The Utility of Human Error (Theory) & High-Reliability in Outbreaks

Dr. Evonne Curran, Health Protection Scotland

A Webber Training Teleclass

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The Utility of Human Error (Theory) & High-Reliability in Outbreaks

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Hosted by Martin Kiernan
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www.webbertraining.com **January 21, 2014**

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NHS National Services

Evonne T Curran

SRN 1979
ICN 1987
Dip in Infection Cont 1990 (Glasgow University)
MPH 1994 (Glasgow University)
Doctor of Nursing 2011 (Stirling University)

Outbreak Programme of Work at Health Protection Scotland 2006
Outbreak Column for JIP since 2012

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Hospital outbreaks

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Outbreak column 2: norovirus, our perennial infection control winter challenge

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Outbreak column 3: outbreaks of *Pseudomonas* spp from hospital water

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Outbreak column 4: an 'infection control never event' – nosocomial bloodborne virus outbreak

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Outbreak column 5: *Streptococcus pyogenes* (Group A Streptococci) (GAS)

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Outbreak Column 6: Outbreaks in neonatal intensive care units (NICUs)

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Outbreak Column 7: Pseudo-outbreaks (part 1)

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Pseudo outbreaks and no-infection outbreaks (part 2)

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Outbreak Column 9: Endoscopy-related outbreaks

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Outbreak Column 10: What causes outbreaks – questions of attribution

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Outbreak Column 11: Consequences of outbreaks; lessons for healthcare workers and infection prevention and control teams

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So why might HET and HRT be useful in outbreaks?

There is nothing so practical as a good theory…

Kurt Lewin

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We need to understand…

- Errors – so we can produce tools which make these errors less likely
- High-reliability – so we can take a safer approach to decision making
- That we can make bad situations worse (even if our goal is to improve them)

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To err is both human and system

- What errors cause outbreaks and what errors arise in outbreak management?
- Demonstrate tools to diminish the risk of outbreaks and minimise the impact of outbreaks when they arise?
- Human error (theory) & High-reliability theory

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So what do we know about what the causes of outbreaks?

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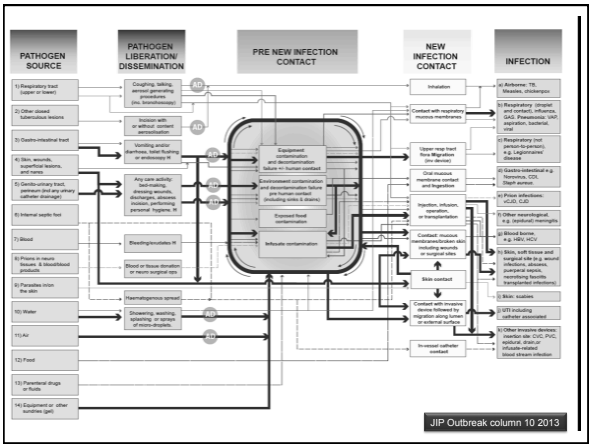

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Pathogens, Pathways and New Hosts necessary for outbreaks are present in every healthcare system every day

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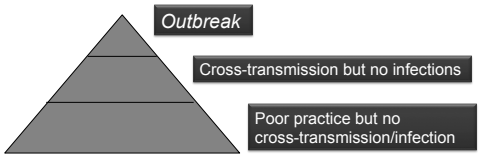
Its never 1 thing

Its lots of things that conspire together

The circumstances that caused it are likely to have happened before



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Outbreak: conditions and causes

Outbreak provoking conditions	Unsafe acts (causes)
Shortages of staff	Failure of hand hygiene
Lack of single rooms	Failure to isolate infectious patients
Lack of training on infectious disease presentation	Failure to isolate infectious patients
Vials present that can be used more than once	Infusion of contaminated substances

OUTBEAK

Adapted from Reason: The Human Contribution

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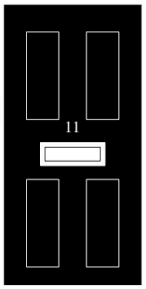
Who is to blame?

The system designers

The front-line workers



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Is it *bad people* or a *bad system*?

