

How to use Reporting Guidelines to plan and publish infection control studies (RCTs, ITS, outbreak reports, Observational Epidemiological studies, Systematic reviews)

*Using the short “ORION/CONSORT” Abstracts for
conference and journal abstract submission & review*

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On behalf of ORION group

Aims workshop/lecture

- Familiarise/remind you of current status of evidence based medicine
- (re) Introduce you to CONSORT, STROBE, PRISMA
- Describe ORION as an example relevant to infection control studies
- The case for journal endorsement of reporting guidelines
- Work through two examples of ORION and CONSORT abstracts of published papers
- Work through proposed studies using the reporting guidelines to help plan them

Who has heard of/used?

- CONSORT?
- STROBE?
- ORION?
- STROME-ID?
- PRISMA?
- EQUATOR NETWORK?

EQUATOR NETWORK

www.equator-network.org;

PLoS Med Editors 2013

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 and facilitate replication effective interventions.

TIDiER Statement BMJ 2014



MEDICINE IN GENERAL

- Development consensus derived reporting guidelines, published after consultation with specialist societies & critical academic review
- Equator has a comprehensive on-line database of such guidelines
- Editors specialist journals have joined in :
 - Rehabilitation Medicine- editors 38 journals agreed to require adherence of submissions to relevant guidelines
 - Dermatology (4,5)
 - Surgical (6,7)
 - Anaesthetic (8)
 - Public Health journals (9).

Infection Prevention and Control?

- ORION: positive reviews and editorials endorsing its use

Gastmeier P Lancet ID 2007, McConnell, Johnson Lancet ID 2007, Struelens CMI 2007

- Forceful advocacy of endorsement of guidelines by journals, use by authors and peer reviewers, and their inclusion in medical, nursing and public health curricula

Larson E, Cortezal J Clin Epidemiol 2012

- 14 studies in IPC journals in last year used ORION guidelines to describe their study or carry out reviews of the IPC literature.
- STROBE guideline used in 21 papers in infection control, general surgery, physiotherapy, nephrology, genetics.

ECCMID 2012 & 2013 & 2014

Guidelines for submission of abstracts

ESCMID and SHEA strongly support the improvements of reporting of study results and ask that those submitting abstracts to use the relevant reporting guidelines :

CONSORT (RCT)

STROBE (observational study in epidemiology)

ORION (outbreak report or interventional study)

Interactive Workshops in SHEA, ECCMID (x2), FIS, IFIC (x2)

AIMS ABSTRACT CHECKLISTS

1. Help investigators write a high quality conference/journal abstract
2. Provide referees with a framework to help referee a conference abstract
3. Help HCWs and researchers select the best papers/conference presentations for continuing professional development..
what article to read?
what conference oral/poster session to go to?

CONSORT 1996, 2010

CONsolidated Standards Of Reporting Trials

Item	Description	Reported on line number
Title	Identification of the study as randomized	
Authors *	Contact details for the corresponding author	
Trial design	Description of the trial design (e.g. parallel, cluster, non-inferiority)	
Methods		
Participants	Eligibility criteria for participants and the settings where the data were collected	
Interventions	Interventions intended for each group	
Objective	Specific objective or hypothesis	
Outcome	Clearly defined primary outcome for this report	
Randomization	How participants were allocated to interventions	
Blinding (masking)	Whether or not participants, care givers, and those assessing the outcomes were blinded to group assignment	
Results		
Numbers randomized	Number of participants randomized to each group	
Recruitment	Trial status	
Numbers analysed	Number of participants analysed in each group	
Outcome	For the primary outcome, a result for each group and the estimated effect size and its precision	
Harms	Important adverse events or side effects	
Conclusions	General interpretation of the results	
Trial registration	Registration number and name of trial register	
Funding	Source of funding	

STROBE STATEMENT 2007

STrengthening the Reporting of OBservational studies in Epidemiology

- Title Indicate the study's design with a commonly used term in the title (e.g cohort, case-control, cross sectional)
- **Study design** Description of the study design (e.g cohort, case-control, cross sectional)
- Objective Specific objectives or hypothesis
- Setting Description of setting, follow-up dates or dates of outcome events ; ranges on other time scales for the outcomes (e.g., prevalence at age 18, 1998-2007).
- Participants *Cohort study/ Case Control study/Cross sectional study*—Give most important eligibility criteria, sources and methods of selection, follow up methods; case ascertainment & control selection;
Matched Cohort give matching, number exposed and unexposed
Matched Case-control study— matching criteria, number controls per case
- Variables **Clearly define primary outcome** for this report.
- Statistical methods Describe **statistical methods**, including those used to **control for confounding**
- Results - Report Number of participants at the beginning and end of the study
Report estimates of associations. Consider translating relative risk into absolute risk
Report appropriate measures variability & uncertainty (e.g., odds ratios with CI)
- Conclusions General interpretation of study results in context general evidence, **limitations, biases, in relation to hypotheses**

