NSS

Time to Clean Report

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Contents

Background

Over recent years Healthcare Environment Inspectorate (HEI) Annual Reports[1] have highlighted a consistently poor standard of cleaning in some NHSScotland hospital departments. Most recently, seven of the inspections carried out in emergency departments recognised "significant shortcomings with either the cleanliness of the department, patient equipment, or both". For this reason, Healthcare Improvement Scotland (HIS) recommends that NHS boards should be establishing systems to ensure a sufficient 'time to clean' between patients and for routine cleaning.

Health Protection Scotland (HPS) and Health Facilities Scotland (HFS) undertook projects to gather evidence regarding time to clean communal reusable patient care equipment and the development of a domestic system which estimates the time required for domestic services to clean the healthcare environment.

The aim of the HPS study was to develop an evidence base for cleaning times on a national and international level and conclude with recommendations for improving hospital cleanliness through the modification of existing cleaning times. This will involve the completion of a systematic review of the published literature on cleaning times and two separate data collection methods to answer the study question.

> ***"How long do healthcare workers spend on decontamination of communal reusable patient care equipment?"***

The HFS Time to Clean system was created as a replacement for the Lothian Tool system to provide domestic services with an IT system which calculates the required domestic services resource and times based on the size and items within a given area. This will allow the appropriate allocation of resources for current healthcare premises but in particular when planning services within new hospital sites.

HPS Summary Report: Estimated time spent by healthcare workers on decontamination of communal reusable patient care equipment

The NHSScotland National Infection Prevention and Control Manual[2] currently recommends that decontamination of communal reusable patient care equipment should be undertaken at the following times:

- Between each use;
- After blood and/or body fluid contamination;
- At regular predefined intervals as part of an equipment cleaning protocol; and
- Before inspection, servicing or repair.

According to the manual, local decontamination protocols should state who has responsibility for the decontamination of care equipment and how frequently routine cleaning should be undertaken.

The NHSScotland National Cleaning Services Specification[3] offers a template for the required minimum frequency of routine cleaning for the hospital environment and patient care equipment; however, it does not indicate how much time healthcare workers should spend on cleaning tasks. In contrast, the Revised Healthcare Cleaning Manual[4] of the National Patient Safety Agency (NPSA) provides an exemplar protocol that divides the responsibility of cleaning tasks between nursing and domestic staff. Despite its ostensibly prescriptive structure, it continues to acknowledge the significance of local factors in determining appropriate cleaning duties.

Understandably, in practice there exists a considerable overlap in the cleaning responsibilities of nursing and domestic staff, further complicated by the competing demands on nursing staff in relation to direct patient care. In 2012, Health Protection Scotland (HPS) held a series of focus groups with senior charge nurses to identify the barriers to compliance with equipment decontamination in NHS Boards.[5] Following on from these findings, HPS undertook the National Time to Clean a Bedspace Study(discharge), leading to a recommended minimum time of 40 minutes to clean a general bedspace and 60 minutes to clean a bedspace in a specialty area.

In order to judiciously distribute limited hospital resources, it is imperative to provide an estimate of the average time currently spent by nursing and domestic staff on patient care equipment decontamination. This study aims to develop an evidence

base for cleaning times on a national and international level and develop recommendations for improving hospital cleanliness through the modification of existing cleaning times.

Method

The study involved the completion of a systematic review of the published literature on cleaning times and two separate data collection methods in order to answer the study question.

"How long do healthcare workers spend on decontamination of communal reusable patient care equipment?"

Systematic Review

The databases MEDLINE, CINAHL and EMBASE were searched to identify relevant published literature. A combination of Medical Subject Headings (MeSH) and free-text search terms were developed and adapted to suit each database, including the following: "housekeepers", "cleaners", "domestics", "medical equipment", "shared equipment" and "non-invasive equipment". In addition, Google Scholar was used to search for grey literature relevant to the subject. All literature searches were conducted in May 2016. Articles were excluded from the review on the basis of the following criteria: article was published in a language other than English; article did not concern the decontamination of reusable communal patient care equipment (i.e. off-topic); or article concerned reusable medical devices (e.g. ultrasound transducers). The time period 2000–2016 was chosen for the database search, following a scoping exercise on publication activity relevant to the subject.

The systematic review followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) format for study identification and selection. Initially the title and abstract of each article were screened for relevance by the lead reviewer. Of those articles that were deemed potentially relevant, the full text was retrieved and screened against the exclusion criteria. For situations in which it was unclear whether studies should be included, consensus was reached through discussion with the other reviewers. Reference Manager (Reference Manager Version 12, Thomson Reuters) was used for bibliographic management.

Critical appraisal of the studies was carried out using the Scottish Intercollegiate Guidelines Network methodology (SIGN).[6] As a further measure, the McDonald-

Arduino evidentiary hierarchy was used as a framework for assessing the evidence relevant to the impact of time spent on equipment cleaning.[7] Together, these two systems classify evidence on the basis of both study design (e.g. interrupted time series) and outcome measure (e.g. reduction in microbial bioburden); such a combination allows the evidence to be graded on multiple parameters of quality.

Observational Study

Firstly, a list of general equipment used within a standard ward, a critical care ward and a theatre area was generated. A visit to the clinical skills laboratory at the Glasgow Caledonian University was arranged over two days for a group of volunteers to undertake timings to clean each piece of equipment.

The volunteers involved nursing staff, domestic staff and non-healthcare staff. Non-healthcare workers without any previous training in equipment cleaning were included to represent the variable experience of healthcare workers currently working in Scotland. The observers were not masked to the occupation of participants, although data collections forms were subsequently made anonymous using randomly allocated numbers. This measure ensured that the data analyst remained unaware of participant occupation until data analysis had been completed.

All participants were provided with a participant information sheet (Appendix 1) which provided information on the study, instructions for the day, data collection method, and the cleaning method to be followed during the cleaning timings (which follows best practice). Each participant was asked to sign and date their participants form as evidence to their informed consent to participate and follow the instructions laid out.

Once the formalities were complete volunteers were divided into pairs with one healthcare worker (nurse or domestic) working in partnership with a non-healthcare worker. This would allow those with experience of cleaning healthcare equipment to instruct those with no healthcare cleaning experience. Instructions were given that the healthcare worker cleaned each piece of equipment first and the non-healthcare worker could observe how the cleaning should be done. In order to validate the process the equipment was deemed clean if it was visibly clean. No other method to determine cleanliness was used. Within the clinical area visual inspection is generally used to determine whether equipment has been sufficiently cleaned. The timings to be recorded only included the time it took for the piece of equipment to be cleaned. No allocation of time for hand hygiene or donning/doffing of PPE was

incorporated. Each study pair was provided with a data collection sheet (Appendix 2) which was relevant to the clinical room. For the purposes of this study a general ward area, a critical care area and a theatre area were used. The three rooms chosen reflected the equipment which would be captured within the majority of acute areas.

