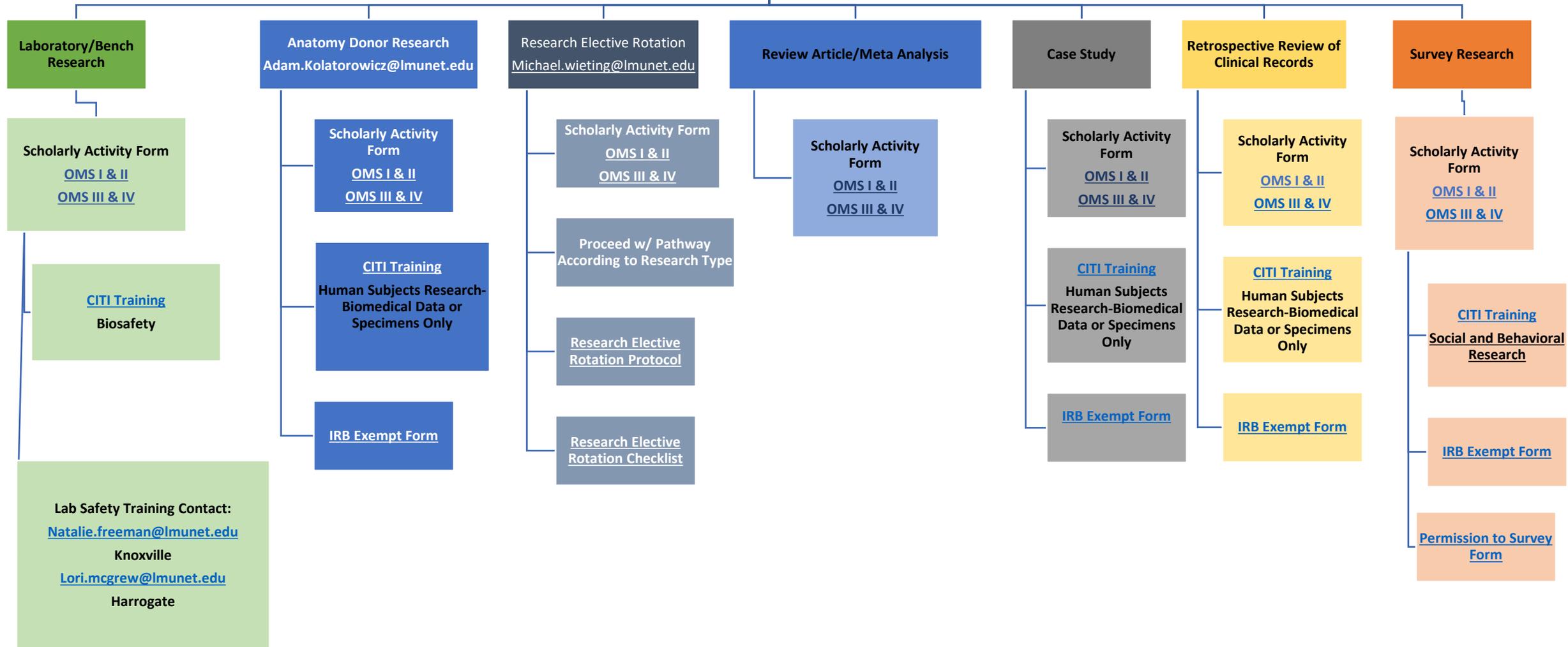


Where to Find LMU-DCOM Research Information

[LMU-DCOM Student Research](#)

- Forms/Applications
- Research & Grant Committee
 - Research Faculty
 - Student Research

