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Centre for Health Protection

Infection Control Research Now and Future

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- Sharing on the 5th International Congress of the Asia Pacific Society of Infection Control (8-11 November 2011)
  1. Evidence Based Interventions that Improve Patient Outcome – Is Elimination an Achievable Goal?
  2. Top 10 “Must-Do’s for the Elimination of Hospital-Associated Infections
  3. ORION (Outbreak Reports and Intervention Studies of Nosocomial Infection) Statement – Guidelines for Intervention Control Research Studies
  4. Where are the Gaps in Infection Control Research?

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Evidence Based Interventions that Improve Patient Outcome – Is Elimination an Achievable Goal?

William Jarvis, United States

- In the mid-1970s, CDC's Study of the Efficacy of Nosocomial Infection Control (SENIC) programs estimated ~30% of the big four HAIs were preventable
- Recently, the application of bundles, or groups of prevention interventions packaged together, have demonstrated that a higher proportion of HAIs are preventable
- Two examples: central line-associated bloodstream infections and MRSA infections
- Opined: Although all HAIs may not be eliminated, much higher proportion of HAIs are preventable and should be prevented through the application of evidence-base bundled interventions

Top 10 "Must-Do's" for the Elimination of Hospital-Associated Infections

William Jarvis, United States

- Active HAI surveillance using standardized definitions and protocols
- Collecting, analyzing and acting on the data
- Knowledge of the best guidelines and other published HAI prevention evidence
- Conduct risk assessment
- Infection control program should focus on the HAIs causing the greatest morbidity and mortality in your facility

Top 10 "Must-Do's" for the Elimination of Hospital-Associated Infections (cont'd)

William Jarvis, United States

- At a minimum, prevention bundles for CLA-BSI (insertion and maintenance bundles), CA-UTI, SSIs, VAP, and MRSA (and/or other MDROs) infections should be implemented
- Both compliance with process measures and HAI rates should be calculated
- Integral components: education and reinforcement of hand hygiene and emphasis on environmental hygiene

ORION (Outbreak Reports and Intervention Studies of Nosocomial Infection) Statement

- *The Lancet Infectious Diseases* 2007;7(4):282-8
- The quality of research in hospital epidemiology (infection control) must be improved to be robust enough to influence policy and practice
- In order to raise the standards of research and publication a CONSORT equivalent for these largely quasi-experimental studies was prepared
- ORION consists of a 22 item checklist

1. Title and abstract

- Description of paper as outbreak report or intervention study
- Design of intervention study (e.g. interrupted time series with or without control group, cross over study)
- Brief description of intervention and main outcomes

2-5 INTRODUCTION
2. Background

- Scientific and/or local clinical background and rationale
- Description of organism as epidemic, endemic, or epidemic becoming endemic

3. Type of paper

- Description of paper as intervention study or an outbreak report
- If an outbreak report, report the number of outbreaks

4. Dates

- Start and finish dates of the study or report

5. Objectives

- Objectives for outbreak reports
- Hypotheses for intervention studies

6-15 METHODs
6. Design

- Study design. Use of Effective Practice and Organisation of Care Group classification recommended (controlled before and after study or interrupted time series)
- Whether study was retrospective, prospective, or ambidirectional
- Whether decision to report or intervene was prompted by any outcome data
- Whether study was formally implemented with predefined protocol and endpoints

7. Participants

- Number of patients admitted during the study or outbreak
- Summaries of distributions of age and lengths of stays
- If possible, proportion admitted from other wards, hospitals, nursing homes, or from abroad
- Where relevant, potential risk factors for acquiring the organism
- Eligibility criteria for study
- Case definitions for outbreak report

8. Setting

- Description of the unit, ward, or hospital and, if a hospital, the units included
- Number of beds, the presence and staffing levels of an infection control team

9. Interventions

- Definition of phases by major change in specific infection control practice (with start and stop dates)
- A summary table is strongly recommended with precise details of interventions, how and when administered in each phase

10. Culturing and typing

- Details of culture media, use of selective antibiotics and local and/or reference typing
- Where relevant, details of environmental sampling

11. Infection-related outcomes

- Clearly defined primary and secondary outcomes (e.g. incidence of infection, colonisation, bacteraemia) at regular time intervals (e.g. daily, weekly, monthly) rather than totals for each phase, with at least 3 data points per phase and, for many two phase studies, 12 or more monthly data points per phase
- Denominators (e.g. numbers of admissions or discharges, patient bed days)
- If possible, prevalence of organism and incidence of colonisation on admission at same time intervals
- Criteria for infection, colonisation on admission, and directly attributable mortality
- All cause mortality
- For short studies or outbreak reports, use of charts with duration of patient stay and dates organism detected may be useful

