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## **Infection control in Indonesian Hospitals**

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Chapter

5

**A TOOL TO ASSESS KNOWLEDGE, ATTITUDE AND  
BEHAVIOUR OF INDONESIAN HEALTHCARE  
WORKERS WITH RESPECT TO INFECTION  
CONTROL**

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*Submitted for publication*

## ABSTRACT

Improvement of the behaviour of healthcare workers is an important aspect of infection control in healthcare. The biggest challenge is not the lack of effective precautions and evidence-based guidelines, but the fact that healthcare workers apply these measures insufficiently. Interventions to improve adherence to infection control measures should incorporate an evaluation of barriers to and facilitators of change. We investigated knowledge, attitude and behaviour toward infection control in two teaching hospitals on the island of Java by means of a questionnaire to identify problem areas, barriers and facilitators.

More than half of the healthcare workers of the participating departments completed the questionnaire. Of the 1036 respondents (44% nurses, 37% physicians and 19% assistant nurses), 34% were vaccinated against hepatitis B, 77% had experienced needle stick accidents and 93% had been instructed about infection control. The mean of the correct answers to the knowledge questions was 44%; of the answers to the attitude questions 67% were in agreement with the correct attitude; obstacles to compliance with infection control guidelines were perceived in 30% of the questions and the mean self-reported compliance was 63%. Safe handling of sharps, hand hygiene and the use of personal protective equipment were identified as the most important aspects for interventions.

Significant positive correlations were found between knowledge, attitude, self-reported behaviour and perceived obstacles. The greater the healthcare workers' knowledge, the more they showed the correct attitude, the more obstacles they perceived and the better their self-reported behaviour.

The questionnaire in conjunction with site visits and interviews was a valuable tool to identify trouble spots in the hospitals and to determine barriers to and facilitators of change that should be taken into account when planning interventions. Successful interventions should cover hospital management, the infection control organisation, as well as the healthcare workers on the wards.

## **INTRODUCTION**

Despite all the efforts of infection control professionals, infections remain a major unwanted side effect of healthcare, often causing serious harm to patients. The statement of Johan Peter Frank, director of the General Hospital in Vienna around 1800, does not belong only in the past: 'Can there be a greater contradiction than a hospital disease: an evil that one acquires where one hopes to loose one's own disease?'. The biggest problem is not the lack of effective precautions and evidence-based guidelines, but the fact that healthcare workers apply these measures insufficiently. Improving this negligent behaviour of healthcare workers is a main aspect of infection control in healthcare.

Human behaviour is a complex process determined among others by knowledge about and attitude towards the behaviour, perceived social standards and self-efficacy.<sup>1 2</sup> A first step in the development of interventions aimed at improving adherence to infection control measures by changing behaviour is a careful evaluation of barriers to and facilitators of change. In the knowledge and attitude of individual healthcare workers both should be assessed. In this respect, self-reported behaviour is important too: it is difficult to convince someone who has a very favourable opinion about his own behaviour that he should change his behaviour. Several studies have investigated the knowledge, attitude and behaviour of healthcare workers in relation to infection control.<sup>3-10</sup> All studies except one come from high-income countries.<sup>7</sup>

We investigated the knowledge, attitude and self-reported behaviour with respect to infection control of physicians, nurses and assistant nurses in two teaching hospitals on the island of Java, Indonesia, by means of a questionnaire to detect problem areas, barriers and facilitators. We hypothesised that, firstly, the better the knowledge of healthcare workers about infection control, the more problems they will perceive in complying with infection control guidelines; secondly, that healthcare workers with better knowledge about infection control will be more realistic about their own behaviour and thus report worse compliance than those with less knowledge; finally, that knowledge and attitude will show strong positive correlations.

## **METHODS**

### **Setting**

The study was conducted in two general hospitals on the Indonesian island of Java: Dr. Soetomo hospital in Surabaya and Dr. Kariadi hospital in Semarang.

Both hospitals are government hospitals that provide subsidised services for lower socioeconomic classes. Up to 86% of patients have no health insurance and have to pay cash for their hospital stay, medicines, laboratory tests and dressings.<sup>11 12</sup> In Surabaya, a mean of 41,095 patients was admitted in 2003-2004 and in Semarang 21,451. Both hospitals provide nursing and medical care in class I, II and III. The highest standard of comfort is provided in the more expensive class I, the lowest in class III. In this study, healthcare workers from the Departments of Internal Medicine, Surgery, Obstetrics & Gynaecology, Paediatrics and Intensive Care participated and in Dr. Kariadi hospital the class department also participated.