Extensions to CONSORT and STROBE

- CONSORT- CRCT
 - Herbal Medicine
 - on website
- STROBE- molecular epidemiology
 - STROME-ID
 - on website

Lancet ID 2014

STROBE EXTENSION

[10.1136/bmjopen-2015-010134](https://doi.org/10.1136/bmjopen-2015-010134)

STROBE-AMS: Recommendations to optimise reporting of epidemiological studies on antimicrobial resistance and informing improvement in antimicrobial stewardship

Evelina Tacconelli ; [Maria A. Cataldo](#) ; M. Paul ; L. Leibovici ; Jan Kluytmans ; Wiebke Schröder ; Federico Foschi ; Giulia De Angelis ; Chiara De Waure ; Chiara Cadeddu ; Nico T. Mutters ; Petra Gastmeier ; Barry Cookson

The PRISMA Statement 2009

Preferred Reporting Items for Systematic Reviews and Meta-Analyses

www.prisma-statement.org

TITLE	RESULTS-study selection (flow diagram)
ABSTRACT-structured summary	-study characteristics
INTRODUCTION-rationale	- risk bias within studies
-objectives	-results individual studies
METHODS-protocol	(effect estimates, 95% CI)
-eligibility criteria	-synthesis results
-study selection	- risk bias across studies
-search strategy	DISCUSSION
-data extraction	- summary results
- risk bias individual studies	-strength evidence for main outcomes
-summary measures	- limitations:risk of bias at study and
-synthesis methods	outcome levels and reporting bias at
- risk bias across studies	review level
-additional analysis	-Conclusions: in context current evidence

ESCMID Online Lecture Library
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The ORION statement:

Guidelines for transparent reporting of

Outbreak Reports & Intervention studies Of Nosocomial Infection

A CONSORT equivalent for Infection Control
Studies

Funded by Health Technology Assessment Board

Stone et al Lancet Infect Dis 2007; J Antimicrob Chemother 2007

www.idrn.org/orion.php

Co-authors & Collaborating Institutions

- Barry Cookson *Microbiology*
- Ben Cooper *Stats/Modelling*
- Chris Kibbler *Microbiology*
- Jenny Roberts *Health Economics* *Royal Free & University College Medical School*
- Graham Medley *Modelling* *Health Protection Agency, Colindale*
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University of Dundee Medical School
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- Phil Wiffen *EBM*
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Pharmaco-economics

