Overview of Common Research Methods in Primary Care and Key Components of Successful Grant Applications

Aziz Sheikh
OBE, MSc. MD, FRCGP, FRCP, FRCPE, FRSE, FMedSci
Professor of Primary Care Research & Development and
Joint Editor-in-Chief, *npj: PCRM*

Singapore, 30 May 2015

Objectives

- Introduce the range of research designs
- Provide a framework for considering and selecting optimal study designs
- Summarise salient features of these study designs
- Critical appraisal and reporting tools
- Highlight critical factors in successful grant applications
- Provide opportunity for discussion and questions

Why do we undertake research?

- Fundamentally, to try and find answers to questions that we don't know the answer to
- In this context, the aim is to get as close as possible to 'truth'
- The research approach used needs therefore always to be cognisant of this core driving factor underpinning the research endeavour

Range of study designs

What study design are potentially available?

?

Optimal study designs for different research questions

The choice of study design needs to be guided by the question

- How common is this problem?
- Does this treatment work?
- How good is a diagnostic test?
- Should we screen?
- What causes this disease?
- What did people think or do?

Optimal study designs

- How common is this problem? Systematic review; Cross-sectional survey
- Does this treatment work? Systematic review; RCT
- How good is a diagnostic test? Prospective cohort study
- Should we screen? Systematic review; RCT
- What causes this disease? RCT, cohort study, case control study
- What did people think or do? Cohort study, cross-sectional survey, qualitative study
- Other more specialist contexts/designs: genetic epidemiology, diagnostic accuracy, health economics etc

Hierarchy of evidence for assessing clinical effectiveness

- Level 1: Systematic reviews/meta-analysis
- Level 2: Randomised controlled trials
- Level 3: Controlled trials without randomisation
  Analytical studies: cohort/case control
- Level 4: Observational studies with before/after comparisons
- Level 5: Expert consensus

Salient features of commonly employed study designs

I. Assessing clinical effectiveness

Systematic review

- Aim is to produce an unbiased synthesis of the evidence
- Originally used for clinical effectiveness questions, but increasingly used for a range of study questions
- Key features
  - Clearly articulated research question
  - Production of a detailed SR protocol
    - Search strategy
    - Inclusion/exclusion criteria
    - Quality appraisal of studies
    - Data synthesis – descriptive, quantitative, qualitative
    - Assessment of publication bias
  - Meta-analysis only if clinically and statistically appropriate
- Reported using PRISMA

Randomised controlled trials

- Aim is to randomly assign individuals/groups to the intervention of interest or (usually) control
- Needs a detailed protocol developed up-front
- Randomisation is fundamental because it distributes confounders equally
- Blinding – preferably of both assessor and subject – is important because it reduces the risk of selection and information biases
- Intention-to-treat analysis reduces the risk of bias in the analysis
- Reported using CONSORT

Variants on the simple RCT

- ≥3 arm trials
- Factorial trial e.g. 2x2
- Cluster trials
- Preference trials
- Adaptive/Bayesian trials
- N=1 trial designs
- Comprehensive cohort study designs

Quasi-experimental study designs

- Controlled clinical trial
- Controlled before-after
- Interrupted time series

II. Studying disease frequency and risk factors

Observational study designs

- Descriptive – cross-sectional stuides
- Analytic
  - Case control
    - Incident
    - Prevalent
  - Cohort
    - Prospective
    - Retrospective

Cross-sectional studies

- Used to describe disease frequency, risk factors etc
- Typically undertaken using questionnaires or phone surveys
- Can also be undertaken using routine electronic health record data to assess diagnosed prevalence of disease
- Key features
  - Appropriate sampling frame
  - Random sampling
  - Use of a validated instrument
  - High response rates
  - Measures of imprecision
- Reported using STROBE

Case control studies

- Commonly used to study association between risk factors in those with a condition ('cases') and those without the disease ('controls')
- Frequency of exposure to risk factors is compared between these 2 (or more) groups
- Particularly useful for the study of rare conditions
- Key issues
  - Controls need to be drawn from the same population as cases
  - Need to take account of risk of confounding
  - Take measures to minimise the risk of recall bias
  - Difficult/impossible to determine a temporal relationship between exposure and outcome

Cohort studies

- Used to compare outcomes in those 'exposed' and 'unexposed' to a risk factor(s)
- Frequency of outcomes is then compared between these 2 (or more) groups

- Key issues
  - Typically need long periods of follow-up so challenging/expensive to mount
  - Attrition is a major risk to the validity of cohort studies
  - Need to ensure disease free at entry into cohort
  - Unbiased measurement of exposures and outcomes is important
  - Need to take account of confounding

III. Understanding views, perceptions and experiences

Qualitative studies

- Used to understand views, perspectives, experiences
- Can be undertaken using
  - Interviews
  - Focus groups
  - Observation
- Key features
  - Naturalistic
  - Typically involves purposive/maximum variant sampling
  - Need to consider the relationship between the researcher and the subject being researched
  - Range of analytical approaches – deductive and inductive
  - Saturation considerations guide sample size decisions

Critical appraisal and reporting tools

www.equator-network.org

En Español | Login

equator network

Search: Go

Enhancing the QUAlity and Transparency Of health Research

Home | About EQUATOR | Resource Centre | Courses Events | Research Projects | Contact | News | Forum

Welcome to the EQUATOR Network website – the resource centre for good reporting of health research studies

Too often, good research evidence is undermined by poor quality reporting.

