

Developing a Good Research Question

Dr. Julia Wytsma and Dr. Temesgen Beyene

October 23, 2020



This session will be recorded

- We are recording this Zoom session so that it can be watched again at your convenience, and so that we can share it with your colleagues who were not able to join us today.
- If you would prefer that this recording **not** be shared with your EM colleagues, please email amcknight@ghem.ca within 24 hours of the session.
- We will share the presentation slides and other materials (journal articles, etc.) by email; you will have access to all materials regardless of whether the recording is shared.

Please also note:

- The information in this presentation and the video recording is up to date as of the date it was recorded October 23, 2020.
- It has not been updated to include any subsequent advances in practice, and the information presented in this video does not replace hospital, health centre, or governmental guidelines.

New Research “Office Hours”

- Extra support for your resident academic projects
- Dr. Julia will offer Zoom research office hours after grand rounds every month, usually the first Thursday of the month (will be included on the teaching schedule)
- Bring your projects to discuss one-on-one or in small groups

Outline

- Review the 'anatomy and physiology' of a good research question
- Apply these principles to example questions
- Question workshop of second year residents' proposed questions

A Trip Back In Time...

Clinical Epidemiology 1

Introduction

Written by: Jennifer Bryan, MD, MA, FRCP

With course and slide contributions by:

Drs. Cheryl Hunchak, Lisa Puchalski-Ritchie, Nazanin
Meshkat, Anne Aspler

University of Toronto, Division of Emergency Medicine

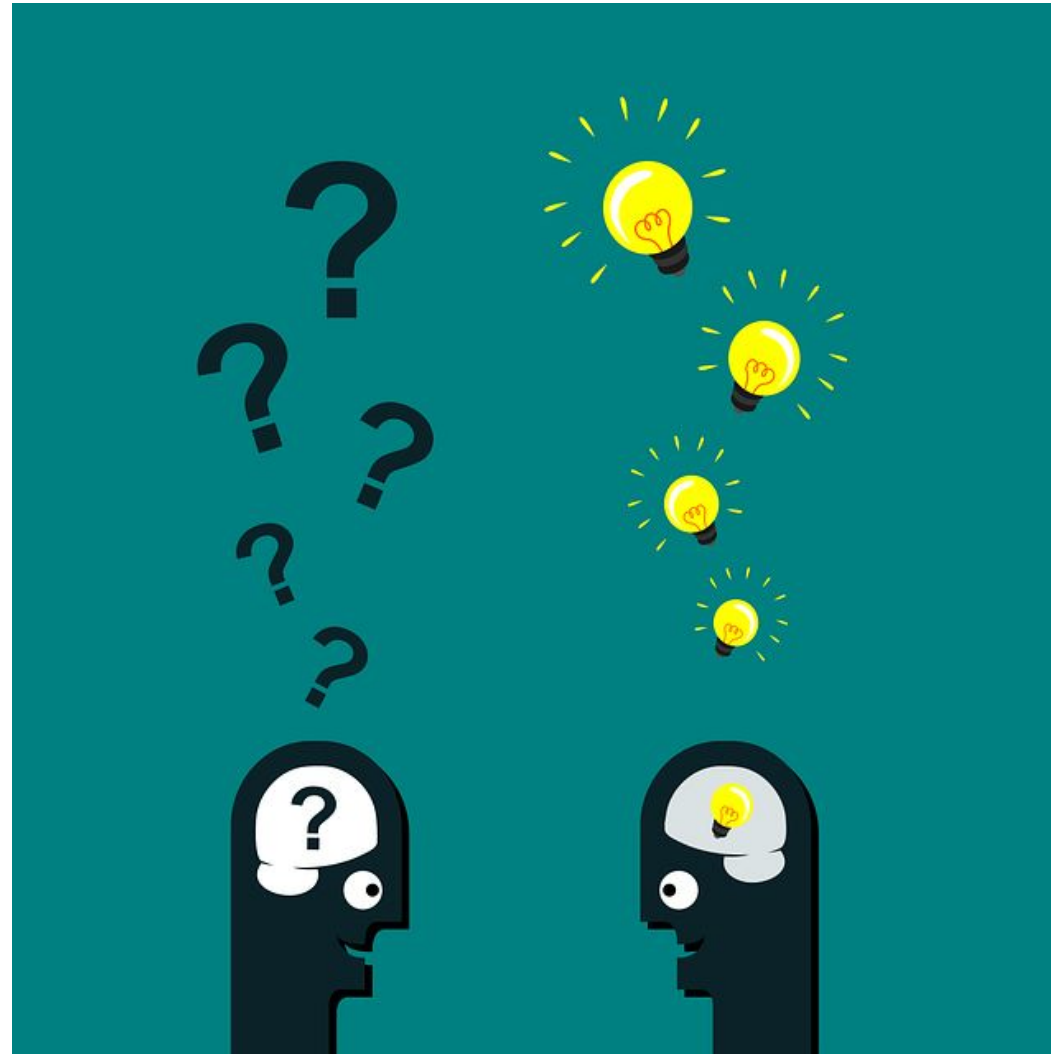
How to Develop a Research Plan

- Research Question – question addressed
- Background and significance – why is the question important?
- Design - time frame, epidemiologic design
- Subjects – who? selection criteria and method
- Variables – what will be measured? predictors, outcomes, confounds
- Analysis – how will data be analyzed? sample size?

How to Develop a Research Plan

- **Research Question**
- Background and significance
- Design
- Subjects
- Variables
- Analysis

Where do research questions come from?



Origins of a Question

- Curiosity
- Patient care
- Speaking to experts
- Conferences
- Skeptical attitude
-
- Teaching juniors
- Reading journals
- Mentors
- Systematic review
- Answering a question

**Develop a curious, questioning and critical approach to delivery of
Emergency Medicine care – recurrently question current practice!**

Curiosity – “I wonder”

- I wonder....

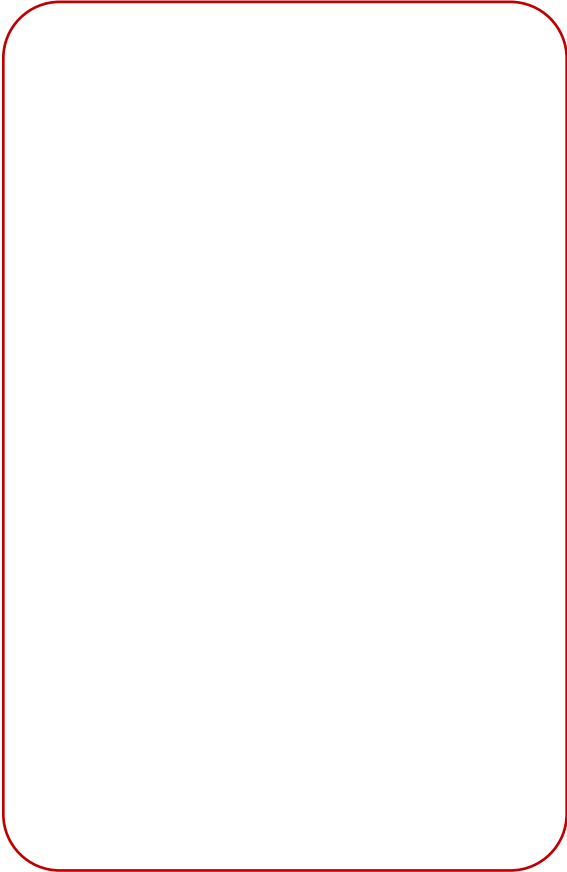
If we could treat hospital acquired pneumonia with a shorter duration of antibiotics?

Whether workers from certain industries are at greater risk of covid-19 infection?

If delayed presentation to hospital affects outcome of patients presenting with STEMI?

If ED POCUS availability affects time to OR in trauma patients?

Origins of a Question



Narrowing down a concern to a question

Should people drink more coffee?

How often do Ethiopians drink coffee?

Does drinking coffee lower the risk of developing diabetes?

Is there an increased risk of high cholesterol from excess caffeine?

Does caffeine in tea have the same effect on risk of developing diabetes as coffee?

Do people with a family history of type 2 diabetes who drink a lot of coffee have a lower risk of developing diabetes than those who rarely drink coffee?