Evidence Base for Infection Control Interventions

Davey et al Cochrane 2005; Cooper et al BMJ 2004

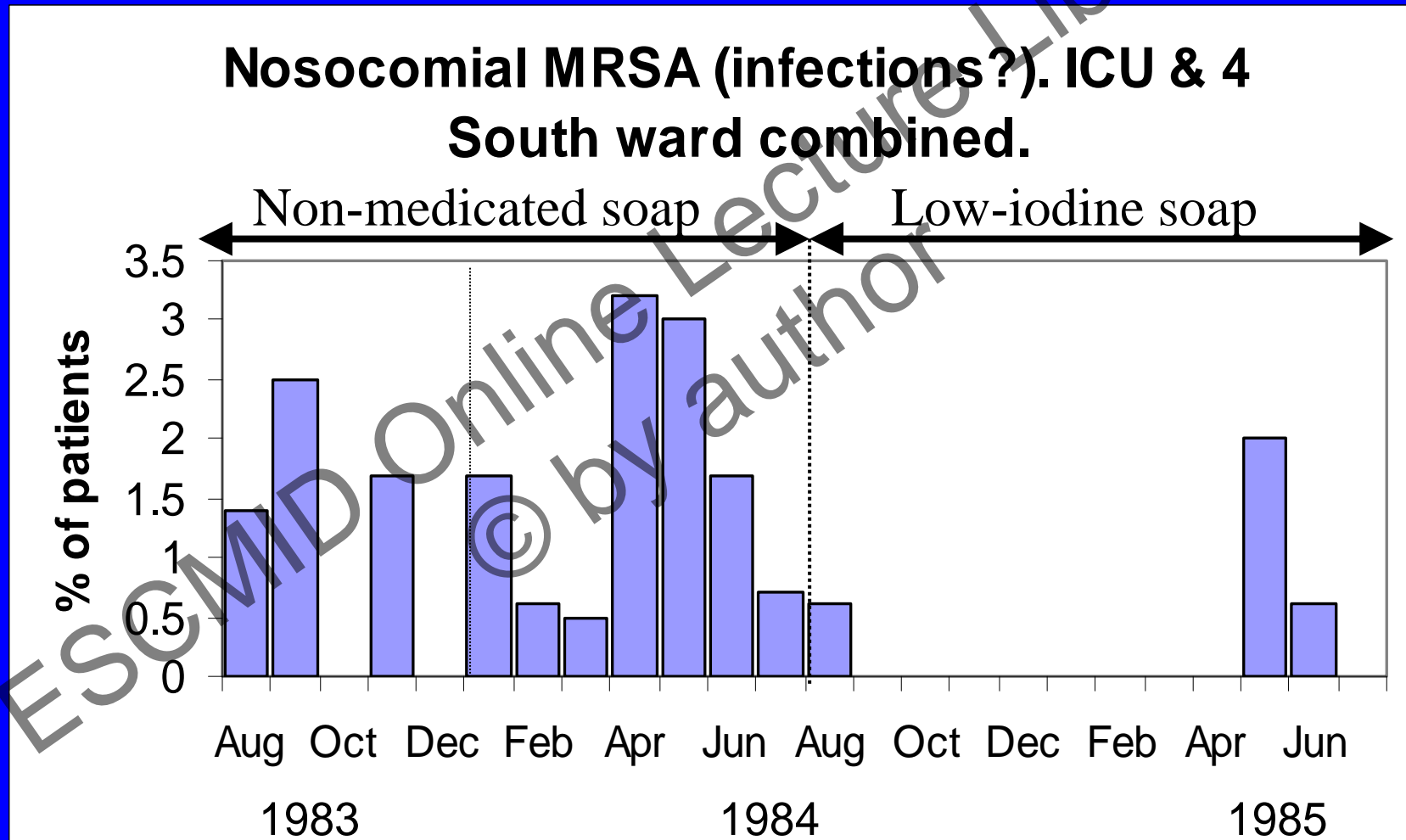
- Cochrane review of interventions to change antibiotic prescription & evaluate HCAI outcomes (2005) & HTA (2003) review isolation practices in MRSA show limited evidence of some effect but inadequate reporting & major flaws in design & statistical analysis
- Lack of details eg on interventions & timings
- Failure to assess & adjust for confounders/biases
- Aggregation of outcomes (misses trends)
- Analysis fails to account for dependencies of infectious outcomes
- Quality of infection control research must improve to provide robust evidence for policy & practice

To summarise the problem.....

Cooper B et al BMJ 2004, HTA 20003, Davey et al Cochrane 2005; Ramsay et al JAC 2003

- Studies conclude interventions cause Δ MRSA or antibiotic use or *Clostridium difficile*
- Validity of conclusions threatened by **confounders & biases**, unaccounted for in studies, which provide plausible alternative explanations of outcome and by **inappropriate statistics** e.g. aggregation of data (misses time trends) & assumption that infection outcomes are independent (Chi-Sq; OR)