The data collection was undertaken over a two day period and this was merely due to availability of the skills lab. The area was provided for three hours each day which allowed sufficient time for all available equipment to be cleaned at least once and for mean timings to be calculated.

Health board survey

The second data collection component of the study was to determine how many times per shift a healthcare worker would clean pieces of equipment. This would allow the organisers to determine the time spent by healthcare workers per shift on cleaning. By collecting timings (mean) for cleaning of each piece of equipment and determining how many times per shift (mean) each piece of equipment was cleaned, an overall time spent cleaning each piece of equipment per shift can be determined as can whole time spent cleaning per shift.

To achieve the data collection for the number of times equipment would be cleaned per shift the organisers requested the participation of the health boards in NHSScotland by e-mail via members of the senior management team. Responses were limited and therefore the request was made again via e-mail to the Infection prevention teams and also via the Equipment and Environment Decontamination Expert Advisory Steering group.

Results

Systematic Review

The literature search identified 367 unique articles following de-duplication. After screening by title and abstract, 43 proceeded to the subsequent stage. Following screening by full text, five articles were included for critical appraisal. No articles were excluded during the appraisal process. Two articles estimated the time currently being spent by healthcare workers on cleaning shared patient care equipment[8,9] and three articles[10,11,12] evaluated interventions which increased the time spent on cleaning Appendix 3. The quality of included studies was predominantly of SIGN level 3 evidence (e.g. cross-sectional studies); however, there were a few studies classified as SIGN level 2+ evidence (e.g. cross-over studies). Similarly, the studies varied across the McDonald-Arduino evidentiary hierarchy from level V (i.e. demonstrating a reduced incidence of infections) to level II (i.e. demonstrating in-use bioburden reduction). Consequently, the evidence was judged to be of low to moderate quality.

Saito et al[8] concluded from their observational study that healthcare workers undertaking multiple roles as a part of their job (e.g. registered nurses) tended to perform cleaning and disinfection tasks with a lower frequency and for a shorter duration. In particular, housekeepers spent almost twice as long on equipment cleaning (23 minutes per shift) than registered nurses (13 minutes per shift). The average duration of time spent cleaning fixed surfaces (e.g. beds and chairs) was over nine times as long for housekeepers (94 minutes per shift) as it was for registered nurses (10 minutes per shift). Zoutman et al[9] used a questionnaire distributed to senior managers to ascertain that routine cleaning of a private room required nearly half as long a mean time (17.3 minutes) as that needed to clean a ward room (34.2 minutes) with an unspecified number of beds. Likewise, terminal cleaning of a private room took almost twice as much time (30.4 minutes) as routine cleaning, mainly due to additional tasks (e.g. replacement of privacy curtains). This observation implies that higher room turnover, resulting from a shorter length of stay, would further increase the amount of time required to keep patient rooms clean.

The interventional studies that evaluated the impact of increased cleaning times operated in one of three different forms: (i) increasing the daily frequency of routine cleaning; (ii) increasing the total number of working hours for cleaning staff; or (iii)

recruiting additional cleaning staff. All three studies demonstrated a reduction in either environmental contamination and/or HCAIs. However, no single study examined the effect of an increased cleaning time in isolation; therefore, it was not possible to determine whether these outcomes were due to the increased time spent cleaning or other elements of the intervention.

Observational Study & health board survey

From the items of communal patient care equipment found in Table 1 (6 bed ward area) the bed frame required the longest mean 'time to clean' (181.1s; 95% CI: 141.4 – 220.9), followed by the patient monitoring system (170.3s; 95% CI: 107.8 – 232.8), Hoist (152.7s; 95% CI: 33.8 – 271.6), patient locker (124.2s; 95% CI: 104.5 – 144.0), and commode (111.6s; 95% CI: 70.1 – 153.1). In contrast, pillows underwent the shortest mean cleaning times (9.9s; 95% CI: 3.9 – 15.9) followed by stethoscopes (13.6s; 95% CI: 8.1 – 19.1), feed pumps (16.2s; 95% CI: 9.6 – 22.7) and reusable basins (18.0s; 95% CI: 4.4 – 31.6).

The most frequently cleaned items of patient equipment were the wash basin (median=20; Range 8 - 24) followed by the nurse call system (median=10; Range 3 – 24) and the patient bed table (median=10; Range 2 - 44). The least frequently cleaned items were the stethoscope (median=1; Range 1 – 3), sphygmomanometer (median=1; Range 1 – 1) and the patslide (median=1; Range 1 – 4).

The length of time to clean items of equipment did not always correlate to the overall time spent cleaning those items per shift. For example, a mean of 6 beds were cleaned by a nurse on shift equating to 18.1 minutes bed cleaning per shift. Bedframes are large items of equipment and it could be expected they would take more time than others. However wash basins which have a mean clean time of 18.0 seconds are cleaned frequently (median=20) per shift which equates to 19.3 minutes per shift, more than bed cleaning.

The total time spent by one nurse cleaning reusable communal patient equipment per shift within a 6 bed ward is 181.1 minutes (3.01 hours) when the mean equipment times are multiplied by the mean times cleaned data. For the ITU it was 53.3 minutes and 125.8 minutes (2.09 hours) for the theatre area.

