# Evaluating hygienic cleaning in health care settings: What you do not know can harm your patients

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Recent studies using direct covert observation or a fluorescent targeting method have consistently confirmed that most near patient surfaces are not being cleaned in accordance with existing hospital policies while other studies have confirmed that patients admitted to rooms previously occupied by patients with hospital pathogens have a substantially greater risk of acquiring the same pathogen than patients not occupying such rooms. These findings, in the context recent studies that have shown disinfection cleaning can be improved on average more than 100% over baseline, and that such improvement has been associated with a decrease in environmental contamination of high touch surfaces, support the benefit of decreasing environmental contamination of such surfaces. This review clarifies the differences between measuring cleanliness versus cleaning practices; describes and analyzes conventional and enhanced monitoring programs; addresses the critical aspects of evaluating disinfection hygiene in light of guidelines and standards; analyzes current hygienic practice monitoring tools; and recommends elements that should be included in an enhanced monitoring program.

***Key Words:*** Enhanced environmental hygiene monitoring; surface disinfection cleaning; health care process improvement; patient safety; health care-associated pathogen transmission; quality assurance.


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The medical and economic toll of infections with increasingly antibiotic resistant pathogens has continued to escalate. Whereas efforts to improve hand hygiene and isolation practices have been implemented to help mitigate this problem, recent studies have documented the limitation of such interventions.[1-4] Although active surveillance protocols and rigorous adherence to precautions may decrease methicillin-resistant *Staphylococcus aureus* (MRSA) transmission, in certain settings[5] such interventions have not decreased overall nosocomial infection rates in several northern European countries, which remain similar to rates in southern European countries and the United States,[6] and have not been shown to be consistently effective or necessary in this country.[7] It has now been well documented that a wide range of particularly environmentally resilient hospital-acquired infection (HAI) pathogens can be readily cultured from near patient surfaces.[8-10] Eight recent studies have now confirmed that patients occupying rooms previously occupied by patients with vancomycin-resistant *Enterococcus* (VRE),[11-15] MRSA,[13-16] *Clostridium difficile*,[17] and *Acinetobacter baumannii*[18] infection or colonization have on average a 73% increased risk of acquiring the same pathogen than patients not occupying such rooms (Fig 1). Over the past 4 years, 8 studies using direct covert observation or a fluorescent targeting method have confirmed that only 40% of near patient surfaces are being cleaned in accordance with existing hospital policies.[11,19-25] These findings, in the context of the fact that 11 studies have now shown that the thoroughness of disinfection cleaning can be improved to 82% (on average more than 100% over baseline)[11,21,22,26-33] and the fact that such improvement has been associated with an on average 68% decrease in environmental contamination of "high-risk objects,"[11,21,22,24,28,34] together support the likely benefit of decreasing environmental contamination of such surfaces. In addition, 5 studies have recently shown that improved routine disinfection cleaning practice is associated with an average 40% decrease in transmission of VRE,[11-15,28] MRSA,[15,34] and *A baumannii*.[18]

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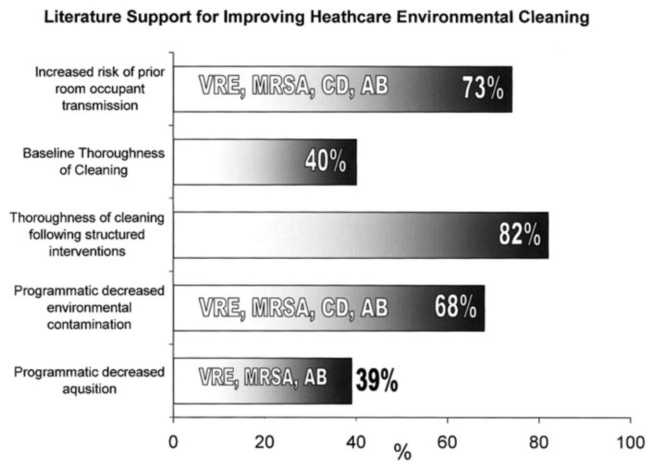