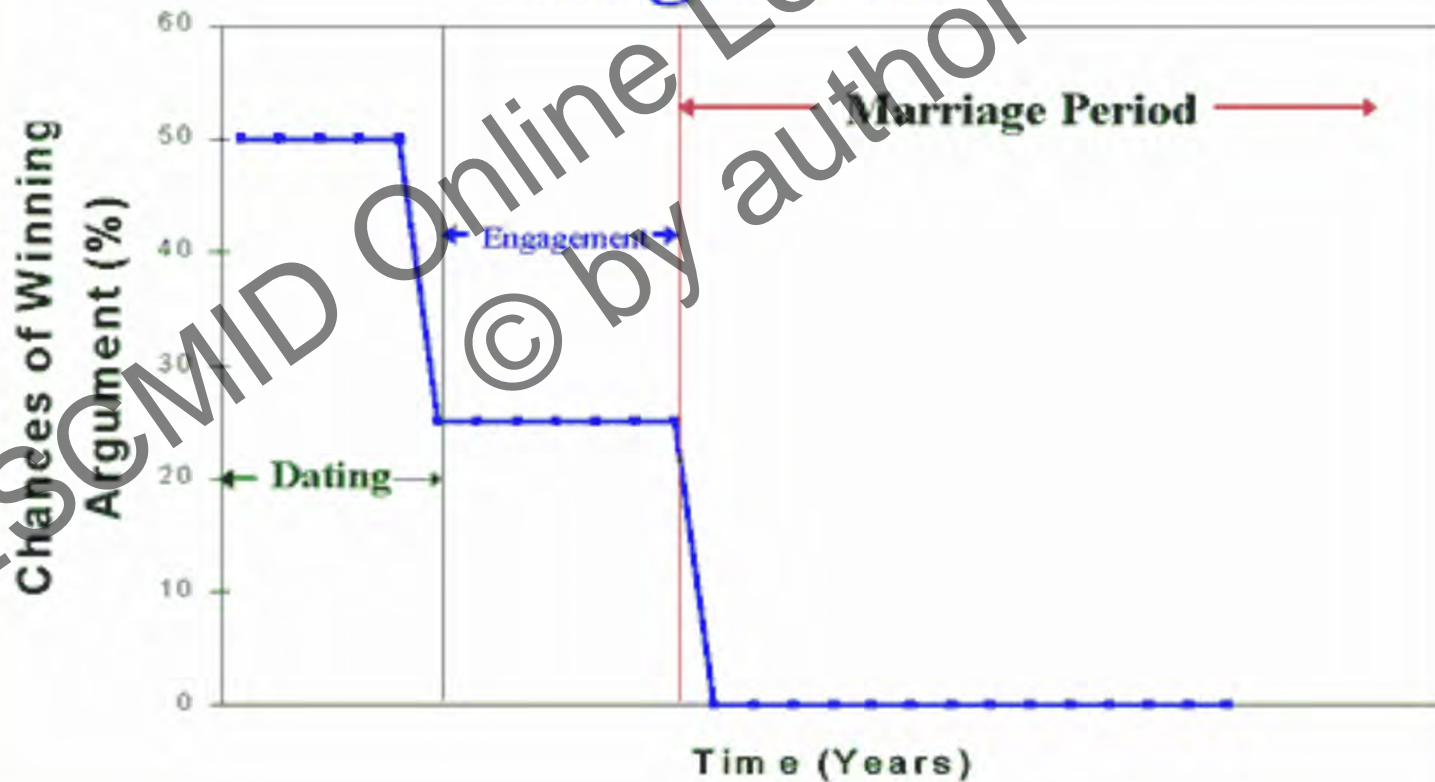
The sort of problems: regression to mean, statistical analysis



Onesko KM, Infection Control 1987

Interrupted time series

Chances of a Man Winning an Argument



AIM OF ORION Statement

CONSORT equivalent for infection control studies

- Improve standards research & publication
- Transparency of reporting
- Readers relate studies to their situation.
- Facilitate synthesis of evidence
- Framework for reviewers & editors to assess papers
- Criteria research grant assessment panels
- Designed especially for Interrupted Time Series (with or without controls groups) and outbreak reports.

Key issues addressed by ORION

Transparency: Why was the study done? (hypothesis)
What sort of study? (design)
Exactly what was done, to whom, when?

Analysis: Disaggregated data
Account for dependencies
Confounders

Inference: How do findings relate to hypothesis?
What else influenced the findings?
Do findings generalise ?

Components of ORION

*Stone et al Lancet ID 2007;JAC
2007;www.idrn.org/orion.php*

- adapted CONSORT statement to the wide variety settings interventions, designs & statistical issues infection control studies & outbreak reports
- Consultation with professional societies
- Independent academic review in two journals
- 22 item checklist
 - Title
 - Abstract
 - Introduction
 - Methods
 - Results
 - Discussion
- **Summary table**
 - Population
 - Clinical setting
 - Precise nature & timing of all interventions
- **Graphical summary results**

ORION Checklist: Introduction

	Item No	Descriptor
Title & Abstract	1	Description of paper as outbreak report or intervention study. Design of intervention study (eg ITS +/- controls; cross over study etc). Brief description of intervention.
Introduction background	2	Scientific and/or local clinical background and rationale . Description of organism as epidemic, endemic or epidemic becoming endemic
Type of paper	3	Description of paper as Intervention study or outbreak report. If an outbreak report, report the number of outbreaks.
Dates	4	Start and finish dates of the study or report stated.
Objectives	5	Objectives for outbreak reports. Hypotheses for intervention studies.

