Lifting the lid: a clinical audit on commode cleaning

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Abstract
Many healthcare-associated infections (HCAIs) are preventable by infection control procedures designed to interrupt the transmission of organisms from a source. Commodes are in use constantly throughout healthcare facilities. Therefore commode surfaces are constantly handled, and any pathogens present have the potential to be transferred to not only other surfaces but also, more importantly, to patients, thus compromising patient safety. In order to examine the effectiveness and thoroughness of cleaning commodes an audit was undertaken to assess compliance with evidence-based practice. This audit demonstrates a cycle which includes defining best practice, implementing best practice, monitoring best practice and taking action to improve practice. The audit results confirmed an issue that the authors had long suspected. That is, that commodes allocated to individual patients are not always cleaned after every use. Using adenosine triphosphate (ATP) bioluminescence as an indicator of organic soiling also demonstrated that commodes that were considered clean were not always cleaned to a high standard. Implementing the audit recommendations improves staff knowledge through education, standardises cleaning procedures and ultimately improves patient safety.

Introduction
Healthcare-associated infection (HCAI) is costly, both in financial terms and in patient morbidity and mortality (National Audit Office, 2000). The National Audit Office surveyed 219 acute NHS trusts and concluded about 100,000 cases of HCAI occur annually, causing approximately 5000 deaths and costing £1 billion.

Preventing HCAI has become a major challenge for everyone employed in health care. In an attempt to improve standards, the British government has launched a number of initiatives (Department of Health, 2004, 2008a). The *Health Act* places a duty on hospitals to provide and maintain a clean and appropriate environment for health care (Department of Health, 2008b). Each day, we are charged with providing our patients with an environment that is microbiologically safe (Cochrane, 2000, 2009).

Many micro-organisms have a reservoir where they live, grow and multiply. They can be transferred from their reservoir to a new host indirectly on people or inanimate objects. In clinical settings, indirect transmission may involve equipment (Wilson, 2006).

Good hygiene in the prevention of HCAI has a long history, although the effectiveness of hospital cleaning as a control measure remains a subject of debate (Hota, 2004). Commodes have not been clearly demonstrated to have a definite role in HCAI; however, various studies have demonstrated

the presence of pathogens on commodes (Vardhan et al, 2000). This clinical audit set out to determine and assess compliance with best practice for the cleaning of commodes.

Literature review

A literature search was undertaken to find a suitable audit tool. Keywords were used to search databases. (CINAHL, Medline, Proquest and electronic journals)

The audit tool produced by the Infection Control Nurses Association (2004) and the National specifications for cleanliness in the NHS (National Patient Safety Agency, 2007) were examined for suitability, however, the sections pertaining to commodes were similar to those currently used in the Trust, and did not provide suitable depth to the audit. Other studies (Malik et al, 2003; Dancer, 2004; Lewis et al, 2008) used a more scientific approach to monitor the effectiveness of cleaning by microbiological monitoring (using surface swabbing), but the results can take several days. This approach would require more resources and was not viable at the time of the audit. As a result of the limitations of published audit tools the author developed a new, specific audit tool for commode decontamination. A further literature search and review was conducted to establish best practice.

Studies suggested that what is clean and acceptable can be difficult to define unambiguously as cleanliness is often based upon subjective visual assessment (Willis et al, 2007). It can be argued that it is only possible to define cleanliness by including a more objective and scientific approach (Lewis et al, 2008). In food manufacturing and processing, emphasis is placed on environmental surface cleanliness to control pathogens and a more scientific approach is adopted (Cooper et al, 2007).

Adenosine triphosphate (ATP) bioluminescence is a sensitive indicator of organic soiling, including residual microbial contamination and involves surface swabbing and any molecules that react with the enzymes luciferin and luciferas result in the emission of light (Griffith et al, 2000; Willis et al, 2007). A hand-held luminometer provides the results in seconds and values are given in relative light units (RLU) (Willis et al, 2007).

To evaluate the efficacy of cleaning systems in hospitals using ATP bioluminescence, visual assessment and microbiological methods, studies have been undertaken by Lewis et al (2008) and Cooper et al (2007). These studies also tested the use of audit tools. These audits suggest that relying on primarily visual assessment may provide false reassurance on cleaning efficacy and the microbiological status of the environment. However, what is required for day-to-day commode cleaning analysis is a real-time approach, where corrective action can be sanctioned immediately. Results following microbiological swabs or impression plates require a 48-hour incubation period before results are available; therefore, this method would not provide immediate results for healthcare workers and would require specialist equipment, training, time and finance.