Table 1
Mean time, median frequency and estimated time per shift (mean time x median frequency) for patient care equipment in a six-bed ward

Item	Mean Time (seconds)	Median Frequency	Estimated Time per Shift (minutes)
Bedpan Holder	20.2 [95% CI: 14.0 – 26.4]	2 [Range: 1 – 2]	0.7
Bed Rails	65.9 [95% CI: 46.3 – 85.4]	6 [Range: 1 – 16]	6.6
Bedside Table	83.4 [95% CI: 55.2 – 111.7]	10 [Range: 2 – 44]	13.9
Blood Pressure Cuff	30.6 [95% CI: 13.1 – 48.2]	6 [Range: 4 – 44]	3.1
Catheter Stand	17.1 [95% CI: 7.9 – 26.4]	5 [Range: 1 – 7]	1.4
Chair	77.9 [95% CI: 63.4 – 92.4]	8 [Range: 2 – 14]	10.4
Commode	111.6 [95% CI: 70.1 – 153.1]	4 [Range: 3 – 24]	7.4
Computer Keyboard	25.5 [95% CI: 10.4 – 40.6]	5 [Range: 1 – 8]	2.1
Dressing Trolley	65.2 [95% CI: 51.7 – 78.8]	3 [Range: 1 – 13]	3.3
Drip Stand	50.6 [95% CI: 32.9 – 68.2]	8.5 [Range: 1 – 10]	7.2
Electrical Bedframe	181.1 [95% CI: 141.4 – 220.9]	6 [Range: 2 – 14]	18.1
Feed Pump	16.2 [95% CI: 9.6 – 22.7]	2 [Range: 1 – 3]	0.5
Hoist	152.7 [95% CI: 33.8 – 271.6]	2 [Range: 1 – 15]	5.1
Hoist Straps	86.5 [95% CI: 0.0 – 174.8]	2 [Range: 1 – 15]	2.9
Infusion Pump	31.0 [95% CI: 27.2 – 34.8]	5 [Range: 1 – 9]	2.6
Linen Buggy	76.5 [95% CI: 3.1 – 149.9]	4 [Range: 2 – 6]	5.1
Locker	124.2 [95% CI: 104.5 – 144.0]	6.5 [Range: 1 – 16]	13.5
Mattress	88.6 [95% CI: 64.9 – 112.2]	6.5 [Range: 2 – 18]	9.6
Medicine Trolley	100.3 [95% CI: 56.4 – 144.1]	2 [Range: 1 – 2]	3.3

Monitoring System	170.3 [95% CI: 107.8 – 232.8]	4.5 [Range: 1 – 8]	12.8
Nebuliser Unit	33.1 [95% CI: 27.6 – 38.7]	2 [Range: 1 – 3]	1.1
Nurse Call System	31.3 [95% CI: 15.0 – 47.5]	10 [Range: 3 – 24]	5.2
Patslide	45.5 [95% CI: 32.5 – 58.4]	1 [Range: 1 – 4]	0.8
Pillow	9.9 [95% CI: 3.9 – 15.9]	6 [Range: 1 – 14]	1.0
Pulse Oximeter	17.0 [95% CI: 10.9 – 23.1]	6 [Range: 3 – 38]	1.7
Raised Toilet Seat	67.5 [95% CI: 2.7 – 132.3]	6.5 [Range: 4 – 9]	7.3
Reusable Basin	18.0 [95% CI: 4.4 – 31.6]	8 [Range: 2 – 14]	2.4
Sharps Tray	23.1 [95% CI: 11.2 – 35.1]	7 [Range: 1 – 11]	2.7
Sphygmomanometer	51.8 [95% CI: 33.4 – 70.1]	1 [Range: 1 – 1]	0.9
Stethoscope	13.6 [95% CI: 8.1 – 19.1]	1 [Range: 1 – 3]	0.2
Telephone	15.7 [95% CI: 0.0 – 41.5]	2 [Range: 1 – 10]	0.5
Television	17.5 [95% CI: 11.9 – 23.1]	1 [Range: 1 – 4]	0.3
Thermometer	18.8 [95% CI: 10.2 – 27.3]	6 [Range: 1 – 38]	1.9
Wash Basin	57.8 [95% CI: 39.7 – 75.8]	20 [Range: 8 – 24]	19.3
Waste Bin	53.2 [95% CI: 35.1 – 71.4]	7 [Range: 4 – 30]	6.2
Total			181.1

From the items of communal patient care equipment found in Table 2 (ITU) the bed frame required the longest mean 'time to clean' (181.1s; 95% CI: 141.4 – 220.9), followed by the patient monitoring system (170.3s; 95% CI: 107.8 – 232.8), resuscitation trolley (143.8s; 95% CI: 0.0 – 320.9) and patient locker (124.2s; 95% CI: 104.5 – 144.0). Hoists were cleaned during the observational study but no data was received from the health board survey and has therefore been removed from the analysis of the ITU data. In contrast, pillows underwent the shortest mean cleaning times (9.9s; 95% CI: 3.9 – 15.9) followed by stethoscopes (13.6s; 95% CI: 8.1 – 19.1), pulse oximeter (17.0s; 95% CI: 10.9 – 23.1) and sharps trays (23.1s; 95% CI: 11.2 – 35.1).

The most frequently cleaned items of patient equipment within ITU was pillows (median=6; Range 2 - 10) followed by chairs (median=3.5; Range 2 – 5) and patient beds, lockers and chairs (each median=3; Range 1 – 3). The least frequently cleaned items were the resuscitation trolley, nurse call system, monitoring system, and ECG (each median=1; Range 1 – 1).

The total time spent by one nurse cleaning communal reusable patient care equipment per shift within an ITU ward is 53.3 minutes (0.88 hours) when the mean equipment times are multiplied by the mean times cleaned data.

Table 2
Mean time, median frequency and estimated time per shift (mean time x median frequency) for patient care equipment in an intensive care unit

Item	Mean Time (seconds)	Median Frequency	Estimated Time per Shift (minutes)
Bedpan Holder	20.2 [95% CI: 14.0 – 26.4]	1 [Range: 0 – 2]	0.3
Bed Rails	65.9 [95% CI: 46.3 – 85.4]	2.5 [Range: 0 – 5]	2.7
Bedside Table	83.4 [95% CI: 55.2 – 111.7]	3 [Range: 3 – 3]	4.2
Catheter Stand	17.1 [95% CI: 7.9 – 26.4]	0 [Range: 0 – 0]	0
Chair	77.9 [95% CI: 63.4 – 92.4]	3.5 [Range: 2 – 5]	4.5
Commode	111.6 [95% CI: 70.1 – 153.1]	0.5 [Range: 0 – 1]	0.9
Computer Keyboard	25.5 [95% CI: 10.4 – 40.6]	1 [Range: 1 – 1]	0.4
Defibrillator	28.0 [95% CI: 18.7 – 37.3]	0 [Range: 0 – 0]	0
Dressing Trolley	65.2 [95% CI: 51.7 – 78.8]	0 [Range: 0 – 0]	0
Drip Stand	50.6 [95% CI: 32.9 – 68.2]	1 [Range: 1 – 1]	0.8
ECG Machine	118.1 [95% CI: 94.7 – 141.7]	1 [Range: 1 – 1]	2.0
Electrical Bedframe	181.1 [95% CI: 141.4 – 220.9]	3 [Range: 1 – 5]	9.1
Feed Pump	16.2 [95% CI: 9.6 – 22.7]	0 [Range: 0 – 0]	0
Hoist	152.7 [95% CI: 33.8 – 271.6]	0 [Range: 0 – 0]	0
Infusion Pump	31.0 [95% CI: 27.2 – 34.8]	3 [Range: 1 – 5]	1.6
Locker	124.2 [95% CI: 104.5 – 144.0]	3 [Range: 1 – 5]	6.2
Mattress	88.6 [95% CI: 64.9 – 112.2]	3 [Range: 1 – 5]	4.4
Monitoring System	170.3 [95% CI: 107.8 – 232.8]	1 [Range: 1 – 1]	2.8

