



In Search of Better Health



INTRODUCTION TO OPEN SCIENCES, RESEARCH INTEGRITY, & RESEARCH ETHICS

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Outline

1. Research redefined
2. Open Sciences
3. Scientific misconduct as a threat to research credibility & reproducibility - RI
4. Research Ethics
5. Intertwining of OS, RI and RE
6. Research cycle and credibility concerns at each stage

Research...

- ❖ Systematic investigation
- ❖ Solving a problem
- ❖ Generalizable knowledge
- ❖ Research should be of quality

Open Sciences Defined

- ❖ All movements and practices that make multilingual scientific knowledge openly **available**, **accessible** and **reusable** for everyone
- ❖ OS increases **scientific collaborations** and **information sharing** for the benefits of science and society,
- ❖ OS opens the processes of scientific knowledge creation, evaluation and communication to **societal actors** beyond the traditional scientific community.

(UNESCO Declaration on Open Sciences, 2021)

Open Science comprises **all scientific disciplines** and aspects of **scholarly practices**, i.e.

1. Basic and applied sciences,
2. Natural sciences
3. Social sciences and,
4. Humanities.

Key Pillars of Open Sciences

1. Open scientific knowledge,
2. Open science infrastructures,
3. Science communication,
4. Open engagement of societal actors,
5. Open dialogue with other knowledge systems.

Pillar 1: Open Scientific Knowledge

❖ Refers to open access to the following:

1. **Scientific publications** – journal articles, books, reports, & papers.
2. **Open research data** – raw & processed data & metadata (texts, images, sounds, codes).
3. **Open educational resources** - avail teaching, learning, & research materials.
4. **Open source software** – publicly available source codes.
5. **Open hardware** – avail design specifications to allow modifications & improvements

Pillar 2: Open Science Infrastructures

- ❖ Refers to shared research infrastructures needed to serve the needs of different communities.
- ❖ Critical components of OS infrastructures are:
 1. Virtual platforms – digital research services, online portals and environments
 2. Physical infrastructures
 - ✓ Open laboratories
 - ✓ Open science platforms and repositories for publications, research data and source codes

Pillar 3: Science Communication

- ❑ Access to scientific knowledge should be as open as possible.
- ❑ Access restrictions need to be proportionate and justified.
- ❑ They are only justifiable on the basis of the following:
 - 1) Protection of human rights,
 - 2) National security,
 - 3) Confidentiality,
 - 4) Right to privacy and respect for human participants
 - 5) Legal process and public order,
 - 6) Protection of intellectual property rights, personal information,
 - 7) Protection of sacred & secret indigenous knowledge,
 - 8) Protection of rare, threatened or endangered species

Pillar 4: Open Engagement of Societal Actors

- ❖ Refers to extended collaboration beyond scientific community.
- ❖ Making the scientific process more inclusive and accessible to the broader society.
- ❖ Comprises of new forms of collaboration such as:
 - a) Crowdfunding,
 - b) Crowdsourcing,
 - c) Scientific volunteering
 - d) Citizen science
- ❖ Act of giving all stakeholders a voice in developing research that responds to their concerns, needs & aspirations

Pillar 5: Open Dialogue with Knowledge Systems

- ❖ Refers to dialogue between different knowledge holders.
- ❖ Recognition of the richness of diverse knowledge systems & producers.
- ❖ Promotes the inclusion of knowledge from traditionally marginalized scholars.
- ❖ Enhance inter-relationships and complementarities between diverse groups.
- ❖ Everyone should receive fair and equitable share of benefits arising from utilization of their knowledge

Core Values of Open Sciences

Value	Defined
Quality & Integrity	Research methods and outputs should be widely available for rigorous review and scrutiny, and transparent evaluation processes.
Collective Benefit	- Global public good - Should benefit humanity as a whole
Equity & Fairness	- Equity among researchers from developed and developing countries. - No any form of discrimination
Diversity & Inclusiveness	- Science should support needs and pluralism of the scientific community. - Beyond the traditional scientific community.