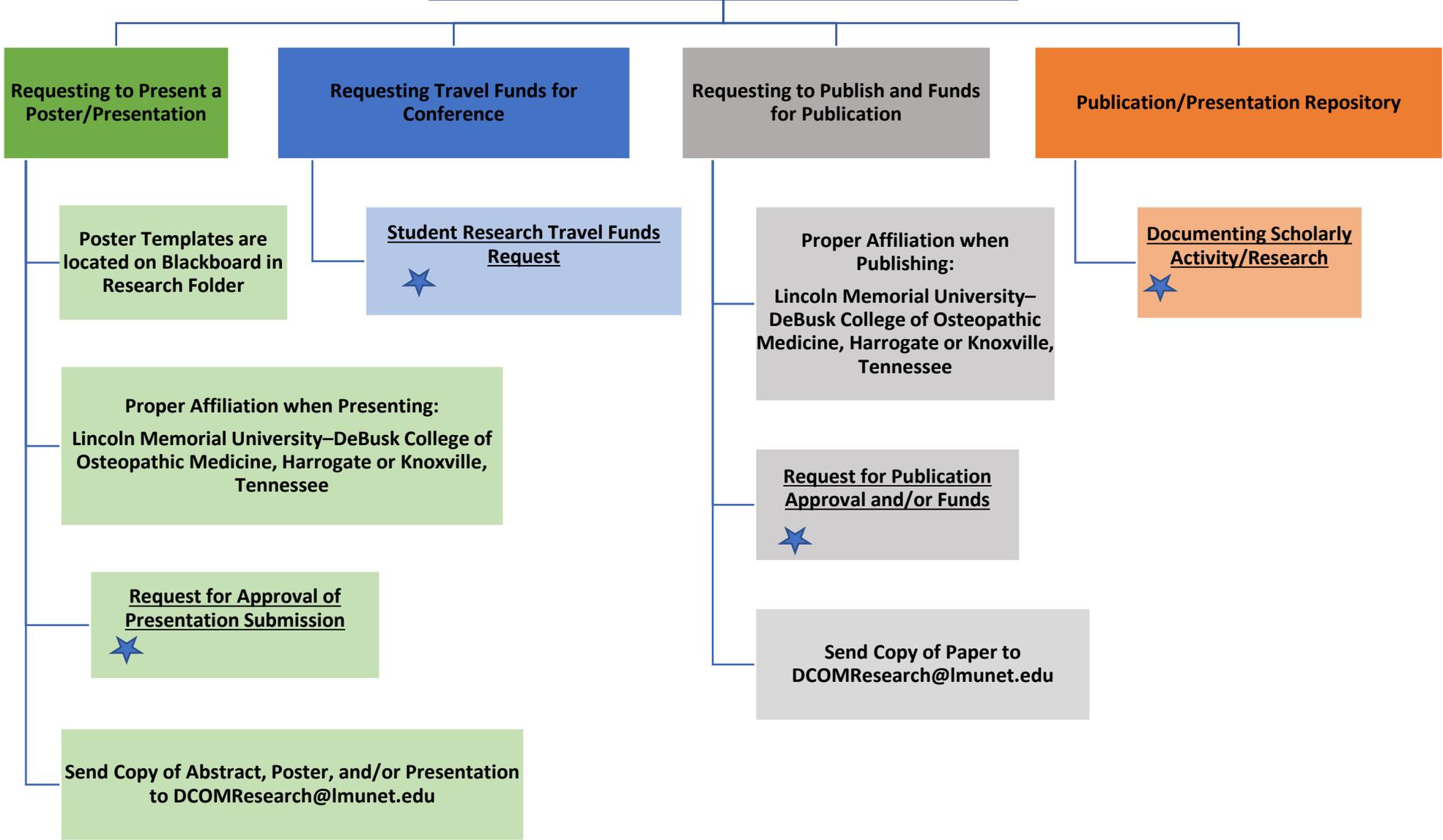
**LMU-DCOM Student
Scholarly Activity and Research
Pathways**



**LMU-DCOM Student
Request for Presentation, Travel Funds, and
Publication**

LMU-DCOM Research Website Link

★ Links to required forms



The Influence of Target Inflation Pressures on Physiological Outcomes Associated with External Counterpulsation (ECP) Treatment



Folarin Onifade, OMS-II, Nick Townsend, PAS-II, Matthew Holland, OMS-IV, Allison O'Brien, OMS-II, Brooke Vase, B.S., Rachel Hickman, B.S., Stacy Chelf, Ph.D., and Jeffrey Martin, Ph.D.
DeBusk College of Osteopathic Medicine, Lincoln Memorial University, Knoxville, TN 37932