- There are a very few bad people
- There are some people who behave recklessly (that must be called to account)
- There are failures to follow process (frontline worker resource issues)
- There are failures of process (not frontline workers)

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Not a case of who is to blame….

- Understand how errors happened and as far as is possible design them out
- If possible before errors happen…

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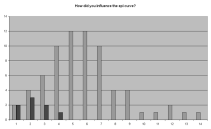
What are we trying to do?

- Prevent outbreaks
- Prepare for outbreaks
- Detect outbreaks early
- Manage optimally
- Prevent recurrence
  - Learn from what happened
  - Make the causative errors less likely
  - Prevent unintended consequences



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Human error (outbreaks)

- Outbreaks involve **unsafe acts** and **outbreak-provoking conditions**
  - **Unsafe acts**
    - Frontline HCWs (IPCTs)
  - **Outbreak-provoking conditions**
    - People who design, resource and require the system to continue regardless of resources

Person and system

Adapted from: Human error models and management: Reason: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1070929/

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Swiss Cheese Model

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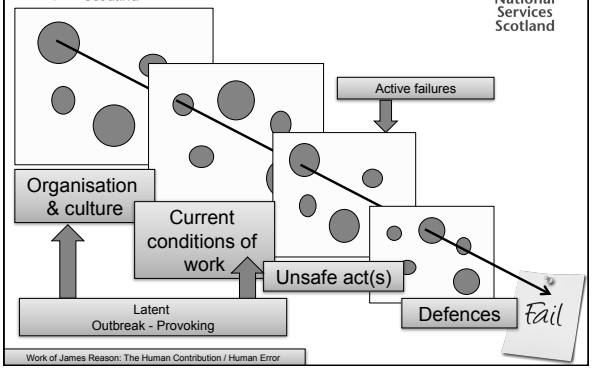
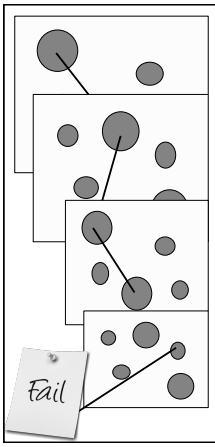


Work of James Reason: The Human Contribution / Human Error



Most important thing is keep the endoscopy waiting list down
Don't keep the patients waiting
Don't make a mistake

Insufficient equipment (some away)
Insufficient staff
Multiple tasks required
Mis-communication (involving failure to realise the implications of the communication)
Failure to detect and/or communicate a decon failure

Use of a contaminated scope

No information to indicate the scope was contaminated

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Inherent system weaknesses in healthcare

- Continuously changing populations; healthcare procedures; environments
- Design-in outbreak risks
- **Infection prevention is never number 1**
- Lots of 1-2-1 delivery – no one sees or can recognise errors (can go on a long time)
- Procedure variation is often the norm – difficult to standardise
- Many different procedures / pathways
- Many steps in any individual procedure
- Lots of if *this* finding then *that* action
- Time from error to error-related outcome is long
- Constrained budget with conflicting priorities (*throughput vs quality*)
- Infectious symptoms mimic many other non-infectious diseases
- Inability to isolate when infection risks identified

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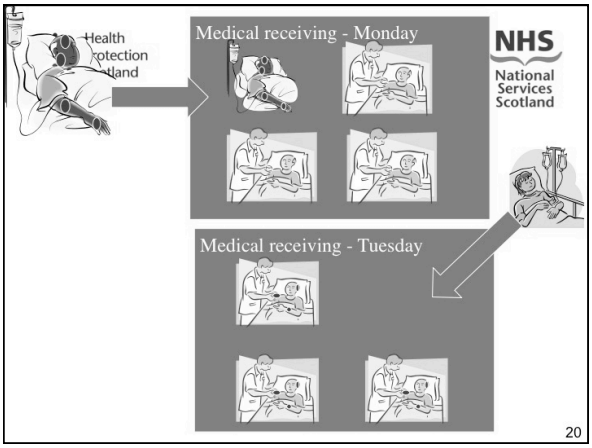