**Fig 1.** Summary of studies that provide support for improving heath care environmental cleaning practice.

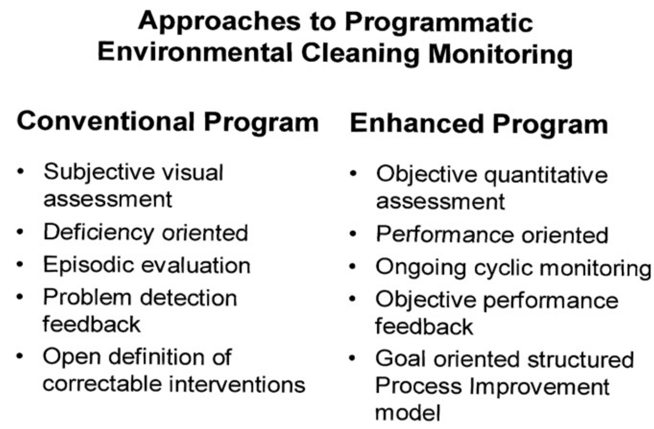


**Fig 2.** A comparison of the elements of conventional hygienic monitoring with enhanced programs.

## GUIDELINES AND STANDARDS

During the past 6 years, there has been a dramatic evolution of recommendations and standards as well as state laws related to improving environmental hygiene in health care settings. In 2003, the Centers for Disease Control and Prevention (CDC) Guidelines for Environmental Infection Control in Healthcare Facilities—Environmental Surfaces recommended that hospitals clean and disinfect "high-touch surfaces."[35] A subsequent CDC guideline strongly recommended (category 1B) that hospitals "monitor (ie, supervise and inspect) cleaning performance to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and likely to be touched by the patient and health care professionals."[36] As a consequence of these recommendations, the 2007 revised Center for Medicare and Medicaid Services Interpretative Guideline for its infection control standard now requires that the infection prevention and control program of hospitals "must include appropriate monitoring of housekeeping activities to ensure that the hospital maintains a sanitary environment."[37] These documents, as well as similar ones in Great Britain and Canada, reflect an evolving mandate that patient area environmental hygiene in health care settings be objectively analyzed and optimized.[38,39]

## EVALUATING ENVIRONMENTAL CLEANING PRACTICE

### Problem-oriented environmental monitoring

As a result of studies that linked environmental contamination with the transmission of *Staphylococcus aureus* in the late 1950s, attempts were made to use swab-based environmental culturing for *S aureus* as a means for evaluating low-level disinfection cleaning practice in many hospitals. Although the practice diminished in value as the prevalence of *S aureus* in HAIs decreased and the unreliability of sporadic poorly standardized environmental culturing became evident, environmental surface culturing continues to have a role in infection prevention practice. The CDC pointed to the lack of environmental standards for routine sampling but also identified its value if used properly for research or education.[35] The use of environmental cultures has greatly enhanced our understanding of the epidemiology of *C difficile* transmission[40,41] as well as MRSA[42] and VRE.[43,44] Such cultures have also been useful in evaluating the role of environmental contamination in outbreak settings involving *C difficile*,[45,46] *Acinetobacter*,[47] VRE,[11] MRSA,[48] and glycopeptide insensitive *S aureus*.[49] Although potentially useful, logistical challenges involved in the collection of a large enough number of cultures to permit proper epidemiologic analysis, the cost of data collection and specimen analysis (typically including pulse-field gel electroforesis or other strain identification process) as well as the intrinsic challenge of drawing epidemiologically sound conclusions from possibly erratic fluctuations in environmental contamination as a result of unknown confounding variables represent important challenges related to problem-oriented environmental monitoring. Given these issues, the possible short- and long-term benefits of such information make it prudent to weigh carefully the overall value of collecting such data.

### Conventional environmental cleaning monitoring

The ongoing evaluation and monitoring of cleaning interventions to reduce the risk of transmission of environmental pathogens through defined procedures have been elements of infection prevention and control practice in

# Approaches to Programmatic Hygienic Monitoring

## Conventional Program

### Advantages

An established model
Easily incorporated into general patient safety monitoring rounds
Rapid remedial action feasible

### Limitations

Inability to evaluate actual HP
Based only on negative outcome analysis
Limited generalizability of findings
Poor specificity and low sensitivity
Intrinsically subjective with a high potential for observer bias
Poor programatic specificity
Potential for observer bias
Only evaluates daily HP
Limited ability to support TJC standard EC.04.01.03.EP2
Limited ability to demonstrate compliance with CMS CoP 482.42
Benchmarking not feasible