Nurse Call System	31.3 [95% CI: 15.0 – 47.5]	1 [Range: 1 – 1]	0.5
Patslide	45.5 [95% CI: 32.5 – 58.4]	2 [Range: 2 – 2]	1.5
Pillow	9.9 [95% CI: 3.9 – 15.9]	6 [Range: 2 – 10]	1.0
Portable Ventilator	47.7 [95% CI: 19.0 – 76.4]	2.5 [Range: 0 – 5]	2.0
Pulse Oximeter	17.0 [95% CI: 10.9 – 23.1]	1 [Range: 1 – 1]	0.3
Resuscitation Trolley	143.8 [95% CI: 0.0 – 320.9]	1 [Range: 1 – 1]	2.4
Reusable Basin	18.0 [95% CI: 4.4 – 31.6]	0 [Range: 0 – 0]	0
Sharps Tray	23.1 [95% CI: 11.2 – 35.1]	3 [Range: 1 – 5]	1.2
Sphygmomanometer	51.8 [95% CI: 33.4 – 70.1]	0 [Range: 0 – 0]	0
Stethoscope	13.6 [95% CI: 8.1 – 19.1]	3 [Range: 3 – 3]	0.7
Telephone	15.7 [95% CI: 0.0 – 41.5]	1.5 [Range: 1 – 2]	0.4
Thermometer	18.8 [95% CI: 10.2 – 27.3]	1 [Range: 1 – 1]	0.3
Wash Basin	57.8 [95% CI: 39.7 – 75.8]	0 [Range: 0 – 0]	0
Waste Bin	53.2 [95% CI: 35.1 – 71.4]	3.5 [Range: 2 – 5]	3.1
Total			53.3

From the items of communal patient care equipment found in Table 3 (operating theatre) the anaesthetic machine required the longest mean 'time to clean' (287.3s; 95% CI: 0.0 – 596.8), followed by the operating table (193.2s; 95% CI: 148.8– 237.6), monitoring system (170.3s; 95% CI: 107.8 – 232.8 and table attachments (97.7s; 95% CI: 36.7– 158.6). In contrast, pulse oximeters underwent the shortest mean cleaning times (17.0s; 95% CI:10.9 – 23.1) followed by reusable basins (18.0s; 95% CI: 4.4 – 31.6), thermometers (18.8s; 95% CI:10.2 – 27.3) and sharps trays (23.1s; 95% CI:11.2 – 35.1).

The most frequently cleaned items of patient equipment were dressing trolleys (median=6; Range 10 - 10) followed by kick buckets (median=6; Range 10 – 10) and the anaesthetic machine (median=7; Range 4 - 7). The least frequently cleaned items were the stethoscope (median=1; Range 1 – 1), computer keyboard (median=2; Range 1 – 2) working surfaces (median=2.5; Range 1 – 6) and the patslide (median=3; Range 2 – 7).

Anaesthetic machines and operating tables were identified as taking the longest mean time to clean from the theatre environment data (287.3 & 193.2 seconds respectively) with a total clean time per shift (33.5 & 14.5 minutes respectively). We note again within the theatre data that for items of equipment which take less time to clean but are cleaned more frequently the total time taken to clean per shift is significant. Dressing trolleys in total took 10.9 minutes and monitoring systems were 14.2 minutes.

The total time spent by one nurse cleaning reusable communal patient equipment per shift within an operating theatre is 125.8 minutes (2.09 hours) when the mean equipment times are multiplied by the mean times cleaned data.

Table 3 Mean time, median frequency and estimated time per shift (mean time x median frequency) for patient care equipment in an operating theatre

Item	Mean Time (seconds)	Median Frequency	Estimated Time per Shift (minutes)
Anaesthetic Machine	287.3 [95% CI: 0.0 − 596.8]	7 [Range: 4 − 7]	33.5
Blood Pressure Cuff	30.6 [95% CI: 13.1 − 48.2]	6 [Range: 3 − 10]	3.1
Computer Keyboard	25.5 [95% CI: 10.4 − 40.6]	2 [Range: 1 − 2]	0.9
Diathermy Unit	82.0 [95% CI: 51.8 − 112.2]	4 [Range: 1 − 6]	5.5
Dressing Trolley	65.2 [95% CI: 51.7 − 78.8]	10 [Range:10 − 10]	10.9
Drip Stand	50.6 [95% CI: 32.9 − 68.2]	4 [Range: 2 − 7]	3.4
Instrument Trolley	68.3 [95% CI: 0.0 − 148.6]	4 [Range: 4 − 10]	4.6
Kick Bucket	50.8 [95% CI: 33.4 − 68.2]	10 [Range:10 − 10]	8.5
Monitoring System	170.3 [95% CI: 107.8 − 232.8]	5 [Range: 1 − 11]	14.2
Patslide	45.5 [95% CI: 32.5 − 58.4]	3 [Range: 2 − 7]	2.3
Pulse Oximeter	17.0 [95% CI: 10.9 − 23.1]	5.5 [Range: 3 − 9]	1.6
Reusable Basin	18.0 [95% CI: 4.4 − 31.6]	5 [Range: 4 − 7]	1.5
Sharps Tray	23.1 [95% CI: 11.2 − 35.1]	2 [Range: 2 − 2]	0.8
Stethoscope	13.6 [95% CI: 8.1 − 19.1]	1 [Range: 1 − 1]	0.2
Closed Suction	59.5 [95% CI: 0.0 − 586.8]	6 [Range: 4 − 6]	6.0
Table Attachments	97.7 [95% CI: 36.7 − 158.6]	5 [Range: 4 − 6]	8.1

Telephone	15.7 [95% CI: 0.0 – 41.5]	1.5 [Range: 1 – 2]	0.4
Theatre Table	193.2 [95% CI: 148.8 – 237.6]	4.5 [Range: 4 – 11]	14.5
Thermometer	18.8 [95% CI: 10.2 – 27.3]	5.5 [Range: 3 – 6]	1.7
Waste Bin	53.2 [95% CI: 35.1 – 71.4]	3 [Range: 1 – 4]	2.7
Working Surfaces	32.5 [95% CI: 0.7 – 64.3]	2.5 [Range: 1 – 6]	1.4
Total			125.8

Despite variation in the experience of participants, there was broad uniformity in the time taken by different occupations to clean the selected items. One-way ANOVA determined that there were no statistically significant differences between non-clinical, nursing and domestic staff in the mean 'time to clean' ($p = 0.69$).