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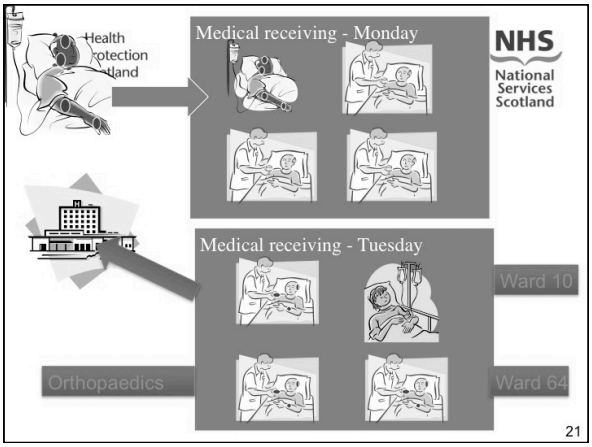

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Organisation & Culture

Clinical team and or IPCT

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Poor safety culture – Tolerates violations in practice Erroneous assumptions of safety, e.g. bed-making and dressings – batch drug-make up Admission to open bay areas regardless of patients' symptoms Job is to tick the box

Alert signals: not a priority, competing targets non outbreak focus

Simplification of reasons for data variation

Non-involvement of experts – we know it all

External pressures: work-arounds to get things done

Learning: no shared learning from events past

Resources: insufficient funding understaffed as the norm

Poor attitudes to error reporting (fear / blame)

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Current conditions of work

Clinical team and or IPCT

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People: poor staffing levels immediately preceeding the event, insufficient competent staff

Environment: poor, poorly maintained, insufficient space, e.g. isolation facilities, tap-splash during sterile procedures, making the best of what there is

Information: few indicators of risk no indicators of contamination

Equipment: difficult to maintain, poorly maintained equipment, difficult to use correctly, insufficient

Methods: insufficient time to perform SOPs ,too complicated cannot be followed or achieved with the available resources Multiple priorities that must be done all at the same time!

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System defences

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Nothing or little to indicate equipment or environment is contaminated

Risks in some people undetectable

Little to prevent contamination becoming cross-transmission

Inadequate surveillance (lack of back up)

Failure in oversight

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Clinical team Unsafe Acts

- Use of PPE
- Decontamination of spillages
- Hand hygiene
- Failure to follow SICPs
- Laundry
- Safe injection practices
- Sharps use disposal
- Patient placement (assessment on admission and throughout)
- Alert signals: unable or difficult to detect; if detected fail to involve IPCT - poor communication with the IPCT

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Errors in the system occur in the Swiss cheese slices of O&C, CCW, unsafe acts and lack of, or a failure of, defences

But what specific type of errors do the IPCTs commit?

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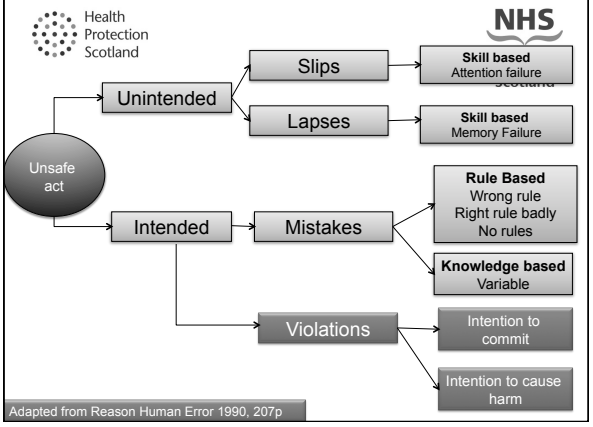

Adapted from Reason Human Error 1990, 207p

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Skill based: Slips and lapses for the IPCT

- Poor alert signal detection & investigation
- Fail to investigate & remove all reservoirs, improve system post outbreak
- Poor communication too few; too little; no purpose; too late (Linguard et al)
- Loose situational awareness: wrong data = poor decision making