Aim

The role of commodes in the transmission of HCAI has not been documented definitively, but evidence has demonstrated the presence of pathogens on commodes (Vardhan et al, 2000). One study examined swabs that were taken from commodes during an outbreak of diarrhoea and vomiting, and many were positive for small round structured virus (Green et al, 1998). Furthermore faecal contamination of commodes is not aesthetically acceptable.

A pilot audit was conducted with the aim of examining compliance with infection control practice against specific standards and criteria. It was anticipated that this would improve quality and standards, encourage safe practice, improve service delivery and provide an efficient cost effective service. (Ayliffe et al, 2000; Cooper and Benjamin, 2004)

The audit was undertaken in three parts.

Part one was to visually assess the cleanliness of commodes. The standard for this audit was that all parts of the commode including the underneath should be visibly clean with no blood and body substances, dust, dirt, debris or spillages.
Part two was to undertake a direct observation of commode decontamination. This was to enable the auditor to assess how commodes are decontaminated, when commodes are decontaminated and what solution is used to for decontamination.
Part three involved testing pre- and post-commode cleaning for ATP. The rationale for this is that ATP bioluminescence testing is very quick, can be undertaken in the area of work and is a sensitive indicator of organic soiling, including residual microbial contamination (Griffith et al, 2000). Values are given in RLU.

Sites selected

Two medical wards were selected as pilot sites.

Each ward has 27 beds, with predominantly four-bed bays and six side rooms. The occupancy levels were 100 % during the audit. Wards X and Y were selected due to a time period of increased incidence of *Clostridium difficile* infection.

Methodology

The audits would be an opportunity to pilot the tools and provide insight into potential good practices and areas where practices could be improved. The infection control nurse would conduct the audit and using the new tools would audit three members of staff from each of the identified areas. Each area would be visited once. It has to be appreciated that the small number of staff involved would not provide results representative of practice among the whole staff compliment (Cresswell, 2009).

Two separate audit tools (Tables 1 and 2) were used and these are demonstrated here as Audit 1 and Audit 2 for commodes with Audit 2 including parts 2 and 3 of the assessment. Scores were calculated by adding the total numbers of yes answers then and dividing by the total number of questions (including all yes and no answers) but excluding the non-applicable responses; then multiplying by 100 to obtain the percentage.

Audit part 1
Four commodes per ward were examined by visual assessment (Table 1).

Audit part 2
This audit tool examined particular details, e.g. concentration of chlorine-based decontaminant, staff knowledge, etc. It used direct observation and questioning of staff on how, when and what solution is used for commode cleaning. The approach taken by the auditor was no concealment without intervention (National Institute for Clinical Excellence, 2002; Cooper and Benjamin, 2004). The problem with this type of observation audit is that when staff have awareness of being observed, they will often change their practice and is referred to as the '*Hawthorne effect*' (LoBiondo-Wood and Haber, 2002). As this was a pilot audit, convenience sampling included three staff per ward being observed (Table 2).

Audit part 3
Finally for the third part of the audit, ATP levels were determined using 'cleantrace' swabs and a uni-lite NG luminometer (Biotrace, 1996). Swabs were taken immediately pre-cleaning and repeated 10 minutes after cleaning using the manufacturer's guidelines and expressed as RLU. Owing to the

limited availability of swabs and the time and financial constraints, at the time of the audit, four commodes were sampled per ward

Discussion of results

Tables 3 and 4 provide an overview of the collated results. Examples of some of the obtained ATP results are also demonstrated in Tables 1 and 2.

The majority of the commode surfaces were in a good condition with the exception of a frame on Ward Y. This had been damaged by the constant removal of the seat for cleaning. Surfaces must be designed for easy cleaning to prevent areas which trap particles and dust (NHS Estates, 2002).

Six commodes stored in the sluice were identified as ready for use. Despite this, one commode had a stain on the armrest and four had soiled wheels. This poses questions regarding what healthcare workers deem as clean and if all areas are actually cleaned? It is essential that cleaning be thorough and consistent and that all surfaces are wiped. Surface decontamination quality is dependent upon good practice (Rutler and Webber, 2001; Rutala et al*,* 2007). The findings of the remaining two commodes are as follows. One commode on Ward X had been positioned by a patient's bedside in a four-bed bay. This had a soiling on the underside of the seat. The other, in an occupied side room on Ward Y, had faeces on the frame and a soiled seat although it had not been used by the present patient.

Not all side rooms have en-suite facilities. If the patient is nursed in a side room because they have an infection, then they are allocated a commode that remains in the room. It must however be decontaminated after every use and once the patient is discharged. This raises questions concerning the efficacy of side room terminal cleans and/or deficiencies within roles and responsibilities for decontaminating equipment.