Figure 1 shows the estimated total time taken per shift each nurse spends cleaning reusable communal patient care equipment within a general ward, ITU ward and operating theatre area. The figures were calculated from the mean time to clean for each piece of equipment multiplied by the median number of times the equipment is cleaned in the clinical area. The greater amount of time spent cleaning was within a general ward area followed by the theatre area and then ITU.
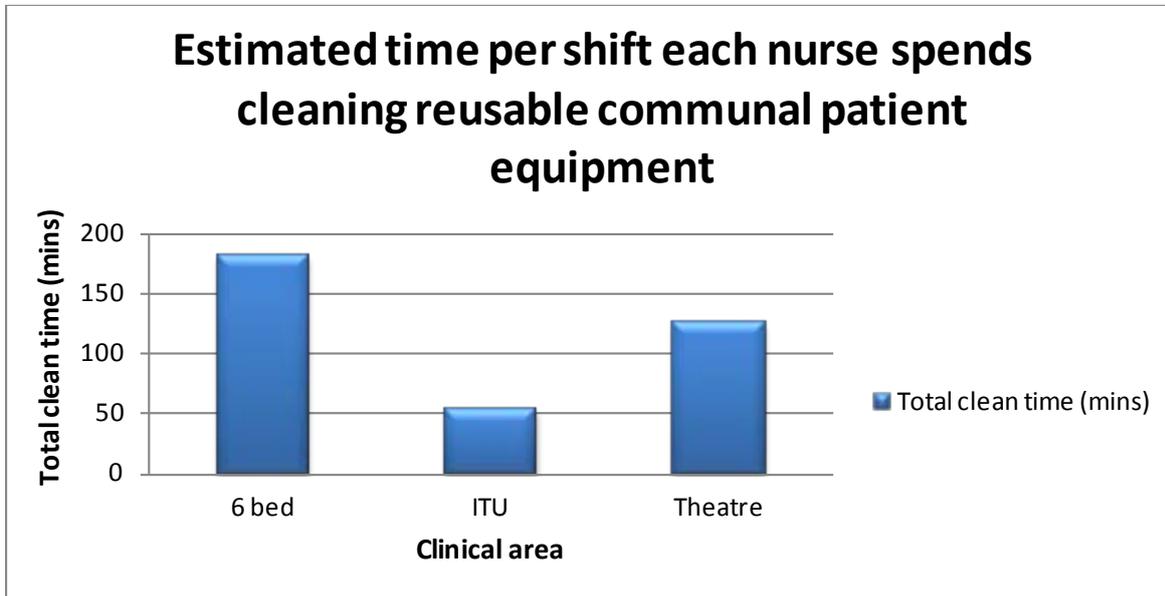

Figure 1: Estimated total time taken per shift each nurse spends cleaning reusable communal patient care equipment

The data was then further analysed to determine the percentage of time per shift the total cleaning time represented. The estimated percentage has been represented in relation to a 7.5-hour shift (early/late/day shift), 9.38-hour shift (night shift) and 12-hour shift (day/night shift). These shift patterns reflect the majority of clinical shift patterns within NHSScotland. Figure 2 shows a comparison of the percentages per shift staff spend cleaning within a general ward area, an ITU and a theatre relative to the possible shift patterns they may have worked. From the data received it is clear that nurses within general ward areas spend a greater percentage of time cleaning (40%, 32.08% and 25%) for a 7.5-hr, 9.38-hr and 12-hr shift respectively than staff within an ITU (11.7%, 7.33% and 9.38) or theatre (27.8%, 22.2% and 17.41%).
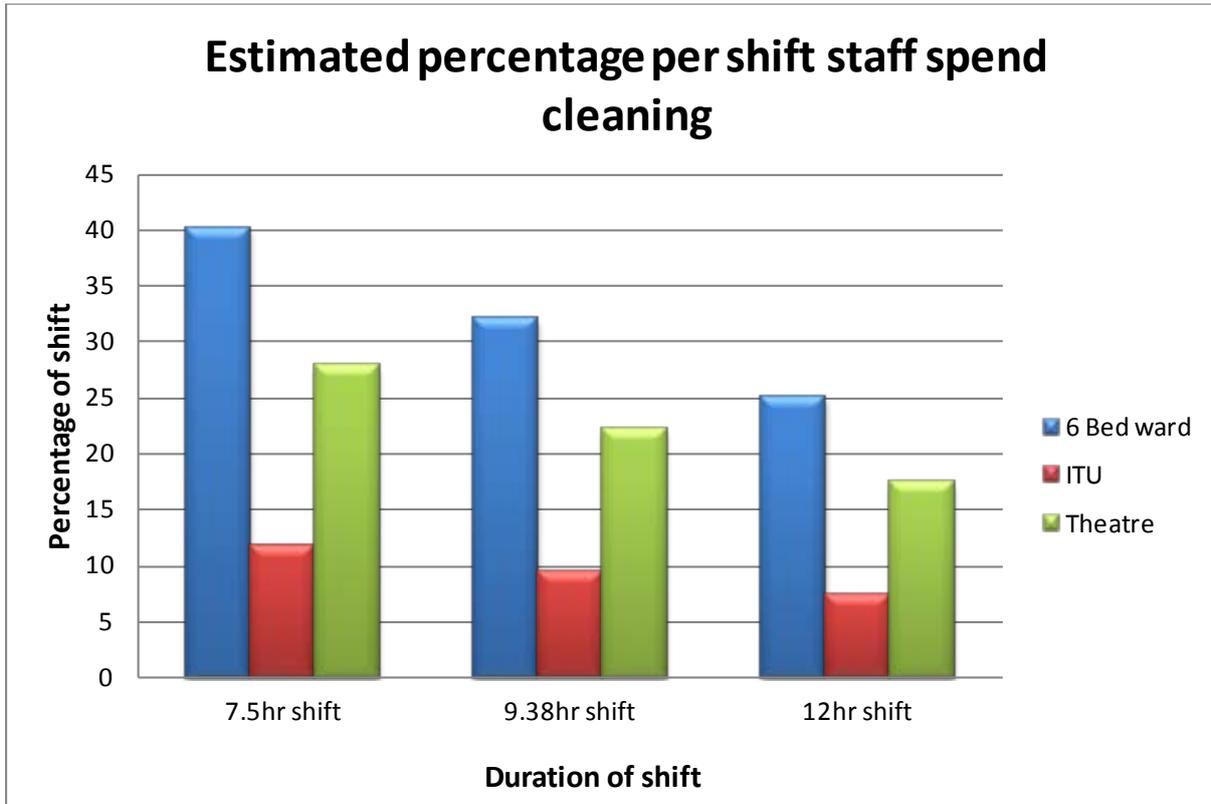
Figure 2: Estimated percentage per shift staff spend cleaning