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Situational awareness

- An up to date understanding of the situation in a constantly changing environment
- When all the information you require is unavailable
- *Key: system design, teamwork, training & practice*

http://dspace.brunel.ac.uk/bitstream/2438/1804/1/Situation_awareness_and_safety_Stanton_et_al.pdf

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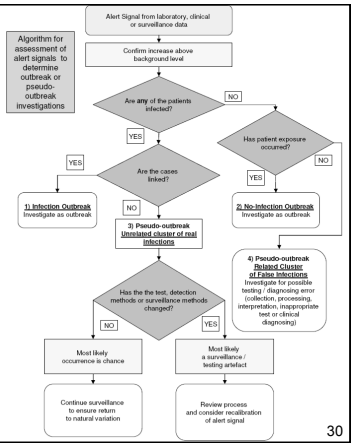

JIP Outbreak column 7 & 8 2013

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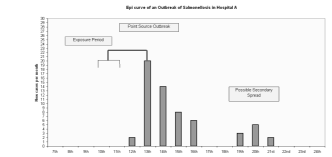
Practice data presentation and inference



Cases	8th	9th	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr	16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr
JB					Pos									
FC														
JL					Pos									
MJ							Pos							
JW						Pos								
JR														
MO														Pos
CB												Pos		
CW														Pos
DB												Pos		
SH														Pos
ET													Pos	

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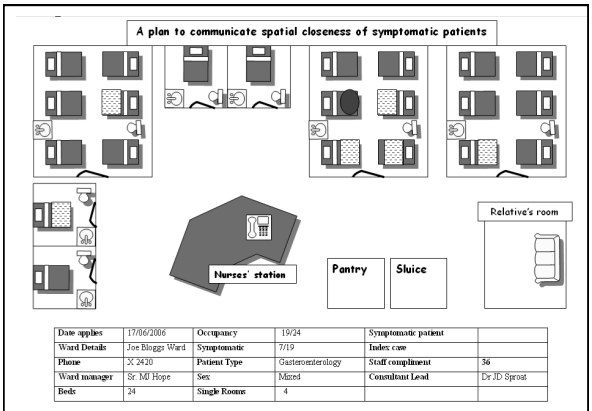

Date applies	17/06/2006	Occupancy	19/24	Symptomatic patient	
Ward Details	Joe Bloggs Ward	Symptomatic	7/19	Index case	
Phone	X 2420	Patient Type	Gasteroenterology	Staff compliment	36
Ward manager	Sr. MJ Hope	Sex	Mixed	Consultant Lead	Dr JD Sprost
Beds	24	Single Rooms	4		

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Outbreak checklist

- Do confirm done (not read do)
  - Multiple tasks being done at the same time
  - Multiple communications ongoing
- Preparedness
  - Test runs, email group checks, SBAR practice, SBAR templates
  - Do all members of the team know what to do
  - Don't wait for an outbreak to practice

Atwl Gwande; Peter Pronovost; James Reason

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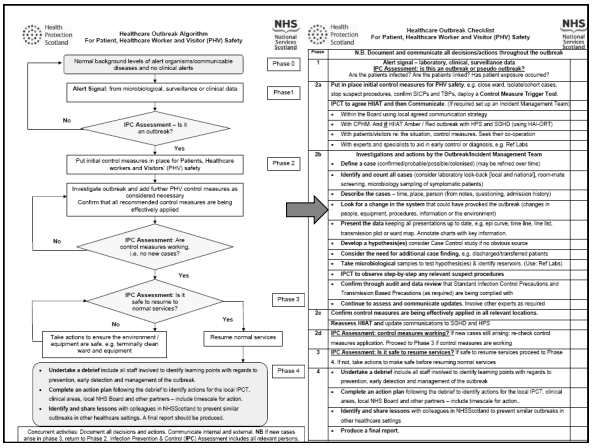

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Rule based Mistakes for the IPCT

Wrong control measures	Apply the right control measures badly	Don't apply the right control measures

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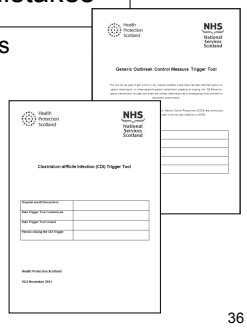
Reducing Rule Based Mistakes

- Control measure Trigger Tools
- Go/no go (assessment)
- Day 0 actions
- Every day/shift actions until incident closed



We don't know everything ...
and we certainly cant remember everything!

