# Introduction to medical research:

# Essential skills

**Iveta Simera**

**EQUATOR Network, Centre for Statistics in Medicine, NDORMS**

**EQUATOR – OUCAGS training course**
**13 September 2014**

# Iveta Simera

Head of Programme Development
EQUATOR Network; Oxford

Experience:

Laboratory research, systematic reviews, research reporting and reporting guidelines

Writing, reviewing, training, research ethics

Not editor but working closely with journal editors for over 8 years

## My talk today:

- Course outline
- Overview of medical research
- Key ethical principles
- Useful resources

The EQUATOR Network is funded by:
NHS National Institute for Health Research
MRC Medical Research Council
CIHR IRSC
CHIEF SCIENTIST OFFICE
Pan American Health Organization

# Course outline

- Overview of **key steps and common methods** in medical research and its publication

- **4 modules** (introductory basic level, 3½ h):
  - Research planning: before you start your research project
  - Research design and protocol
  - Statistical thinking
  - Research publication and dissemination

- Course is build around **competencies** specified in the **Academic Compendium** of the UK Foundation Programme

# Session 1: Research planning

- Objectives - by the end of this module participants should have:
  - Clearer idea of what medical research involves
  - What are the key ethical and governance issues
  - How to turn research idea into a specific research question
  - How to systematically collect and synthesise literature to support further research project design and planning
- Programme, facilitators

| Time | |
|---|---|
| 9.00 | Welcome and introduction |
| 9.15 | Overview of research process |
| | Overview of ethical and governance issues in clinical research |
| 9.45 | Introduction to systematic reviews |
| 10.30 | ***Break (20 minutes)*** |
| 10.50 | Formulating the research question |
| 11.50 | Literature searching |
| 12.20 | Online resource access |
| 12.40 | Summing up |
| 13:00 | Session ends |

# Medical research: what is it and what does it involve

- Different ways to look at it
- Research as a process: clinical research continuum


Phase I, II studies

Clinical studies (phase III, observational research, ..)

Systematic reviews

Clinical guidelines

Phase IV
Outcomes research



Adapted from Khoury, *Genet Med* 2007:9(10):665–674.

# Types of clinical research

- Observational studies
  - Case reports
  - Surveys
  - Cohort studies
  - Cross-sectional studies
  - Case-control studies
- Experimental studies
  - Randomised trials
  - Non-randomised studies
- Qualitative research
- Research synthesis (systematic reviews)

# Types of studies by research questions / focus

- Treatment evaluations - RCTs
- Disease aetiology, harms, .. - Observational studies

- Prognostic studies
- Diagnostic studies
- Experiences, views, .. – Qualitative studies
- Quality improvement studies
- Economic evaluations
- Patients' involvement in research

# Different types of research designs

- Some research designs are more suitable for answering a given research question than others - important to choose an appropriate research design!
  - E.g. RCT – treatment evaluation
- Different advantages but also limitations
- Bring different ethical issues
  - E.g. – accepting concept of randomisation

» More in the next session!

# Principles guiding medical research

- Ethical guidelines are important in clinical research
  - They safeguard participants' health, safety and privacy
  - They help in building public trust in medical research (unethical practices lead to wasting time and money and increased regulation – burden)

- Ethics –very broad term
- Demonstrated in the Declaration of Helsinki

# Declaration of Helsinki: Key ethical principles

- General principles
- Risks, burdens and benefits
- Vulnerable groups and individuals
- Scientific requirements and research protocols
- Research ethics committees
- Privacy and confidentiality
- Informed consent
- Use of placebo
- Post-trial provisions
- Research registration and publication and dissemination of results
- Unproven interventions in clinical practice

# Despite regulation problems occur

Andrew Wakefield (1998)

Hwang Woo-Suk (2004-0

thebmj Research Education News & Views Campaigns

Tamiflu campaign

Tamiflu data: Who saw what when

6 Practical Neurology

EDITORIAL

Pract Neurol 2008; 8: 6–7

Delays in publishing the results of clinical trials harm patients,

blic health

## What is missing from descriptions of treatment in trials and reviews?

Replicating non-pharmacological treatments in practice depends on how well they have been described in research studies, say **Paul Glasziou** and **colleagues**

Have you ever read a trial or review and wondered exactly how to carry out treatments such as a "behavioural intervention," "salt reduction," or "exercise programme"? Although CONSORT and related initiatives have focused on the assessment of validity and presentation of results,[1 2] less attention has been given to the adequacy of the description of the treatment used. For pharmacological treatments the description would need to include the dose, titration, route, timing, duration, and any monitoring used. For complex treatments the problems are even greater.