## Enhanced Program

### Advantages

Direct evaluation of Environmental cleaning
Uses a standardized, consistent,objective and uniform system of monitoring
Provides regular and ongoing performance results to ES staff
Facilitates the monitoring of many data points to optimize performance analysis
Provides positive practice based feedback to ES staff
Allows for objective remedial interventions
Easily adaptable to existing PI modalities
Facilitates compliance with TJC standards
Facilitates compliance with CMS CoP
Intrinsic internal benchmarking
External benchmarking, reporting and recognition feasible

### Limitations

Requires new program implementation
Ongoing administrative support critical to success
Potential resistance to objective monitoring and reporting
While useful, the covert baseline evaluation may be difficult to implement effectively

Potential monitoring tool issues

**Fig 3.** A comparison of the advantages and limitations of conventional versus enhanced programmatic monitoring of EC process.

acute care hospitals for many years. Until recently, such evaluation has exclusively relied on visual assessment of the cleanliness of surfaces. Currently, 89% of a large sample of US acute care hospitals confirmed that they perform visual assessments of cleanliness during regular environment of care rounds as the primary means for evaluating cleaning practice in their hospitals.[50] The elements of what can be considered "conventional" monitoring of low-level disinfection or environmental cleaning (EC) are outlined in Fig 2. Traditionally, such rounds are performed on a regular basis and involve the infection preventionist (IP) and director of emergency services (ES) as well as an administrative representative from patient care services. Together, these individuals visit several patient care areas to monitor compliance with a range of safety practices and to assess visual cleanliness. The identified deficiencies, as they pertain to potential pathogen transmission issues, are reviewed and remedial activities approved by the infection control committee. Such assessment of EC, known as a "visual audit" in Great Britain, relies on the observation of visible soilage of surfaces by potentially infectious material or dust and dirt.[9] Such findings are assumed to represent practice failures by the individual or individuals directly responsible for "ensuring"[36] the microbial safety of the surface in question. Whereas conventional monitoring may identify sporadic gross lapses in cleaning practice as summarized in Fig 3, this practice has a number of limitations including the following:

- An inability to objectively assess actual EC practice;
- the reliance on episodic negative findings as a basis for remedial individual and programmatic interventions;
- placement of undue emphasis on the cleanliness of floors and walls, which have limited roles in pathogen transmission,[51,52] because of the ease with which gross contamination or dirt can be visually documented on these surfaces;
- with the exception of gross contamination by potentially infected material, a low sensitivity for defining what represents a microbiologically "dirty" surface;
- poor correlation with microbial contamination, namely, what appears to be clean may harbor substantial levels of microbial contamination[53,54];
- poor programmatic specificity, ie, what may appear to represent a lapse in EC may not be;
- intrinsically subjective with a high potential for observer bias;
- the direct involvement of ES management and patient care leadership in a monitoring system with low sensitivity and specificity, which may lead to inconsistent and potentially misdirected responses to what appear to be lapses in EC;
- an inability to evaluate other than daily EC practice;
- limited ability to support The Joint Commission (TJC) standard EC.04.01.03.EP2, which states that the institution must be able to demonstrate that it "uses the results of data analysis to identify opportunities to resolve environmental safety issues"[55];
- limited ability to demonstrate compliance with the Center for Medicare Services (CMS)[37] Conditions for Participation (CoP), section 482.42.;
- the need to utilize substantial leadership level personnel resources;
- a limited ability to evaluate more than a small sample of patient care areas on a frequent basis; and
- an inability to define and respond to institutional or interinstitutional standards of EC through benchmarking.

As an adjunct to such conventional monitoring activities, 78% of hospitals also analyze patient satisfaction surveys to evaluate EC.[50] Whereas such surveys may episodically identify gross lapses in EC, the very poor specificity and sensitivity of such surveys make it challenging to use them to evaluate overall practice within an institution.

