**Risk Assessment and Priority Setting in Infection Control in Low- to Middle-Income Countries**
**Dr. Nizam Damani, Queen's University, Belfast, UK**
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*Risk Assessment & Priority Setting in Infection Control in Low- to Middle-Income Countries*

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## Outline

- Setting the scene
- How to apply the concept of risk assessment in Infection Prevention & Control (IPC)
- **Eliminate** or **minimize** hazards & Health care associated infections (HCAIs) esp. in low to middle income countries
- Conclusions

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### WHO Report on the Global Burden of Health Care-associated Infections (HCAI)
(A systematic review of the literature)

- <u>5% to 15%</u> of hospitalized patients in general wards and as many as 50% or more of patients in intensive care units (ICUs) in resource rich countries acquire HCAIs
- Magnitude of the problem in low/middle income countries is unknown and/or grossly underestimated due to lack of surveillance data

http://www.who.int/gpsc/en/

3

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## Risk Assessment in IPC

- **Risk assessment** is a systemic process for assessing and integrating professional judgments about probable adverse conditions and/or events
- **Risk management** is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of adverse events

Hubbard D. *The Failure of Risk Management: Why It's Broken and How to Fix It*. John Wiley & Sons,2009.

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## Risk Assessment in IPC

This approach can be used for hazards *or* risks that arise from the *environment* or *items/equipment*, as well as *patient-related risks*

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## Key Definitions

- **Hazard** is defined as *something with the potential to cause harm*
  - Microorganisms & chemical disinfectant
- **Risk** is defined as *the likelihood of harm resulting from a hazard*
  - HCWs acquiring Blood Borne Viral infection due to exposure to contaminated sharps injuries
  - Exposure to chemical disinfectant (e.g. glutaraldehyde) in an poorly ventilated area
  - Risk of cross infections to HCWs, visitors and other patients due failure to isolate patient and/or failure to comply with good infection control practices
  - Re-use of items/equipment without adequate decontamination

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1

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## Risk Factor

**Risk Factor** = Probability (*Frequency*) $x$ Impact *(Severity)*

- Local and/or national *surveillance data* on the incidence of HCAIs will give you the *probability* or *frequency* and *adverse incident reports* and *audits* of IPC practices will give you the information on the *frequency* of failure to carry out task or a procedure as per recommended guidelines

- **Risk assessment** will give you the information on the *impact or severity of disease* to individuals (patient, HCWs, visitors & community)

## Four Key stages of Risk assessment



**1. Identify Risks**
- Identify risk/hazards
- Assess who can be harmed e.g. patients, HCWs, visitors or commmunity
- Quantify risk by getting the information on the frequency (probability) and impact it had on individuals

**2. Analysis risk**
- Measure potential impacts
- Record findings
- Develop Risk Assessment Matrix

## 2. Risk Analysis : Why Are They Happening?...1

**Sources of performance deficit**
- These occur due to an *act of omission* e.g., failure to comply with current professionally accepted practice which could be due to :
  - Lack of knowledge
  - Lack of communication
  - Inadequate provision of education, training and supervision
  - Lack of availability/regular supply of goods e.g. hand hygiene products, PPE
- These occur due to an *act of commission* i.e., an act should not have been committed which could be due to :
  - Lack of commitment
  - Lack of consideration for others

*This is more complex and may also require management reinforcement*

## 2. Risk Analysis : Why Are They Happening?...2
Type III error 2
- Occurs when *we fail to understand the true nature* of the problem

- Real solutions are adopted to deal with the wrong problems, rather than incorrect solutions to real problems

- Often due to *lack of communication* or *misinterpretation of information*
- Put an agreed evidence based risk reduction plan in place in the problem area