Narrowing down a concern to a question

Should people drink more coffee?

How often do Ethiopians drink coffee?

Does drinking coffee lower the risk of developing diabetes?

Is there a risk of increased cholesterol from excess caffeine?

Does drinking caffeine in tea have the same effect on risk of developing diabetes as coffee?

Among a sample of patients seen in TASH ED
what proportion of patients with and without
a diagnosis of DM report drinking more than 3
servings of coffee a day when interviewed?

Master the literature

- Literature review provides context and rationale
 - What do we already know?
 - What studies have been done? How?
 - Has the question been answered well? Read critically!
 - Who do results apply to? Do they apply to your population?
 - What is unknown?

Does the evidence apply in your setting?



African Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/afjem



Research primer

Developing a research question: A research primer for low- and middle-income countries

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^e WHO Collaborating Centre for Research on Surgical Care Delivery in LMICs, Dept of Surgery, BARC Hospital (Govt. of India), Mumbai, India

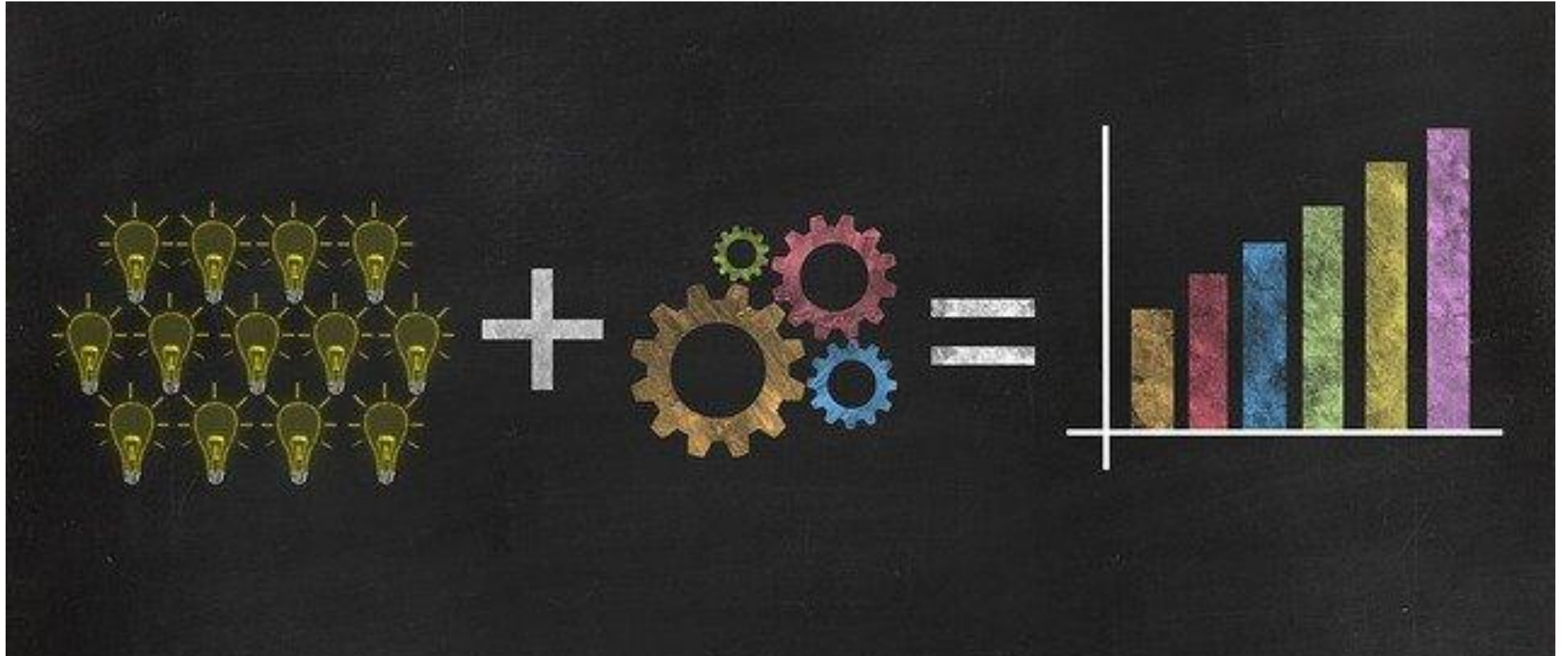
^f Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden

“Is this diagnostic or treatment approach, which is (or is not) supported by research in a well-resourced setting, ...