In both hospitals, an infection control committee and an infection control team have been introduced. There are no infection control practitioners who can dedicate themselves full-time to infection control tasks. Responsibility for infection control on

nursing wards lies with senior nurses, who have had some infection control training and are called 'infection control nurses'. Their position is comparable to that of 'link nurses' in some European hospitals<sup>13 14</sup> and their experience varies.

### **Design of the study**

Information about knowledge, attitude and behaviour of healthcare workers was collected through a questionnaire. The questionnaire was designed by the researchers and a Dutch medical psychologist. It was translated into Indonesian and, after a pilot study, adapted by Indonesian physicians, infection control nurses and a medical psychologist. The target was to include at least 50% of all healthcare workers (physicians, nurses, assistant nurses and infection control nurses) in each hospital, department and profession. Representatives of each department were in charge of distribution of the questionnaires. Participants completed the questionnaire during sessions at which a researcher or infection control nurse was present to supervise and to answer questions. Before healthcare workers started completing the questionnaire, the goal of the questionnaire was explained, individual completion was required and anonymous analysis of the results was guaranteed. A case number, through which profession and department of the respondent could be identified, was written on the form directly before or after a respondent completed the form. The number on the form could not be tracked to individual respondents, except when only one respondent with a given profession in a given department participated in the study.

After completion of the questionnaire, site visits and unstructured interviews with healthcare workers were undertaken when necessary to clarify results that were not understood by the researchers.

### **Design of the questionnaire**

Data on population characteristics and knowledge, attitude and self-reported behaviour with respect to hand hygiene, prevention of blood-borne diseases, personal hygiene and use of personal protective equipment, urinary catheterisation, intravenous catheterisation and care of surgical wounds were collected by means of closed questions. Department, profession, years of experience, instruction about infection control, hepatitis B vaccination status and needle stick accidents experienced were the population characteristics that were required (Appendix 1). Whether needle stick accidents occurred and which action was taken after needle stick accidents can be considered to reflect behaviour. The results of these questions are therefore presented together with the other self-reported behaviour questions.

The attitude of healthcare workers toward infection control was investigated in two ways: by questions about their opinion of statements about infection control (further called 'attitude') and by asking whether they perceived obstacles in complying with infection control guidelines (further called 'perceived obstacles').

The answers could be ticked in pre-printed boxes: 'true', 'false', or 'don't know' for the knowledge questions; 'yes', 'no', or 'don't know' for the attitude statements; 'yes' or 'no' for the questions about behaviour and 'agree', 'don't agree', or 'don't know' for the questions about perceived obstacles.

The questionnaire contained 21 questions about knowledge, 39 about attitude, 39 about perceived obstacles and 23 about self-reported behaviour.

### **Statistical analysis**

For the questions about attitude and behaviour, the desired attitude or behaviour was labelled as 'correct'. For analysis, correct answers regarding knowledge, attitude and

behaviour were analysed as 'correct'; incorrect answers, missing values and 'don't know' were all categorised as 'incorrect'. For the questions about perceived obstacles; 'no', missing values and 'don't know' were all interpreted as 'not perceiving an obstacle'. Scores for the individual questions of each category (knowledge, attitude, perceived obstacles and behaviour) were pooled, which yielded total scores per category for each respondent.

Because the number of infection control nurses was small, results of regular nurses and infection control nurses are presented together. Only when there is a significant difference are the results given separately.

The statistical package SPSS (SPSS version 14.0, SPSS inc., Chicago, Illinois) was used for the analysis. Differences between demographic variables and scores for individual questions and groups of questions were compared using the chi-square statistic and analysis of variance. Scores of  $p=0.05$  or above were regarded as not statistically significant (NS).

Correlations between scores for knowledge, attitude, self-reported behaviour and perceived obstacles, both total scores and scores per separate item, were calculated with Spearman's rho. As a surrogate marker for reliability, the internal consistency of the questionnaire was assessed with Cronbach's Alpha. Scores above 0.700 were considered to yield reliable measurements of a homogeneous domain.

## RESULTS

### Population characteristics

#### *Demographics*

In Surabaya, 55% of healthcare workers in the targeted departments completed the questionnaire, ranging from 18% of nurses in the ICU to 98% of physicians in Surgery (Table 1). In Semarang, 60% of nurses and 93% of physicians in the participating departments completed the questionnaire (table I). According to hospital statistics, only four assistant nurses worked in the participating departments, while 59 respondents in Semarang ticked the box 'assistant nurse'. Apparently the definition of 'assistant nurse' among respondents was broader than that of hospital management.

