



# Hand hygiene in intensive care units: a matter of time?

J.T. Stahmeyer<sup>a,\*</sup>, B. Lutze<sup>b,c</sup>, T. von Lengerke<sup>b</sup>, I.F. Chaberny<sup>c,d</sup>, C. Krauth<sup>a</sup>

<sup>a</sup> Hannover Medical School, Institute for Epidemiology, Social Medicine and Health Systems Research, Hannover, Germany

<sup>b</sup> Hannover Medical School, Medical Psychology Unit, Hannover, Germany

<sup>c</sup> Leipzig University Hospital, Institute of Hygiene/Hospital Epidemiology, Leipzig, Germany

<sup>d</sup> Hannover Medical School, Institute for Medical Microbiology and Hospital Epidemiology, Hannover, Germany

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## SUMMARY

**Background:** Healthcare-associated infections are a frequent threat to patient safety and cause significant disease burden. The most important single preventive measure is hand hygiene (HH). Barriers to adherence with HH recommendations include structural aspects, knowledge gaps, and organizational issues, especially a lack of time in daily routine.

**Aim:** To determine the number of hand hygiene opportunities (HHOs), compliance rates, and time spent on hand hygiene in intensive care units (ICUs).

**Methods:** We conducted an observational study in two ICUs to determine the average number of HHOs per patient. Documentation was based on the World Health Organization concept of 'five moments for hand hygiene'. HHOs were collected in 12 patient rooms for 12 h each.

**Findings:** On average, 134 (internal ICU) and 182 (surgical ICU) HHOs per patient were observed during the 12 h observation period. Overall HH compliance was 42.6%. Considering additional HHOs during the night shift, we estimated 218 (internal ICU) and 271 (surgical ICU) HHOs per patient-day. The average duration of hand disinfection was 7.6 s. The time spent on HH was 8.3 (internal ICU) and 11.1 (surgical ICU) min during the day shift for each patient for all healthcare workers (nurses: 6.9 min in the internal ICU and 8.3 min in the surgical ICU). If nurses fully complied with guidelines, 58.2 (internal ICU) and 69.8 (surgical ICU) min would be spent on HH for each patient during the day shift.

**Conclusion:** Complying with guidelines is time-consuming. Sufficient time for HH should be considered in staff planning.

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## Introduction

Healthcare-associated infections (HCAIs) are a major threat to patient safety, causing significant disease burdens.<sup>1</sup> Approximately five million HCAIs are estimated to occur in

acute care hospitals in Europe annually, inducing 25 million extra days of hospital stay.<sup>2</sup> On average, the length of stay in an intensive care unit (ICU) is prolonged by 5.3 days if patients acquire an HCAI.<sup>3</sup> Two German studies calculated additional costs per patient of €22,905 for surgical site infections following sternotomy, and €17,282 for meticillin-resistant *Staphylococcus aureus* (MRSA) pneumonia.<sup>4,5</sup> The total burden of HCAIs amounts to €13–24 billion in Europe, with their overall prevalence in acute care hospitals estimated at 6%.<sup>2,6</sup> Highest HCAI rates pertain to intensive care units (ICUs), where 19.5% of patients had at least one HCAI, compared with

\* Corresponding author. Address: Medizinische Hochschule Hannover, Institut für Epidemiologie, Sozialmedizin und Gesundheitssystemforschung, Carl-Neuberg-Str. 1, Hannover, 30626, Germany. Tel.: +49 511 5324449; fax: +49 511 5324449.

E-mail address: [Stahmeyer.Jona@mh-hannover.de](mailto:Stahmeyer.Jona@mh-hannover.de) (J.T. Stahmeyer).

5.2% for other specialties.<sup>6</sup> In Germany, 5.1% of hospital patients suffer from HCAI. Again, highest rates pertain to ICUs (18.6%).<sup>7</sup> Estimates assume that annually, 20,000–30,000 deaths are attributable to HCAs in Germany.<sup>8</sup>

The single most important measure to prevent HCAs is hand hygiene (HH).<sup>9,10</sup> According to the World Health Organization (WHO) multimodal 'clean care is safer care' strategy and the 'five moments for hand hygiene' concept, HH should be performed: (1) before touching a patient, (2) before aseptic procedures, (3) after body fluid exposure risk, (4) after touching a patient, and (5) after touching patient surroundings.<sup>2,11</sup> All parts of the hand should be covered, and disinfection should take between 20 and 30 s (German guidelines recommend 30 s, consistent with the European Standard EN 1500).<sup>12,13</sup> An international study on the WHO strategy showed a significant increase in HH compliance (HHC) from 51% to 67.2%.<sup>1</sup> Largest increases pertained to surgical (35.9–71.4%) and internal medicine wards (10.9–85.5%). Compliance was higher in nurses (54.9–71.5%) than physicians (43.7–60.1%), and highest after body fluid exposure (76.1–86.9%).<sup>1</sup> The German campaign ('Aktion Saubere Hände', ASH) was started in 2008 based on the WHO concept, and since 2010 more than 700 healthcare institutions have actively participated. Baseline data had shown a compliance rate of 60.9%.<sup>14</sup> In 2014 and 2015, HHC in ICUs was 74% and 73%, respectively.<sup>15,16</sup>