## Enhanced EC monitoring

In response to an evolving understanding of the importance of the near-patient environment (also referred to as the "patient zone")[56] in the transmission of health care-associated pathogens (HAP) as well as studies that identified opportunities for improving EC,[57-59] an objective and substantially more structured approach to monitoring such activities has recently evolved. As currently practiced and summarized in Fig 2, the basic components of "Enhanced" EC monitoring encompasses the following elements:

- Uses an objective monitoring tool to evaluate the process of EC;
- is performance rather than deficiency oriented;
- is based on the development of an independently functioning structured monitoring program incorporating specific EC policy-based expectations and goals;
- relies on the repetitive monitoring of actual EC by trained, unbiased individuals on an ongoing basis; and
- is incorporated independently into the institution's ongoing quality improvement process through the infection control committee.

As summarized in Fig 3, the advantages of such an enhanced program include the following elements:

- Allows for the direct evaluation of the process of hygienic cleaning;
- incorporates a built-in standardization and uniformity of evaluation;

**Evaluating Patient Zone Environmental Hygiene**

| Method | Ease of Use | Identifies Pathogens | Useful for Individual Teaching | Directly Evaluates Cleaning | Published Use in Programatic Improvement |
|---|---|---|---|---|---|
| Covert Practice Observation | Low | No | Yes | Yes | 1 Hospital [11] |
| Swab cultures | High | Yes | Not Studied | Potentially | 1 Hospital [60] |
| Agar slide cultures | Good | Limited | Not Studied | Potentially | 1 Hospital [58] |
| Fluorescent gel | High | No | Yes | Yes | 49 Hospitals [22,26,32,33] |
| ATP system | High | No | Yes | Potentially | 2 Hospitals [20,74] |

**Fig 4.** Summary of the 5 methods used in evaluating environmental hygiene.

- incorporates ES staff education based on specific objectively evaluable expectations;
- facilitates the development of a program that has a high potential for identifying specific as well as systemic institutional programmatic issues that limit or adversely impact EC;
- allows for short cycle monitoring of ES staff performance with direct feedback to improve EC and documents the sustainability of improvements, once they have been achieved;
- has the potential for using positive performance achievement to reinforce good performance and the value of such performance in the context of the institution's objectively defined patient safety goals;
- has the ability to objectively identify and document individual EC oversights and the need for remedial action;
- represents a system easily adaptable to established process improvement (PI) modalities such as the Plan-Do-Act (PDA) cycle, Positive Deviance, Six sigma, and others;
- facilitates compliance with TJC standards;
- facilitates compliance with CMS CoP mandates;
- provides objective performance information for internal and interinstitutional benchmarking;
- allows for use of the same monitoring systems for one-on-one and small group, hands-on, education; and
- facilitates the use of the same process improvement system over a range of practices and venues within the hospital and potentially other health care settings.

It is beyond the scope of the current discussion to provide a complete cost/benefit analysis of these programs, but, in light of current financial constraints, one additional advantage worth noting is that, overall in a large study of 36 hospitals, the program appears to be resource neutral, with less than a 1% increase in ES resources.[26]

Although enhanced EC monitoring has a range of advantages, several limitations to its use have so far been identified (Fig 3), including the following:

- The need to develop and implement a new program often in a setting of limited IPs' resources;
- the critical need for administrative support for successful implementation and maintenance of the ongoing program;
- the need to maintain a positive, blameless, close working relationship between IP and ES leadership;
- complexities associated with the need (or at least value) of covertly collecting a preintervention assessment of EC to optimize subsequent data analysis and education; and
- potential monitoring tool issues.

Whereas objective monitoring of practice has evolved as the cornerstone of enhanced programs, the incorporation of patient survey results and problem-based interventions constitute important components of the overall program.

## ANALYSIS OF HYGIENIC PRACTICE MONITORING TOOLS

Whereas the advantages of enhanced EC monitoring in contrast to the limitations of conventional monitoring provide support for hospitals implementing programs to objectively monitor EC, the advantages and limitations of various monitoring approaches and tools must also be considered. As summarized in Fig 4 and noted below, there are currently 5 systems that may be potentially useful for enhanced programmatic monitoring.