Principles of Open Sciences

Value	Defined
Transparency, scrutiny, critique and reproducibility	• Enhanced openness across all research stages • Enhanced societal impact • Reinforces trust and confidence in research findings
Equality of Opportunities	• Equal opportunity to access and benefit from scientific endeavor
Responsibility, respect and accountability	• Respect for ethical principles
Collaboration, participation and inclusion	• Collaborate beyond boundaries
Flexibility	• There is no one-size-fits-all in open science practices
Sustainability	• Beneficial in the long-term

Threats to Research Credibility and Reproducibility – Research or Scientific Misconduct & Mertonian Norms

Research or Scientific Misconduct

- ❖ Refers to deliberate fabrication, falsification and plagiarism at all stages of research cycle:
- ❖ It can happen when proposing, implementing, reporting and or reviewing research.
- ❖ It is a significant but threat to the research enterprise globally.
- ❖ There is a need to be scientists with **research integrity**

Research Integrity Defined

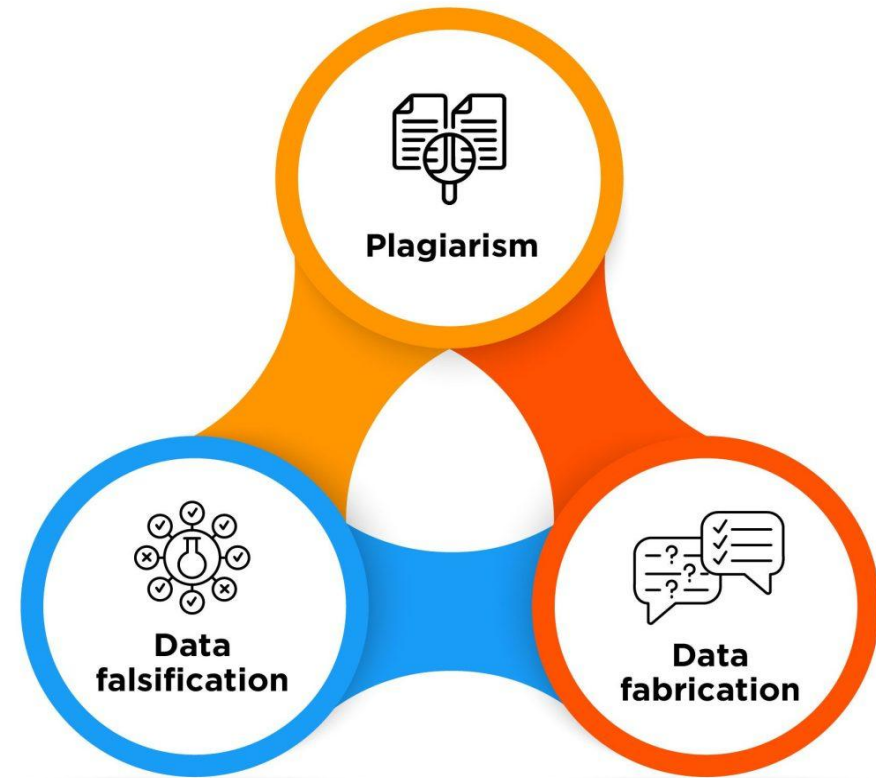
- RI are all factors that foster;
 - Good research practice
 - Promote trust and confidence in research process
(*UKRIO*)
- RI most importantly relies on the **conduct** of researchers
- **Behavior of a researcher** determines strengthens of RI.