**Why are full descriptions of treatment important?**

The uptake of positive findings from trials is

receiving numerous requests for additional details from doctors and patients, the author of a randomised trial on graded exercise for chronic fatigue syndrome[6] subsequently published a supplementary article with a more detailed "prescription."[7] Similarly, it is not possible to set up a stroke unit, offer low fat diets, or give smoking cessation advice without sufficient details on the components that were planned and delivered.[8]

**Extent of the problem**

To assess the extent of problems with descriptions of treatment we prospectively assessed 80 consecutive studies selected for abstraction in the journal *Evidence-Based Medicine* from October 2005 to October 2006. The journal is aimed specifically at doctors work-

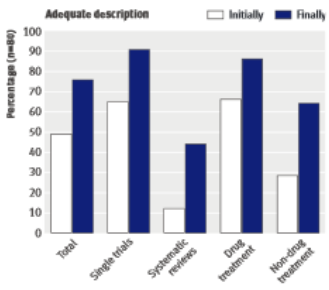



**Fig 2 | Percentage of studies with sufficient description of treatment initially (based only on the published paper) and after supplementary information was obtained**

primary outcomes defined in the most recent protocols and those defined in published articles.

**Results** One hundred two trials with 122 published journal articles and 3736 outcomes were identified. Overall, 50% of efficacy and 65% of harm outcomes per trial were incompletely reported. Statistically significant outcomes had a higher odds of being fully reported compared with nonsignificant outcomes for both efficacy (pooled odds ratio, 2.4; 95% confidence interval [CI], 1.4-4.0) and harm (pooled odds ratio, 4.7; 95% CI, 1.8-12.0) data. In comparing published articles with protocols, 62% of trials had at least 1 primary outcome that was changed, introduced, or omitted. Eighty-six percent of survey responders (42/49) denied the existence of unreported outcomes despite clear evidence to the contrary.

**Conclusions** The reporting of trial outcomes is not only frequently incomplete but also biased and inconsistent with protocols. Published articles, as well as reviews that incorporate them, may therefore be unreliable and overestimate the benefits of an intervention. To ensure transparency, planned trials should be registered and protocols should be made publicly available prior to trial completion.

*JAMA. 2004;291:2457-2465* www.jama.com

**Author Affiliations:** Centre for Statistics in Medicine, Institute of Health Sciences, Oxford, England (Drs Chan and Altman), Nordic Cochrane Centre, Copenhagen, Denmark (Drs Hróbjartsson and Gøtzsche and Ms Haahr), University Health Network, University of Toronto, Toronto, Ontario (Dr Chan). **Corresponding Author:** An-Wen Chan, MD, DPhil, Centre for Statistics in Medicine, Institute of Health Sciences, Old Road, Headington, Oxford, England OX3 7LF (anwen.chan@utoronto.ca).



(Reprinted) JAMA, May 26, 2004—Vol 291, No. 20 2457

KEY

equator network

Misconduct cases source: http://www.slideshare.net/cjrw2/infamous-cases-of-research-misconduct

# researchwaste.net

researchwaste.net

Home | About | Documents | News and Blog | Links

# Research

## Increasing value, reducing waste

It has been estimated that 85% of research is wasted, usually because it asks the wrong questions, is badly designed, not published or poorly reported. This diminishes the value of research and also represents a significant financial loss. However, many causes of this waste are simple problems that could easily be fixed, such as appropriate randomisation or blinding of a clinical trial. A first step towards increasing the value of research and increasing waste is to monitor the problems and develop solutions that aim to fix them.

**Access articles**


researchwaste.net is a place to share and exchange documentation, information, and resources on how to increase the value of both basic and applied research and reduce or avoid wasting research. It is based on a series of articles that were published in the medical journal *The Lancet* in 2014.