The data was further reviewed to ascertain how long staff would spend cleaning items of equipment from the lists only once per shift compared to the total time cleaning per shift shown in Table 4. It is clear from the figures that in both the 6 bed area and the theatre areas staff are cleaning items of equipment more than once per shift and that within the ITU area the total time cleaning is approximately the same as the time taken to clean each item of equipment once.

Table 4: Total time to clean each item of equipment once

Clinical area	Time to clean each piece of equipment X1	Total time spent cleaning
6 Bed area	56 minutes	181.1minutes
ITU	55 minutes	53.3 minutes
Theatre	41 minutes	125.8 minutes

Discussion

The limited evidence retrieved for the literature review is indicative of the lack of original research conducted in the field of decontamination more generally. Perhaps unsurprisingly, the evidence base was of low quality, particularly with regard to the impact of increased cleaning times on the occurrence of HCAIs. Of the few trials relevant to this issue, most adopted a cross-over design that evaluated a complex intervention with multiple cleaning components. For this reason, it would be advisable to conduct a trial with independent treatment and control groups, in which the control group is allocated standard cleaning practice. In addition, future trials should include a sufficient follow-up period to prove sustained, long-term improvements in cleanliness and a consequential impact on patient-relevant outcome measures.

The only available estimates of the time spent by healthcare workers on cleaning were provided by studies conducted in Canada and the USA and may not be representative of cleaning times in North America, let alone accurately depict cleaning times on an international level. There is also a lack of clarity over the terminology used to distinguish communal reusable patient care equipment from reusable medical devices (RMDs), reusable care equipment or fixtures and fittings in the patient environment. For example, listing ultrasound transducers as non-invasive portable items potentially shared between patients[13], which might otherwise be categorised as RMDs or ward furniture, i.e. bedside tables described as 'fixed surfaces' being a separate category from patient care equipment[8]. Such confusion interferes with attempts to provide accurate estimates of the time spent on cleaning communal reusable patient care equipment.

Relatively little research attention has been paid to the physical components of decontamination and as such we aimed to provide an estimate of the time required for healthcare workers, including both experienced and novice domestic staff, as well as nurses, to clean selected items of reusable communal reusable patient care equipment in accordance with procedures outlined in the NCSS.

From the focus groups, undertaken by HPS in 2012, senior charge nurses (SCN) raised the issue that nurses perceived they were increasingly spending more time cleaning communal reusable patient care equipment. The findings of this study estimate each nurse spends 181.1 minutes within a general ward area cleaning

equipment per shift, 53.3 minutes within ITU and 125.8 within an operating theatre. It is not possible to conclude that these figures are representative of the situation in practice; however, this is the first study to estimate time spent cleaning in NHSScotland and the data obtained does provide baseline data for future research. It can be concluded from this study that nurses spend a substantial percentage of their day cleaning reusable communal reusable patient care equipment.

The percentages of time per shift staff spent cleaning were valuable and somewhat surprising. It was not expected staff would be spending such a large proportion of their time cleaning. The 6 bed area findings were the most surprising; 40% of time cleaning for a 7.5-hour shift or 25% if it was a 12-hour shift. This reflects clinical practice within a general ward area where a nurse is allocated to care for a number of patients over a shift and responsible for cleaning a number of items of care equipment i.e. bedtables, lockers or bedrails. This is reflected in the data returns where to clean each piece of equipment once in a general ward area would take 56 minutes however the total cleaning reported by nursing staff was 181.1 minutes indicating multiple cleans are occurring. Theatre responses also indicated multiple cleans of equipment where the time to clean each item of equipment once took 41 minutes however the total reported time cleaning was 125.8 minutes. This reflects theatre clinical practice where all equipment is cleaned before and after each surgical case during a theatre session. The number of patients booked for a theatre session will determine how many times equipment will require to be cleaned. The one area where there was little difference in the times for cleaning items once and the total cleaning time per shift was for the ITU area. Here to clean items of equipment once was calculated to take 53.3 minutes however the total equipment cleaned responses from the health board survey was 55 minutes. This replicates clinical practice within an ITU setting where generally a nurse will be allocated to care for one patient and will be responsible for cleaning the equipment in use for that patient for the duration of their shift.

It must also be considered the data findings are representative of one nurse on a shift and therefore must be multiplied by the number of nurses working per shift to understand the overall impact cleaning may have within each clinical environment and/or direct patient care. Further work could provide a more quantitative finding of the actual cleaning undertaken in clinical areas inclusive of the number of staff on duty and duration of shift.

Whilst HPS recognise cleaning of patient care equipment is an integral part of patient care practices and must be performed the data collected showed nursing staff were undertaking a large proportion of routine cleaning tasks which are not linked to direct patient care but ensuring equipment is clean for general use. Whilst routine cleaning is also important for patient safety it raises questions regarding who should be responsible for routine cleaning. Based on the findings of this study nursing staff are responsible for the majority of cleaning of communal reusable patient care equipment, domestic staff for the healthcare environment and allied health professionals and medical staff for the equipment they use during patient care interventions. Building on the findings of this study would allow a more detailed breakdown of time allocated to cleaning reusable communal equipment and possible impact if any on patient care and HCAI.