### Covert practice observation

Covertly monitoring EC can provide an objective assessment of individual ES staff performance and compliance with cleaning protocols. This approach has been used to evaluate and improve environmental hygiene related to VRE transmission in one hospital. Hayden et al utilized a trained research observer to covertly monitor daily disinfection cleaning of 8 high-risk objects in an intensive care unit during the 2-month baseline portion of the study.[11] Thoroughness of disinfection cleaning was then monitored following educational interventions along with immediate feedback during cleaning by the research staff. As a result, the thoroughness of environmental cleaning improved from 48% to 87%, and VRE transmission decreased significantly. Although clearly effective, logistical issues related to maintaining such a program outside a research setting could limit adaptation of this form of EC monitoring as a process improvement intervention.

## Swab cultures

As noted previously, swab cultures of surfaces have been utilized in a range of clinical settings to study the environmental epidemiology of many HAPs as well as in the evaluation of outbreaks related to specific organisms. Whereas several outbreak intervention studies have attributed favorable outcomes to improved EC in association with decreased environmental contamination by target organisms, none of the reports specifically note whether serial environmental culture results were actually used to provide EC practice feedback to the ES staff. In a single study evaluating the impact of various programmatic and educational interventions to improve disinfection cleaning of intensive care unit keyboards, the confirmation of VRE contamination was used effectively to improve cleaning performance.[27] Broth-enriched swab cultures to quantify bacterial contamination of patient area surfaces have been used in a single study, along with Adeneinetriphosphate (ATP) results, to provide direct feedback to ES staff.[60] In this study, overall ATP scores improved following feedback, but the impact on actual bacterial contamination was not reported. Although swab cultures are easy to use, the cost of processing, including isolate identification (if needed), the delay in analyzing results, the need to develop baseline values for comparisons, and the limited feasibility of monitoring multiple surfaces in multiple patient rooms as part of an ongoing EC monitoring program in other than a research setting may be issues that could limit the broad application of such a system for evaluating EC practice.

## Agar slide cultures

Agar-coated glass slides with finger holds were developed to simplify quantitative cultures of liquids. The slides have been adopted for use in environmental surface monitoring to assess the limitations of visual audits of EC.[58] Subsequently, several studies have used agar-coated slide systems to evaluate cleaning practice as well as to compare cleaning regimens[61,62] by quantifying aerobic colony counts (ACCs) per square centimeter[61,63] as well as to compare cleaning regimens.[61,63] Although 2 studies[61,64] measured ACCs before and after cleaning, no studies to date have evaluated the actual thoroughness of cleaning of the same objects to determine whether objects with relatively high ACCs surfaces were either poorly cleaned or actually overlooked by the ES staff. Although some difficulties have been encountered in utilizing the agar contact culturing on other than large, flat surfaces, they potentially provide an easy method for quantifying viable microbial surface contamination. There is a need, similar to that noted above for swab cultures, to develop baseline values for accurate interpretation of study findings. Agar-coated slides and dedicated incubation systems are commercially available.

## Fluorescent gel

A monitoring system using an essentially invisible transparent gel that dries on surfaces following application and resists abrasion was developed specifically to evaluate the thoroughness of environmental cleaning in health care settings. Following the identification of opportunities to improve cleaning in 23 hospitals,[59] use of the system within a structured process improvement program led to the thoroughness of disinfection cleaning improving from 48% to 77% in 36 study hospitals.[26] The same system was subsequently used by Goodman et al to evaluate EC in 10 intensive care units in a single hospital. Following performance feedback, the thoroughness of cleaning improved from 44% to 71%.[22] Further analysis of this study has confirmed that improved EC was associated with decreased MRSA and VRE transmission.[15] Most recently, the same monitoring tool and PI system were used in coordination with group performance benchmarking and facilitated program analysis in 12 hospitals within a single health care system.[33] Average thoroughness of terminal room disinfection cleaning improved significantly with 11 of the 12 study hospitals achieving sustained rates of improved cleaning to 85% or above. However, as noted in Fig 4, the fluorescent gel system cannot be used to measure actual cleanliness of surfaces but only thoroughness of cleaning practice. For this reason, the system must be used in conjunction with environmental cultures for problem-oriented hygienic monitoring as discussed previously. The system is commercially available for use in acute care hospitals on a subscription basis.