Table 1: Response rates for the questionnaire

	Department	nurse <sup>1)</sup>	physician	assistant nurse	total
Surabaya	Internal Medicine	58 (88)	53 (39)	32 (65)	143
	Surgery	73 (54)	78 (98)	49 (43)	200
	Obstetrics & Gynaecology	32 (65)	28 (30)	17 (45)	77
	Paediatrics	71 (82)	26 (27)	40 (66)	137
	ICU/others <sup>2)</sup>	17 (18)	0 (0)	3 (60)	20
	total	251 (60)	185 (46)	141 (53)	577
Semarang	Internal Medicine	33 (69)	52 (99)	9 <sup>4)</sup>	94
	Surgery	39 (100*)	58 (100 <sup>3)</sup> )	12 <sup>4)</sup>	109
	Obstetrics & Gynaecology	42 (56)	28 (67)	12 <sup>4)</sup>	82
	Paediatrics	25 (52)	57 (100 <sup>3)</sup> )	12 <sup>4)</sup>	94
	ICU/others <sup>2)</sup>	66 (51)	0 (0)	14 <sup>4)</sup>	80
	total	205 (61)	195 (100 <sup>3)</sup> )	59 <sup>4)</sup>	459
Total Surabaya + Semarang		456	380	200	1036

1) The category 'nurse' includes infection control nurses (9 in Surabaya, 12 in Semarang) and nursing managers (4 in Surabaya); 2) ICU/others represents the intensive care units (ICU), the class department (Semarang) and the nursing management department (Surabaya); 3) the number of respondents who completed the questionnaire exceeded the official number of personnel in this specific profession and department; 4) the total number of personnel in this specific profession and department is unknown.

It is likely that the majority of participating physicians were residents, because 77% in Surabaya and 67% in Semarang had less than ten years of experience in their profession.

***Vaccination hepatitis B***

In Surabaya, 41% of the respondents were vaccinated against hepatitis B, in Semarang 31% ( $p=0.001$ , Appendix 1). Doctors were vaccinated more often (Surabaya 56%, Semarang 54%, NS) than nurses (Surabaya 25%, Semarang 17%, NS) and assistant nurses (Surabaya 45%, Semarang 7%,  $p<0.001$ ). The shorter healthcare workers worked in their current profession, the higher the percentage vaccinated against hepatitis B, ranging from 44% of healthcare workers with less than 5 years of experience to 26% of healthcare workers with 20 or more years of experience ( $p=0.002$ ). No significant differences were found between the departments.

***Instructions about infection control***

Most healthcare workers were instructed in the importance of infection control (Surabaya 97%, Semarang 91%,  $p<0.001$ ) and hospital guidelines for infection control (Surabaya 88%, Semarang 74%,  $p<0.001$ ). Instructions to report when they showed symptoms of an infectious disease were given to 62% of respondents in Surabaya and 44% in Semarang ( $p<0.001$ ). Information about which professionals were responsible for infection control was given to 66% in Surabaya and 41% in Semarang ( $p<0.001$ ).

The proportion who were instructed in the importance of infection control varied from 99% in Obstetrics & Gynaecology (of the two hospitals combined) to 82% in the class department ( $p<0.001$ ). The proportion who were instructed about which professionals were responsible for infection control varied from 94% in Obstetrics & Gynaecology to 67% in the intensive care units ( $p<0.001$ ).

Fifty-six percent of the respondents from Surabaya were instructed in what to do after a needle stick accident and 38% in Semarang ( $p<0.001$ ). Nurses in both hospitals were instructed more often than doctors and assistant nurses ( $p<0.001$ ). In Surabaya, no significant differences were observed between departments. In Semarang, the proportion instructed was highest in Obstetrics & Gynaecology (54%) and lowest in Paediatrics (21%,  $p=0.001$ ).

**Knowledge**

The mean of the correct answers to the knowledge questions for all healthcare workers combined was 44% (Appendix 1). Knowledge about the prevention of blood-borne diseases and infections of intravenous catheters and surgical wounds was unsatisfactory with three out of four, three out of three and two out of three questions scoring below a knowledge level of 40%, respectively. The knowledge of physicians was significantly better than that of nurses and assistant nurses ( $p<0.001$ ). All departments except the ICU scored better than the class department ( $p<0.005$ ). Total scores for knowledge of less experienced healthcare workers were slightly higher than those of more experienced healthcare workers, with the exception of the group with 15 to 19 years of experience, which had the lowest scores of all groups ( $p<0.001$ ). No significant differences were observed between the two hospitals.