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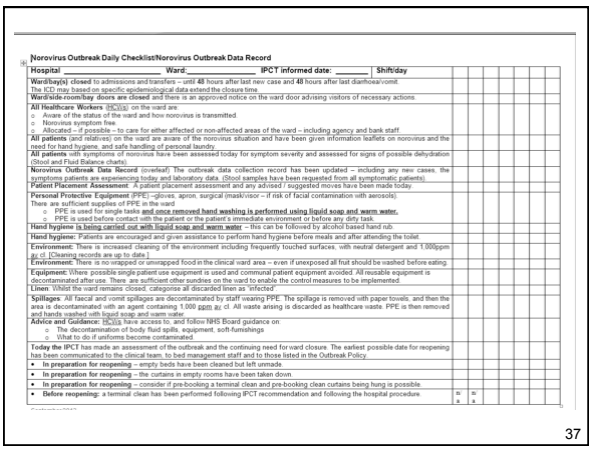

Norovirus Outbreak Daily Checklist/Norovirus Outbreak Data Record

Hospital: _____ Ward: _____ IPCT informed date: _____ | Shift/day

Ward/bay(s) closed to admissions and transfers – until **48** hours after last new case and **48** hours after last diarrhoea/vomit.
The ICD may based on specific epidemiological data extend the closure time.

Ward/side-room/bay doors are closed and there is an approved notice on the ward door advising visitors of necessary actions.

All Healthcare Workers (HCWs) on the ward are:
- Aware of the status of the ward and how norovirus is transmitted.
- Norovirus symptom free.
- Allocated – if possible – to care for either affected or non-affected areas of the ward – including agency and bank staff.

All patients (and relatives) on the ward are aware of the norovirus situation and have been given information leaflets on norovirus and the need for hand hygiene, and safe handling of personal laundry.

All patients with symptoms of norovirus have been assessed today for symptom severity and assessed for signs of possible dehydration (Stool and Fluid Balance charts).

Norovirus Outbreak Data Record (overleaf) The outbreak data collection record has been updated – including any new cases, the symptoms patients are experiencing today and laboratory data. (Stool samples have been requested from all symptomatic patients).

Patient Placement Assessment: A patient placement assessment and any advised / suggested moves have been made today.

Personal Protective Equipment (PPE) –gloves, apron, surgical (mask/visor – if risk of facial contamination with aerosols).
There are sufficient supplies of PPE in the ward
- PPE is used for single tasks **and once removed hand washing is performed using liquid soap and warm water.**
- PPE is used before contact with the patient or the patient's immediate environment or before any dirty task.

Hand hygiene is being carried out with liquid soap and warm water – this can be followed by alcohol based hand rub.

Hand hygiene: Patients are encouraged and given assistance to perform hand hygiene before meals and after attending the toilet.

Environment: There is increased cleaning of the environment including frequently touched surfaces, with neutral detergent and 1,000ppm av.cl. (Cleaning records are up to date.)

Environment: There is no wrapped or unwrapped food in the clinical ward area – even if unexposed all fruit should be washed before eating.

Equipment: Where possible single patient use equipment is used and communal patient equipment avoided. All reusable equipment is decontaminated after use. There are sufficient other sundries on the ward to enable the control measures to be implemented.

Linen: Whilst the ward remains closed, categorise all discarded linen as 'infected'.

Spillages: All faecal and vomit spillages are decontaminated by staff wearing PPE. The spillage is removed with paper towels, and then the area is decontaminated with an agent containing 1,000 ppm av. cl. All waste arising is discarded as healthcare waste. PPE is then removed and hands washed with liquid soap and warm water.