1. *Relevant to my local epidemiology*
2. *Relevant to my emergency department*
3. *Available*
4. *Feasible*
5. *Safe*
6. *Effective*
7. *Good value for money*
8. *Culturally appropriate, and*
9. *Of a public health benefit*

...in my resource-limited setting?”

What makes a good research question?



“FINER” criteria for a good research question

F
I
N
E
R

“FINER” criteria for a good research question

F	FEASIBLE Adequate subjects and expertise, affordable and fundable, manageable scope and time
I	INTERESTING Answering the question is interesting to investigator and colleagues
N	NOVEL Contributes new information, contributes/refutes/extends previous findings
E	ETHICAL Should not pose unacceptable physical risk or invasion or privacy – must pass IRB
R	RELEVANT Impacts clinical practice, scientific knowledge, healthy policy, or future research

Source: “Designing Clinical Research 4th Ed.” Hulley, S.B et al. 2013.

PICO: the anatomy of a clinical question

P

Population, patient, problem

- Precise and brief description of subjects
- Participants should be relevant to study's target population

I

Intervention (controlled) or exposure (not controlled)

- Therapy (medication, procedure), delivery of therapy (who, where)
- Risk factor, prognostic factor, eetiology
- Diagnostic test or result

C

Comparison or control

- What is the alternative to the intervention?