Limitations

The format of the observational component did incur a number of limitations: in particular, the study did not intend to evaluate the effectiveness of cleaning by different occupations. Rather, it aimed to provide cleaning time estimates that represented the variable experience of healthcare workers in the NHS. However, despite the broad occupational range of participants, only nine individuals volunteered for the study and a larger sample size might have improved external validity of the estimates. The higher proportion of infection control staff might be expected to have raised cleaning times through greater thoroughness, yet infection control professionals were less effective at cleaning high-touch surfaces than environmental service workers.[14]

Not all participants were able to clean every single item in the time allocated. Recognising this limitation, the missing data (7.9%) was balanced across both occupations and items, and is therefore unlikely to have influenced the findings of the study. Additionally, the study was conducted within a simulated teaching ward, instead of a clinical ward with ongoing patient care; hence, the circumstances may not have been entirely representative of cleaning duties in the near-patient environment (e.g. patient belongings on bedside tables necessitating removal prior to cleaning). With this in mind what we can demonstrate is that this study offers strength in being the first study, following a systematic search of the literature, to

provide estimates of the time required for healthcare workers in the NHS to clean items of communal reusable patient care equipment.

Data received from health boards was limited regarding how many times per shift items of equipment were decontaminated, only providing 13 data returns for the general ward area, 2 from ITU areas and 5 operating theatre areas. Therefore the returns will not truly reflect the potential differences in cleaning of equipment between differing clinical specialities within general wards, ITU and theatre specialities. What the data has told us is a generic estimate of cleaning within those clinical specialities.

Whereas the observational study gathered data on cleaning times for both nursing and domestic staff, the health board survey only collected cleaning frequencies for nursing staff. The frequency of cleaning for items that are typically cleaned by domestic staff is therefore likely to be under-reported. Similarly, the observational study provided an estimate of ideal cleaning times, in the absence of competing priorities, while the survey offered more realistic estimates for the frequency of cleaning in practice. However, the survey method may be less reliable due to bias in reporting. The differences between the two approaches suggest that any conclusions drawn from the combined estimates should demonstrate a degree of caution.

From the health board survey it is not possible to determine what shift pattern the survey respondents were working at the time of data collection therefore estimates have been based on the most common three shift patterns within NHSScotland (7.5, 9.38 and 12 hours).

HFS - NHS Scotland; Time to Clean System report

Background

This paper has been created at the request of the Domestic Services Expert Group (DSEG) who are seeking further information on the expected benefits from introducing the Time to Clean system across NHS Scotland.

The Time to Clean system has been created as a replacement for the Lothian Tool system which was in use in two boards within NHS Scotland. Both systems aim to provide domestic services with information on required cleaning times and resources based on the size and items that are within a given area. The Time to clean system has been built on the same IT platform as the Facilities Monitoring Tool (FMT) and can therefore share a large proportion of information on the NHS Scotland estate pertinent to Domestic Services.

The Time to Clean system has been linked to the FMT system and has created a database of cleaning times based on the elements that are monitored on a frequent basis e.g. Floors, Toilets.

There is an ongoing challenge across domestic services with the appropriate allocation of resource in particular when planning for services within new hospital sites. Determining resource for such sites is based on historical knowledge of domestic services managers. Although there is a significant level of experience within Domestic Services with the most efficient allocation of cleaning time and resource, moving to new healthcare premises can often bring unforeseen challenges and therefore a greater level of information is required to plan and adapt services.

Programme Position

The deliverable from the Project Initiation Document is that the Time to Clean system will be tested and available for NHS Scotland boards to use. There is no obligation for boards to use the system; the functionality will be there for use through the FMT system.

Work completed to date

Cleaning timings study completed across 3 NHS Scotland health boards (NHS Dumfries & Galloway, NHS Grampian and NHS Fife) with the average time calculated for each task input in the system.

Building of the time to clean system in line with feedback from domestic services with the aim to make data input and usability of the system as user friendly as possible. Initial testing carried out within NHS Dumfries & Galloway which highlighted a requirement for further system development to achieve a greater breakdown of items under each monitoring element in line with the database of cleaning times achieved.

Next Steps

• Further system development to be carried out by Synbiotix which is due to be complete by 12th August 2016

• Further testing to be carried out with in NHS Dumfries & Galloway

• System demonstration to NHS Lothian

• Once User acceptance Testing has been carried out the system will be made available for all NHS Scotland boards

Expected Benefits

Benefits of implementation and use of Time to Clean include:

• Ability to plan Domestic Services resource for new and existing healthcare premises based on factual data.

• Time to Clean system can provide an evidence base for domestic services seeking service change including reallocation of resource or additional time required based on national timings

• Time to Clean system mirrors the FMT system therefore information on the NHS estate has already been uploaded saving time and resource for health boards

• Linking to FMT system, Time to Clean provides a timing for only those elements which are audited

• Cleaning timings derived from Standard Operated Procedures identified through revised Cleaning Services Specification

- Frequencies of clean can be amended within the Time to Clean System in line with the requirements of the revised National Cleaning Services Specification
- Ability for Domestic Service to plan for new hospital moves in a timely fashion and provide substantial data to support requests for appropriate resource.

A benefits log has been created as part of the project and can be made available

Identified Risks

There are a few risks that have been identified with the implementation of the Time to Clean System which are highlighted below.

A full risk log has been created as part of the project documentation

- There is a risk that any cleaning timings study is not accepted as accurate information however the system can allow for timings to be amended should further research into cleaning times be required.

- There is a reputational risk to boards that the Time to Clean system may highlight a significant gap between the resources required to clean versus the current service provision.

- There is a risk that the system does not fulfil the identified benefits noted above however, through constant communication with the system supplier, the expected benefits are factored into all work

- There is a risk that NHS Boards will not use the system. A mitigation of this risk is that the system has been designed to be user friendly and tailored for a variety of uses from planning a move to a large acute site to checking existing current service provision against a particular problem area within a board.

Summary

The time to clean system provides NHS Scotland boards with the opportunity to plan their domestic services in line with national timings. The system links to other key initiatives within domestic services such as the revised Cleaning Services Specification and Facilities Monitoring Tool to ensure a joined up approach to the planning, delivery and audit of domestic services across NHS Scotland.

Recommendations

- Consideration should be given to HPS widening a component of this study relating to the time spent by nursing staff cleaning reusable patient equipment. This would involve recruitment of a larger number health boards and would improve data collection for each of the clinical areas providing a more accurate reflection of cleaning within different clinical specialities. It would also allow HPS to ascertain shift patterns worked relative to the time spent cleaning.

- Consideration should be given to undertaking the more detailed time to clean study in conjunction with the preferred option from the Alternative Approaches to decontamination paper submitted to the Scottish Government in May 2017. This would allow HPS to study the time spent by nurses cleaning comparative to clinical areas which have and do not have healthcare support workers (HCSW) (who are employed to undertake routine cleaning). This would provide valuable data regarding the impact of a HCSW on nurses cleaning responsibilities.