Within clinical areas, Pratt et al (2007) emphasise that healthcare workers must understand their personal responsibility when cleaning equipment. A further audit would be beneficial to assess staff perceptions of their roles and responsibilities for cleaning.

Table 1. Audit tool 1 commodes								
TOPIC: **OUTCOME CRITERIA:**	**COMMODE DECONTAMINATION** **All parts of the commode are visibly clean including the underneath with no blood, body fl uids substances, dust, dirt, debris or spillages.**	**COMMODE LOCATION** **Ward** **Sluice** **Side room** **Other** **Please specify**						
STATEMENT **All Commodes Are Effectively And Appropriately Decontaminated After Every Use**	AUDIT CRITERIA PART ONE 1. The following surface areas are visibly clean (check the commode) Back rest Arm rests Top of seat Underneath of seat Frame Foot rest Wheels 2. The following areas are intact and in good condition (check the commode) Back rest Arm rest Top of seat Underneath of seat Frame Foot rest wheels 3. A system has been used to identify that the commode is clean	YES		NO		NA	COMMENTS What system is in place? Verna care green tape Seat turned up Other, please specify	

The audit results confirmed an issue that the authors had long suspected. That is, commodes, allocated to individual patients, are not always cleaned after every use. As discussed earlier, some bacteria and viruses can survive on equipment, therefore if not cleaned after each use then the patients could potentially re-infect themselves. Equipment must be cleaned after each use (Pratt et al*,* 2007).

Even though wheels appeared visibly soiled, the audit results highlighted that these were not cleaned regularly. It might be argued that wheels are not an infection risk as they are seldom in direct contact with patient. It is not reasonable to expect floors areas to be as clean as hand contact surfaces (Willis et al, 2007), however, commodes are moved around the ward and micro-organisms could be distributed in the process and then transmitted to other patients. Spores from *Clostridium difficile* are excreted from the faeces of infected patients who have diarrhoea. These spores can contaminate equipment and the environment, although correlation between environmental contamination and cases of *Clostridium difficile* has been reported, it is difficult to establish whether this is a cause of, or an effect of, the infection (National *Clostridium difficile* Standards Group, 2004).

All staff used a chlorine/detergent buffered solution (as per organisational commode cleaning procedure) to decontaminate the commodes. This contains a detergent and 1000 ppm available chlorine. The decision to clean, disinfect or sterilise depends upon the risks involved of how the equipment is used, and the likelihood of the equipment transmitting infection (Inglis, 2003).

Wilson (2006) identifies categories for cleaning, disinfection and sterilisation. Low-risk categories are classed as items used on intact skin. Intermediate items are items used that have contact with mucous membranes or are contaminated by microbes that are easily transmitted.

It might be argued that, for commodes, cleaning is adequate. Cleaning is a method of decontaminating low-risk equipment and as a preparation for disinfection or sterilisation. Approximately 80% of microorganisms are removed by cleaning (Wilson, 2006). However, not all patients who use commodes have intact skin. Patients might have an unknown infection, for example, excretion of small round structure virus in faeces begins a few hours before symptoms and can continue for 7–10 days (Chadwick et al , 2000).

Where uncertainty exists around the types of soiling a combined detergent and disinfectant should be used. A single one-step approach is recommended to simplify both training and practice (Centres for Disease Control and Prevention, 2003).

The Department of Health (2006) recommends that chorine-based disinfectants be used to reduce environmental contamination with *Clostridium difficile* spores.

Table 2. Audit tool 2 commodes					
TOPIC: STANDARD	**COMMODE DECONTAMINATION** **All commodes are effectively and appropriately decontaminated after every use**	**COMMODE LOCATION** **□ Sluice** **□ Side room** **□ Other** **Please specify**			**WARD**
	AUDIT CRITERIA PART TWO 1. Chlorine Products are available on the ward (check for the presence of this) 2. Chlorine/detergent buffered solution is discarded ever 24 hours (check signature list in the sluice) 3. Chlorine/detergent buffered solution is mixed in the correct container (check container in the sluice) 4. Staff can state the correct procedure for preparing at 1000ppm (Ask staff how many tablets [as per manufacturer's instructions] and how many litres of water are used) □ Staff member one □ Staff member two □ Staff member three 5. If using hypochlorite tablets, cold water is used for diluting (question staff) □ Staff member one □ Staff member two □ Staff member three 6. Commodes are cleaned after every use (question staff) □ Staff member one □ Staff member two □ Staff member three	YES YES	NO NO	NA NA	COMMENTS COMMENTS

