Human Waste Disposal
Martin Kiernan, Southport & Ormskirk Hospital
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Human Waste Disposal

Assessing the Risks of Differing Management Solutions

Hosted by Carol Pellowe
King's College, London

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Disclosures

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- Member of advisory boards and provider of clinical advice to Carefusion, Pfizer, Gama and Vernacare and have presented at educational meetings supported by Ethicon, Molynlycke, Vernacare & Convatec
  - The views presented before you are my own

Faeces

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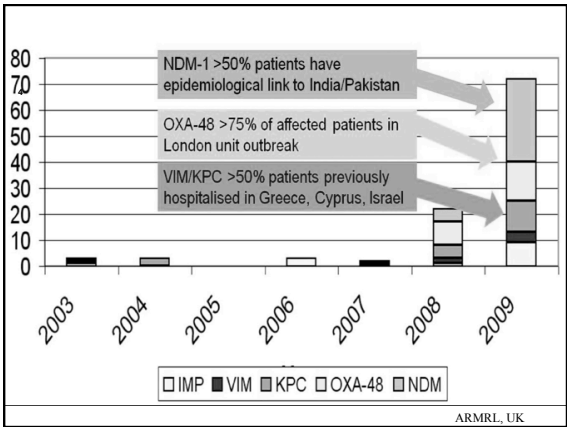
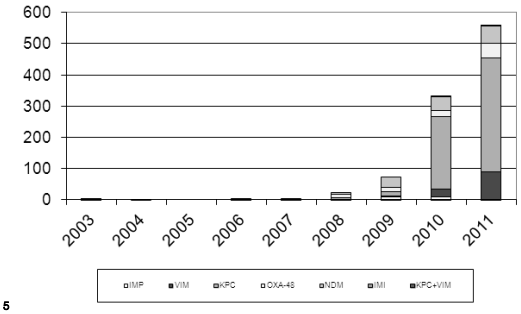
- Contains just about every group of human pathogen
  - Some very significant to healthcare
    - C. difficile
    - VRE
    - MDR Gram-negatives
    - MRSA
    - Norovirus
    - Etc etc
- So… who is a transmission risk?
  - and how do you know?



ARMRL, UK

Carbapenemase-producing Enterobacteriaceae in the UK



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ARMRL, UK

Faeces

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- We deal with a lot of it each year
  - There are about 100 billion bacteria per gram
  - Half a million Kg/yr in my facility, 90 million Kg in the NHS in England
- Incredible source of information
  - human stool has a data capacity of 100,000 terabytes of information stored per gram
    - Larry Smarr, *The Atlantic*, July/August 2012
  - 10g = 1 Exabyte of data
- Passed through an incredibly clairvoyant organ

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Disposal

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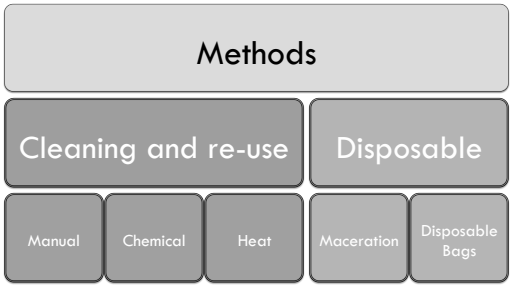

Literature Searching

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- Search terms “Bedpan AND Infection” any field
  - CINAHL, BNI, MEDLINE, AMED
  - 114 results
    - Majority not related to disposal/decontamination
  - Restrict to title and abstract
    - 12 (3 of which completely unrelated to decontamination)
- Macerator and infection
  - 3 results

Let’s look at the Research

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- Hardly anything in the literature about something that happens in EVERY healthcare facility in the world
- So that means either:
  - It is not thought to be a problem
  - It is not recognised as a problem

Is disposal equipment a risk?

Van Knippenberg-Gordebeke G (2011) AJIC 39 (5) E23

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- Survey response from 77 Dutch Hospitals looking at bedpan practice
  - Respondents reported outbreaks of *C. difficile*, Norovirus, *Pseudomonas aeruginosa*, *Salmonella*, and *Acinetobacter baumanii*
- 94% reported that disposal systems (Washer Disinfectors) were never considered as being implicated in any of these outbreaks

Bedpans in the Literature

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- Residual soil present after the wash/disinfection cycle
- Inadequate wash results in “unsightly” bedpans and raises the possibility of pathogens being protected from disinfection within organic matter
  - Chadwick and Oppenheim (1994) Lancet 344 p685

Bedpans in the Literature

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- VRE survival through heat disinfection process of 80° for 3 minutes, enhanced by organic matter
  - Freeman, Kearns et al (1994) Lancet 344 p65
- Inadequate disinfection of bedpans associated with cross-infection by VRE
  - Systematic review, Woodford N. et al, Clinical Microbiology Reviews (1995) 8(4) 585-615

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Variation in Accepted practices