## ATP bioluminescence

The measurement of organic ATP on surfaces using a luciferase assay and luminometer has been used to evaluate cleanliness of food preparation surfaces for more than 30 years.[65] A specialized swab is used to sample a standardized surface area, which is then analyzed using a portable handheld luminometer. The amount of ATP, both microbial and nonmicrobial, is quantified and expressed as relative light units (RLU). Although readout scales vary more than 10-fold[66] and sensitivity varies between commercially available systems,[67] very low readings are typically associated with low ACCs on food preparation surfaces.[68] Very high RLU readings may represent either the viable bioburden, organic debris including dead bacteria, or a combination of both. Indeed, a recent study has found that debris accounts for approximately 66% of ATP on surfaces.[58] The clinical relevance of this issue was clarified by Griffith et al[69] as well as in a study of ambient contamination of surfaces potentially touched following handwashing based on proposed cleanliness standards.[70] A mean ATP RLU reading of 3707 was found on the 618 surfaces tested, with 89% failing to meet the <500 RLU level in a proposed standard. In contrast, only 27% (168/618) of the same surfaces had ACCs above the proposed ACC cleanliness standard of <2.5 (colony-forming units)/cm$^2$. In 2007, a study was undertaken by the National Health Service to evaluate the potential role the ATP tool in evaluating EC in hospitals.[54] While noting limitations in the ATP system, the authors concluded that the tool could potentially be used effectively for education of ES staff, although an evaluation of such use was not part of the study design. Although it is likely that part of the lack of correlation between ATP readings and ACCs noted in the preceding studies relates to the fact that ATP systems measure organic debris as well as viable bacterial counts, several studies have noted additional environmental factors that may increase or decrease ATP readings, including residual detergent and disinfectants that may either increase of decrease RLU readings,[71] plasticisers found in microfiber cloths,[72] ammonium compounds found in laundry chemistries,[72] and surfaces in poor condition.[58] Additional logistical limitations of the ATP tool include the need to develop baseline values, to evaluate a surface within a few minutes of cleaning,[70] and the inability to use the system when a bleach-based disinfectant is being used for cleaning.[60] Boyce et al[60] used preintervention ACCs along with ATP results in education of the ES. Subsequently, individual housekeepers were asked to clean a room that they were told would be monitored by the ATP system following cleaning. As a result of these interventions, the authors documented significant improvement in the daily cleaning

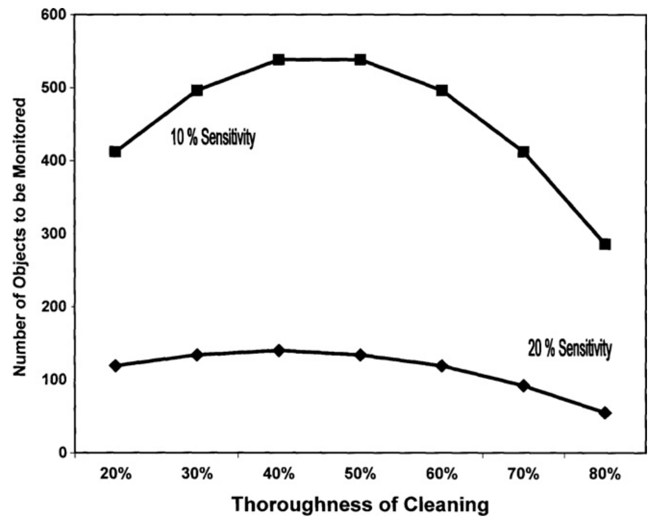


**Fig 5.** The relationship between the number of high-risk objects evaluated and the ability to detect significant change in the thoroughness of cleaning.

of 4 near-patient surfaces as measured by the ATP system.[60] Luminometers and specimen collection swabs are available from several commercial sources.

## Cleanliness versus cleaning practice

When choosing an evaluation method for use in an enhanced program of EC monitoring, it is important to consider whether the cleaning process or the actual cleanliness of surfaces is to be monitored. Observation and fluorescent gel systems directly evaluate the *cleaning process*, but the swab or slide culture as well as ATP bioluminescence systems measure *cleanliness*. Although the latter 3 systems could be used to monitor hygienic cleaning practice, to do so necessitates monitoring the surface to be evaluated both before and after cleaning because a proportion of surfaces may actually be clean prior to monitoring as a result of their being cleaned previously and not yet contaminated at the time of monitoring.[60,73] Furthermore, the intrinsically low concentration of most major HAPs on surfaces limits the use of pathogen-specific monitoring as a means for assessing actual practice.[62,73,74] Although it is conceptually possible to effectively monitor hygienic cleaning with the latter systems, defining the level of microbial contamination that actually correlates with good or poor EC in a clinical setting has yet to be defined objectively.