Threats to being a scientist with RI

1. Fabrication, Falsification, Plagiarism (FFPs).
2. Questionable / Detrimental Research Practices (QRPs)
3. Irresponsible use of AI/ML

1. FFP

**The infamous three
"cardinal sins" of
scientific misconduct**



2. Responsible Use of AI/ML

- Disclose the use of AI
- Softwares like copyleaks will detect the use of AI.
- If AI was used for **writing assistance**, **acknowledgment section**.
- If AI was used for **data collection, analysis, or figure generation**, authors should describe this use in the **methods**.
- Chatbots can never be authors.
- AI is not responsible for accuracy, integrity, and originality of the work.
- **Humans** still in control and takes full responsibility.



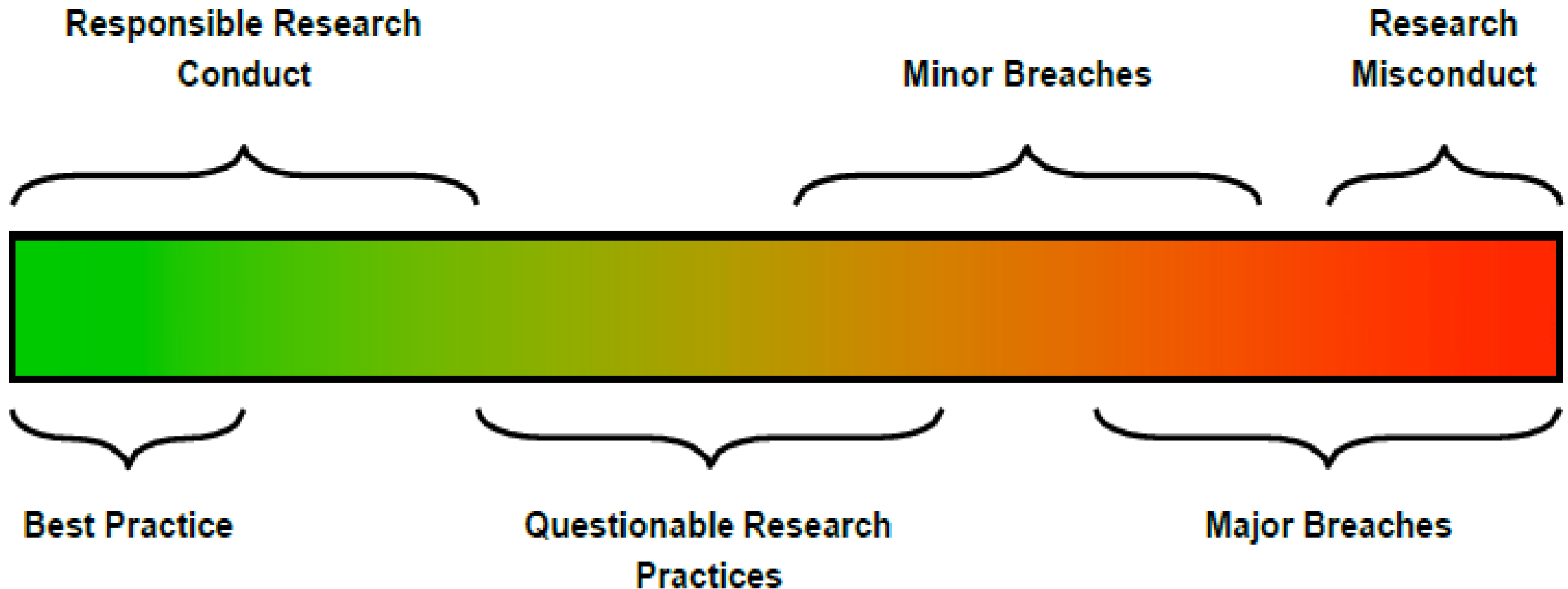
“I believe the biggest threat to authors from AI is still looming on the horizon.”