# Typical research process: key steps

**Conception**

**Design**

**Execution**

**Analysis**

**Publication and reporting**

equator network

See research flowchart handout for more details

# Key elements of good research

**Conception**

Design

Execution

Analysis

Publication and reporting

- Turning idea into a research question (clear research aim, rationale, hypothesis)
- Treatment – clinical equipoise
- Consult study with 'users' – patients' input (questions, design - outcomes, process, ..)
- Systematic review of existing evidence
- Consider research participants: practicalities; wellbeing; courtesy; respect

# Key elements of good research

Conception

**Design**

Execution

Analysis

Publication and reporting

- CONSULT with a STATISTICIAN
- Develop appropriate design to answer question
- Adequate sample size
- Adequate steps to reduce bias
- Carefully balance risk and benefits; inclusion and exclusion criteria
- Develop a protocol
- Ethical approval – informed consent, PIS, questionnaires, ..

# Key elements of good research

Conception

Design

**Execution**

Analysis

Publication and reporting

- Participants' recruitment and **consent** form – trained personnel (voluntary, avoid coercion, right to withdraw, fully informed, ..)
- Good clinical practice conduct, research integrity principles (data collection, data protection and confidentiality)

# Key elements of good research

Conception

Design

Execution

**Analysis**

Publication and reporting

- Data analysis should be hypothesis driven (statistical analysis plan)
- A statistician should be employed from the study conception
- Avoid any data fabrication / falsification

# Key elements of good research

Conception

Design

Execution

Analysis

**Publication and reporting**

- Research only has **value** if
  - Study methods have validity
  - Research findings are published in a usable form
- The goal should be **transparency** and honest account
  - Should not mislead
  - Should allow replication (in principle)
- **Impact** - research paper needs to be usable, 'fit for purpose'
  - we need to think beyond our own work
- **Reporting guidelines:** www.equator-network.org

# Useful resources

# Research Services

Find funding

Major sponsors, including EC

Applying for funding

Costing and pricing

Research Facilities and Equipment

Managing awards, reporting outcomes and Open Access


Clinical Trials & Research Studies


Research integrity and ethics


Business Intelligence (BI) Reports

Research Data Management site

## Key contacts

- Research Services
- Research Accounts
- Isis Innovation Limited
- Research Facilitators

## Quick Links

EC info (Horizon 2020 /

Select a link from the list and click 'Go'.

Go

X5 Research costing and pricing system

open access oxford
Expanding the possibilities

RESEARCH DATA OXFORD

- About research support
- Contacts
- News
- Researchers' Portal
- Consultations and Committees
- Training and professional development
- Find funding
- Major sponsors, incl. EC
- Applying for funding
- Costing and pricing
- X5: Costing and pricing system
- Research Facilities and Equipment
- Research contracts
- Consulting activity
- Clinical Trials and Research Governance
  - About us
  - Research Governance
  - Research Classification and Procedures
  - Sponsorship and Ethics Applications

# Clinical Trials and Research Governance

The Clinical Trials and Research Governance (CTRG) team supports University Clinical Researchers. CTRG has a role in promoting and supporting high quality research within the University, and ensuring the University meets its requirements as Sponsor and host institution.

About CTRG →


Research Governance →

Research Classification and Procedures →

Sponsorship and Ethics Applications →

Resources →

Training →


Back to top


## Contacts

- Contact the CTRG team

## Find us

- Directions to CTRG team, Joint Research Office (836kb)

## Map

- Click here for a Google Map

## Documents

- Glossary of acronyms used on this site (141kb)

## Related links

- Safety Reporting (Serious Adverse Events)
- Clinical Trial Units

Research Design Service
South Central

NHS
National Institute for Health Research

Home | About us | Funding | Training | Public Patient Involvement | Planning a study | Resources | Latest news | FAQs | Contact | Internal


We provide free advice on research design to researchers in the South Central region who are developing proposals for national, peer-reviewed funding competitions for applied health or social care research

### How we can help

If you have a research question you would like to turn into a fully developed funding proposal, we can help. Our experienced Research Advisors have expertise in key aspects of preparing grant applications, including:

- Design
- Methodology
- Identifying an appropriate funder
- Involving patients and public
- Costing your research project

### Who we can help

Read on and find out if you are eligible for our support.