Advice and Guidance: HCWs have access to, and follow NHS Board guidance on:
- The decontamination of body fluid spills, equipment, soft-furnishings
- What to do if uniforms become contaminated

Today the IPCT has made an assessment of the outbreak and the continuing need for ward closure. The earliest possible date for reopening has been communicated to the clinical team, to bed management staff and to those listed in the Outbreak Policy.

- **In preparation for reopening** – empty beds have been cleaned but left unmade.
- **In preparation for reopening** – the curtains in empty rooms have been taken down.
- **In preparation for reopening** – consider if pre-booking a terminal clean and pre-booking clean curtains being hung is possible.
- **Before reopening:** a terminal clean has been performed following IPCT recommendation and following the hospital procedure.

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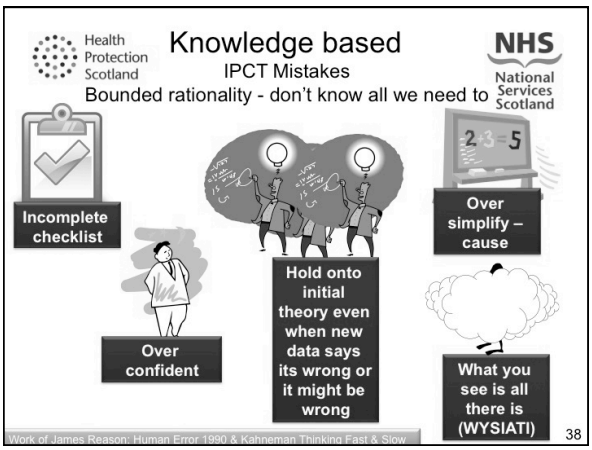

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Knowledge based errors

- No rules to help / guide
- You are on your own
- Houston you do have a problem

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What to do?

- **Defer to experts**
- Trial and error – reduce the number of tries
- Be mindful of how these errors will arise
- Test hypotheses
- Ensure adoption of high-reliability

(make rules wherever possible when not in an outbreak)

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High-Reliability Theory

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- Deference to expertise
- Reluctance to simplify
- Sensitivity to operations
- Commitment to resilience
- Pre-occupation with failure

= mindfulness

= capability to discover and manage unexpected events

= Reliability

Work of Weick & Sutcliffe

http://www.marylandpatientsafety.org/documents/AnnualConference2013/Track-6-Feroli-HO-2.pdf
http://high-reliability.org/files/Managing_the_Unexpected.pdf

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Deference to expertise

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Ask:

In this situation, who are the experts?
Are they around the table?

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Reluctance to simplify

Ask: what is wrong with this hypothesis?

Look: for lots of explanations – don't stop with the first one you like – its never just a lack of hand hygiene

Look: to disprove your own explanations? Let someone play the shark!

Encourage everyone to have an opinion

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Sensitivity to operations

IPCTs are humans and our systems can and will fail
Ask your team: where are we most likely to fail?
How could we make us less likely to fail?

Bank holiday Monday; Focus is on a concurrent outbreak; Organism has not discernable qualities

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Commitment to resilience

Ask: Good as we are how can we make it better?

What is the literature/outbreak database telling us to be ready for?
How can we best get ready for….

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Pre-occupation with failure

Small outbreaks are early warnings for big outbreaks – what are they alerting you to?

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"It is fine to celebrate success but it is more important to heed the lessons of failure"

Bill Gates

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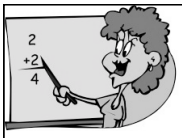

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Outbreaks

- Debrief
- Improve the system
- Don't make it more complicated
- Anticipate unintended consequences
  - Reduced Legionnella increased scalds
  - Increased wash-hands basins increased risk of pseudo outbreaks

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The Utility of Human Error (Theory) & High-Reliability in Outbreaks

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Healthcare Outbreak Debrief Tool

Overall what worked well?

Overall what could have worked better?