The EQUATOR Network is an international initiative that seeks to improve reliability and value of medical research literature by promoting transparent and accurate reporting of research studies.

Reporting guidelines

Library for Health Research Reporting

Authors

Information for authors of research reports

Summary of examples of tools available to assess the quality of research/reporting

Design	Quality assessment	Reporting guideline
SR	CASP	PRISMA
RCTs	Cochrane ROB tool	CONSORT
Observational studies	**CASP**	**STROBE**
Qualitative	**RATS/CASP**	**CONSORT**

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	
	2b	Specific objectives or hypotheses	
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	
Participants	4a	Eligibility criteria for participants	
	4b	Settings and locations where the data were collected	
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	
	6b	Any changes to trial outcomes after the trial commenced, with reasons	
Sample size	7a	How sample size was determined	
	7b	When applicable, explanation of any interim analyses and stopping guidelines	
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	

Assessing reporting of qualitative studies: RATS

R Relevance of study question
A Appropriateness of qualitative method
T Transparency of procedures
S Soundness of interpretive approach

Key components of successful grants

Successful grant applications

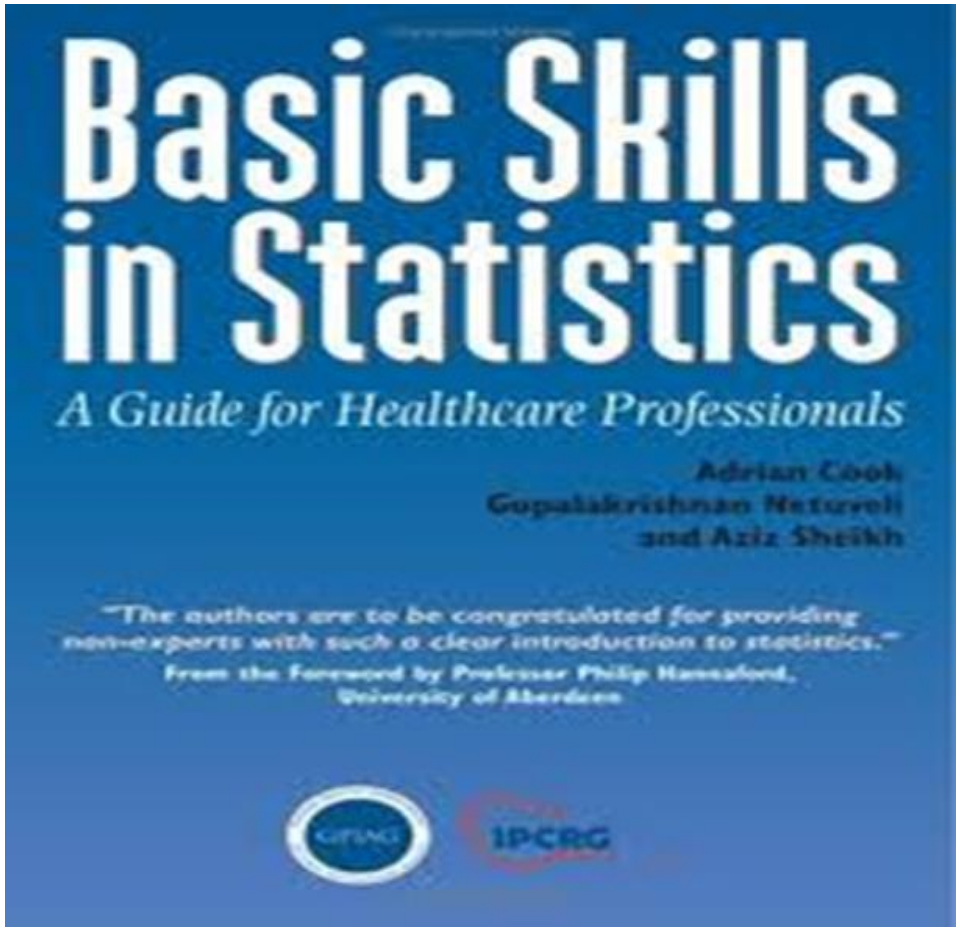
- Important research question(s)
- Robust methods
- Appropriate PI and skill-mix in the research team
- Track record of undertaking related work on time and within budget
- Preliminary/feasibility work
- Value for money

Any questions?

Conclusions

- ✓ Introduce the range of research designs
- ✓ Provide a framework for considering and selecting optimal study designs
- ✓ Summarise salient features of these study designs
- ✓ Critical appraisal and reporting tools
- ✓ Highlight critical factors in successful grant applications
- ✓ Provide opportunity for discussion and questions

Further reading



Overview of Common Research Methods in Primary Care and Key Components of Successful Grant Applications

Aziz Sheikh
OBE, MSc. MD, FRCGP, FRCP, FRCPE, FRSE, FMedSci
Professor of Primary Care Research & Development and
Joint Editor-in-Chief, *npj: PCRM*

Singapore, 30 May 2015