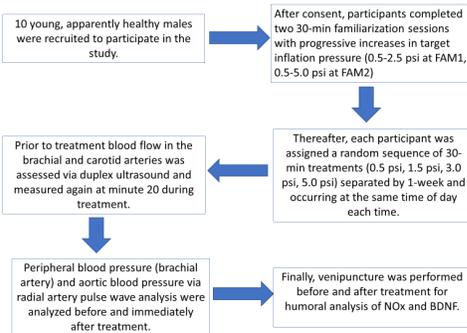
Abstract

Background: External Counter Pulsation (ECP) is a FDA approved treatment for the management of refractory angina that typically utilizes high target inflation pressures (250+ mmHg) impacting accessibility and limiting operational design.
Objectives: To compare the physiological impact of ECP at various target inflation pressures.
Method: 10 apparently healthy male subjects participated. After consent, participants were familiarized with ECP. Thereafter, each participant was given a random sequence of 30-min treatments (0.5 psi [25mmHg], 1.5 psi [80 mmHg], 3.0 [155mmHg] and 5.0 psi [260mmHg]) separated by a week. Prior and after treatment brachial artery blood pressure and aortic blood pressure were measured and venipuncture was performed to determine humoral concentrations of NOx (nitrates and nitrites) and brain derived neurotrophic factor (BDNF). Blood flow in the brachial and carotid artery was assessed pre and at 20-min of treatment.
Results: ECP at any target inflation pressure did not affect NOx or BDNF concentrations. Different target inflation pressures were found to cause differential effects on blood pressure and blood flow rates, particularly in the brachial artery.
Conclusions: Target inflation pressure appears to have minimal effects on carotid artery blood flows, but higher inflation pressures appear to progressively improve the blood flow profile in the brachial artery during treatment (increased antegrade, decreased retrograde). For the beneficial changes in brachial flow profiles, it appears that near or supra-systolic pressures are required.

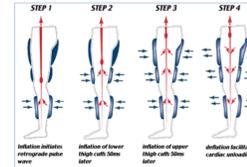
Introduction

Current Use: External Counter Pulsation (ECP) is an FDA approved treatment for refractory angina,¹ but has also been utilized, with beneficial outcomes, in other clinical populations (e.g., Diabetes Mellitus, Long COVID, arterial disease, etc).²⁻⁵ Notably, only one target inflation pressure is typically used (~300 mmHg) in treatment sessions which limits design and application scenarios that would make the treatment more accessible.
Intended Use: We sought to compare the physiological impact and outcomes of ECP at various target inflation pressures. Specifically, we wanted to determine the differential impacts of varied target inflation pressures on brachial and carotid artery blood flow during treatment as well as change in aortic blood pressure, brachial artery blood pressure, nitric oxide metabolites, and brain derived neurotrophic factor (BDNF) compared to pre-treatment values.

Methods



What is External Counterpulsation (ECP)?



External counterpulsation (ECP) utilizes pneumatic cuffs wrapped around the calves, lower thigh and upper thighs/buttocks to induce rapid inflation during cardiac diastole, progressively from distal to proximal. Standard target inflation pressure (5.0-5.5 psi) is known to markedly increase blood flow shear stress and increase venous return while decreasing cardiac afterload.

Results

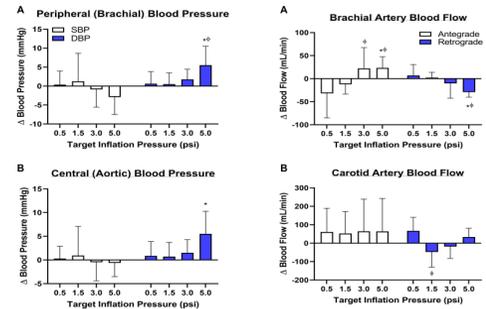


Figure 1A. Change in peripheral (brachial artery) blood pressure values from pre-treatment to immediately post-treatment. *, significant change within condition (pre v post values), p<0.05. †, significantly different compared to 0.5 psi condition (25 mmHg), p<0.05.

Figure 1B. Change in central (aortic) blood pressure values derived from applanation tonometry at the radial artery. *, significant change within condition (pre v post values), p<0.05.

Figure 2A. Change in brachial artery antegrade and retrograde blood flow rates from pre-treatment to measurement at the 20-min mark of each treatment condition. *, significant change within condition (pre v post values), p<0.05. †, significantly different compared to 0.5 psi condition (25 mmHg), p<0.05.

Figure 2B. Change in carotid artery antegrade and retrograde blood flow rates from pre-treatment to measurement at the 20-min mark of each treatment condition. p<0.05. †, significantly different compared to 0.5 psi condition (25 mmHg), p<0.05.