## **Attitude**

### ***Agreement with attitude statements***

The mean score of the answers to all attitude questions that were in agreement with the preferred attitude was 67% (Appendix 1). Agreement was unsatisfactory for personal hygiene and the use of personal protective equipment; five out of nine statements scored below an agreement level of 40%. Doctor's and nurses attitudes were significantly better than those of assistant nurses ( $p < 0.001$ ). Less experienced healthcare workers had slightly higher scores than more experienced ones, with the group with 15 to 19 years of experience having the lowest score ( $p < 0.001$  for both scores). No significant differences were observed between the two hospitals or the departments.

### ***Perceived obstacles to complying with infection control guidelines***

Obstacles to complying with infection control guidelines were perceived for 30% of the items raised in the questionnaire (Appendix 1). Most obstacles were perceived to complying with guidelines about the prevention of blood-borne diseases; for three out of five statements more than 40% of respondents perceived problems. Doctors perceived more obstacles than nurses ( $p = 0.025$ ) and assistant nurses ( $p = 0.019$ ). Healthcare workers in Internal Medicine and Surgery perceived more obstacles than those from Obstetrics & Gynaecology ( $p = 0.028$  and  $0.023$ , respectively), Paediatrics ( $p = 0.049$  and  $0.041$ ) and the class department ( $p = 0.029$  and  $0.027$ ). No significant differences were observed between the hospitals or years of experience.

## **Self-reported behaviour**

### ***Compliance with precautions***

The mean self-reported compliance with precautions was 63% (Appendix 1). Self-reported behaviour was unsatisfactory for personal hygiene and the use of personal protective equipment; for two out of three statements less than 40% of the respondents behaved in accordance with the norm. Nurses reported significantly better compliance than doctors and assistant nurses ( $p < 0.001$ ). No significant differences were observed between the two hospitals, the departments or more and less experienced healthcare workers.

### ***Needle stick accidents and action after needle stick accidents***

In Surabaya, 76% of healthcare workers experienced needle stick accidents, in Semarang 88% ( $p < 0.001$ , Appendix 1). No significant differences were found between the professions and years of experience. In Surabaya, fewer needle stick accidents were reported in the Department of Internal Medicine than in the other departments ( $p < 0.001$ ); no significant differences were found between the departments in Semarang.

In both cities, the majority of personnel (96%) who experienced needle stick accidents reported to have washed or rubbed with alcohol afterwards, while 22% (Surabaya) and 14% (Semarang,  $p = 0.003$ ) told a supervisor or an infection control nurse. Assistant nurses reported their needle stick accidents the most (Surabaya 39%, Semarang 32%) and doctors the least (Surabaya 7%, Semarang 6%,  $p < 0.001$ ). More experienced healthcare workers and especially the group with 15 to 19 years of experience reported their needle stick accident to a supervisor or infection control nurse more often than less experienced healthcare workers ( $p < 0.001$ ).



**Correlations between knowledge, attitude and behaviour**

Significant positive correlations were found between knowledge, attitude, self-reported behaviour and perceived obstacles (Table 2). The greater healthcare workers’ knowledge, the more they showed the preferred attitude, the more obstacles they perceived and the better their self-reported behaviour.

Table 2: Correlations between knowledge, attitude and behaviour

	Spearman’s rho			
	knowledge	attitude	obstacles	behaviour
knowledge	1	0.272*	0.102*	0.246*
attitude	0.272*	1	0.134*	0.365*
obstacles	0.102*	0.134*	1	0.031
behaviour	0.246*	0.365*	0.031	1

\* Indicates that the correlation is significant at the p<0.001 level.

**Internal consistency of the questionnaire**

The Crohnbach’s Alpha score for instructions for infection control was 0.634, total knowledge 0.448, agreement with attitude statements 0.761, perceived obstacles 0.610 and self-reported behaviour 0.921.

**DISCUSSION**

The present survey of knowledge, attitude and self-reported behaviour with respect to infection control of healthcare workers in two Indonesian hospitals revealed problems concerning the prevention of blood-borne diseases and the use of personal protective equipment.

