Journal of Hospital Infection 91 (2015) 166–170

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

The adenosine triphosphate method as a quality control tool to assess 'cleanliness' of frequently touched hospital surfaces

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ARTICLE INFO

Article history:
Received 11 March 2015
Accepted 12 June 2015
Available online 2 July 2015

Keywords:
Adenosine triphosphate
Education
Hospital cleaning
Visual inspection

SUMMARY

Background: The adenosine triphosphate (ATP) method is widely accepted as a quality control method to complement visual assessment, in the specifications of requirements, when purchasing cleaning contractors in Swedish hospitals.

Aim: To examine whether the amount of biological load, as measured by ATP on frequently touched near-patient surfaces, had been reduced after an intervention; to evaluate the correlation between visual assessment and ATP levels on the same surfaces; to identify aspects of the performance of the ATP method as a tool in evaluating hospital cleanliness.

Methods: A prospective intervention study in three phases was carried out in a medical ward and an intensive care unit (ICU) at a regional hospital in mid-Sweden between 2012 and 2013. Existing cleaning procedures were defined and baseline tests were sampled by visual inspection and ATP measurements of ten frequently touched surfaces in patients' rooms before and after intervention. The intervention consisted of educating nursing staff about the importance of hospital cleaning and direct feedback of ATP levels before and after cleaning.

Findings: The mixed model showed a significant decrease in ATP levels after the intervention ($P < 0.001$). Relative light unit values were lower in the ICU. Cleanliness as judged by visual assessments improved. In the logistic regression analysis, there was a significant association between visual assessments and ATP levels.

Conclusion: Direct feedback of ATP levels, together with education and introduction of written cleaning protocols, were effective tools to improve cleanliness. Visual assessment correlated with the level of ATP but the correlation was not absolute. The ATP method could serve as an educational tool for staff, but is not enough to assess hospital cleanliness in general as only a limited part of a large area is covered.

Introduction

Contaminated surfaces in healthcare settings contribute to transmission of pathogens and improved surface cleaning reduces healthcare-associated infections.[1,2] Many studies report that cleaning interventions, including education, development

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http://dx.doi.org/10.1016/j.jhin.2015.06.011
0195-6701/

of cleaning protocols or checklists and daily feedback, improve effectiveness of cleaning and disinfection practices. There is no international standard to objectively assess hospital cleanliness.[3,4] Visual assessment in INSTA800 is the current Swedish standard method to evaluate cleaning. INSTA800 is a Nordic standard originally developed for assessing cleaning in office environments (www.SIS.se). Since visual assessment is regarded as a poor indicator of cleaning efficacy, the adenosine triphosphate (ATP) method, widely used in the food processing industry, is used in Sweden to complement visual assessment for monitoring hospital cleanliness. It is now a widely accepted quality control standard within cleaning specifications required of hospital cleaning contractors.

In this study we examined whether the biological load, as measured by ATP on frequently touched near-patient surfaces, may be reduced through enhanced cleaning routines, education and feedback to the staff. In addition we investigated the correlation between visual assessment of cleanliness and ATP levels on the same surfaces. The overall aim was to point at some aspects of the performance and pitfalls of the ATP method as a tool in evaluating cleanliness of frequently touched surfaces in a Swedish hospital.

Methods

Setting

This study was carried out in 2012—2013 at a regional hospital in mid-Sweden. The hospital is operated by a private healthcare provider (Aleris AB). It serves a population of 65,000 inhabitants and has 76 beds allocated to three medical wards, one surgical/orthopaedic ward, and one intensive care unit (ICU). There are three outpatient clinics. One medical ward and the ICU were selected for this study. The choice of wards was based on the motivation among the staff to participate. No informed consent from patients was necessary. The medical ward had 18 beds distributed in six single rooms and six double rooms. The double rooms and two of the single rooms shared bathrooms and the two single rooms had en-suite bathrooms. The ward was staffed daily by three registered nurses and five nursing assistants. Two senior and two junior doctors were present in the wards daily during weekdays. The average length of stay was six days; bed occupancy was 120%. Patients were generally elderly, and hospitalized for a variety of internal medicine disorders. The ICU had four beds, two located in one room and two in single rooms. It had one toilet and one shower, but these were basically never used by patients. One registered nurse and two nursing assistants staffed the ICU daily during weekdays. The ICU was the responsibility of one anaesthesiologist. The average length of stay was two days; bed occupancy was 50—75%.

Cleaning routines

Daily as well as post-discharge cleaning of floors and bathroom surfaces was outsourced to a cleaning company (Coor Service Management, Solna, Sweden). All other surfaces were cleaned by the nursing staff, post discharge, as well as during patient stay. Nursing staff also managed any acute spillages. There were no written cleaning instructions and the nursing staff had no formal training in how to clean hospital surfaces. A surface disinfectant with 70% propanol and a tenside (Dax Surface Disinfection Plus®, CCS Healthcare AB, Dalarna, Sweden) poured on disposable wipes was used for post-discharge cleaning of all frequently touched surfaces. In the ICU it was also used for cleaning near-patient sites during the patient stay; this cleaning was performed approximately every other day. In the medical ward, either water with a detergent or an alcoholic hand rub/alcohol surface disinfectant was used, and surfaces were cleaned once a week. In both wards one wipe was used per patient area and then disposed of.

Study design

This study was designed as a prospective, controlled intervention study in three phases: the observation phase, the intervention phase and the follow-up phase. The observation phase lasted one month (December 10th, 2012 to January 1st, 2013). Other than the chief nurses, staff were not informed about the project during this phase. During the intervention phase (January 8th to January 18th, 2013), the project was presented to the staff. They were educated by the authors about healthcare-associated infections, the importance of cleaning hospital surfaces to prevent cross-transmission between patients, and how to perform cleaning according to the national policy document for cleaning hospital surfaces published by the Swedish Association of Infection Control (www.SFVH.se). The authors assisted the wards to develop a written cleaning protocol, which was approved by the infection control department of the county. It included daily cleaning of near-patient, frequently touched surfaces directly after morning toilette. The surfaces were cleaned with a disinfectant consisting of 70% isopropanol and a tenside liberally poured on to a disposable wipe for single use or a disposable microfibre cloth. Staff were instructed to rub surfaces until visibly clean. During the follow-up phase (January 28th to February 18th, 2013), the new cleaning procedure continued and the staff received daily feedback of the measured relative light unit (RLU) value of each test surface, which was written on a whiteboard in each ward.

Test surfaces

In both wards, 10 surfaces judged to be frequently touched by the hands of staff and patients were selected as test surfaces. Six of 10 surfaces were cleaned by the staff and were referred to as 'intervention surfaces'. In the medical ward the six intervention surfaces were from each of the 18 patients' beds and close surroundings. In the ICU the six intervention surfaces were from the four patients' areas. The remaining four of the 10 surfaces were cleaned by the external contractor and were called 'control surfaces'. The 'control' surfaces were cleaned in accordance with an external protocol, and the staff employed by the contractor did not receive training or direct feedback during the study. Test and control surfaces are presented in Tables I and II.

Sampling and test methods

A protocol for rotating sampling was developed comprising 20 test surfaces per day in the medical ward and 10 test surfaces per day in the ICU. On every occasion, an area of 100 cm^2 was sampled on the same site of each test surface. When the