12. Economic outcomes

- If a formal economic study done, definition of outcomes to be reported, description of resources used in interventions, with costs broken down to basic units, stating important assumptions

13. Potential threats to internal validity

- Which potential confounders were considered, recorded or adjusted for (e.g. changes in length of stay, case mix, bed occupancy, staffing levels, hand hygiene compliance, antibiotic use, strain type, processing of isolates, seasonality)
- Description of measures to avoid bias including blinding and standardisation of outcome assessment and provision of care

14. Sample size

- Details of power calculation, where appropriate

15. Statistical methods

- Description of statistical methods to compare groups or phases
- Methods for any subgroup or adjusted analyses, distinguishing between planned and unplanned (exploratory) analysis
- Unless outcomes are independent, statistical approaches able to account for dependence in the outcome data should be used, adjusting, where necessary, for potential confounders
- For outbreak reports statistical analysis may be inappropriate

16-19 RESULTS
16. Recruitment

- For relevant designs, such as cross over studies or where there are exclusions of groups of patients, the dates defining the periods of recruitment and follow-up, with a flow diagram describing participant flow in each phase

17. Outcomes and estimation

- For the main outcomes, the estimated effect size and its precision (usually using confidence intervals)
- A graphical summary of the outcome data is often appropriate for dependent data (such as most time series)

18. Ancillary analyses

- Any subgroup analyses should be reported and it should be stated whether or not it was planned (i.e. specified in the protocol) and adjusted for possible confounders

19. Harms

- Prespecified categories of adverse events and occurrences of these in each intervention group
- This might include drug side effects, crude or disease-specific mortality in antibiotic policy studies, or opportunity costs in isolation studies

20-22 DISCUSSION
20. Interpretation

- For intervention studies an assessment of evidence for/against hypotheses, accounting for potential threats to validity of inference including regression to mean effects and reporting bias
- For outbreak reports, consider clinical significance of observations and hypotheses generated to explain them

21. Generalisability

- External validity of the findings of the intervention study, i.e. to what degree can results be expected to generalise to different target populations or settings
- Feasibility of maintaining an intervention long term

22. Overall evidence

- General interpretation of results in context of current evidence

Where are the Gaps in Infection Control Research?

Andreas F Widmer, University Hospital Basel, Switzerland

- Gaps in basic infection control issues
  - Masks
  - Hand hygiene
  - Contact isolation
  - ….
- New technologies for diagnosis of nosocomial infections

Gap I: The best surgical mask to prevent viral transmission is unknown

- Not all surgical masks are equal
- The international requirements (USA, EU) differ and are tested for *S. aureus* only, not for viruses
- Clinical studies show effect, but types of masks are not standardised

Gap II: The easiest but effective handrub technique is still to be determined

- Handwashing as the standard of care for hand hygiene is still common in the literature outside infection control
- The WHO hand hygiene technique significantly improves bacterial killing, but simpler techniques may be equally effective

Gap III: The optimal type of contact isolation to be determined

- Effective against MRSA, VRE and other pathogens in parts of Switzerland, The Netherlands and Scandinavian countries, and improvements after enforcement in the UK and France
- Essential for survival of humans in the last 3000 years (tuberculosis, plague, cholera, etc)

Gap IV: The optimal mode of skin disinfection prior to surgery still to be determined

- Current standard of care in 2011: Chlorhexidine
  - Mandatory in UK
- Likely the truth for optimal preparation of surgical site
  - Alcohol 70% with
    - Either Chlorhexidine
    - Or PVP Iodine (or octenidin or polihexanid)

Gap V: No clue how to stop spread of *Enterobacteraceae* producing ESBL or MBL or both

- How to stop or limit transmission in hospitals and community
- Mircobiology reports of mode of resistance not mandatory for European and US microbiology laboratories

ESBL: Extended Spectrum β-Lactamase

MBL: Metallo-β-Lactamase

Gap VI: Tools for maintenance of behaviour changes in HCWs

- Many infection control activities are not long-lasting
- Excellent for publications
- Before-after studies usually publishable, but inappropriate statistics with $p<0.0001$
- After all: regression to the mean

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Thank you

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