ORION Checklist: Methods 1

Methods Design	6	<p>Study design. Use of EPOC classification recommended (CBA, ITS) Whether study was retrospective, prospective or ambidirectional Whether decision to report or intervene was prompted by any outcome data Whether formally implemented study with pre-defined protocol and endpoints.</p>
Participants	7	<p>Numbers of patients admitted during the study or outbreak. Mean ages & LOS. Eligibility criteria for intervention study. Case definitions for outbreak report</p>
Setting	8	<p>Description of the unit, ward or hospital and if a hospital, the units involved. Number of beds, the presence and staffing of an Infection Control Team.</p>
Intervention	9	<p>Definition of phases by a major change in specific infection control practice. Start & stop dates. A summary table is strongly recommended with precise details of interventions, how & when administered in each phase.</p>
Typing	10	<p>Details of culture media, use of selective antibiotics & local and /or reference typing. Where relevant details of environmental sampling</p>

Setting: 1300-1600 bed teaching hospital. ICT with 5 full time infection control nurses from Oct 1992.MRSA initially epidemic, later endemic	Dates: 1989-1997	Population characteristics: Number of patients during study: 506012. Mean age of MRSA patients (SD): 68 (23) years.		
Major infection control changes during the study: Carer hand-hygiene education and feedback; patient isolation; screening; MRSA eradication; antibiotic use; automatic readmission alerts, disinfection, sterilization, air control & building construction.				
	Isolation	Screening	Eradication	Other measures
Phase 1 48 months (Jan 1989 - Dec 1992)	None	None	None	No MRSA control measures
Phase 2 24 months (Jan 1993 - Dec 1994)	1.Single room. 2. Cohorting on closed and open bays in special circumstance (e.g. unit specific outbreaks).	1.Admission screens for previous MRSA patients. 2.Contacts screened. 3.Treated MRSA patients: weekly for 4 weeks, then monthly.	Mupirocin and chlorhexidine. Mupirocin used for almost all patients, irrespective of MRSA carriage*.	1.CDC guidelines 1983 2.Computer alerts for readmitted MRSA patients (July 1994 on).
Phase 3 36 months (Jan 1995 - Dec 1997)	As phase 2	As phase 2	As phase 2 until September 1997.	As phase 2 + staff hand-hygiene education & feedback programme
Isolation details: From 1993 single rooms may not have been used when there was nasal carriage only and lack of available rooms.). Contact for overflow with nasal carriage only. 60 single rooms available for acute services patients (without negative pressure).				
Screening details. Screening sites: nose, lesion, groin, infected sites. Patients in "septic" orthopaedic ward screened on admission from July 1994.				
Eradication Details: From phase 2 most patients received ≥ 1 nasal mupirocin courses, irrespective of MRSA carriage*. After September 1997 mupirocin was limited to those with known nasal carriage and without chronic skin lesions and indwelling devices. Criteria for eradication: 2 negative sets of cultures ≥ 24 hrs apart.				