—Mike Trigg



3. Questionable Research Practices (QRPs)

Deviance from established norms and standards



Examples of QRPs

1. Selecting reporting of data with no good explanation
2. Manipulating statistical analysis to get desired results
3. Poor record keeping
4. Overstating significance of research
5. Inappropriate authorship
6. Refusing to share data, methods, and materials
7. Poor supervision of a research group
8. Negligent or exploitation mentorship
9. Disrespectful treatment of colleagues and trainees
10. Not disclosing significant Conflicts of Interest
11. Violating human or animal research regulations

Selective reporting

I am not going to report;

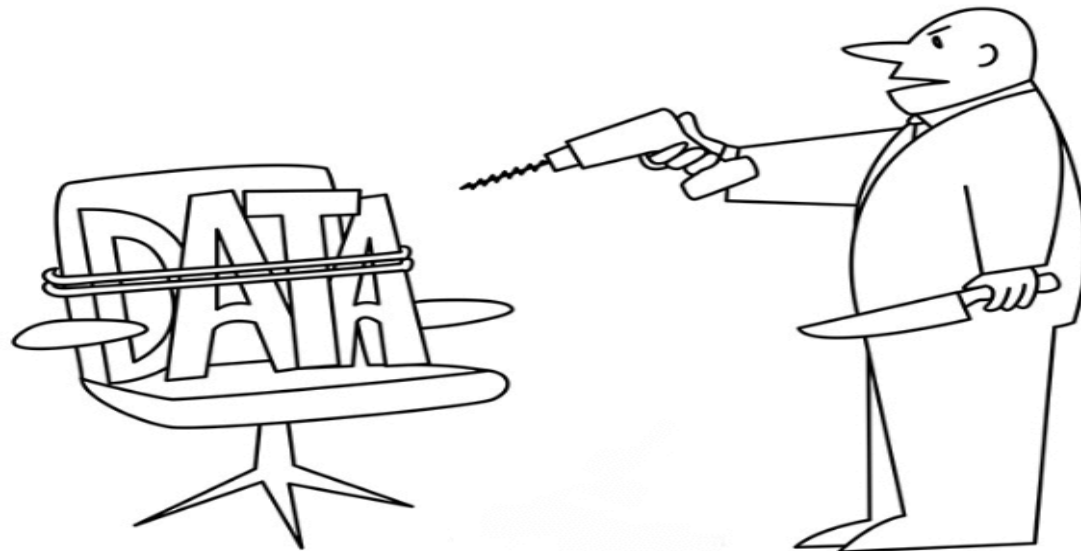
1. Unexpected or negative results
2. Data that contradicts my hypothesis
3. Methodology, data & analysis – reproducibility crisis.



P-Harking or Data Dredging

Example: Conducting multiple tests until significant finding is found

Formulating hypotheses post hoc



“If you don't reveal some insights soon, I'm going to be forced to slice, dice, and drill!”

Salami Slicing

Manuscript divided into small manuscripts to increase no. of publications

No proof of new contributions in manuscripts



Multiple concurrent submissions

Increasing chance of publication if rejected by some journals

Should submit to **ONE** journal at a time

When rejected can resubmit to second journal



Inappropriate authorship



Ghost Authorship

Intentionally excluding deserving authors

A '**nobody**' writes the paper & '**somebody**' publishes.

Anyone who contributes to manuscript must be listed as author if appropriate, or in acknowledgments along with institutional affiliations, if relevant



Honorary authorship

Authorship based solely to **honour** someone

E.g. Someone who acquired the funds for the study



Gift authorship

One listed as an author but did not contribute significantly to the research

E.g. Colleague added on understanding he/she will do the same for you without contributing to his/her research, to swell your publication lists



Coercion authorship

Authorship often attained by **intimidation or threat**;

“Authorship” based on one’s position

E.g. Director of Institute where study took place;