### Reason's 'Swiss cheese' model of error causation related to infection prevention and control



**Infection hazard**

Failed or absent defences across a number of levels

Organisation
Technical
Team
Individual

Organisational culture not supportive of infection prevention

Design flaws in systems and processes for infection prevention

Inadequate training and low knowledge of correct and integrated practices

Lack of leadership and teams that value infection prevention

Lack of motivation

**Active failures (person) and latent conditions (system)**

Error in, or omission of, correct infection prevention practice

Storr J, Wigglesworth N & Kilpatrick C. *Integrating human factors with infection prevention and control*. The Health Foundation, 2013

### Sample Risk Assessment Tool for Hospital-based Infection Control Programme

| Pathogen Syndrome | Severity of infection (1 – 5) | Size of population at risk (1 – 5) | Vulnerability Likelihood that the program is prepared to manage this problem (more prepared = lower score) (1 – 5) | Total Risk Score The severity of the risk is determined by multiplying the scores |
|---|---|---|---|---|
| Bloodstream infection | 4 | 3 | 4 | 48 |
| Surgical site infection | 3 | 4 | 4 | 48 |
| MRSA | 3 | 4 | 3 | 36 |
| *C difficile* | 4 | 4 | 2 | 32 |
| Influenza | 2 | 4 | 3 | 24 |
| Ventilator-associated infection | 4 | 2 | 3 | 24 |
| Resistant GNR | 5 | 2 | 1 | 10 |
| Urinary tract infection | 1 | 3 | 3 | 9 |
| Vancomycin-resistant enterococci | 1 | 2 | 3 | 6 |

From : Weber SG et al. Healthcare associated infections, Oxford University Press, 2013

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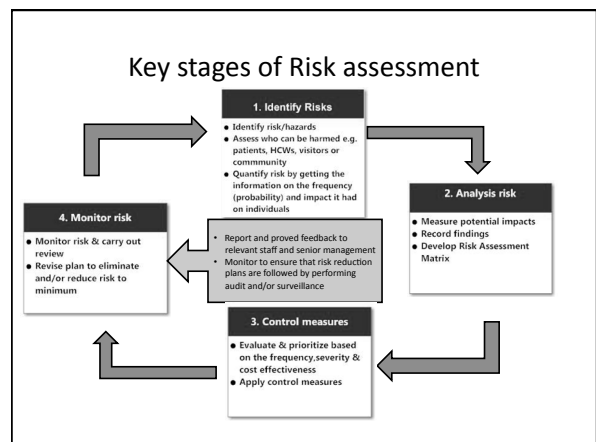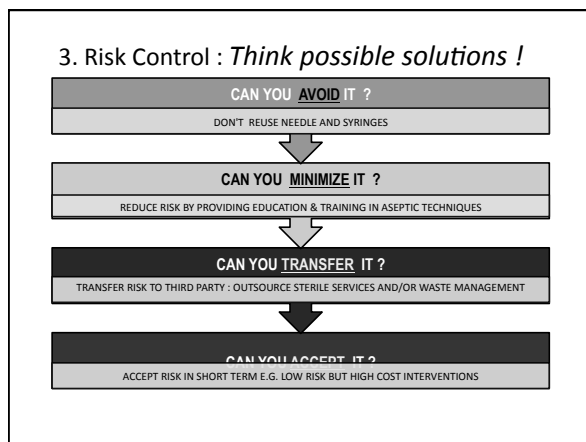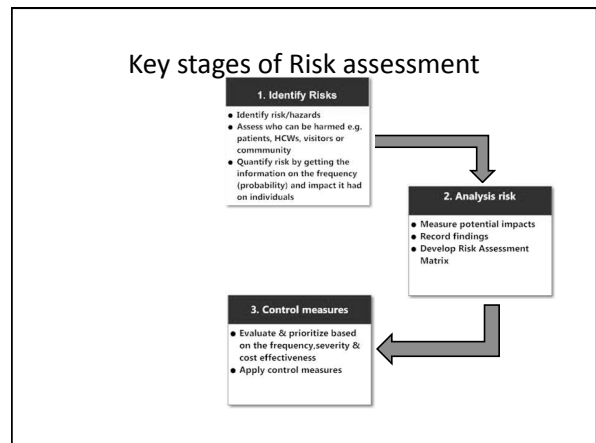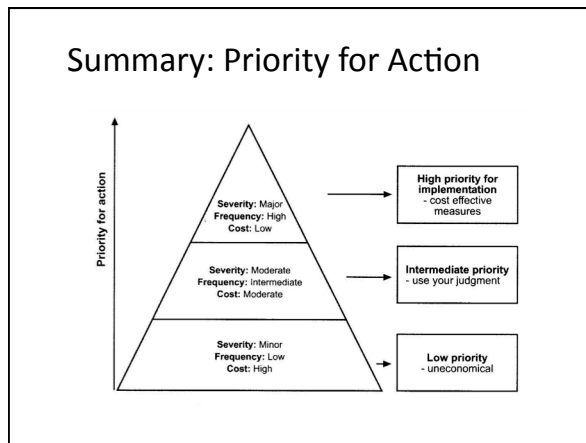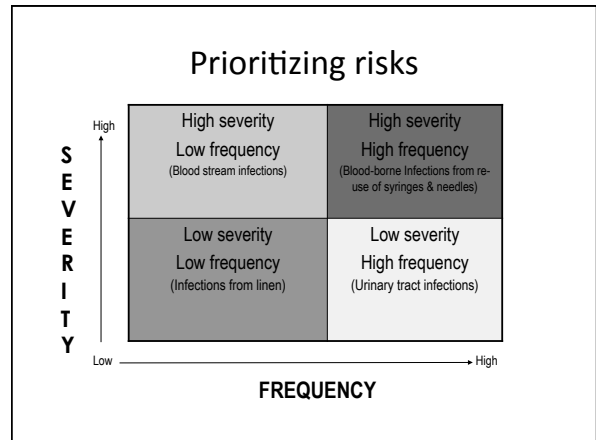**Dr. Nizam Damani, Queen's University, Belfast, UK**
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## RISKS MATRIX