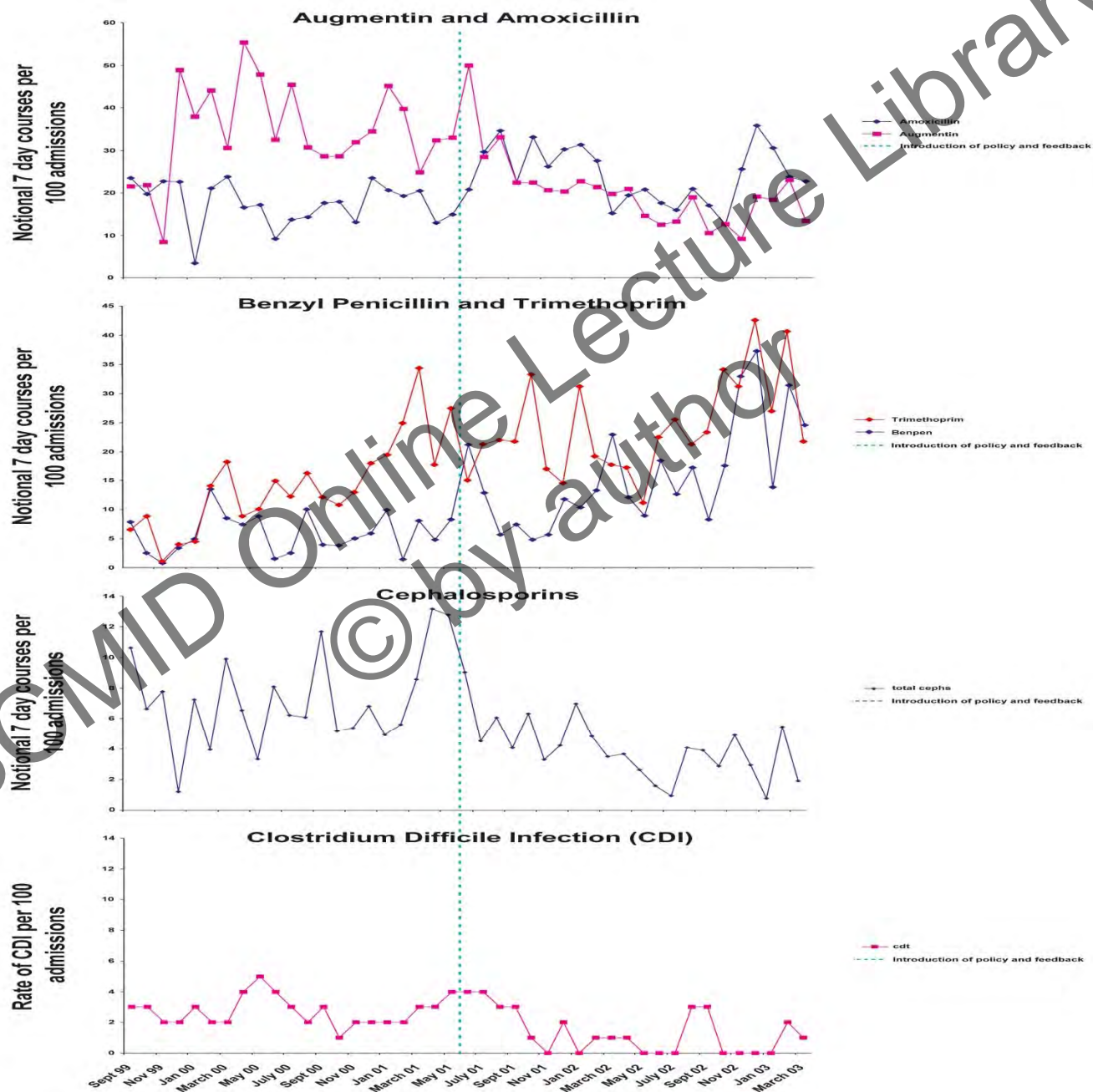
ORION Checklist: Methods 2

Infection related outcomes	11	<p>Clearly defined primary & secondary outcomes (eg incidence infection, colonisation) at regular time intervals (eg weekly, monthly, yearly) not as totals for each phase of a study, with at least 3 time points per phase and for many 2 phase studies, 12 or more monthly data points per phase.</p> <p>No place for the uncontrolled before and after study with only two time points.</p> <p>Denominators (eg numbers admissions or discharges, patient bed days) Criteria for outcome measures.</p> <p>For short studies use of charts with duration patient stay & dates organism detected may be useful.</p>
Economic outcomes	12	<p>If a formal economic study done, definition of outcomes to be reported, description of resources used in intervention, costs broken down to basic units and important assumptions stated.</p>
Potential Threats to Validity	13	<p>Which potential confounders were considered, recorded or adjusted for (eg changes in length of stay, case mix, occupancy, staffing levels, hand-hygiene, antibiotic use, strain, processing isolates)</p> <p>Description of measures to avoid bias including blinding, standardisation outcome assessment & delivery care</p>

ORION Checklist: Results

Results Recruitment	16	For relevant designs, the dates for each period recruitment & follow up. A flow diagram may help describe patient flows in each phase (eg cross over study)
Outcomes & estimation	17	For the main outcomes, the estimated effect size and its precision A graphical summary is appropriate for dependent data (most ITS)
Ancillary analyses	18	Report subgroup analyses and adjust for possible confounders.
Harms	19	Pre-specified categories of adverse events & occurrences of these in each group or phase.