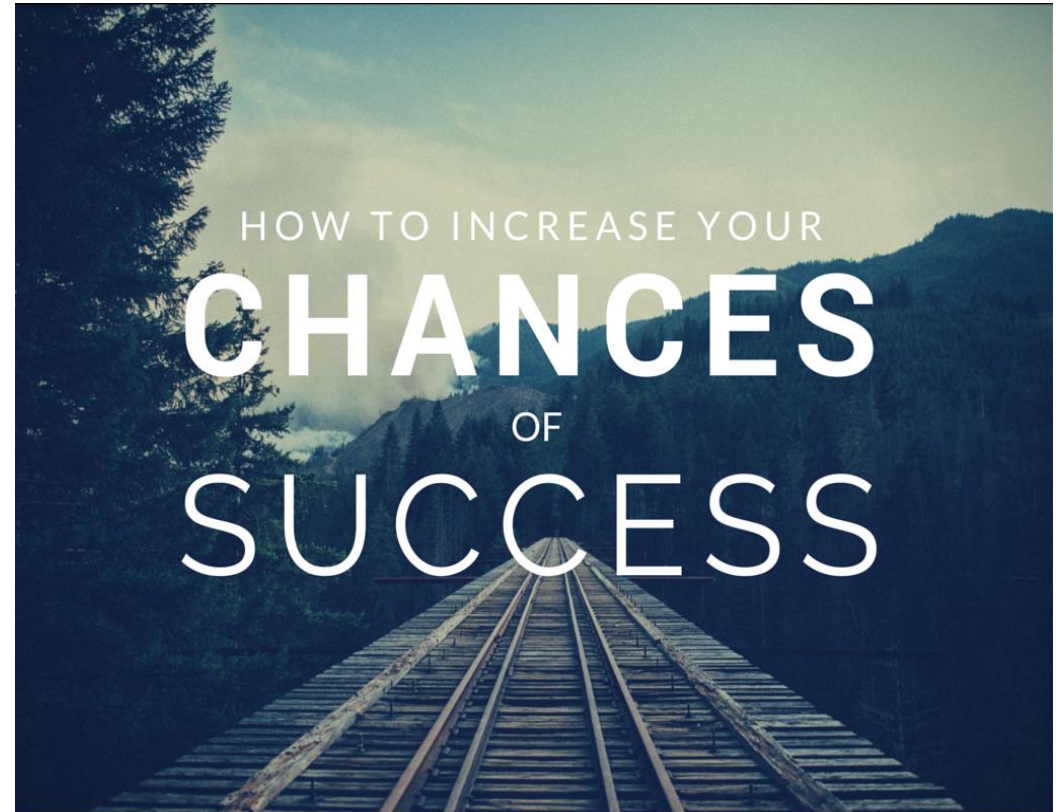


Guest authorship

Inclusion of author with no contribution to the study hoping it will **improve chances** of study being **published** or status of the publication

E.g.

Adding the name of a Nobel Prize winner



Conflict of Interest in Research

Circumstances that create a risk that professional judgment or action regarding a **primary interest** will be unduly influenced by a **secondary interest**

Secondary interests include:

- ✓ Financial interests,
- ✓ Pursuit of professional advancement,
- ✓ Recognition,
- ✓ Desire to do favors for friends, family, students, or colleagues

Conflict of Interest



Professional
Obligations



Personal Gains or
Interest

Mertonian Norms

- ❖ Named after Robert K. Merton (1942),
- ❖ Defines the CUDOS approach to ensuring research integrity.

Mertonian Norm	Definition in practice
Communality (or Communism)	Open sharing of scientific knowledge
Universalism	Research for the common good
Disinterestedness	No personal interest but the bigger picture
Organized Skepticism	Rigorous scrutiny & in-depth verification

Ethics defined

- ❖ **Ethics** are moral principles that govern a person's behavior or the conduct of an activity.
- ❖ **Bioethics** studies right and wrong doings in life sciences.
- ❖ **Medical ethics** is concerned with the obligations of the doctors and the hospital to the patient along with other health professionals and society.
- ❖ **Business ethics** are the principles that are deemed necessary for fair business practices
- ❖ **Media Ethics** constructs the way journalists conduct their roles within the context of mass communication.