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- Hand washing and chemical/ thermal disinfection is used in developing and resource-limited nations

Variation in Accepted practices

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- Australia/Canada - a mixture of macerator and washer disinfector
- UK - 94% of hospitals use a single-use pulp disposal system
- Europe – Majority use thermal disinfection using a washer/disinfector
- US – a common method is single patient plastic with local cleaning after use

The Magic Wand

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- Extended spray nozzle for 'precise washing at a hygienic distance', and an efficient vacuum breaker that prevents backflow contamination
- Wand bedpan cleaners 'clean' 30% of the time
  - Carling PC et al ICHE (2008) 29(1) pp1-7

Manual Cleaning

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Manual Cleaning in the Literature

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- Spray from the wand during bedpan cleaning resulted in splashing and aerosolisation of faecal material
- Believed to be a contributing factor in increased numbers of cases of CDI
- Disposable system and other interventions brought about a 50% reduction in CDI
  - A. Tomiczek et al Healthcare Quarterly Vol 9, Oct 2006

Chemical Disinfection

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- Problems
  - Different (inter)national guidelines
  - No Standardised Operating Procedure
  - Incorrect use of disinfectants (dilution etc)
  - No validation
  - Exposure risk to staff
  - Frequency unclear
  - Time consuming procedure
  - Microbial contamination of prepared disinfectants

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Washer Disinfector System

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- Plastic/stainless steel reusable bedpans
- Pre-wash and rinses using cold and hot water
  - Washed between 80-85°C for 60 sec
  - Pre and full washes last for an average of 5-8 minutes
- Washers expected to meet ISO 15883-3 standards
- Rely upon heat and detergents for cleaning

Machine disinfection

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- Advantages
  - Standard operated procedure (SOP)
  - Thermal disinfection
  - Continuous monitoring
  - More reliable than chemical disinfection
  - No residues
  - No exposure to chemicals for operators
  - Validation

Washer Disinfectors

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- Validation & Maintenance to ensure cleaning & disinfection
  - Steam / hot water
  - Water supply
  - Validate temperature / duration
  - Written records of maintenance for assurance
- Is there assurance that this is diligently performed?

Validation & Maintenance in the Netherlands (2010)

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- 33% maintained yearly, 67% twice a year
- Validation
  - 17% never validated
  - 79% not validated after repair
  - 36% not validated after routine maintenance
  - 64% not validated periodically

Webber Teleclass – Gertie Van Knippenberg-Gordebeke
April 2011

Washer Disinfector Functionality

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- Installation errors responsible for poor cleaning
  - user testing of the efficacy of WDs critical to ensure appropriate functionality
- When corrected, did not inactivate C. difficile spores
- Conclusion
  - Currently accepted thermal decontamination parameters for all bedpan WDs (ie, 80ºC for 1 minute) are not adequate to eliminate C difficile spores from bedpans

Re-evaluating Guidance

Diab-Elschahawi, Furnkranz et al, JHI (2010) 75, pp 62-65

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- Increasing numbers of naturally thermotolerant pathogens shed with the stool such as C. difficile and VRE
- Strategy for CDI could be patient-related bedpans with sterilisation before use on another patient or single use devices
- Infection control teams should keep in mind that considerable transmission could occur when naturally thermotolerant micro-organisms meet insufficient processing of human waste containers

Use of Detergent in WDs

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- Regular intensive cycle of 85ºC for 60 seconds with an alkaline detergent eradicates C. difficile spores
  - Thermal conditions alone were inadequate
- 95ºC for 300 seconds with an enzymatic cleaner did eradicate C. difficile, however visible soil remained
  - Volume of water (60L) used was excessive for routine use, cycle time extended
- Results may be specific to the type of machine used – Manufacturers should validate

Washer disinfector in-use evaluation

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- Continuous improvement model
- Plan was to use UV light to detect organic material, however this was unnecessary
  - Failure redefined as 'visible faecal soil'
- Failure rates linked with
  - use of a rinse agent
    - 44% without ($p<0.001$)
    - 14% with
  - age of machine
    - > 2 years old: Failure rate 38.4% ($p<0.001$)
    - < 2 years old: Failure rate 7.5%

Washer disinfector in-use evaluation

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- In one pilot, failure rates declined to 7.6%
- Only after an intensive education programme and daily monitoring of processed items by the IPC Team
  - This was not sustainable and only lasted 2 months

The weakest link…

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Washer disinfector in-use evaluation

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- Human factors were influential
  - Failure to process promptly means that matter was able to dry before processing
  - Poor stacking, failure to top up detergent and rinse aid
  - Poor loading
    - One site reported 500 maintenance calls in 6 months, primarily for blockage

Design

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- Issues highlighted
  - Error codes not explained
  - No warning light when detergent dispenser empty
  - BP contents spill over spray head when door closed
  - Rinse agent and detergent dispenser connections not clearly identified
  - Design of rack does not provide physical cues or indicators of where soiled items should be loaded
  - Operation of door not hands free