| PROBABILITY (frequency) | INSIGNIFICANT No harm or injury | MINOR Minor harm or injury | MODERATE Medical treatment required | MAJOR Serious injury with long term consequences | CATASTROPHIC Death |
|---|---|---|---|---|---|
| Almost certain 1:10 | High | High | Extreme | Extreme | Extreme |
| Likely 1:100 | Moderate | High | High | Extreme | Extreme |
| Possible 1:1,000 | Low | Moderate | High | Extreme | Extreme |
| Unlikely 1:10,000 | Low | Low | Moderate | High | Extreme |
| Rare 1:100,000 | Low | Low | Moderate | High | High |

*High Priority: Target resources where risk is greatest*

| **E: EXTREME RISK** Immediate action required | **H: HIGH RISK** Prioritised action required |
|---|---|
| **M: MODERATE RISK** Planned action required | **L: LOW RISK** Actions are required by routine procedures |

## Prioritizing risks

| | |
|---|---|
| High severity **Low frequency** (Blood stream infections) | High severity **High frequency** (Blood-borne Infections from re-use of syringes & needles) |
| Low severity **Low frequency** (Infections from linen) | Low severity **High frequency** (Urinary tract infections) |

SEVERITY (vertical axis, Low to High)
FREQUENCY (horizontal axis, Low to High)

## Summary: Priority for Action



Priority for action (vertical axis)

- Severity: Major / Frequency: High / Cost: Low → **High priority for implementation** - cost effective measures
- Severity: Moderate / Frequency: Intermediate / Cost: Moderate → **Intermediate priority** - use your judgment
- Severity: Minor / Frequency: Low / Cost: High → **Low priority** - uneconomical

## Key stages of Risk assessment

**1. Identify Risks**
- Identify risk/hazards
- Assess who can be harmed e.g. patients, HCWs, visitors or commmunity
- Quantify risk by getting the information on the frequency (probability) and impact it had on individuals

**2. Analysis risk**
- Measure potential impacts
- Record findings
- Develop Risk Assessment Matrix

**3. Control measures**
- Evaluate & prioritize based on the frequency, severity & cost effectiveness
- Apply control measures