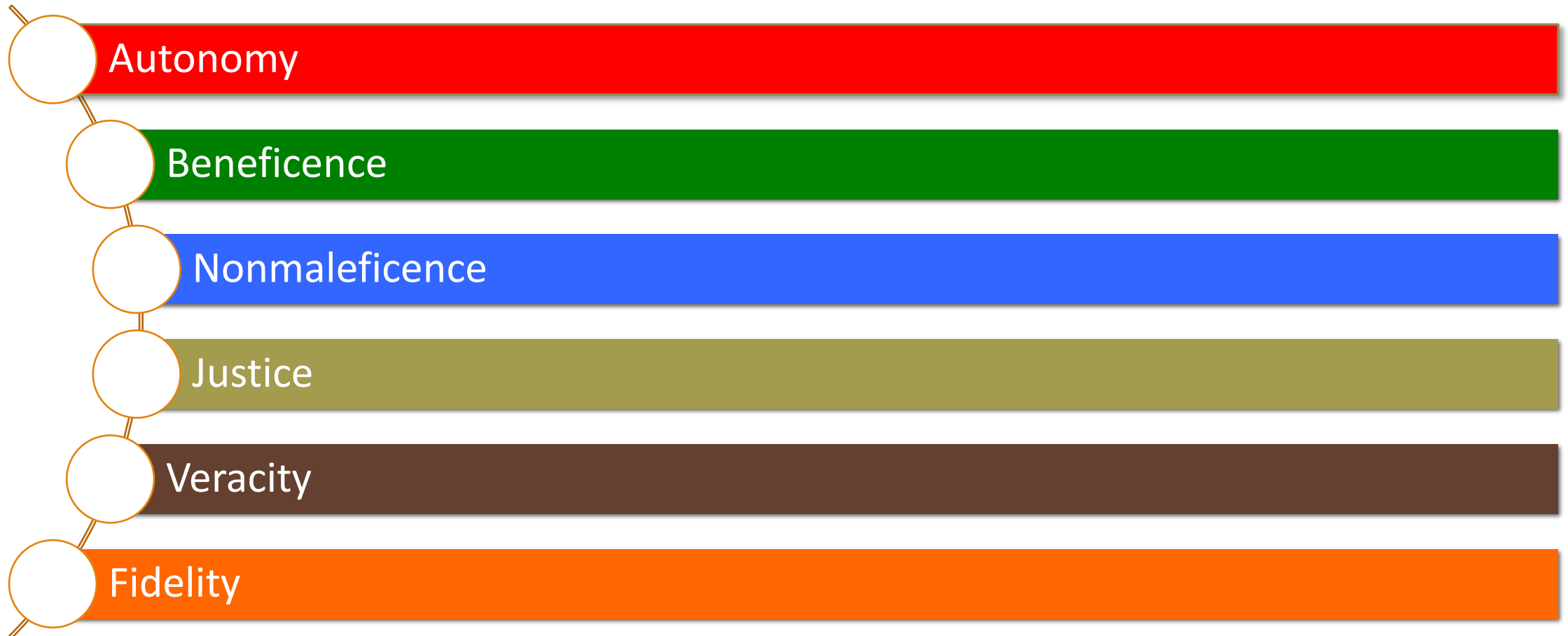


<https://www.enago.com/academy/importance-of-research-ethics/>

Research Ethics...

- ❖ Research ethics involves the application of fundamental ethical principles to research activities
- ❖ Emanated from previous historical scandals regarding medical practice and research
- ❖ Local and internal codes and practices have been developed.

Research Ethics Principles



Principle 1: Autonomy

- + Definition: “autos” = self, “nomos” = rule
- + Right to self determination
- + Treat each individual as an autonomous subject
- + Individuals have right to make decisions to participate in research
- + Must have a capacity to make decisions independently:
 - + Developmental considerations
 - + Health related challenge

Principle 2: Beneficence & Non Maleficence

- + Do good
- + Act in a way that benefits patients/participants
- + Centerpiece of risk/benefit assessment
- + Closely related to non-maleficence
- + What is 'good'?