	7. Chlorine/detergent buffered solution is used to clean the commode (observe staff) □ Staff member one □ Staff member two □ Staff member three 8. A disposable cloth is used to clean the commode □ Staff member one □ Staff member two □ Staff member three 9. Chlorine/detergent buffered solution is poured into a disposable bowl immediately prior to cleaning □ Staff member one □ Staff member two □ Staff member three 10. The cloth used is submerged in the Chlorine/ detergent buffered solution □ Staff member one □ Staff member two □ Staff member three 11. The commode is cleaned starting from the clean surfaces and progressing to the soiled surfaces □ Staff member one □ Staff member two □ Staff member three 12. The commode is dried after decontamination □ Staff member one □ Staff member two □ Staff member three 13. System used to identify that the commode had been cleaned □ Staff member one □ Staff member two □ Staff member three 14. Gloves are worn when cleaning the commode □ Staff member one □ Staff member two □ Staff member three	YES	NO	NA	If no, what solution is used to clean the commode If yes, please state system use □ Green tape □ Seat turned up □ Other COMMENTS

	15. Plastic apron is worn when cleaning the commode □ Staff member one □ Staff member two □ Staff member three 16. Personal protective equipment is removed after procedure □ Staff member one □ Staff member two □ Staff member three 17. Hands are decontaminated after removal of personal protective equipment □ Staff member one □ Staff member two □ Staff member three				

Table 3. Overview of the collated results: Ward X

Commode One	Areas Visibly Clean Pre Cleaning	Pre Cleaning Count	Areas Cleaned	Post Cleaning Count	Reduction
Back Rest	Yes	407	Yes	46	−361
Arm Rest	Yes	505	Yes	92	−413
Top Of Seat	Yes	4571	Yes	119	−4451
Underneath Of Seat	Yes	164	Yes	51	−113
Frame	Yes	10,313	Yes	312	−10,001
Wheels	No	4114	No	7603	+3489

Table 4. Overview of the collated results: Ward Y

Commode One	Areas Visibly Clean Pre Cleaning	Pre Cleaning Count	Areas Cleaned	Post Cleaning Count	Reduction
Back Rest	Yes	180	Yes	88	−92
Arm Rest	Yes	172	Yes	74	−98
Top Of Seat	No	1450	Yes	58	−1392
Underneath Of Seat	Yes	98	Yes	96	−2
Frame	No	3099	Yes	132	−2967
Wheels	Yes	2100	Yes	271	-1829

Studies that have used different indicator organisms found that the use of disinfectant cleaning was more effective than that of using solely detergent (Barker et al, 2004). Similarly when the effect of detergent versus hypochlorite cleaning on environmental contamination and incidence of

Clostridium difficile infection was considered, there was a reduction in infection using products containing hypochlorite compared to cleaning with detergent alone (Wilcox et al, 2003).

Both wards had the buffered decontaminant available, diluted in the correct container, at the correct concentration. When questioned, a new healthcare worker did not know how to prepare the solution; they reported that the procedure had not been explained to them. Inaccurate dilution is one of the main causes of disinfection failure and therefore could result in the transmission of infection (Fraise et al, 2004).

All staff used disposable cloths and discarded these after use. This demonstrated some understanding of cross contamination. Cloths used for cleaning can become heavily contaminated with bacteria, which are readily transferred to hands and equipment (Scott and Bloomfield, 1990).

One healthcare worker poured the mixed decontaminant into a disposable bowl and submerged the cloth in the solution. The other staff poured the solution directly onto the cloths. Cloths were never returned to the solution after contact with the commode. This is important as Daharan et al (1999) found that disinfectant solutions may themselves become contaminated with bacteria that could actually seed the environment with potential pathogens.

Some staff did not clean as per the organisational commode cleaning procedure. This states that cleaning should start at the top of the commode and finish with the wheels. The healthcare worker decontaminating commode two, on Ward Y used the same cloth for the whole commode and started from the top to the lower sections, then returned to the underneath of the seat. It is likely that a number of higher ATP counts recorded after cleaning were a result of organic matter and micro-organisms being distributed by the cleaning process rather than being removed. When questioned staff reported that no training had ever been received regarding how to clean equipment. This instantly raises an issue around the need for the provision of appropriate education and training.

No commodes were dried after cleaning. Drying equipment is important to prevent any remaining bacteria from multiplying (Wilson, 2006).

All staff wore gloves during the procedure; only one used an apron. Disposable aprons must be worn when in close contact with equipment and when there is a risk that clothing may become contaminated, however Pratt et al (2007) found no evidence that established links between uniforms and HCAI.