Discussion

Discussion: No significant changes, nor differential responses to target inflation pressures, were observed for NOx or BDNF. Although there was no change in the brachial systolic blood pressure (SBP) with varied target inflation pressure, there was a significant change in the diastolic blood pressure (DBP) at 5.0 psi (260mmHg) when compared to .5 psi value (25mmHg) and the pre-value (Fig. 1A). We believe that the significant change in brachial DBP post-treatment may be due to autoregulatory mechanisms affecting the peripheral muscular arteries more than the central elastic vessels following treatment to maintain blood pressure following a high shear stress vascular intervention promoting vasodilation. Central aortic blood pressure changes largely mirrored those observed in the brachial artery (Fig. 1B). Blood flow values were found to vary significantly with differing target inflation pressures in the brachial artery with greater increases in antegrade flow and decreases in retrograde flow occurring with higher pressures likely representing greater retrograde mobilization of blood from the lower limbs/abdominal aorta (Fig. 2A). Carotid artery flow rates did not change significantly during treatment illustrating central autoregulatory mechanisms despite marked changes in peripheral flow rates (Fig. 2B).

Limitations: This study was not without its limitations. Measurement of nitrate and nitrite in the blood requires strict adherence to a low nitrate diet for participants in the 72-hours prior to each visit. However, participants confirmed compliance and the values observed for pre-treatment for each session did not suggest any variation due to foodstuffs. Ultrasonography is challenging in any condition, but can be particularly challenging when a patient is physically impacted during measurement (cuff inflations). Thus, a trained sonographer was used for assessments and flow rates were measured using automated software that tracked vessel diameter and Doppler profiles in real time.

Future Studies: It is clear that there is significant physiological impact of lower than traditional target inflation pressures and ECP. However, given that even high target inflation pressure ECP did not significantly impact NOx values, it is difficult to make any determination or prediction regarding relative benefit of higher versus lower target inflation pressures. Further studies should utilize multiple target inflation pressures to determine differential impact on known acute effects (e.g., flow mediated dilation) as well as outcomes in clinical populations (e.g., long COVID) and long-term clinical studies (e.g., CAD, T2DM).

References

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Acknowledgements

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Common Venues for Student Posters

- [LMU Research Day](#)
 - April
- [TN Osteopathic Medical Association Conference](#)
 - April
- [Student National Medical Association Conference](#)
 - April
- [American Association of Colleges of Osteopathic Medicine](#)
 - April
- [Association of Professors of Human and Medical Genetics Conference](#)
 - May
- [American College of Osteopathic Surgeons](#)
 - September
- [Rural Health Association of TN Conference](#)
 - November
- [Osteopathic Medical Education Conference](#)
 - October

Other Opportunities

- [American Osteopathic Association](#)
- [American College of Osteopathic Family Physicians](#)
- [American Association of Colleges of Osteopathic Medicine](#)

- [AACR](#)
- [Melanoma Foundation](#)
- [City of Knoxville](#)

Grant Agency or Topic	Topic	Amount	Deadline
IDSA Education and Research Foundation Grants for Emerging Researchers/Clinicians Mentorship (G.E.R.M.)	Infectious Disease	\$2,000	Application opens November 2021
SIR Foundation Research	Interventional Radiology Research	Varies	Pre-review deadline: September 15, 2021, Final deadline: January 15, 2022
William B Bean Student Research Award	Medical History & Medical Humanities	\$1,500 plus \$750 travel	March 1, 2022
American Academy of Neurology Summer Research	Neurology	Varies	Variable dates
The Neurosurgery Research & Education Foundation (NREF)	Neurosurgery	\$2,500	Please see website for 2022 deadline
Fight for Sight Ophthalmology Research	Ophthalmology	\$2,400	Summer Student Fellowship due March 1
RPB Medical Student Eye Research Fellowships	Ophthalmology	\$30,000	Spring application due January 10 & Fall applications due July 1
SPR Awards	Pediatrics	\$1,000	Please see website for 2022 deadlines
ASTS Presidential Student Mentorship Grants	Transplant Surgery	\$3,500	Must be under mentorship of an ASTS member; February 2022
Asian Pacific American Medical Student Association	Various	Varies	Summer awards are due annually between Jan and March
Sigma Xi Grants-in-Aid of Research	Various	\$1,000 - \$5,000	March 15 and October 1 annually
Wilderness and environmental medicine	Wilderness medicine	\$5,000	October 1, 2021