Most healthcare workers did not know the correct answers to the questions about the risk of transmission of HIV and HCV in case of a needle stick accident and were not aware of the value of post-exposure prophylaxis for HIV infection after a needle stick accident. Main perceived obstacles to adherence to the guideline for safe handling of sharps were the fact that it costs too much time, makes patient care too technical and there are not enough sharp containers. Resheathing of used needles is common practice, explaining the high agreement with the statement that needles should be resheathed to avoid needle stick accidents and the low self-reported behaviour for the statement ‘I never resheath needles’. Interpretation of these facts should take into account the low level of hepatitis B vaccination, the endemicity of hepatitis B in Indonesia<sup>15</sup> and the small number of healthcare workers who were informed about what to do in case of a needle stick accident. Observations on the wards and interviews with personnel revealed that designated hard plastic sharps containers were lacking and empty plastic water bottles were used instead.<sup>16</sup> Unsheathed needles could easily puncture the thin plastic of these bottles and therefore healthcare workers were taught to resheath used needles to prevent needle stick accidents. The majority of healthcare workers experienced needle stick accidents, probably largely as a result of these incorrect instructions. Guidelines for handling needle stick accidents and the role of the infection control organisation in this respect were apparently lacking. Proper attention by the hospital management to blood-borne diseases by creating facilities for correct disposal of sharp objects might enhance awareness and compliance of healthcare workers with safe handling of needles. Ideally, a system for vaccination of healthcare workers and post-exposure prophylaxis should also be part of the hospital infection control system. We do realise that the hospital management

must prioritise the allocation of limited resources. The implementation of a safe method to resheath used needles would, in our opinion, be an acceptable alternative to purchasing proper sharps containers.<sup>17 18</sup> Although not ideal, the work of healthcare workers would become much safer if needles would consistently be resheathed safely.

The inquiry revealed that healthcare workers did not agree with statements about the use of sterile and non-sterile gloves and from their self-reported behaviour it appeared that they did not use gloves and aprons according to the principles of standard precautions. As obstacles to applying the rules, the lack of sufficient supplies of gloves and aprons was mentioned. The distinction between sterile and non-sterile gloves was not clear to most healthcare workers. Observations revealed that there indeed was no distinction between sterile and non-sterile gloves in the hospitals we studied.<sup>16</sup> Disposable latex gloves were in short supply and used gloves were washed, powdered and re-used as 'sterile' gloves. Ideally, interventions would include ensuring the continuous supply of sufficient amounts of disposable gloves and other personal protective equipment. We feel that, in the current low-budget situation, this should not be the first priority. Primarily, the promotion of good hand hygiene after removing gloves should be chosen, because gloves might become permeable for viruses after 're-sterilisation'. Additionally, currently used guidelines should be adapted for use in this setting, especially limiting the use of gloves and other personal protective equipment to situations where it is most crucial. In a paediatric ICU in Jakarta, Indonesia, it was shown that adaptation of certain infection control guidelines of the Centers for Disease Control and Prevention improved compliance with infection control guidelines in a limited-resources setting similar to the hospitals described here.<sup>19</sup>

The results of the questionnaire seem to suggest that there are no problems concerning hand hygiene in the two hospitals. Although knowledge about hand hygiene appeared reasonable, there were inconsistencies in the answers with respect to knowledge, attitude and self-reported behaviour. And, although self-reported compliance was as high as 70%, other studies showed that compliance with hand hygiene rarely exceeds 50% and healthcare workers in general tend to overestimate their own compliance.<sup>20</sup> Observations in the Departments of Paediatrics and Internal Medicine in Semarang, performed after the results of this questionnaire were known, revealed a striking shortage of hand washing facilities: four wash basins for 104 patient beds. Actual compliance with hand hygiene was much lower than reported by the respondents in the current study: 22% and 46%, respectively.<sup>16</sup> No data are available regarding compliance in Surabaya, but observations showed that the number of wash basins was only slightly higher than in Semarang. The combination of factors that compromise hand hygiene, namely shortage of facilities, insufficient knowledge about evidence of the benefit of hand hygiene, and the favourable self-image of compliance with hand hygiene rules, mean that it will take considerable effort to bring about any improvements in hand hygiene.

As far as care of surgical wounds and urinary and intravenous catheterisation were concerned, knowledge was frequently outdated: only a minority of the respondents knew that shaving before surgery does not protect against surgical site infections,<sup>21</sup> or that the use of antimicrobial soap or cream is not indicated for the prevention of urinary tract infections, surgical site infections and catheter-related infections.

Our hypothesis that better knowledge would correspond with a better attitude and perceiving more obstacles was confirmed. Especially infection control nurses and physicians, who were the most knowledgeable healthcare workers, tended to perceive more obstacles than other healthcare workers. Our expectation that people with better knowledge would be more realistic about their own behaviour and thus report worse compliance than those with less knowledge proved wrong. The better healthcare workers' knowledge, and especially their attitude, the better behaviour they reported.

