International Pharmaceutical Students' Federation

Since 1949 | Students today, pharmacists tomorrow.

Critical Appraisal of Journal Articles

Margaret O'Connor, Third Year Student
University of Illinois at Chicago, Illinois, USA,

/IPSForg

www.ipsf.org

IPSF is the leading international advocacy organization for pharmaceutical students and recent graduates, promoting improved public health through provision of information, education, networking and a range of publications and professional initiatives

Pharmacy Education

FIP*Ed*
Education section of FIP

Pharmacy Education Advocacy

Internships

Webinars

Research

Young Researchers' Forum

Pharmaceutical Sciences Initiatives

Pharmacy Practices Initiatives

Educational and scientific poster competitions

Webinar Instructions

Mute Your Microphone at all times

Introduce yourself on the chat box with Name, Country

All Questions will be taken at the end of the Speakers Presentation – Kindly type all questions in the chat box during the presentation

Fill in the evaluation form at the end of webinar: Only those who fill the post webinar evaluation form will get a Certificate at the end of the webinar

Introduction of Speaker

Margaret O'Connor is a **third year pharmacy student at the University of Illinois at Chicago in Chicago, Illinois, USA and is the 2019-2020 editor for the IPSF PEN and Phuture publications.**

Her research interests include public health and interprofessional education.

Background

What is "Critical Appraisal"?
Systematic process to determine the strengths and weaknesses of an article to assess its validity and usefulness.

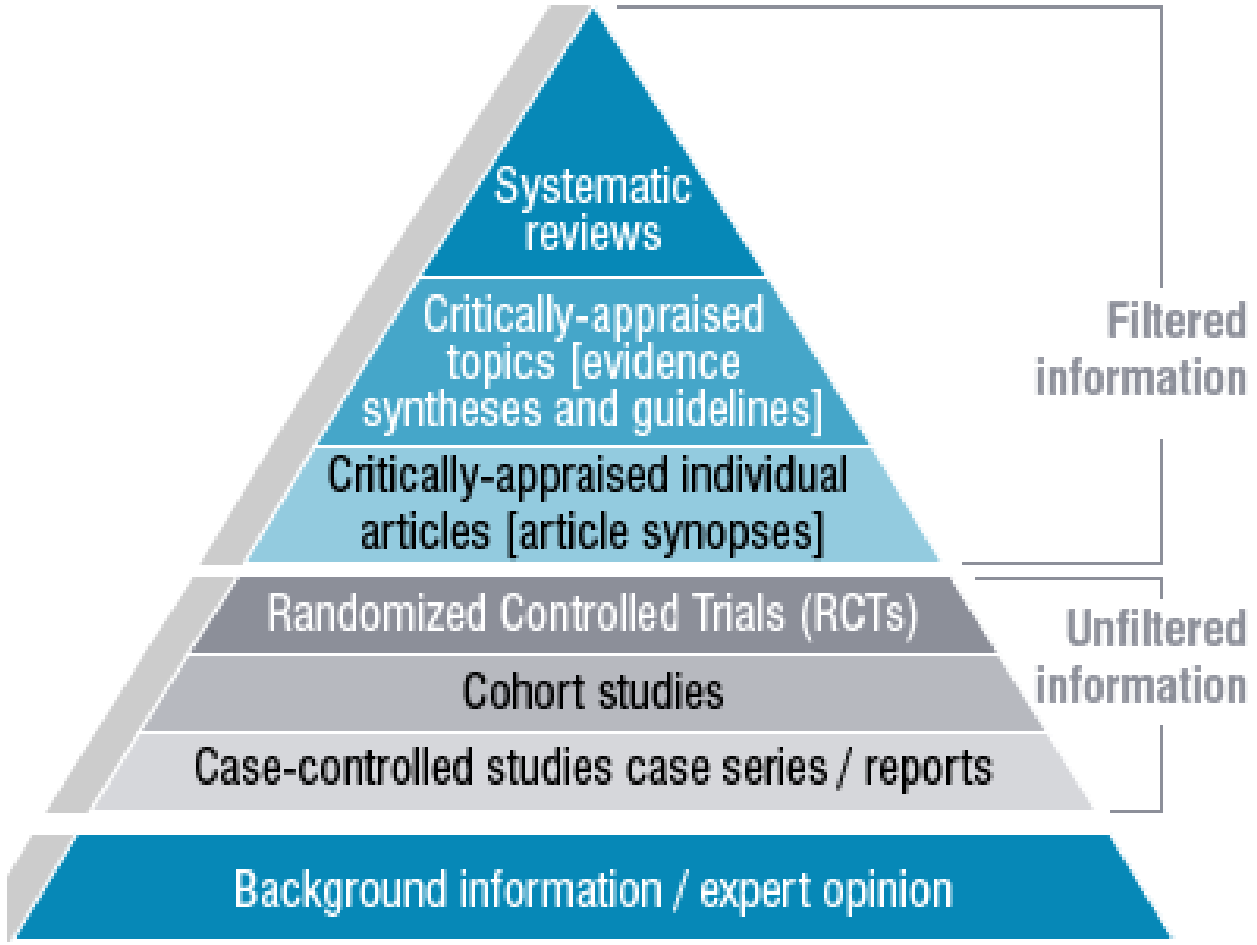
Why do we need critical appraisal?
Needed to compile valid and useful research
Not all literature is of high quality