Machine

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- Higher temperature facilitates baking of faecal material to stainless steel surfaces
  - Stainless steel inferior to polypropylene
    - Also noted by Block et al, JHI (1990) 16 (4) 331-8
- Soil better removed from metal than polypropylene and disinfection better achieved through heat penetration
  - Ayliffe GAJ, Collins BJ and Deverill CEA J Clin Path (1974) 27: 760-63

Washer disinfector in-use evaluation

Bryce E, Lamsdale A et al, AJIC (2011) 39:566-70

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- Conclusion of this study
  - Users need to evaluate in-use efficacy of WDs
  - Items that remain visibly soiled should be sent to the Serile Supply dept for thorough cleaning and disinfection
  - Regular maintenance to inspect spray heads for blockage
  - Designs should minmise the opportunity for human error
  - Integration of human factors analysis when equipment is procured

Disposable System

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- Breaks down the pulp into a fine watery slurry
- Cycle 2 minutes, 4 items simultaneously
- No chemicals required; uses cold water
- Single use medical grade pulp
  - Paper pulp standard with BS EN ISO 9001:2008 BSI Kite Mark PAS029
  - Change to pulp with higher cardboard content linked with blockage
    - Mooney and Pellowe 2011 Abstract presented at Infection Prevention Society Conference

Macerators in the Literature

34

- 15 references on Medline, 3 relate to disposal
- "A major defect in the system is the need at present for a bedpan carrier or support which is not disposable and requires cleaning and disinfection"
  - Bacteriological hazards of disposable bedpan systems. Gibson, G.L. J. clin. Path., 1973, 26, 146-153
- One outbreak paper identified a macerator as a potential source of a Serratia outbreak
  - Herra, Knowles et al, J. Hosp Inf (1998) **38** 135-141

Potential Disadvantages

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- Blockage
  - Remember who the users are!
  - Human factors are always with us
- 1980 Survey of the use and abuse of bedpan macerators
  - macerator breakdowns chiefly due to drain blockages caused by accidental insertion of solid objects (gloves, diapers, plastic bags, etc.) into the machine
    - Collins, Deverall et al, Nursing Times 76(9) Supp 13 pp4-6

Potential Disadvantages

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- Requirement to clean bedpan holder
  - Disposable pulp support
- Unease from water companies
  - UK Expert Consensus Group pressure forced removal of unsubstantiated references in English Department of Health Guidance 'Safe Management of Healthcare Waste'

To dispose or re-use?

Hickman B J Inst Hosp Eng (1989) 43(1) 14-17

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- Paper from engineering standpoint
- Macerators recommended because:
  - Savings on engineering time
    - Less than half the time spent maintaining macerators compared with WD
  - Safer
    - Failure is complete, whereas WD failure may go unnoticed
  - Other considerations (not expanded on)
    - Nurses time, Energy, Disposables cost and storage

Comparative analysis of disposal

Lobe C AETMIS (2009)

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- Comprehensive evaluation of WDs and Macerators
- Incomplete costings
- Proposed a third option – 'hygienic bags'
  - Unevidenced at the time of publication
- Single use products for outbreaks of C. difficile when reusables are not 'sterilised' after use

Hygienic Bags

Dionne, G. AJIC (2010) 38(5) e43

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- Poster at APIC 2010
- Containment at the point of care
- Alleges that waste produced by macerators may lead to issues with drainage
- Plastic support required, as with pulp products and reusable devices; decontamination still required
- Did not address transportation, storage, disposal of untreated human waste

Unknown Unknowns?

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- Environmental contamination with C. difficile more common in symptomatic cases than asymptomatic carriers: 49% v 29%
  - Kim et al, *J. Infect Dis* 1981
- 8% of environmental samples in rooms occupied by non-infected or colonised patients were positive for C. diff
  - Riggs et al, *Clin Infect Dis. 2007*
- We only know what we know

Dirty Utility Rooms

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- Disposal unit or decontamination unit?
- Has the design taken this into account
  - Workflow – dirty to clean?
  - Storage (decontaminated equipment); other items
- Aerosols from sluice hoppers?
  - Toilets
    - Best EL, Sandoe JAT, Wilcox MH. JHI (2012) 80:1-5
- Preferred layout for a sluice
  - 'It has two doors and traffic passes through the dirty side of the sluice room, where the sluice and bedpan washer are situated.. to the clean side where sterilised bedpans are stored.'
  - Bell AD, Gray AS. Proc R Soc Med (1949) 42:631-5

Time for reflection

42

- No system is perfect; solutions should be risk-assessed
- Are these 'low-risk' items?
  - "noncritical patient-care items"
    - HICPAC, 2008 (after Spaulding, 1968)
- We get very concerned about a few micro-organisms on hands however there are just a few more in the average bedpan
  - perhaps we need to reflect on this important topic a little more

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Thank you for listening