The inquiry identified potential barriers to and facilitators for change. Possible barriers are the favourable self-images our respondents tended to have of their compliance with the precautions, the limited facilities like wash basins, gloves and sharps containers, the few obstacles reported by the respondents, the ignorance of the respondents about the shortages of facilities and an infection control organisation that needs reinforcement. Possible facilitators included the generally positive attitude towards infection control and the fact that, although knowledge was sometimes outdated and measures improvised, the healthcare workers were quite aware of the importance of infection control, including the prevention of blood-borne diseases. The few perceived obstacles should be explored further, preferably with focus group discussions or unstructured interviews.

The results of this questionnaire can be regarded as representative for the healthcare workers in these hospitals, since the majority of the healthcare workers of the involved departments completed the questionnaire. Scores for the internal consistency of the questionnaire were rather low for questions about knowledge, reasonable for instructions about infection control and perceived obstacles and rather high for attitude and self-reported behaviour. Apparently knowledge is a more heterogeneous domain and knowledge within certain subdomains may not correlate closely with that in other subdomains. A substantially larger number of questions than we used is needed for a reliable assessment of the level of knowledge. It appears that the majority of the healthcare workers completed the questionnaire carefully, although some politically correct answering might have occurred, even though anonymous analysis of the results was guaranteed to the participants. Observations and interviews that were performed in the wards after completion of the questionnaire confirmed most of the results of the questionnaire and clarified results that appeared strange or inconsistent.

In conclusion, the questionnaire in conjunction with site visits and interviews was a valuable tool to identify trouble spots in the hospitals and barriers to and facilitators of change which should be into account when interventions are planned. The safe handling of sharps, hand hygiene and the use of personal protective equipment were identified as the most important aspects for interventions. For successful implementation of changes barriers should be removed at the level of hospital management which should provide the facilities, the infection control organisation which should be strengthened by the employment of full-time, well-trained infection control professionals, and the wards where healthcare workers should be educated and trained in evidence-based precautions.

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## Appendix 1: Topics addressed in the questionnaire

	%		
	yes	no	missing*
<b>Backgrounds of healthcare workers</b>			
<b>Instructions about hospital hygiene</b>			
Were you vaccinated against hepatitis B?	34	60	6
Have you been instructed about the importance of hospital hygiene?	93	6	1
Have you been instructed about the hospital guidelines on infection control?	80	18	3
Were you told which professionals in the hospital coordinate the infection control?	48	40	12
Have you had instructions to report signs and symptoms of an infectious condition promptly to a supervisor or a hospital infection control practitioner?	53	45	2
Have you had instructions about what to do after a needle stick accident (NSA)?	47	51	3
<b>Accidental blood contact</b>			
Have you ever experienced a NSA?	77	18	6
If yes, what did you do:			
Wash with running water and soap and / or rub with alcohol	86	3	11
Report to supervisor	8	63	29
Report to infection control nurse	13	58	29
<b>Knowledge questions</b>			
	correct	false	missing*
<b>Please state if the following statements are true or false:</b>			
<i>Blood-borne diseases</i>			
After NSA, HIV is transmitted in 0.5% of cases.	23	10	67
After NSA, HCV is transmitted in 3% of cases.	21	7	71
HIV can be prevented by taking antiretroviral therapy promptly after a NSA.	15	30	55
Most hospital personnel have ever experienced NSAs, because of unsafe handling of sharps.	77	12	13
<i>Hand hygiene</i>			
Spreading of bacteria in hospitals occurs mainly via the hands of personnel.	70	23	7
Nosocomial infections are mainly caused by bacteria brought into the hospital by hospital workers.	42	49	10
Hand jewellery make a good hand hygiene impossible.	88	9	3
<i>Personal hygiene and personal protective equipment</i>			
There is evidence that aprons, gowns and masks are effective in preventing hospital-acquired infections.	74	9	18
Gloves reduce the contamination of the hands, but do not prevent it completely.	90	5	5
Wearing gloves when handling sharp instruments protects against NSAs.	47	50	3
<i>Urinary catheters</i>			
Obstruction of urine flow is a good indication for catheterisation.	50	40	10
Prevention of decubitus is a good indication for catheterisation.	60	31	10
Urinary incontinence is a good indication for catheterisation.	21	64	16
Sufficient fluid intake decreases the risk of UTI in catheterised patients.	68	18	13
Applying antibiotic cream to the orifice decreases the risk of UTI in catheterised patients.	29	51	21
<i>Surgical wounds</i>			
Shaving before surgery reduces the chance of surgical site infections (SSIs)	5	91	5
Bathing with antimicrobial soap before an operation reduces the chance of SSI	5	88	7
Risk of SSI after shaving is lowest when done shortly before the operation	74	7	19
<i>Intravenous catheters</i>			
Applying antibiotic cream to the entry site reduces the risk of CRI	22	61	18
Phlebitis is always caused by an infection	37	55	8
Changing / rotating peripheral short tube devices reduces the risk of phlebitis and bacteraemia	5	87	8
<b>Attitude: attitude statements</b>			
	correct	false	missing*
<b>Please state if you agree with the following statements:</b>			
<i>Blood-borne diseases</i>			
To avoid NSAs, needles should be resheathed.	2	95	3
After a NSA, personnel should report promptly to a supervisor or infection control nurse.	63	23	14