- + Do NOT cause harm
- + PREVENT harm
- + REMOVE harm
- + More binding than beneficence
 - + Because you're going beyond just trying to do good to that pt, you're trying to prevent harm

Principle 3: Justice

- + Treat all cases alike
- + Distributive justice refers to distribution of benefits and burdens
- + Equally disbursed according to
 - + Need
 - + Effort
 - + Societal contribution
 - + Merit
 - + Legal entitlement

Principle 4: Fidelity

Duty to be faithful to commitments

Make a promise, follow through:

- Includes implicit and explicit promises
- Implicit – promises that are implied, not verbally communicated
- Explicit – promises that are explicitly communicated

Principle 5: Veracity

The obligation to tell the truth and not to lie or deceive others

Often a source of ethical challenges arising from differences in personal beliefs and unique cultural features

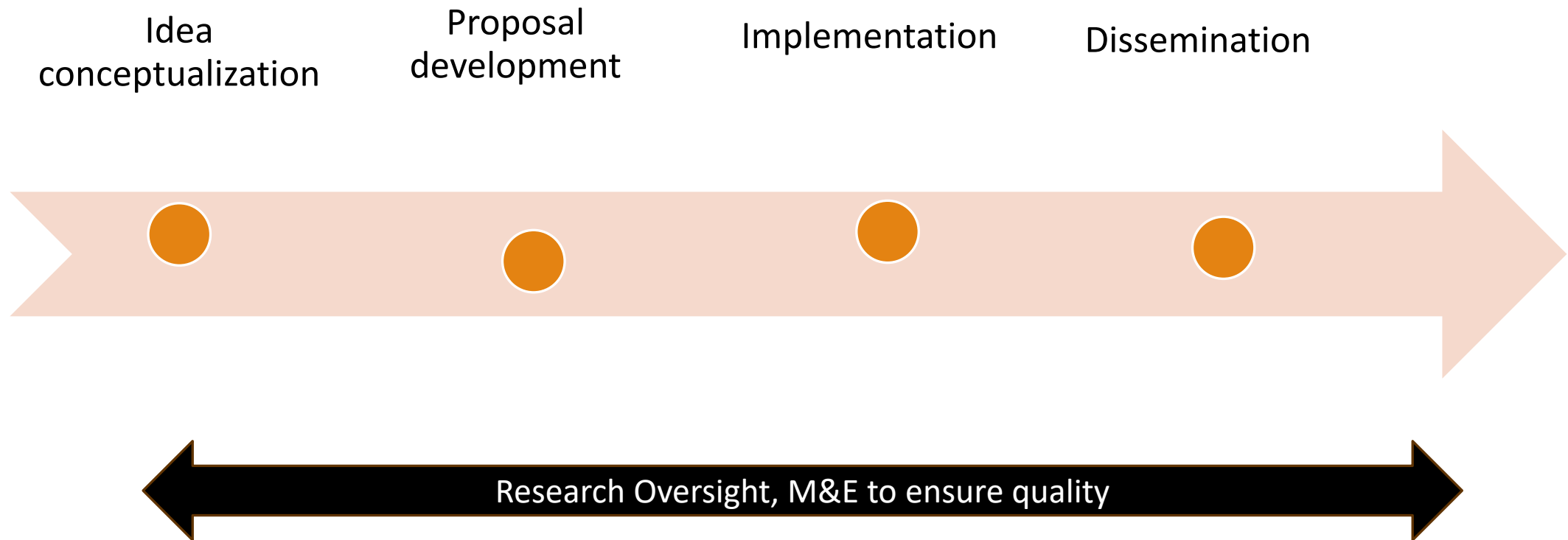
Principle 6: Respect for Persons

- ❑ Closely tied to autonomy
- ❑ Promotes ability of individuals to make autonomous choices and should be treated accordingly
- ❑ Autonomy is preserved through informed consent