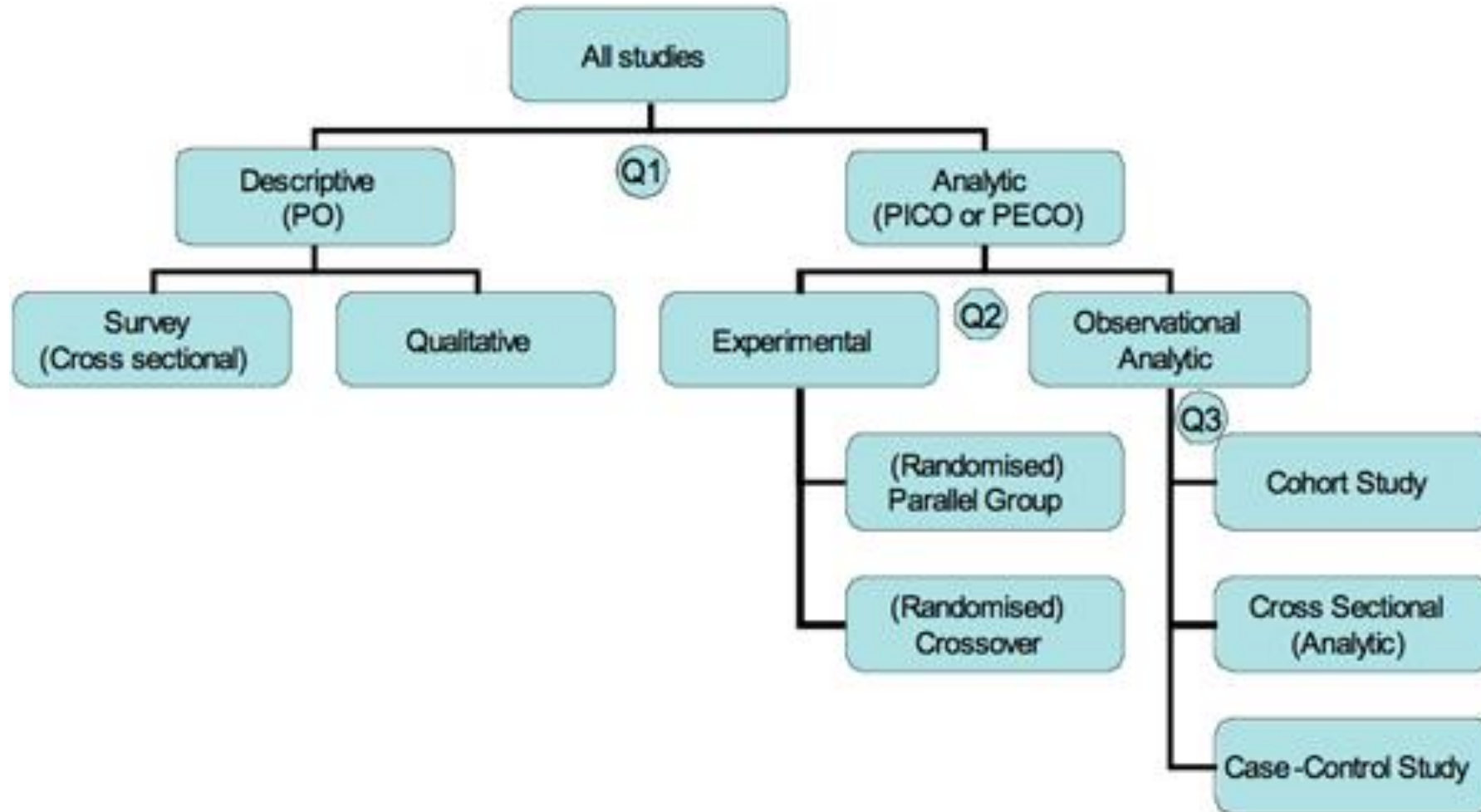
O

Outcome

- A specific outcome at a point in time
- Should be something that matters to patients or clinicians

T/S

PICO and study design



Source: The Centre for Evidence-Based Medicine - <https://www.cebm.ox.ac.uk/resources/ebm-tools/study-designs>

Common Question Pitfalls

- Not clearly defined by PICO
- Not focused: pick one main PICO question
- Not feasible: scope too large, data difficult to retrieve
- Too many outcomes studied

In Summary...

- Be curious and read the literature around your interest area, discuss with mentors and experts
- Narrow your interest down to define a PICO question, then focus your literature search
- Decide how to best answer the question and write your proposal...

Now time for some practice....

PICO Practice 1

Many of your patients with STEMI are brought by family or private taxi to your ED and seem to have long delays in their transport time. Some arrive via EMS.

You wonder if method of transport to hospital affects outcomes of STEMI patients.

What is your PICO question?

PICO Practice 1

P = patients with STEMI presenting to TASH ED

I = arrival by ambulance

C = arrival by other means

O = survival to hospital discharge

For adult patients with STEMI presenting to TASH ED, are those arriving by ambulance, compared to those not arriving by ambulance, more likely to survive to hospital discharge?

PICO Practice 2

Your patient had a falling down accident and has a small hemothorax.

You wonder if it should be drained or managed conservatively.

What is your PICO question?

PICO Practice 2

P = trauma patients with closed small volume hemothorax (<250ml)

I = chest tube drainage

C = conservative management

O = hospital length of stay

For adult patients with chest wall trauma and a closed small volume hemothorax, does chest tube drainage, compared to conservative management, improve hospital length of stay?

Some of your own examples?

PICO Practice 3

You notice many neurosurgical patients have prolonged ED stays prior to being transferred to the Neurosurgery service (admitted to the ward or brought to the OR).

You wonder if this affects their outcome.

What is your PICO question?

PICO Practice 3

P = patients in the ED consulted to neurosurgery

I = ED stay greater than 24 hours after consultation

C = ED stay less than 24 hours after consultation

O = disability score on discharge

Among neurosurgical patients kept in the ED, are those who spend over 24 hours in ED after consultation, when compared with those who spend less time, at greater risk of disability?

Inspiration from your predecessors...



SEEK WISDOM, ELEVATE YOUR INTELLECT AND SERVE HUMANITY!

Addis Ababa University
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PICO Study 1

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DEPARTMENT OF EMERGENCY MEDICINE**



**UTILIZATION OF DIAGNOSTIC FAST ULTRASOUND
IN DETECTING INTRA-PERITONEAL FREE FLUID
COLLECTION DONE IN TASH ED FOR ABDOMINAL
TRAUMA PATIENTS**

**BY Dr. TINBIT YEHUALAESHET
EMERGENCY MEDICINE AND CRITICAL CARE RESIDENT**

“OBJECTIVE- This study will generally assess the utilization of FAST in abdominal trauma patients and the diagnostic accuracy in intra-op findings and to validate the use of FAST US in all abdominal trauma patients.