*Knowledge, attitude and behaviour with respect to infection control*

To avoid NSAs, sharps containers should be used.	93	2	5
<i>Hand hygiene</i>			
Before contact with immune compromised patients, hands must always be washed with soap and water or rubbed with alcohol	95	3	2
Washing hands or rubbing them with alcohol is, for patients with a normal immune system, only necessary before simple surgery and caring for wounds.	36	59	5
Hands should be washed before starting work on the ward.	94	4	2
Visibly soiled hands must be washed with water and soap.	96	2	2
It is the duty of every hospital employee to keep their hands as free of bacteria as possible.	94	4	2
After handling of soiled linen, hands must be washed or rubbed with alcohol.	96	2	2
Nails should be cut short, clean and well-cared for.	98	1	1
On wards employees should use disposable tissues for blowing their nose.	90	7	3
On wards employees should wash their hands after blowing their nose.	96	2	2
<i>Personal hygiene and personal protective equipment</i>			
For every patient who has to be nursed with gloves, the employee has to change the gloves	91	5	4
Non-sterile gloves must be worn in case of contact with non-intact skin.	15	81	4
Non-sterile gloves must be worn when inserting an intravenous catheter.	18	79	4
Non-sterile gloves must be worn for each direct patient contact.	64	31	5
Sterile gloves must be worn during insertion of urinary catheter.	92	5	3
Sterile gloves must be worn in case of contact with mucous membranes.	11	85	4
Handling of soiled and clean linen must be separated.	5	88	7
Disposable (plastic) aprons should be worn when there is a risk that clothing or uniform may become exposed to blood, body fluids, secretions or excretions, with the exception of sweat.	94	3	3
Personnel are allowed to eat or drink when caring for patients.	12	80	8
<i>Urinary catheters</i>			
Always work using an aseptic technique.	85	8	7
Patients with a catheter should drink at least 3000 ml a day.	53	32	15
Antibiotic cream must be applied to the orifice of catheterised patients.	33	50	17
Wash the genital area of catheterised patients daily, as other patients	78	12	10
<i>Surgical wounds</i>			
Hair near the surgical site may be removed, if it is so thick that it will interfere with the surgical procedure.	37	56	7
If hair removal is necessary, remove immediately before the operation, preferably with electric clippers.	25	62	13
If the operation is elective, require the patient to bathe (or be bathed) at least the night before the operation with an aseptic agent.	14	79	7
Patients with potentially transmissible wound or skin infections should be placed on isolation precautions according to the current guidelines.	93	2	5
Personnel should wash their hands before and after taking care of a surgical wound.	96	0	4
Protect with a sterile dressing for 24 to 48 hours postoperatively an incision that has been closed primarily.	90	4	6
When an incision dressing must be changed, use a sterile technique.	95	1	4
When a sterile dressing becomes damp, it has to be changed.	92	3	5
<i>Intravenous catheters</i>			
Before injecting medication through an iv-catheter, the connection point has to be disinfected.	89	3	8
Use either sterile gauze dressing or transparent dressing to cover the catheter site.	87	6	8
If a gauze and tape catheter site dressing is used, replace it when the dressing becomes damp.	90	3	7
If a gauze and tape catheter site dressing is used, replace it when inspection of the site is necessary.	84	7	9
Replace intravenous tubing used to administer blood at the end of the infusion or within 24 hours after initiating the infusion.	77	10	13
Apply antimicrobial ointment to insertion sites as part of routine catheter site care.	23	59	18

<i>Attitude: perceiving obstacles</i>	yes	no	missing*
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**Working according to the guideline can sometimes be difficult, because of different reasons. We would like to be informed about the problems you experience.**

I encounter problems in complying with the guidelines because ...