**Find out more about who the RDS can help and how it supports researchers in the RDS leaflet**

REQUEST SUPPORT

### What you can expect from us

The RDS Charter provides information about the services we offer.

# Planning a study

Information, tips and pointers to other resources to help your research team plan an effective study.

**Specialist advice on specific aspects of a study**

Follow the links on the right.

**Getting started**

For a general overview of what's involved when planning a study, get started with our **Information Pack for Health and Social Care Researchers**

This highlights some of the key issues to consider when making a research grant application, including:

- Refining your research idea
- Examining the current literature
- Getting your methodology right
- The usual structure of a grant application, and what a reviewer would expect to see in each section
- Logistical issues to consider, including time and money
- Types of costs typically requested
- Ethics and governance procedures required of all NHS research
- What Patient and Public Involvement is, and how to do it well
- Other organisations which may be useful to you.

This list is not definitive; your Research Advisor can provide advice specifically tailored to your application.

Download the full **Information Pack for Health and Social Care Researchers**

**Share the knowledge**

If you discover a useful resource not mentioned here, please drop us a line at **rds.sc@nihr.ac.uk**

## Planning a study

INVOLVE

NHS
National Institute for Health Research

My clippings (0) Help Print Text size: AAA

Home | About INVOLVE | Find out more | Resources | News | invoNET | Conference | Search

# Welcome to INVOLVE…

We are funded by the **National Institute of Health Research** (NIHR) to support public involvement in NHS, public health and social care research.

Read more about us

make it clear

**Plain English Summaries in NIHR funded research**

Spotlight on

## Resource centre

View our **publications** and our libraries of references

Visit our databases and resources for researchers

Resource centre

## News and events

**Public engagement funding within research grants – new video from Wellcome Trust**

9 September, 2014

More news

## Keep in touch

**How to contact us and keep in touch.**

Follow @NIHRINVOLVE

More

Select Language

NHS
Health Research Authority

Home | Patients and the public | Research Community | About us | HRA Training | Resources

## Our Committees

Quick links to our committees for research ethics, gene therapy and confidentiality – please make sure you are familiar with the content for the research community before applying.

Our committees ▸

## End of study guidance

New guidance for information to participants at the end of a study is open for comment until 30 September 2014 – we need your views.

### Research community

### Patients and the public

### Section 251

## HRA Approval

Find out the latest news, including our plans for recruitment

More about HRA Approval ▸

## About the HRA

The HRA was established in

Before you apply
Applying for reviews
Applying to RECs
After you apply
During and after your study
Research legislation and governance
Research beyond UK
HRA working in partnership
Data legislation and information governance
Confidentiality Advisory Group
Raising concerns about our services
For REC Members
Regenerative Medicine

# Resources

Resources pages provide additional detail on important topics. This includes links to external sites, reference documents and explanatory text.

Many pages also provide links to other areas of the site, where related information can be found.

We have created these to give you extra detail on key themes, and many of them can be reached from more than one page in the site.

You can find information in this section using the alphabetical list below, the categories in the menu on the left or using the search box.

List of Resources

AfRE

# Association for Research Ethics

promoting excellence in research ethics in human beings through training and education



## Guidelines

The following are our latest guidelines - freely available to everyone.

Looking for presentations from recent workshops? If you are an AfRE member, simply log in. If not, please contact us to find out more about membership, or click here.