- Health Boards should take into consideration the estimated time to clean reusable communal patient equipment by nursing staff when staffing levels are being assessed for both current and new healthcare facilities to ensure all 'between cleans' and routine cleaning can be achieved without compromising patient care.

- Consideration should be given by health boards to using the HFS Time to Clean system for assessing the required domestic services input for healthcare facilities both new and current.

Appendix 1 - Information for Participants –

Time to Clean data collection Tuesday 13th & Wednesday 14th Sept 2016 GCU

Background

Following Senior Charge Nurse (SCN) focus groups HPS identified a need to quantify how much time on average, per shift, nursing staff and domestic staff spend on cleaning communal patient care equipment. SCNs anecdotally believed they were spending more and more time cleaning and less time on direct patient care. HPS detailed a project which would identify time spent on cleaning which has been approved and funded by the Scottish Government for completion of the project.

What can I expect today?

We have been allocated the 6 bed simulation lab for the 13th and the ITU and theatre areas for the 14th. Equipment appropriate to the areas has been placed in the rooms for us to undertake the data collection and we have detergent wipes provided to use for cleaning.

Participants will work in pairs to collect data. This will allow one participant to clean and the other to time the cleaning. We request that one clinical (nurse/domestic) participant works with a non-clinical (HC scientist/information officer/project/programme manager, etc). This allows our experienced colleagues to support our non-clinical colleagues undertake cleaning in the correct manner.

Data collection

The data to be collected is the time it takes to clean each piece of equipment. Timings should be marked beside the equipment name in the columns identified (timing 1 and timing 2) and will be anonymised. Each participant will be given an envelope with a number inside. We would ask that you write this number at the top of your timings column at the end of your data collection. This will allow us to analyse the data in more detail in relation to job role and not person specific.

Cleaning method

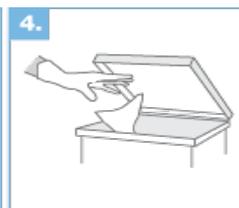Decontaminate equipment with disposable **detergent wipes**.
- Clean the piece of equipment from the top or furthest away point
- Use a one wipe, one surface, one direction method (see below)
- Discard disposable wipes into the healthcare waste receptacle.

2.	3.	4.
Remove one wipe from the bucket.	Working from clean to dirty, wipe in an 'S' shaped pattern, taking care not to go over the same area twice.	Change wipe if it becomes dry or soiled and discard. Let the surface air dry.

Name:.. Signed:...................................... Date:.....................

Appendix 2 – Data collection tool; general ward area

Equipment	Number of times cleaned per shift
Basins - reusable (cleaning)	
Bath (adult)	
Bath Mats	
Bath/shower stools/chairs	
Bedframe	
Bedpan Holders	
Bed cradles	
Bed tables	
Bed rails/bumpers	
Blood glucose machines and boxes	
Blood pressure cuffs	
Cardiac monitor	
Catheter stands	
Chairs (patient)	
Chairs (visitor)	
Commodes	
Computer keyboard/mouse	
Crutches	
Dressing trolley	
Drip stands	
Electric fans (Portable)	
Electrocardiograph ECG machine	
Feed (enteral) Pumps	
Footstools	
Fridge (drug)	
Fridges – specimen	
Hoists	
Hoist slings/straps	
Infusion pumps	
Light - overbed	
Linen buggies	
Linen trolleys	
Lockers/pods	
Mattress - specialist	
Mattress - standard	
Medicine trolley	
Nebuliser masks	
Nebuliser units	
Nurse call system	

Ophthalmoscope	
Oxygen flowmeter	
Oxygen masks/nasal prongs	
Oxygen - portable	
Phones	
Patientline	
Patient chart holder	
Patient height measurer	
Patient monitoring systems - e.g. criticare	
Patient transfer trolleys - theatre/general/x-ray	
Patient transfer boards - patslide	
Pillows	
Pulse oximeter	
Raised toilet seats	
Resuscitation Trolleys	
Scales (standing)	
Scales (sitting)	
Sharps tray	
Sharps trolley	
Showers	
Sphygmomanometer - electric	
Sphygmomanometer - manual	
Stethoscopes	
Suction machine (portable)	
Suction system/bottles	
Stools	
Tables - coffee	
Tables - dining	
Televisions	
Thermometer (mercury)	
Thermometer (Tympanic)	
Tourniquets	
Trolley - phlebotomy	
Ward tables/desks	
Washbasins - patient	
Waste bin (clinical)	
Wheelchairs - self propelling	
Wheelchairs - porter	
Working surfaces	
X-ray box	
Zimmer	
Other -	

Appendix 3 – Characteristics of included studies

Studies estimating current cleaning times

Authors (date)	Study design	Country	Population	Outcome
Saito et al, (2015)	Cross-Sectional Study	USA	144 healthcare workers, including 31 housekeepers and 34 registered nurses, across three general hospitals and two university teaching hospitals.	Observed frequency of cleaning and disinfecting tasks (recorded at five-minute intervals) as a proportion of shifts (% of total shifts) and observed time spent performing cleaning and disinfecting tasks per shift (min/shift).
Zoutman et al, (2015)	Cross-Sectional Study	Canada	50 senior managers responsible for environmental services/housekeeping across acute care hospitals.	Estimates of the time required to perform routine cleaning and terminal cleaning of private, semi-private and ward rooms.

Studies evaluating increased cleaning times

Authors (date)	Study design	Country	Population	Time-based intervention	Outcome
Wilson et al, (2011)	Randomised Cross-Over Study	UK	Two intensive care units.	Twice daily cleaning, in addition to usual once daily cleaning for three 2-month periods.	Statistically significant reduction in environmental methicillin-resistant *Staphylococcus aureus* (MRSA) per bed-area day from 14.6% to 9.1% ($p = 0.006$), sampled from five randomly selected sites around the bed areas, staff hands and communal sites.
Dancer et al, (2009)	Non-Randomised Cross-Over Study	UK	Two matched surgical wards.	An additional member of cleaning staff introduced for a period of six months.	Statistically significant reduction in levels of environmental contamination of 32.5% ($p < 0.0001$), by weekly sampling of ten hand-touch sites and a borderline statistically significant reduction in new MRSA infections of 26.6% ($p = 0.032$).
Rampling et al, (2001)	Interrupted Time Series	UK	One general surgical ward.	An increase in routine domestic cleaning time from 66.5 to 123.5 hours per week for a period of six months.	Reduction in patient acquisition of an outbreak strain of MRSA from 30 cases in the six months prior to the intervention to three cases over the following six months.

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