*Blood-borne diseases*

... there is no proof of the importance of safe blood handling	29	51	20
... they make my work much harder	19	66	15
... it takes too much time	40	47	13
... there are not enough sharps containers	61	26	13
... guideline for safe blood handling makes patient care very technical	58	29	13

*Hand hygiene*

... there is no proof of the importance of hand hygiene	54	40	7
... they make my work harder	16	77	7
... it takes too much time	11	84	6
... there are not enough hand washing facilities on the ward	26	67	7
... it makes patient-care very technical	36	59	5
... the skin of my hands becomes irritated	14	80	6
... others do not follow the guidelines on hand hygiene	27	57	16

*Personal hygiene and personal protective equipment*

... the proof of the importance of the guideline is not really clear	17	75	8
... the guidelines are vague	33	60	8
... they make my work much harder	15	79	6
... it takes too much time	30	64	5
... nobody cares about it	18	70	12
... we do not have enough gloves on the ward	55	41	5
... we do not have enough aprons on the ward	73	21	6

*Urinary catheters*

... there is no proof of the importance of the guideline for urinary catheterisation	15	75	10
... they make my work harder	18	74	9
... it takes too much time	33	60	7
... nobody cares about it	16	70	15
... guideline for urinary catheters makes patient care very technical	54	38	9
... the collection systems do not allow me to obtain closed urine samples	35	49	16
... others do not follow the guideline	26	52	22

*Surgical wounds*

... there is no proof of the importance of the guideline for care of surgical wounds	18	73	9
... they make my work harder	18	74	9
... it takes too much time	33	59	8
... nobody cares about it	14	71	15
... guideline for surgical wounds makes patient care very technical	51	39	10
... we do not have enough sterile dressings	29	62	9
... others do not follow the guideline	21	62	17

*Intravenous catheters*

... the proof of the importance of the guideline is not really clear	16	74	10
... they make my work much harder	17	75	8
... we have no antibiotic cream on the ward	50	38	12
... nobody cares about it	17	68	15
... it makes patient care very technical	31	58	12
... others do not follow the guideline	24	57	19

***Self-reported behaviour***

correct false missing\*

**Please state if you work in this way:***Blood-borne diseases*

To avoid NSAs, I never resheath needles	8	88	4
To avoid NSAs, I use sharps containers	80	16	4
To avoid NSAs, I never fill sharps containers above the line	68	27	5
In the event of handling needles, I wear gloves	49	47	5

*Hand hygiene*

*Knowledge, attitude and behaviour with respect to infection control*

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I wash visibly soiled hands with water and soap	96	2	2
I wash or disinfect hands before and after each patient contact	14	83	3
I wash hands or rub with alcohol before performing simple surgery and caring for wounds, in patients with normal immune systems	91	6	4
<i>Personal hygiene and personal protective equipment</i>			
I wear non-sterile gloves in case of contact with non-intact skin	16	81	3
I only wear (plastic) aprons when there is a risk that my clothing or uniform may become exposed to blood, body fluids, secretions or excretions, with the exception of sweat	36	61	3
After handling soiled linen, I wash my hands or rub them with alcohol	92	5	3
<i>Urinary catheters</i>			
I make sure catheterised patients drink at least 3000 ml a day	37	59	4
I empty the urinary bag at least four times a day or, if necessary, more often	55	40	5
I use a closed and aseptic technique to obtain urine samples	83	12	5
I wash the genital area of catheterised patients daily, in the same way as for other patients who do not have a catheter	48	47	5
<i>Surgical wounds</i>			
If the operation is elective, I require the patient to bathe (or be bathed) at least the night before the operation with an aseptic agent.	19	77	5
If hair near the operation site is so thick it will interfere with the surgical procedure, I remove it	93	3	5
I always wash my hands before and after taking care of a surgical wound	93	2	4
When an incision dressing must be changed, I use a sterile technique	94	6	0
<i>Intravenous catheters</i>			
Before giving medication, I disinfect the external surfaces of the catheter hub and connection points	88	7	5
If a gauze and tape catheter site dressing is used, I replace it when the dressing becomes damp	86	9	6
If a gauze and tape catheter site dressing is used, I replace it when inspection of the site is necessary	77	18	5
I apply antimicrobial ointment to IV insertion sites as part of routine catheter site care	48	47	6
I replace intravenous tubing used to administer blood at the end of the infusion or within 24 hours of initiating the infusion	65	29	6

\* Represents either 'don't know' or missing values.