What can be critically reviewed?
Any article or paper

"Critical appraisal skills enable you to assess the trustworthiness, relevance, and results of published papers so that you can decide if they are believable and useful."

- Critical Appraisal Skills, CASP (2013)

Hierarchy of evidence



Level I: Evidence from a systematic review of all relevant randomized controlled trials (RCT's), or evidence-based clinical practice guidelines based on systematic reviews of RCT's

Level II: Evidence obtained from at least one well-designed Randomized Controlled Trial (RCT)

Level III: Evidence obtained from well-designed controlled trials without randomization, quasi-experimental

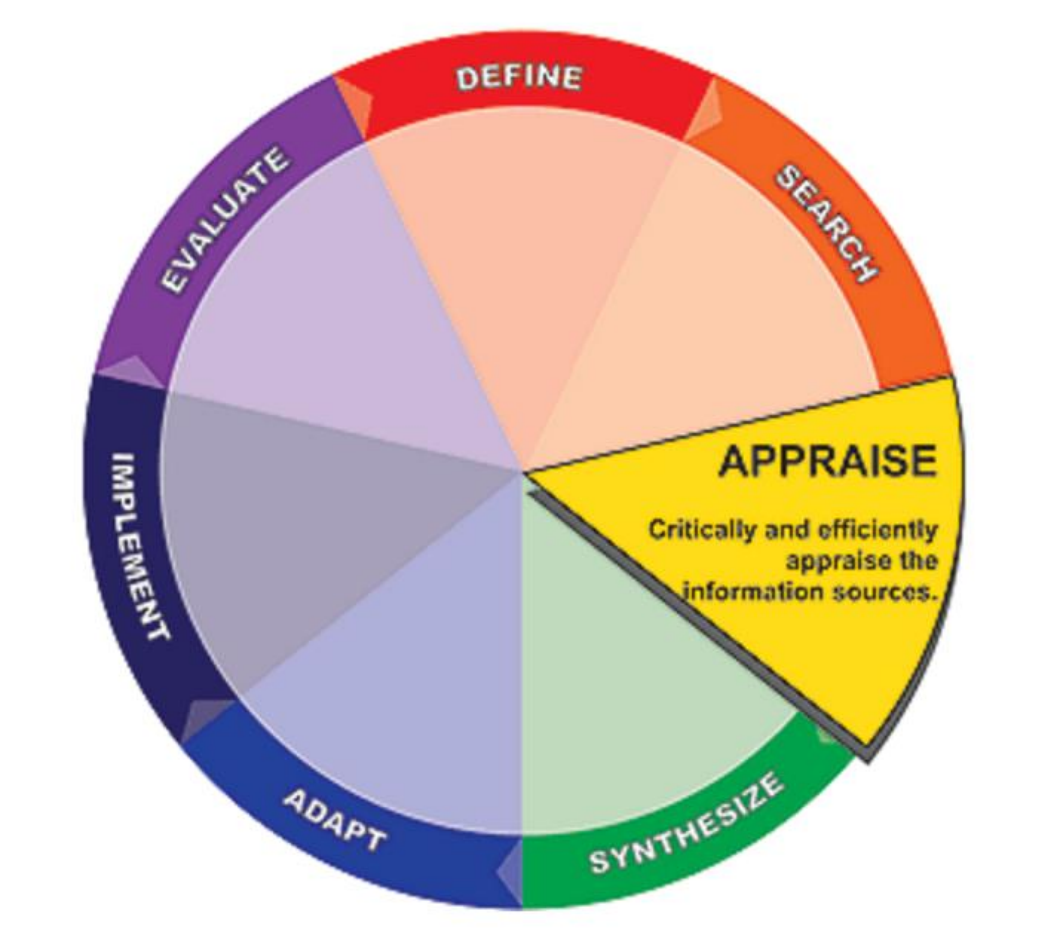
Level IV: Evidence from well-designed case-control and cohort studies