OS+RI+RE Intertwined

- ❖ Research Integrity (RI) and Open Sciences (OS) are interconnected,
- ❖ But they have a different focus in the research spectrum.
- ❖ RI can be promoted through:
 - Establishment of robust research ethics review systems,
 - Fostering transparency and data sharing, and
 - Creating mechanisms for handling scientific misconduct.
- ❖ RE and RI are interrelated in the sense that RI reflects the practical applications of RE.
- ❖ Violations of ethical principles of research reflects a lack of integrity.

Research as a process



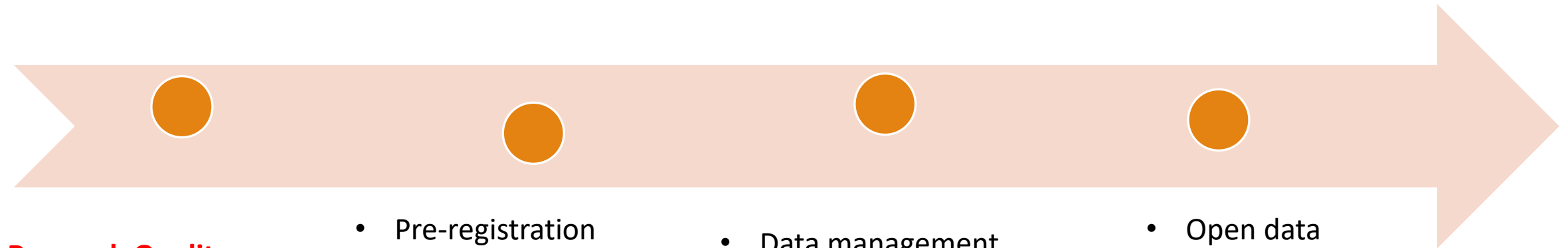
Research quality domain in the process

Idea
conceptualization

Proposal
development

Implementation

Dissemination



**Research Quality
Domain at Different
Stages of Research Cycle**

- Pre-registration

- Data management
- Reproducibility
- Replicability
- Methodological rigor
- FFP
- Col

- Open data
- Open access
- Authorship issues
- Data sharing
- Open sciences

Research Quality Domains in the Cycle

Research Process	RQ Domain	Definition
Research proposal	Pre-registration	• Depositing proposal in a repository • Depositing tools, analysis plan in public portals
	Open sciences	• FAIR principles • FIND principles
	Plagiarism	• Copying without acknowledging
Research oversight	Ethical compliance	• Observance of ethical principles & approaches (beneficence, non-maleficence, fairness & justice, respect for persons. • Protection of human participants • Community and cultural contexts
	Regulatory compliance	• Safe devices • Safe drugs • Environmental safeguards

Research Quality Domains in the Cycle

Research Process	RQ Domain	Definition
Research implementation	Data management	Accepted practices for acquiring and maintaining research data
	COI declaration	Primary vs secondary interest
	Methodological rigor	Extent to which research methods are conducted in a scrupulous and meticulous manner
	Replicability	Getting same results using same methods when another study is conducted
	Reproducibility	Getting same results using same data and code
	Transparency	Act of providing sufficient study details such as methods, data, and analyses openly to allow for scrutiny, replication, and independent verification of their findings
	Fabrication	Deliberate alteration of research data
	Falsification	Deliberate distortion of research data
	Respect for teams	Good working environment and relationship with all research teams

Research Quality Domains in the Cycle

Research Process	RQ Domain	Definition
Dissemination of research findings	Open sciences	• Making science accessible, transparent and reliable
	Open data	• Publicly available research data
	Open access	• Publicly accessible research literature
	Authorship	• Crediting of authors and contributors appropriately
	Data sharing	• Making data open, findable, accessible, interoperable and reusable

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Thank You