ORION exemplar paper..... *Fowler S et al JAC 2007*



ORION Checklist :Discussion

Discussion Interpretation	20	For intervention studies, an assessment of evidence for/against hypothesis accounting for potential threats to validity of inference including regression to mean effects and reporting bias For outbreak reports consider clinical significance of observations & hypotheses generated to explain them
Generalisability	21	External validity of the findings of the outbreak report or intervention study
Overall evidence	22	General interpretation of results in context of current evidence.

Endorsement of CONSORT, STROBE, ORION, PRISMA and extensions by infection control journals

AJIC commentary, JIP commentary November 2016

In 2014 , letter to 11 infection control journals from 18 British, European, USA infection control and evidence based medicine specialists and academics asking for endorsement CONSORT, ORION, STORBE, PRISMA and STROME-id

Main reason to help develop as robust an evidence base as possible to drive policy and practice in the battle to overcome AMR and HCAI which is now a global threat

O'Neill Review Antimicrobial Resistance www.amr.org 16 May 2016

Asked journals if willing to endorse, how they would do this and whether they endorsed or not would they enter an evaluation study?

Will it make a difference?

The only guideline for which extensive evidence is CONSORT. Cochrane review showed completeness of reporting in RCTs increased significantly in association with journal endorsement although suboptimal

Turner L Syst Rev. 2012; 1: 60. doi: 10.1186/2046-4053-1-60

Insufficient evidence available for other reporting guidelines. A prospective controlled study of journal endorsement on quality of published research is required

Stevens A BMJ 2014;348:g3804 doi: 10.1136/bmj.g3804

Implementation of endorsement likely to be critical

- 8 journals agreed and BMC Infect Diseases later did
- One USA refused as felt would not work unless upload checklist was *mandatory* and it was checked by editors/reviewers
- Others with experience of asking for CONSORT/PRISMA checklists felt authors were honest
- Other editors ask for it and if not submitted then becomes part of post acceptance negotiation, and it goes on web extra
- Others simply post the links to checklists and ask authors and reviewers to use them
- Some launch with a commentary

ONE USA JOURNAL-charming

- Being against reporting guidelines was like “not being in favour of Mother and Apple Pie” but thought that their non-IPC papers were of a high enough standard.
- Accepted this might not be true of their IPC submissions, and could consider in the future when new editors take over.

A British Journal

Wanted to study whether their accepted papers were guideline compliant or not before making a decision

Kruger-Dunning principle
1999 (Cornell University)
“some people are too stupid to know they are stupid” but this is very British at the moment



BREXIT LEADER

All agreed to a study

Varied responses gives chance to study the effect of guideline endorsement in a controlled preference trial to compare endorsing v non-endorsing journals, pre-endorsement v post-endorsement, low v high intensity implementation

Hypothesis: Endorsement increases the completeness and transparency of reporting in the infection control literature, and that this effect increases with intensity of implementation (fidelity to intervention)

Is there a downside?

- Too restrictive, infringement of scientific freedom or authorship?, . One former editor, generally in favor, thought might dissuade authors from low income countries but minority view.
- Each guideline is a consensus document created after peer discussion, consultation and critical review etc likely to reflect what field regards as good practice.
- They are intended as guidelines, not as “Holy Writ”----if have not collected confounders, acknowledge and comment on threat to validity posed
- If puts people off this means less work for journal editors, less demand for reviewers, less to read in journals for busy clinicians !
- Less abstracts/presentations at conferences means later start and earlier finishing times, more hours to tour and explore foreign climes like the charming city of Seville!!

Workshop Goals:

This interactive workshop will help you :

1. assess journal abstracts using reporting guidelines like ORION for one ITS study CONSORT for one RCT
2. Use the reporting guidelines that most infection control journals now request as part of submission process
3. Use reporting guidelines to help plan studies and anticipate how you will have to report them (ORION, STROBE)

Encourage you to further study CONSORT, ORION, STROBE and PRISMA statement for studies, grant applications, and papers

Workshop Plan

Working alone or with neighbours:

- 5 mins to read first abstract: Stone et al, *Age and Aging*, 1998 (*hand out*)
- 5 mins to assess with the ORION abstract check-list (*hand-out*)
- 5 mins individual feed-back by show of hands
- Repeat if time for second abstract: Stone et al *PLoS ONE* 2012 (*hand-out*) using CONSORT

**The effect of an enhanced infection-control policy
on the incidence of *Clostridium difficile* infection
and methicillin-resistant *Staphylococcus aureus*
colonization in acute elderly medical patients**