METHODS AND MATERIALS- This is a prospective cross-sectional study to assess the utilization of bedside FAST US and the diagnostic accuracy of bedside FAST US in detecting intraperitoneal collection for patients presenting to the TASH ED with abdominal trauma and who are hemodynamically stable or unstable. FAST performed by emergency medicine senior (R3) residents or attending emergency physicians in the ED will be taken and compared with the results of formal ultrasound, CT scan or intra-op findings.”

PICO Study 1

P: Patients presenting to TASH ED with abdominal trauma

I: FAST ultrasound scan by ED provider

C: Ultrasound or CT with radiology, intra-operative findings

O: Detection of intra-abdominal bleeding

PICO Study 2

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DEPARTMENT OF EMERGENCY MEDICINE



**PAIN TREATMENT PRACTICE AND ITS IMPACT ON PATIENT SATISFACTION
IN EMERGENCY DEPARTMENT: EXPERIENCE FROM TIKUR ANBESSA
SPECIALIZED HOSPITAL, ETHIOPIA, 2019.**

Principal Investigator

Demmelash Gezahegn Nigatu, MD

ADVISORS

Professor Aklilu Azazh (Internist, Professor of Emergency Medicine)

Dr. Tigist Zewdu (Assistant Professor of Emergency Medicine)

“Objective: The general objective of this study is to assess the pain treatment practice and its impact on patient satisfaction in the emergency department of Tikur Anbessa Specialized Hospital, July 15-19, 2019 Addis Ababa Ethiopia.

Methodology: Single centered, prospective, observational study for a continuous 24 hours of 5 days was conducted on total of 106 patients with history of recent pain. Numeric Rating Scale was used to assess patient’s severity of pain. Each patient was evaluated twice, initially at triage and 2-4 hours after arrival. The desire for analgesics was assessed at triage and Patient’s level of satisfaction was also assessed during the second evaluation.”

PICO Study 2

P: Patients presenting to TASH ED with recent pain

I: Analgesia prescription

C: No analgesia prescription

O: Patient satisfaction, pain severity

PICO Study 3

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**DEPARTMENT OF EMERGENCY AND CRITICAL CARE
MEDICINE**

Thesis on accuracy of emergency and critical care residents in interpreting emergency cranial CT scans as compared to neuroradiologist experience from two medical schools in Ethiopia

Nathan Muluberhan (MD, EMCC RIII)

ADVISORS: Temesgen Beyene (MD, & Ass. Prof. of Emergency and Critical care)

Finot Debebe (MD, Msc & Ass. Prof. of Emergency medicine, intensivist fellow)

“Objectives: was to determine competence of emergency medicine residents of TASH in the assessment of cranial CT scans, May 2019

Methodology: A prospective cross-sectional study employed on the EMCC residents of AAU, and St’ Paul MMC. Data collected from May 2019-June 2019 by using structured questionnaires as well as through radiant view software by displaying the full slices of the cranial CT scans.”

PICO Study 3

P: sample CT scans on computer

I: ED resident interpretation of CT head

C: neuroradiologist interpretation of CT head

O: detection of correct pathology

PICO Study 4



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DEPARTMENT OF ANAESTHESIA

Prophylactic effect of sub hypnotic dose of propofol in the prevention of Intraoperative post-delivery nausea and vomiting in mothers undergoing elective caesarean section under spinal anaesthesia at ALERT referral hospital, Addis Ababa, Ethiopia, 2020, a prospective cohort study.

PRINCIPAL INVESTIGATOR: - Adane Bayisa (BSC)

“Objective: To assess the prophylactic effects of sub-hypnotic dose of propofol in preventing the occurrence and severity of post-delivery nausea and vomiting in parturients who underwent elective Caesarean Section under Spinal Anaesthesia

Methods: A prospective cohort study was done at Alert Referral hospital on 62 Parturients who came for elective caesarean section under spinal anaesthesia by using systematic random sampling method. Incidence of nausea and vomiting, severity of nausea and use of rescue anti emetic were assessed.”