### Key aspects of health research ethics: simple practical checklists

General Considerations

Specific Considerations

Participant Information Sheets

Consent Forms

Withdrawn Consent

Renumeration

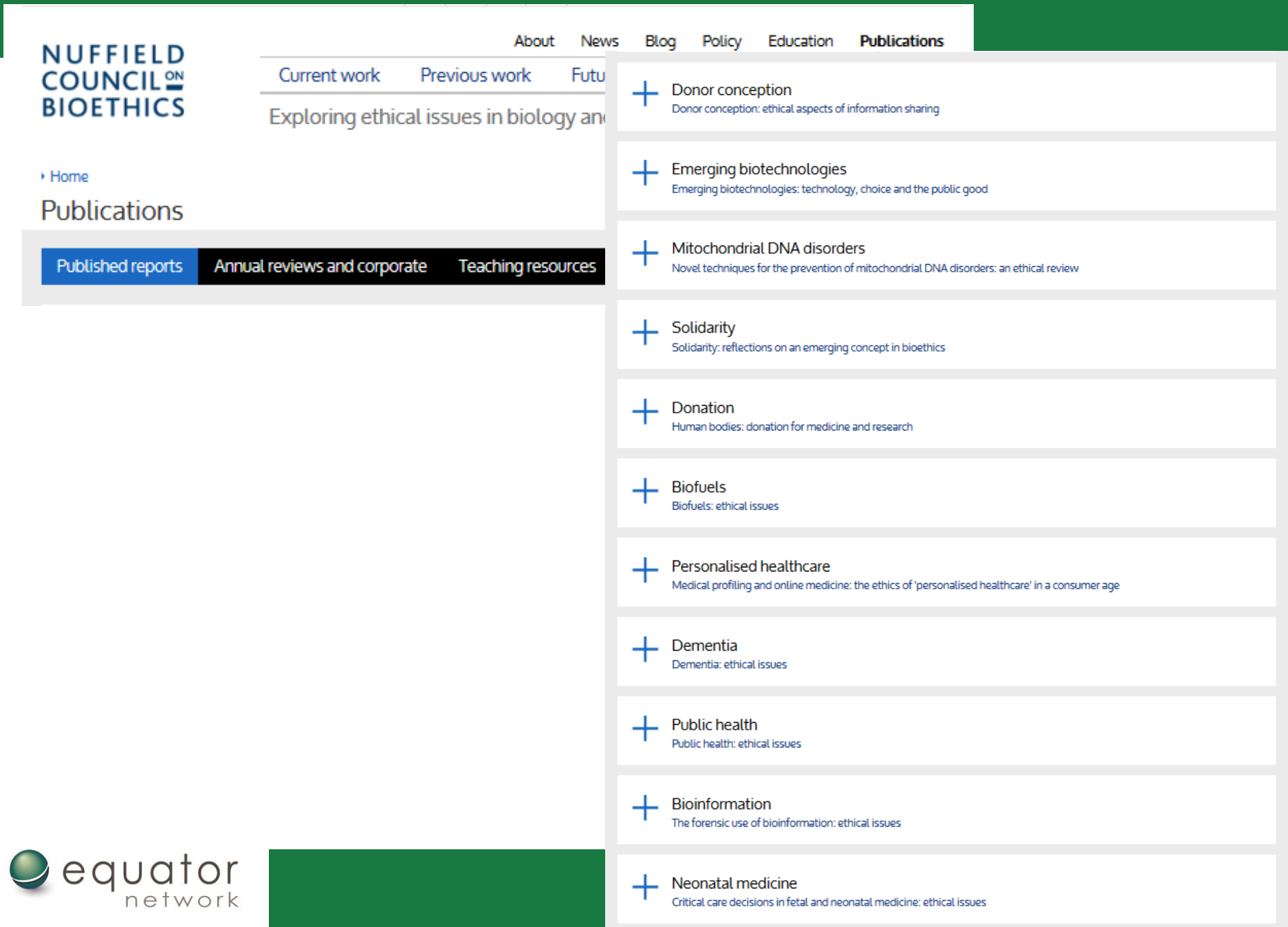
Mental Capacity

Research with Children

Internet Mediated Research

Internet Mediated Research - Top Tips

Clinical Trials of Cell Therapies




equator network

equator network

# Enhancing the QUAlity and Transparency Of health Research

Visit the EQUATOR Spanish Website



## The resource centre for good reporting of health research studies

### Library for health research reporting

The Library contains a comprehensive searchable database of reporting guidelines and also links to other resources relevant to research reporting.

Search for reporting guidelines

Visit the library for more resources

### Key reporting guidelines

| | |
|---|---|
| CONSORT | Full Record \| Checklist \| Flow Diagram |
| STROBE | Full Record \| Checklist |
| PRISMA | Full Record \| Checklist \| Flow Diagram |
| STARD | Full Record \| Checklist \| Flow Diagram |
| COREQ | Full Record |
| ENTREQ | Full Record |
| SQUIRE | Full Record \| Checklist |
| CARE | Full Record \| Checklist |
| SAMPL | Full Record |
| SPIRIT | Full Record \| Checklist |

## Toolkits

The EQUATOR Network works to improve the reliability and value of medical research literature by promoting transparent and accurate reporting of research studies.