## 3. Risk Control : *Think possible solutions !*

**CAN YOU AVOID IT ?**
DON'T REUSE NEEDLE AND SYRINGES

**CAN YOU MINIMIZE IT ?**
REDUCE RISK BY PROVIDING EDUCATION & TRAINING IN ASEPTIC TECHNIQUES

**CAN YOU TRANSFER IT ?**
TRANSFER RISK TO THIRD PARTY : OUTSOURCE STERILE SERVICES AND/OR WASTE MANAGEMENT

**CAN YOU ACCEPT IT ?**
ACCEPT RISK IN SHORT TERM E.G. LOW RISK BUT HIGH COST INTERVENTIONS

## Key stages of Risk assessment

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**2. Analysis risk**
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**3. Control measures**
- Evaluate & prioritize based on the frequency, severity & cost effectiveness
- Apply control measures

**4. Monitor risk**
- Monitor risk & carry out review
- Revise plan to eliminate and/or reduce risk to minimum

Report and proved feedback to relevant staff and senior management
Monitor to ensure that risk reduction plans are followed by performing audit and/or surveillance

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## Risk assessment & Infection Prevention & Control

1. CHARACTERISTICS/TYPE OF MICROORGANISMS
   – Hazard Groups (1-4) of biological agents
   – Fully sensitive strain *vs* Multi-resistant *e.g. MDR/XDR-TB, CRE,VRE, MRSA,ESBL,VISA*
   – Virulence amongst same species e.g. *C.difficile* hypervirulent stain 027 strain

| HAZARD GROUP | DISEASE SEVERITY ( MORBIDITY & MORTALITY ) | EXAMPLES |
|---|---|---|
| Group 1 | • Unlikely to cause human disease | |
| Group 2 | • Can cause *human disease* and may be hazard to employees; it is unlikely to spread to the community and there is usually *effective prophylaxis or treatment available* | • *Clostridium difficile*<br>• *Staphylococcus aureus*<br>• *Bordetella pertussis*<br>• *Neisseria meningitidis*<br>• *Varicella zoster*<br>• Mumps |
| Group 3 | • Can cause *SEVERE human disease* and may be a serious hazard to employees; it may spread to the community, but there is usually *effective prophylaxis or treatment available* | • *Salmonella typhi*<br>• *E. coli O157*<br>• *M.tuberculosis*<br>• *Chlamydia psittaci*<br>• Hepatitis B & C |
| Group 4 | • Causes *SEVERE human disease* and is a serious hazard to employees; it is likely to spread to the community and there is usually *NO effective prophylaxis or treatment available* | • Viral Haemorrhagic fevers e.g Lassa, Ebola, Marburg, Crimean/Congo haemorrhagic fever<br>• Smallpox |

UK HSE: *Biological agents: Managing the risks in laboratories and healthcare premises,* 2005. www.hse.gov.uk

## Risk assessment & Infection Prevention & Control

**2. SEVERITY OF INFECTIONS**
   – Colonization---- mild infection – severe infection—death
• MRSA patient with severe eczema may act as disperser
• Patient with history of cough with positive AFFB in sputum is at high risk of spreading Tuberculosis
• Patient with diarrhoea e.g. VRE, ESBL, CRE, *C difficle* and other enteric pathogens are at high risk of contaminating environment and causing cross infection/ diseases

**3. HOST SUSCEPTIBILITY**
   – IMMUNITY
      • Previous exposure to diseases with life long immunity e.g. Chickenpox *or* previous exposure to diseases with *no* life long immunity e.g. Influenza, Norovirus
      • History of immunization with vaccine preventable diseases . Hep B, MMR,BCG etc
   – Immunosuppression due to disease and/or chemotherapy

## Setting Priority

## 80/20 rule : Pareto Principle

• Pareto was a 19th century economist who discovered the **80/20** rule while studying the distribution of wealth in Italy
• Pareto Principle can equally applies well in IPC in setting priorities as it has been estimated that 80 % of adverse outcomes are often a result of only 20 % of the causes
• Pareto analysis is a simple technique for prioritizing potential causes by identifying the problems