Level V: Evidence from systematic reviews of descriptive and qualitative studies

Level VI: Evidence from a single descriptive or qualitative study

Level VII: Evidence from the opinion of authorities and/or reports of expert committees

Where does it fit in the research process?



General Guiding Questions:

Is the question/focus of the study clear and focused?
→ Is it the same questions I am looking to answer?

Are the methods and analysis used valid and can they be reproduced?
→ Are the results outcomes useful or meaningful?

Ultimately, can this information be useful in
Research Argument and Synthesis
System or Policy change
Patient Care Decisions
Guideline Development

Bottom Line

Can the results/information be **TRUSTED?**

Do the outcomes **MATTER?**

Roadmap

Establish your needs .1
Search for bias or conflicts .2
Define who was studied .3
Find out what happened to the population .4
Determine relevance .5
Ignore potentially opinionated parts of text .6

Set Up

Establish a **QUESTION: PICO**
Patient –**I**ntervention – **C**omparator – **O**utcomes

Establish your **NEEDS:**
What outcomes are you looking for?
What populations are you interested in?

Establishing Your Needs

Evaluate the Title

Establish the Comparison

Define the Population

Assess the Outcomes measured

Study Strength: Methods – Statistics

Conclusion: Best Case Scenario

General Aspects to Assess

Clinical Question(s) – Outcomes of Interest

Population Assessed

Methods Utilized

Outcomes Collected

Analysis Strategies

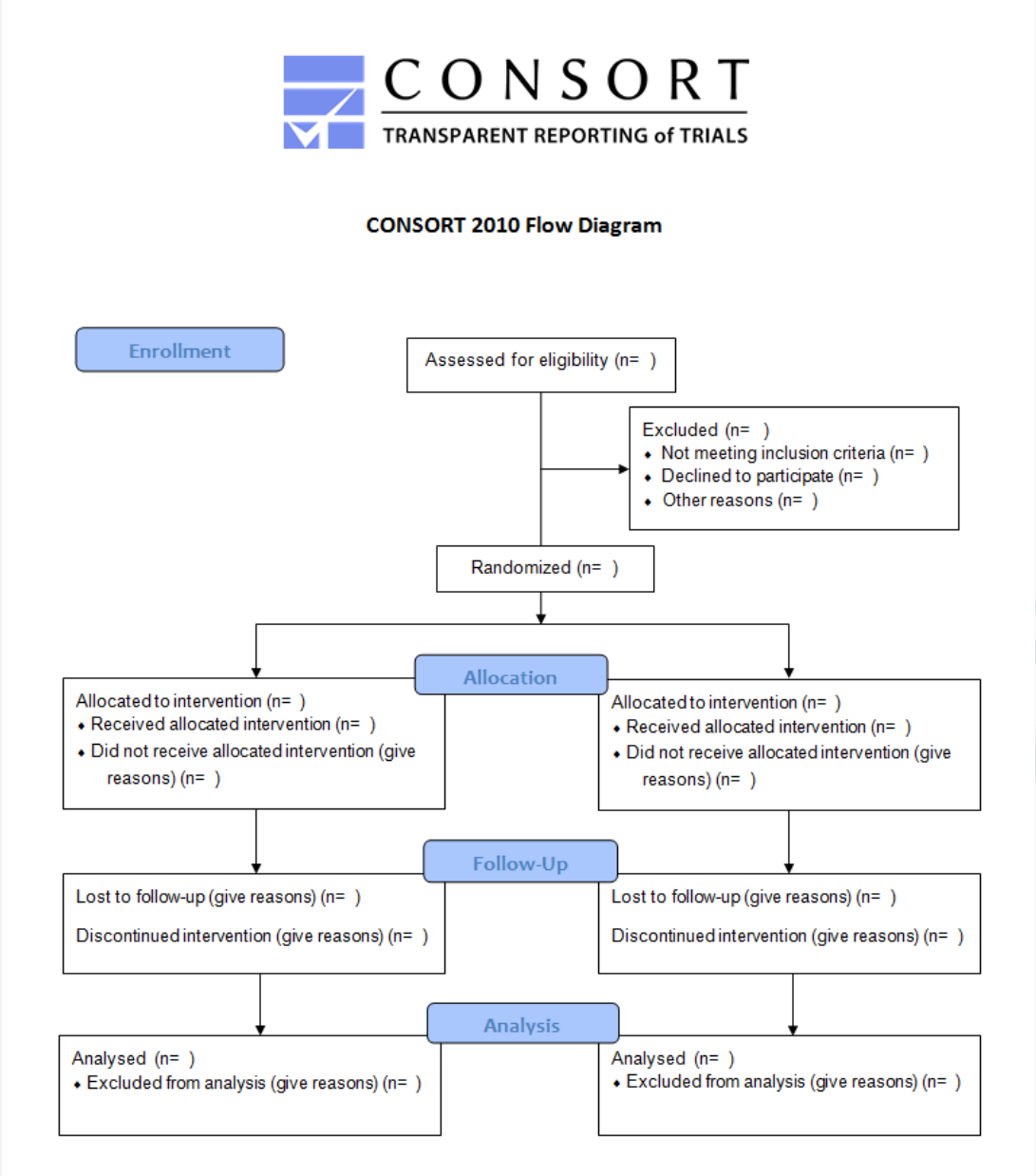
Conclusions

Population

Population Size
Power: generally the number of participants
Greater enrollment = greater power

Population Characteristics
Inclusion Criteria
Exclusion Criteria
Baseline Characteristics

Retention and Drop Out
Consort Diagram



Methods

Randomization
How are the participants assigned to groups
Are these groups balanced

Blinding
Single vs. Double blinded vs. No blinding
Third party administration

Locations
Number of sites