PICO Study 4

P: patients undergoing elective c/s with spinal anesthesia

I: sub-hypnotic dose of propofol

C: no propofol

O: incidence of nausea and vomiting, severity, use of rescue medication

Some more examples:

Clinical profile of peripheral arterial disease at emergency department in Tikur Anbesa Specialized hospital, Addis Ababa, Ethiopia.

Tesfagabr, Shewit (Addis Ababa University, 2018-06)

Clinical features and outcome of acute Coronary syndrome in patients presenting to the emergency departments in Addis Ababa, Ethiopia.

Dr.Wakwaya, Rediet (Addis Ababa University, 2019-08)

Prevalence and risk factors of delirium in intensive care unit and, emergency department of Tikur Anbessa specialized university hospital.

Anteneh, Meron (Addis Ababa University, 2019-08)

Pattern and outcome of Acute Kidney Injury in Tikur Anbessa specialized hospital

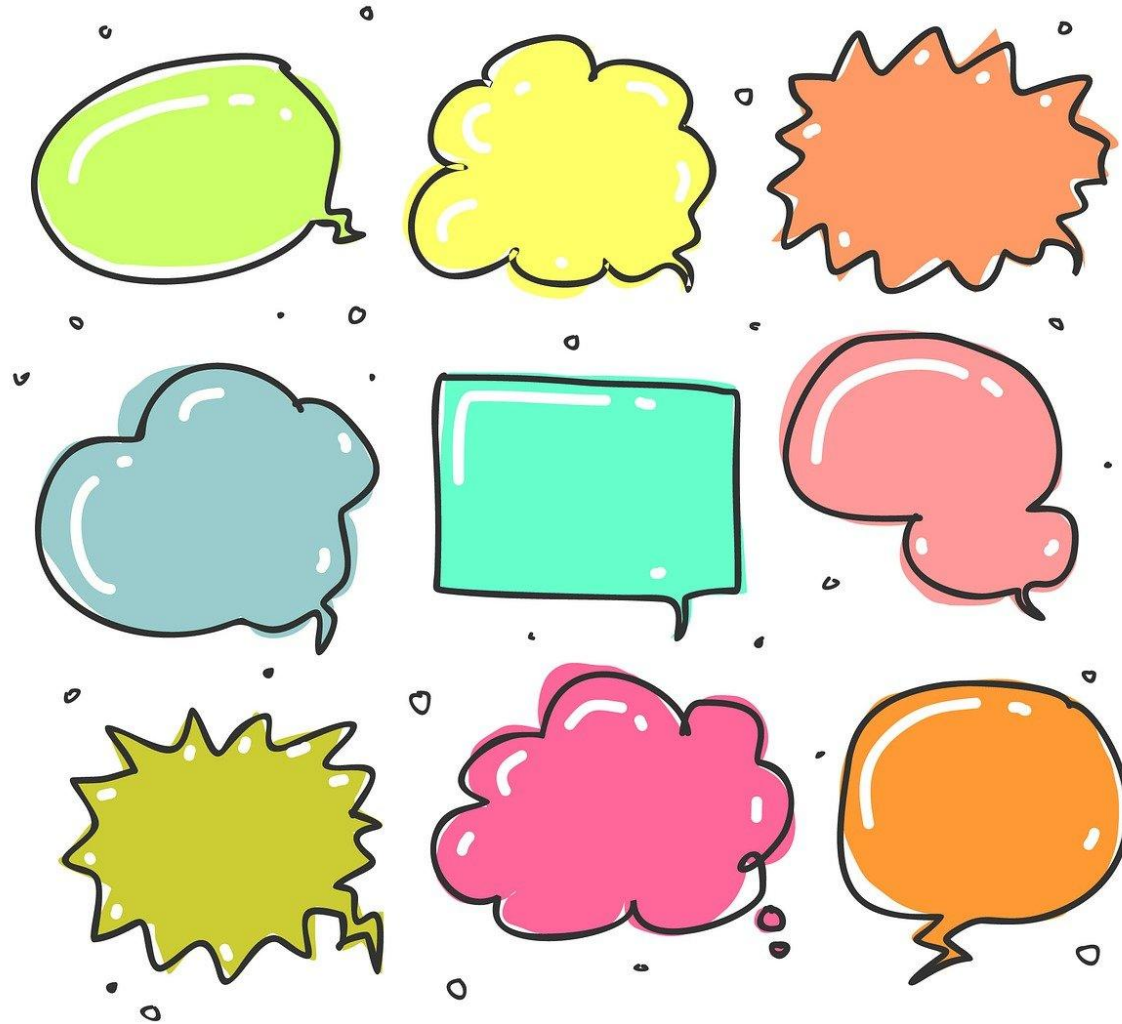
Kefyalew, Merahi (Addis Ababa University, 2019-08)