## Develop Pareto Chart
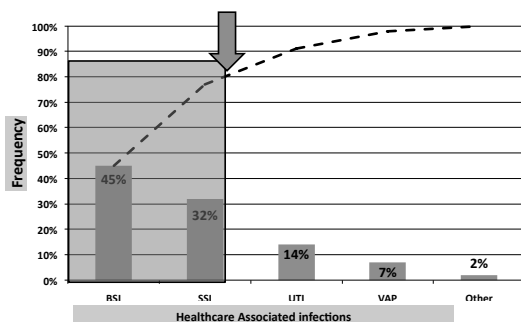


## How to draw Pareto Chart

• Pareto charts can be generated by simple spread sheet programmes
   • OpenOffice.org Calc
   • Microsoft Excel, and
   • Specialized statistical software too
   Create a Pareto chart using MS Excel 2010
   – http://www.wikihow.com/Create-a-Pareto-Chart-in-MS-Excel-2010
   – http://paretochart.org/paretocharttemplateexcel/

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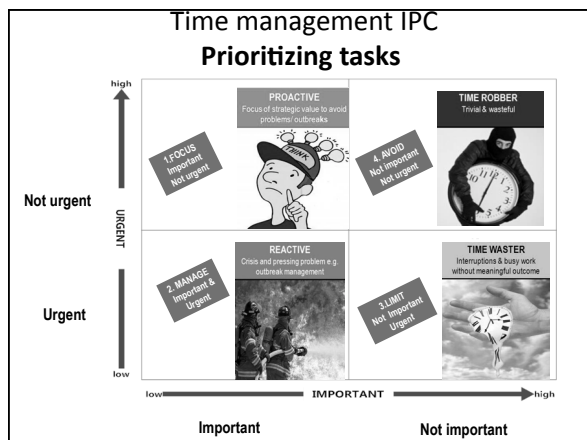**A Webber Training Teleclass**
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## Time management IPC
### Prioritizing tasks



## Conclusions

- Carry out *risk assessment and identify unsafe, unnecessary* and ineffective IC practices
- *Be proactive rather than reactive*
- Take time out from your dairy to THINK so that you can provide strategic direction to your organization
- Look at your surveillance data, information from audits and adverse events
- Analysis information, identify key issues and *prioritize* using 80/20 principle
- Draw up an action plan and provide solution based on the local need and resources
- *Implement simple, & effective solutions* which are achievable and affordable

# Thank you

## 2013
### WHO Teleclass Schedule
Clean Care is Safer Care

**February 6**
**Improving the Patient Safety Culture as a Successful Component of Infection Control Strategies**, Dr. B. Allegranzi

**March 6**
**Patient Participation in Hand Hygiene Promotion and Improvement**, Dr. Y. Longtin & Dr. M. McGuckin

**April 9**
**Innovation and New Indicators in Hand Hygiene Monitoring**, Prof. J. Boyce

**May 6**
**Special Lecture for 5 May**, Prof. D. Pittet

**July 10**
**Risk Assessment and Priority Setting in Infection Control in Low to Middle Income Countries**, Prof. N. Damani,

**August 7**
**Decontamination of High-Touch Environmental Surfaces in Healthcare: A Critical Look at Current Practices and Newer Approaches**, Prof. S. Sattar

**September 3**
**Preventing Central Line-Associated Bloodstream Infections: The Matching Michigan Approach Applied in the USA and Other Countries**, Prof. P. Pronovost

**October 9**
**Implementing Infection Control Through a Patient Safety Partnership Approach in Africa**, J. Storr

**November 11**
**Antimicrobial Resistance Issues Worldwide and the WHO Approach to Combat it**, Dr. C. Pessoa da Silva

**December 4**
**Control of Multi-Drug Resistant Organisms in the Nursing Home Setting**, Prof. A. Voss

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