# GENERAL ELEMENTS OF ENHANCED MONITORING PROGRAMS

The most critical aspect of implementing an enhanced hygienic monitoring program relates to the need for the program to be developed from its inception as a joint ''blame-free'' undertaking between the infection prevention team and the ES leadership. The program must be based on the mutual understanding of the need to optimize patient and health care personnel environmental pathogen/contaminant transmission safety through mutually developed policies and procedures as well as structured, objective performance monitoring. Whereas the CMS standard states that ''monitoring housekeeping activities'' represents a defined component of the responsibilities of ''infection control,''[37] the development of a mutually supportive approach to maximizing patient and health care personnel safety through optimized EC has been critical to programmatic success.[26,33] CMS sees infection prevention and control more programmatically, ie, it is everyone's responsibility. The program in this case needs ownership by major stakeholders, eg, environmental services and infection prevention specialists to be a continuous performance improvement process, with measures that can be appreciated by all participants.

Logistical issues must also be considered as part of planning for the implementation of an enhanced program. Before a decision has been made to use one of the approaches to objectively monitor cleaning practice, it is important to determine the number of data points that must be monitored on a regular basis to accurately assess practice. Although it would be ideal to be able to identify small fluctuations in practice accurately, such an approach would be highly labor intensive. As noted in Fig 5, the sample size needed to accurately detect a 10% variation in cleaning practice within the range of baseline cleaning thoroughness found by the Healthcare Environmental Hygiene Study Group hospitals (20%-80%) is quite substantial.[75] In contrast, monitoring of only 50 to 120 surfaces would be needed to accurately detect a 20% change in practice. Given the range of patient zone objects monitored in the published reports of hygienic practice, which vary from 8[11] to 15,[22] a reasonably accurate determination of thoroughness of cleaning practice could be determined by monitoring 10 to 15 representative patient rooms per evaluation cycle depending on the estimated overall thoroughness of cleaning anticipated.

In addition, it is important, while considering the benefits of enhanced programmatic monitoring of EC, not to overlook the intrinsic importance of standardizing and optimizing cleaning processes, equipment, and disinfectant/cleaning system use to realize the full benefits of more thorough cleaning of high-risk surfaces in the patient zone.

## SUMMARY

Although basic monitoring of EC using visual assessment can identify gross lapses in practice, it has recently become evident that opportunities to improve the thoroughness of patient zone surface cleaning exist within a range of health care settings with only 34% of surfaces in 8 different health care settings being cleaned according to policy.[68] In the context of careful epidemiologic studies that have confirmed a substantially increased risk of acquiring HAPs from prior room occupants and the clear documentation that thoroughness of environmental hygiene can be objectively evaluated and improved through structured interventions and that improved cleaning of high-risk surfaces both decreases environmental contamination and patient acquisition of HAPs, it would appear that there is clear support for hospitals and other health care facilities to consider the importance of optimizing EC in the patient zone. Although the implementation of the type of enhanced hygienic monitoring program outlined above will facilitate compliance with TJC and CMS standards, it is also important to note that such programs meet the specifications of the Department of Health and Human Services Action Plan to Prevent Healthcare Associated Infections (June 2009), which states the following: ''Standardized methods (ie, performance methods) that are feasible, valid, and reliable'' should be used ''for measuring and reporting compliance with broad-based HAI prevention practices that must be practiced consistently by a large number of health care personnel.''[76] Carrying out such a systematic program with measurable achievements and goals can receive deserved visibility by being included in the chief executive officer and Board of Trustee's dashboard on a quarterly basis. Given the increased attention by Department of Health and Human Services to patient satisfaction surveys, now that reimbursement depends on such reporting, it is likely that future CMS reimbursement will depend on actual performance. Furthermore, in this context, patient perception of cleanliness takes on another dimension and level of importance to organizations' leadership. In view of the above considerations, it is highly likely that enhanced environmental monitoring programs will enable the organization to provide measurable, objective data to support their claims of providing a clean and safe environment for patients, their families, and health care personnel.

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