Our Toolkits support different user groups, including:

**Authors**
Information and resources for authors

## EQUATOR highlights

**13/08/2014 - Videos now available from the scientific meeting in Paris: Improving reporting to decrease the waste of research**

The 6th annual lecture, presentations and roundtable discussion were recorded and are now available to watch Read More

**13/08/2014 - Interview with Iveta Simera about the EQUATOR Network**

The plagiarism detection software company iThenticate recently interviewed EQUATOR's Head of Programme Development, Iveta Simera Read More

**12/08/2014 - Declaration of transparency**

## News

COMET initiative: Group seeks standardization for what clinical trials must measure
3/09/2014

STRATOS initiative
3/09/2014

New actions by PLoS Medicine Editors to advance research transparency – focus on observational studies
27/08/2014

Montreal Statement (on research collaboration) is now available in Spanish
27/08/2014

equator network

**Enhancing the QUAlity and Transparency Of health Research**

Visit the EQUATOR Spanish Website

Home | Library | Toolkits | Courses & events | News | Blog | About us | Contact

Home > Toolkits > Authors of research reports

## Authors of research reports

The following resources will help you to produce high quality research publi

- Planning and conducting your research
- Writing up your research
- Data sharing, reporting data
- Additional guidance for industry sponsored research
- Ethical guidelines and considerations
- Publishers' resources for authors
- Reviewing research articles
- Communicating research to media
- Other resources
- Training opportunities

### Planning and conducting your research

It is important to be aware of reporting requirements and to think about reporting when you are planning and conducting your research study:

- UK NIHR Clinical Trials Toolkit provides practical advice to researchers in designing and conducting publicly funded clinical trials in the UK. Through the use of an interactive routemap, this site provides information on best practice and outlines the current legal and practical requirements for conducting clinical trials.
- UK MRC Experimental Medicine Tool Kit provides guidance on legal and good practice requirements when designing, conducting and disseminating experimental medicine studies.
- UK MRC Data and Tissues Tool Kit provides practical help with legislative and good practice requirements relating to the use of personal information and human tissue samples in healthcare research in the UK, e.g. Data Protection Act (1998), Human Tissue Acts. Much of the information, which is held in route maps, focuses on the planning and approvals stage of setting up a research project.
- The SPIRIT 2013 Statement provides guidance on the minimum content that should be included in a clinical trial protocol and consists of a 33-item checklist.
  Chan A-W, Tetzlaff JM, Altman DG, Laupacis A, Gøtzsche PC, Krleža-Jerić K, Hróbjartsson A, Mann H, Dickersin K, Berlin J, Doré C, Parulekar W, Summerskill W, Groves T, Schulz K, Sox H, Rockhold FW, Rennie D, Moher D. SPIRIT 2013 Statement: Defining standard protocol items for clinical trials. Ann Intern Med 2013;158(3):200-7.

**Systematic reviews** represent an important part of published research. As with primary research, good systematic reviews need to be well planned, well conducted and well reported. The following resources provide guidance for the development of robust systematic reviews:

- Cochrane Handbook for Systematic Reviews of Interventions, Cochrane Collaboration. Standards for the Reporting of Cochrane Intervention Reviews (MECIR), Cochrane Collaboration
- Little J, Higgins JPT (editors). The HuGENETM HuGE Review Handbook, version 1.0. Guidelines for systematic review and meta-analysis of gene disease association studies (see also Systematic Reviews of Genetic Association Studies, PLoS Medicine 2009, 6 (3):e1000028)
- Systematic Reviews. CRD's guidance for undertaking reviews in health care. Centre for Reviews and Dissemination, University of York, 2009
- Methods Guide for Effectiveness and Comparative Effectiveness Reviews (AHRQ 2008 -)
- Finding What Works in Health Care: Standards for Systematic Reviews. Chapter 5 – Standards for Reporting Systematic Reviews. Institute of Medicine consensus report. 2011

- Resources for planning and design
- Reporting guidelines
  - Know principles of responsible reporting early to prevent problems later

equator network