Site location

Validity: Internal and External

Internal
Study design and methodology
Populations and randomization

External
Is the study applicable to others
Can the methods be employed in other settings

Evaluating Bias

Randomization and Blinding
Were the groups truly equal?

Conflicts of Interest
Employment or funding

Types of Potential Bias
Selection – Performance –Detection- Attrition-Reporting

Outcomes

Is the data collected relevant?
How are outcomes organized?
Primary – Secondary – Surrogate
How are the outcomes analyzed?
→ Statistical Analysis

Are the positive outcomes of interest
Due to **chance** alone?
A result of **bias**?

Hopefully we can prove that they are due to the **intervention**

Statistics

Help us to determine if OUTCOMES are due to chance or are due to the intervention

Means of evaluating validity and strength of outcomes

Statistical Analysis: Tools

Absolute Numbers: how many subjects in each group experienced an event
Group A Events: 80/1000 → 8%
Group B Events: 60/1000 → 6%
2% absolute difference: Absolute Risk Reduction (ARR)

Relative Numbers: likelihood of event without knowing your baseline
6% vs. 8% → 25% difference between groups
Relative Risk Reduction (RRR) – 0.75

Statistical Analysis: Tools

Hazard Ratio: often describe relative differences
Total number of adverse events AND their timing
Hazard: slope of the survival curve for each group
Hazard Ratio: ratio of both of the slopes
At any given time:

HR: 0.5 – half as many patients in the treatment group are experiencing events

HR: 1 – rates of events are identical in both groups

HR: 2 – twice as many patients in the treatment group are experiencing events

Confidence Interval: allowable margin of error
Provides a plausible range of values for the actual effect
NOT a probability of magnitude
If the CI INCLUDES 1 – difference is NOT statistically significant

Statistical Analysis: Tools

P Values: shows how often a result would occur by chance alone if there was NO DIFFERENCE between our two groups