Notes and supporting information is provided from page 9 of this document. HPS would be pleased to assist with the use of this Healthcare Outbreak Debrief Tool – this includes chairing a debrief or sharing the findings to prevent recurrence 2

http://www.hps.scot.nhs.uk/haiic/ic/toolkits.aspx#outbreak

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Healthcare Outbreak Debrief Tool

National Services Scotland

	Debrief Questions	Response	Suggested system changes
1.	**Awareness/Preparedness:** • Before the outbreak were the clinical team aware that their patients were vulnerable to this type of outbreak?		
2.	**Alert Signal and pre-outbreak Surveillance** • How and by whom was the alert signal recognised? • Could the alert signal have been recognised more promptly? • Could pre-outbreak surveillance have resulted in earlier detection?		
3.	**Control Measures (Patient, Healthcare Worker, Visitor):** • Were initial control measures appropriate? • Were initial control measures implemented both timeously and effectively? • As the investigation progressed, was the need for additional control measures identified (and if necessary implemented)? • If control measures were not working, i.e. more cases after the incubation period, was an assessment made of existing controls and the need for additional control measures?		

Notes and supporting information is provided from page 9 of this document. HPS would be pleased to assist with the use of this Healthcare Outbreak Debrief Tool – this includes chairing a debrief or sharing the findings to prevent recurrence 3

Version 1.0 January 2013

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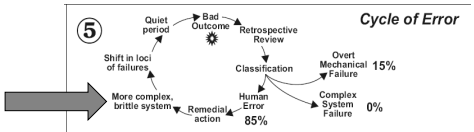
We can make it worse



Organizational *reactions to failure* focus on human error. The reactions to failure are: blame & train, sanctions, new regulations, rules, and technology. These interventions increase complexity and introduce new forms of failure.

Work of www.ctlab.org

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Probability of success in a process

	0.95	0.99	0.999	0.99999
1	0.95	0.99	0.999	0.99999
25	0.28	0.78	0.98	0.998
50	0.06	0.61	0.95	0.995
100	0.006	0.37	0.9	0.99

Spath: Error reduction in healthcare

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Phew!

- We are likely to forget
- We are likely to apply
  - the wrong rules or
  - the right rules badly
  - (or no rules at all)
- We will likely to meet –situations we have not met before

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Understanding how we and our systems are likely to err can provide us with the wherewithal to be more resilient!

Mindfulness leads to resilience

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The end

The next few slides provide additional definitions

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Definition: **Outbreak**

- An outbreak (healthcare)
  - > cases than expected in a given area or among a specific group of people over a particular time period
  - (can be 1)

http://www.cdc.gov/excite/classroom/outbreak/objectives.htm
http://www.who.int/topics/disease_outbreaks/en/

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Health Protection Scotland

NHS National Services Scotland

Definition : **system**

- An interconnected set of elements that is coherently organized in a way that achieves something.
  - Elements
  - Interconnections
  - Functions / purpose

Thinking in systems by Donella Meadows
(Also see www.clinicalmicrosystem.org)

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Health Protection Scotland

NHS National Services Scotland

What elements are in a system?

- People – Populations
  - Patients, healthcare workers, (visitors), pathogens
  - Leader(s)
- Environment
- Equipment
- Methods
- Information

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Definition: **Theory**

- A theory is accepted as a valid explanation of a phenomenon.

http://www.livescience.com/21491-what-is-a-scientific-theory-definition-of-theory.html

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29 January *(FREE ... WHO Teleclass - Europe)*
INNOVATION AND IMPLEMEMTATION STRATEGIC APPROACHES TO REDUCE CATHETER-RELATED BACTERAEMIA: THE RESULTS OF A EUROPEAN MULTICENTRE STUDY (PROHBIT)
Dr. Walter Zingg, University of Geneva Hospitals, Switzerland
Sponsored by WHO Patient Safety Agency, CLEAN Care is Safer Care

30 January **UNIVERSAL MRSA SCREENING - IS IT WORTHWHILE, AND FOR WHOM?**
Dr. Barry Cookson, London School of Hygiene and Tropical Medicine, and University College London

February 6 **HAND HYGIENE - IS IT THE 100% SOLUTION?**
Dr. Yves Longtin, Infectious Disease Research Centre, Quebec City

February 12 *(South Pacific Teleclass)*
PREVENTING CATHETER ASSOCIATED URINARY TRACT INFECTIONS: WHAT'S NEW

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