From Dr. Merah's report:

Result A total of 144 cases of AKI were included in the study...The most common causes of AKI were Sepsis (43.2%) ... Uremic encephalopathy, sepsis and hyperkalemia were factors that were identified as mortality predictors in overall AKI patients. AKI patients with sepsis were found to have lower hospital survival than those without sepsis. From the laboratory findings, there was significant difference between creatinine values on admission and discharge. Conclusion: As sepsis was the dominant cause of AKI as well as mortality predictor and cause of lower hospital survival, early initiation of antibiotics in the Emergency unit would be beneficial in order to improve the in-hospital outcome of patients with AKI.

There are many follow up
PICO questions to develop!

Workshop: R2 Research Proposals



Current R2's Research Proposals Workshop

- Dr Kalkidan: Characteristics and factors associated with DKA in patients at TASH ED
- Dr Yonas: Clinical profile of patients with cervical ca kept in ED BLH
- Dr Meron: Digoxin use and it's subsequent clinical outcome in patients with afib

Current R2's Research Proposals Workshop

- Dr Matiwos: Assessment of quality of CPR done during weekend and week days in TASH
- Dr Astewusagn: prevalence and major clinical presentation of hematologic malignancy patients in the ED of TASH
- Dr Biruk: Clinical profile and outcome of cardiogenic shock in black lion Ed

Current R2's Research Proposals Workshop

- Dr Belayneh: Assessment of poisoning cases and their management among ED visits of government hospitals, AA
 - P-pts with poisoning
 - I-poisoning management
 - C-
 - O-improvement /discharge ,death...
- Dr Yegeta Research title: clinical profile of trauma patients getting head ct scan in emergency room

Resources

- Hulley, S.B. et al. 2013. *Designing Clinical Research (4th Ed)*. Philadelphia, USA: Lipincott Williams and Wilkins.
- Rob D. Mitchell, et al., African Journal of Emergency Medicine, <https://doi.org/10.1016/j.afjem.2020.05.004>
- University of Oxford, Centre for Evidence-Based Medicine. Asking focused questions: <https://www.cebm.ox.ac.uk/resources/ebm-tools/asking-focused-questions> (Accessed online Oct 2020) and Study Designs: <https://www.cebm.ox.ac.uk/resources/ebm-tools/study-designs> (Accessed online Oct 2020)

Extra Question Examples

PICO Practice 4

You notice several medication errors related to improperly labelled syringes of medications drawn up in the ED.

You wonder if producing standard medication labels would reduce these errors.

What is your PICO question?

PICO Practice 4

P = medications used in the ED

I = standardized medication labels with name, concentration, dose

C = usual practice (tape or no label)

O = medication errors

For commonly used ED medications, does use of standardized labels, compared to tape (or no label,) produce less medication errors?

PICO Practice 5

You assess a 40-year-old patient with fever and a new heart murmur.

Your senior performs a bedside ultrasound and does not see any vegetations.

You wonder how good POCUS is at detecting vegetations compared to a formal echo.

What is your PICO question?

PICO Practice 5

P= patients with suspected endocarditis

I = POCUS performed by ED clinician

C = trans-esophageal echo performed by cardiology

O = detection of vegetations

In adults with suspected endocarditis, is bedside ultrasound, when compared with TEE performed by cardiology, as good at detecting vegetations ?