P= 0.04 → 4% of the time you would have similar outcome by chance

Generally, P values <0.05 are deemed to statistically significant

May be less useful than CI as it does not highlight the possible range of results

Statistical Analysis: Tools

Intention-to-Treat Analysis:
All subjects that were randomized in the beginning are included in the final analysis
Used to avoid the effects of crossovers/drop-outs which detriment initial randomization

Per-Protocol Analysis:
Only subjects who completed the entire study and follow- up are included in final analysis.
Reduces the chance of false concluding non-inferiority

Statistical Error Types

Decision you made			
		Do <u>not reject</u> the null hypothesis	**<u>Reject</u> the null hypothesis**
True condition in the population	The null hypothesis should **<u>not</u>** be **<u>rejected</u>**	**You are correct** in not rejecting the null. **(True negative)**  Probability of correctly not rejecting the null hypothesis = **1-α** (equivalent to **confidence level**)	**You made a mistake!** **Type I error**: Rejected the null hypothesis, when you should not. **(False positive)**  The risk of making Type I error = **α** (equivalent to **significance level**)
	The null hypothesis should be **<u>rejected</u>**	**You made a mistake!** **Type II error**: Research hypothesis is true but you decide to stick with the null hypothesis. **(False negative)**  The risk of making Type II error = **β**	**You are correct** in rejecting the null hypothesis and accepting the research hypothesis. **(True positive)**  Probability of getting correct = **1- β** (This is also called **statistical power**)

Type I Error - alpha
Reject the null when the null is true
False Positive

Type II Error – beta
Accept the null when the null is true
False Negative
b= power (population size)
Type II error decreased with higher power

Summarizing and Presenting Results

Systematic Review

Journal Club*

Guideline Development

Patient Care Decisions

Components of a Journal Club

Title/Citation
Objective
Background
Methods
Trial Design
Study Population/Inclusion Criteria
Exclusion Criteria
Treatment Arms
Outcome Measures
Statistical Analysis

Results
Enrollment
Baseline Characteristics
Treatment Efficacy
Adverse Effects

Authors Conclusion
Discussion
Strengths
Limitations
Discussion

Potential Pitfalls

Avoid echoing the authors conclusions that are presented in the results/discussion

If results seem too good to be true, they probably are

Be sure to compare outcomes to previous studies

Useful resources

CEBM: https://www.cebm.net/2014/06/critical-appraisal/
Worksheets in several different languages

CASP UK Checklists: https://casp-uk.net/casp-tools-checklists/
Critical appraisal tools for different paper types
BMJ: https://www.bmj.com/about-bmj/resources-readers/publications/how-read-paper
How to read papers and other helpful resources

ACP Journal Clubs: https://annals.org/aim/journal-club

Temple University Libraries: https://guides.temple.edu/systematicreviews/criticalappraisal
Tools for Critical Appraisal

University of South Australia: https://guides.library.unisa.edu.au/SystematicReviews/CriticalAppraisal
Tools for Critical Appraisal

International Pharmaceutical Students' Federation

Established in 1949, IPSF is the leading international advocacy organisation for pharmacy and pharmaceutical science students and recent graduates that promotes improved public health through the provision of information, education, networking, and a range of publications and professional activities.

Andries Bickerweg 5, 2517 JP The Hague, the Netherlands
Tel +31703021992 | Fax +31703021999
ipsf@ipsf.org

Thank you!

www.ipsf.org

Email moconn34@uic.edu

/IPSForg

Any Questions?

Phuture 2020: Call for Research Articles

Examples of Potential Topics:
Pharmacogenomics
Novel Drug Delivery Systems and Pharmaceutical Technology Medication Access – Cost and Availability
Complicated Disease State Management
Pain Management – Oncology – Psychology - etc. Digital Health and Telemedicine

Call:

https://drive.google.com/file/d/1d7EyypB0E69j1bbtJ9ON1z8yxBHVyKrR/view?usp=sharing

Google Form: https://forms.gle/TmXPA76hw5FgLZyr7

IPSF.org

facebook.com/IPSForg

“International Pharmaceutical Students’ Federation”

@**IPSF**org

youtube.com/IPSForg

twitter.com/IPSForg

issuu.com/IPSF.org

IPSForg