Several factors have been identified as impeding HHC, including organizational factors such as patient care intensity, workload, and lack of time.<sup>2,10</sup> However, there is little information on time spent on HH. One study analysed contact rates between healthcare workers and patients in a general ICU of a large UK teaching hospital.<sup>17</sup> Patient contacts were classified as 'direct' (e.g. contact with body fluids) or 'indirect' (e.g. touching equipment within patient's bed space). An average of 350 daily contacts (159 direct and 191 indirect) per patient were estimated. Observed HH compliance rates were poor (direct contacts: 43%; indirect: 12.2%). The authors concluded that 3–4 h per day would be needed per patient if HH was performed at all times, and that HH is an important but time-consuming task which should be considered in planning staff.<sup>17</sup> Another study analysed HHOs for nurses and doctors in a large university teaching hospital located in Sydney, Australia. Frequency was estimated at an average of 67 HHOs per patient per day in medical wards, and 73 HHOs in surgical wards. Nurses (compliance: 76%) had about three times more HHOs than physicians (52%), and HHC was highest after patient contact and body fluid exposure risk.<sup>18</sup>

Average time for nursing activities for different patient types in an internal ICU (based on procedures such as dressing changes, drugs application, washing, and control of catheters) has been estimated to vary between 5 h 50 min and 7 h 49 min per shift in Germany.<sup>19</sup> An accompanying survey showed an average nurse:patient ratio of 1:2.47 in tertiary referral hospitals. The authors concluded that adequate patient care in compliance with HH guidelines is not possible considering current nurse:patient ratios. Thus, an increase in nurse:patient ratios in ICUs up to 1:1 has been called for.<sup>19</sup>

The aim of this study was to determine the average number of HHOs per patient during day shifts in ICUs, and the actual time spent on hand disinfections. Data were extrapolated to reflect the total daily number of HHOs, and to estimate the time needed for HH assuming full compliance.

## Methods

### Setting

The study was conducted at Hannover Medical School, a tertiary referral hospital with 1518 beds in Hannover, Germany. In January 2014, we observed HHOs and HHC in one internal and one surgical ICU (14 and 21 beds, and 750 and 1900 patients per annum, respectively) within the PSYGIENE project (PSYchologically optimized hand hyGIENE promotion), a cluster-randomized controlled trial analysing tailored interventions to increase compliance on ICU, of which the present study was a counterpart.<sup>20</sup>

Observations were carried out in six patient rooms in each ward from 07:00 to 19:00, resulting in 12 observation days in order to record all HHOs for a respective patient. As two patients were transferred to another ward, observers switched to another patient/room. This resulted in 144 h of total observation time consisting of a total of 14 patients. Passive observers were seated in the corner of the room in order not to disturb workflows.

### Ethics

As part of the PSYGIENE trial (German Clinical Trials Register no. DRKS00010960), this study was approved by the ethics committee of Hannover Medical School (no. 1434–2012) and authorized by the works council of Hannover Medical School.

### Measures

Counting of HHOs and HHC documentation was based on the WHO 'five moments of hand hygiene' concept.<sup>2,11</sup> We recorded the professional group responsible for the HHO (nurse, doctor, or other, e.g. physiotherapist or transportation staff), time of day of HHO, HHC, and unneeded hand disinfections. Additionally, by stopwatch we measured the duration of 300 hand disinfections (about every third of each hand disinfection performed, for merely practical reasons of adequate documentation given limited resources). Observations were conducted by trained hygiene specialists with extensive experience in direct observation of hand hygiene compliance according to WHO.<sup>21</sup> These educated nurses have actively participated in the German ASH campaign and have conducted observations for several years.

The average number of HHOs per patient in the day shift was calculated by dividing all HHOs by the number of observation days (12 days). HH was defined as compliant if healthcare workers performed alcohol-based hand rub or handwashing with soap and water. HHC was calculated by dividing the performed hand disinfections by the number of HHOs. Analyses were stratified for ICU type and professional group. Compliance rates were analysed according to HHOs ('five moments' concept). The calculation of HHOs in the night shift (19:00–07:00) was extrapolated to analyse HHOs per patient-day. Calculations are based on the day:night ratio found in a study estimating that 38.1% (internal ward) and 32.5% (surgical ward) of all daily HHOs were performed during the night shift.<sup>18</sup>

### Statistical analyses

Data were analysed with IBM® SPSS® Statistics Version 23.0. Differences in frequency distribution data were analysed using

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