ATP results

Most parts of the commode did demonstrate a reduction in counts after cleaning. There is no set value for ATP bioluminescence that represents an unsatisfactory level of contamination for commodes; therefore it is difficult to ascertain the acceptable level. Malik et al (2003) considered counts of 500 RLU or below acceptable, others considered 250 RLU an acceptable level (Lewis et al, 2008). However, a high ATP bioluminescence count after cleaning would indicate inadequate cleaning.

The limiting aspect with ATP monitoring is that identification of micro-organisms is not possible. In one study, meticillin-resistant *Staphylococcus aureus* (MRSA) was detected under a bed while the ATP result was low (Willis et al, 2007). This highlights that while ATP is an indicator of organic soiling, pathogens can still be found at low ATP bioluminescence levels.

Some areas of the commodes appeared clean but recorded a high ATP bioluminescence count. The frames and wheels recorded the highest counts pre-cleaning. This would indicate that these are the most commonly missed areas during cleaning, although all frames were observed to be cleaned during the audit. Alternatively, this may be due to the fact that routine practice was changed as staff were aware of being observed.

Staff used the correct solution to decontaminate the commodes and when questioned were able to identify when cleaning should be undertaken. However, this was not evident in the audit findings which revealed soiled commodes and that some staff, included in the audit, did not demonstrate the correct cleaning process or wear the correct protective clothing.

Implementation of actions as a result of the audit recommendations

The audit identified both good and bad practice.

Feedback to staff had to be timely and results were reported verbally to the ward managers and staff at the time of audit and later at their ward meeting. The lack of cleaning on some areas of the commodes was unacceptable and could leave a potential reservoir of infection.

Immediately after the audit feedback, one ward carried out a deep clean of all commodes. The results from the other ward were of lesser concern and the staff on both wards agreed to be vigilant and comply with organisational policy, which is formulated on current research based evidence.

It is also essential to share best practice and this was done through communications at ward/departmental and committee meetings (Higgs et al, 2008). Ward staff now have clearly defined roles and responsibilities for commode cleaning. Commode cleaning posters are now displayed in ward sluices. These act as a visual aid for staff and reinforce the steps needed for effective cleaning. A system to identify that a commode is clean and ready for use is now in place. When cleaning is completed the commode should be left as depicted in Figure 1.

Figure 1 . Clean commode system: seat turned up and labelled with green tape

The Infection Control Team have enhanced delivery of evidenced- based training sessions regarding: principles and practice of infection control, micro-organism contamination of equipment, effective commode decontamination, agreed roles and responsibilities for cleaning. This enables more adherence to organisational policy and vigilance with practices while facilitating a higher quality of practice.

To enable standardisation of best practice, the audit was rolled out to other areas and included in the planned infection prevention and control audit programme.

Owing to differing brands of commodes within the wards, this audit afforded an opportunity to attempt to standardise equipment. A commode replacement programme was recommended throughout the organisation. The new models of commodes are designed with ease of cleaning in mind.

During future audits, the audit tool will also assist evaluation of not only commode cleanliness, within the organisation, but also perhaps highlight any advantages or disadvantages in the design.

Conclusion and recommendations for practice

Auditing provides an opportunity to examine practice and knowledge against the research-based evidence. The infection prevention and control audit programme will include future commode cleaning audits, using a specific audit tool and ATP bioluminescence testing. Establishing links between surveillance and audit results will enable comparisons to be made in present and future cleaning practices and determine whether there are any significant changes to current rates of *Clostridium difficile* within the organisation.

Introducing a commode replacement programme has enabled equipment which is damaged and therefore difficult to clean thoroughly, to be removed.

As this audit demonstrated, and if change is to occur, there is a need to highlight poor standards of cleaning within the clinical practice areas. However, those work arenas that demonstrate good practice should be applauded and, using the available communication mechanisms within the organisation, share their experiences and successes with others.

Knowledge of the principles of infection control is essential for all healthcare workers. Educating staff will ensure that healthcare workers are clear about their specific responsibility for cleaning equipment, while also furnishing them with more knowledge and insight into the concepts of infection prevention and control. Assessment of practice also facilitates change in individual practice and standardises practice across the organisation. On-going education will also provide any new research-based evidence that may impact on future practices and empower staff to take ownership of future audit activity within their clinical areas.

Commodes are an everyday piece of healthcare equipment, used by many ill patients, within most areas of healthcare. Policies, supervision and training are vital to maintain high standards of care. Timely and appropriate decontamination of commodes and other healthcare equipment is essential to minimise the risks of transmission of HCAI. Good cleaning and decontamination practices also add value to organisations, improve patient safety, raise patient confidence in service provision and ensure quality clinical practices.

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Conflict of interest statement

None declared.

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