Stone et al Age Ageing 1998

Stone et al abstract

- **Title-** not explicit that intervention study β
- **Background-** rationale but no clear hypothesis β
- **Methods-**
 - **design:** not stated β
 - **Brief description** of intervention but not setting, participants or dates β
 - **Outcomes-**
 - (I) no regular time intervals ie not disaggregated β
 - (ii) clear CDI outcomes but not AB
- **Statistical analysis:**
 - fail to account for dependencies β (segmental regression for AB & Poisson for CDI)
 - **Confounders/bias**
 - no mention β
 - **Culture, typing** etc
 - N/R
- **Results-**
 - no estimated size effect & precision, no graphical summary β
- **Conclusions-**
 - no original hypothesis β

The Feedback Intervention Trial (FIT)—Improving Hand-Hygiene Compliance in UK Healthcare Workers: A Stepped Wedge Cluster Randomised Controlled Trial

*Fuller et al PLoS ONE 2012 (PLoS ONE 7(10): e41617.
doi:10.1371/journal.pone.0041617*

FIT abstract checklist

- **Title-**
study identified as RCT
- **Background**
rationale and explicit hypothesis
- **Methods:**
 - **Design-**
described as stepped wedge cluster
 - **Participants-**
setting clear & participants
 - **Interventions-**
describe
 - **Outcome-**
clearly defined primary outcome
 - **Analysis**
Dependencies accounted for
 - **Results-**
estimated size effects & precision
No graphic
 - **Conclusions-**
do not explicitly reference hypothesis

Updated check

- Addition of “fidelity to intervention” to the full ORION?
- Modifications to full ORION for outbreak reports?
Indicate what may not be relevant?
- Do risk factors for outbreaks in terms of poor infection control practices or infrastructure need addition?

Thank you....workshops on
www.idrn.org/orion.php
including first ever one IFIC 2007!

Comments & suggestions to

s.stone@medsch.ucl.ac.uk



Protracted Outbreak of Postarthroscopy Infections
Associated with Flash Sterilization of Instruments

Lopansri et al SHEA 2010

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Outbreak abstract

Lopansri et al HPA SHEA 2010

- **Title: outbreak report** ^{α}
- **Background:** rationale and objectives ^{α}
- **Methods-**
 - case definition ^{α}
 - no outbreak definition ^{β}
 - hospital setting & outbreak control measures but not ward briefly described but little detail on participants ^{$\beta+$}
 - start & stop dates for original index cases but not for whole study ^{$\beta+$}
 - outcomes & stat analysis : R ^{α}
- **Methods (cont)-**
 - Risk factors analysed but others should be mentioned as not having been present ^{$\beta+$}
 - More details on micro/strain?
 - Information on C&S from samples from flash sterilised equipment?
- **Results-**
 - OK: but graph helpful ^{$\alpha-$}
- **Conclusions-**
 - Clinical significance observation & explanatory hypothesis ^{α}

Achieving change through improved audit and feedback:
“the very interactive workshop” using the FIT intervention
to improve hand hygiene as routine clinical practice

Gifen Workshop

Friday 14 May 16.00-17.00

Chris Fuller and Sheldon Stone

ORION ABSTRACT CHECKLIST FOR INTERVENTION STUDIES & OUTBREAK REPORTS

(see handouts)

Title	1. Clear statement that this is an intervention study or outbreak report.
Background	2. Rationale for study with clear hypothesis for intervention studies or objective for outbreak reports
Methods-	3. Clear statement of intervention study design ¹ or case and outbreak definition for outbreak report.
	4. Brief description of participants, setting and of intervention or outbreak control measures (with start & stop dates)
	5. Clearly defined outcomes & denominators at regular time intervals ² , not as totals for each phase <i>(can be put in results instead)</i>
	6. Statistical analysis accounts for any dependencies in the data (can be in results instead) <i>(analysis may not be appropriate for OR)</i>

ABSTRACT CHECKLIST (cont)

Methods (cont)	7. Which potential confounders or biases were considered, recorded or adjusted for ³ (<i>can be in results instead</i>)
	8. Where relevant: details of culture, typing, environmental sampling, & risk factors for acquisition, root cause analysis or organisational risk assessment.
Results-	9. For main outcomes: estimated effect size & its precision (usually 95% CI) (A graphical summary is often appropriate eg for most time series-conference programme v main figure paper).
Conclusions	10. For intervention studies: consider in relation to original hypothesis, accounting for potential confounders & biases. For outbreak reports: consider clinical significance of observations & hypothesis to explain them.