

The Impact of Guidelines on Sterility Precautions During Indwelling Urethral Catheterization at Two Acute-Care Hospitals in Sweden - A Descriptive Survey

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Research article

Keywords: rethral catheterization, insertion technique, guidelines, compliance

Posted Date: June 10th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-33662/v1>

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Version of Record: A version of this preprint was published at BMC Nursing on June 15th, 2021. See the published version at <https://doi.org/10.1186/s12912-021-00619-x>.

Abstract

Background: To support a uniform and evidence-based practice for indwelling urinary catheterization in adults The European association of Urology Nurses (EAUN) published guidelines for this procedure in 2012. The Swedish national guidelines are based on the sterility precautions advocated by EAUN. Nevertheless, some hospitals have local guidelines with other requirements concerning sterility and leave to staff to decide what equipment to use and how to perform the catheterization. The aim of this study was to investigate the nurses' self-reported sterility precautions during indwelling urethral catheterization at two acute-care hospitals, where the local guidelines differ in their sterility requirements. The study also aimed to analyse factors affecting the participants' conformity with sterility precautions recommended in the EAUN-guidelines.

Methods: A structured questionnaire with questions concerning the participant, working conditions and performance of indwelling urethral catheterization was left to 931 nurses in two acute care hospitals. Chi-square test, Fisher's exact test and Mann-Whitney U-test were used for descriptive statistics. Logistic regression was used to analyse variables associated with practicing the sterility precautions as recommended in the EAUN-guidelines.

Results: Answers were obtained from 852 persons (91.5 %). A majority of the participants called their insertion technique "non-sterile". Regardless of what the insertion technique was called, the participants said that the IUC should be kept sterile during procedure. In spite of that not everyone used necessary sterile equipment to maintain the sterility of the catheter. The nurses' conformity with all the sterility precautions as advocated in the EAUN-guidelines were associated with working at departments for surgery and cardiology (OR 2.50, CI 1.78-3.49) and years in profession (OR 1.54, CI 1.03-2.30). It was also associated with use of sterile set for catheterization (OR 2.03, CI 1.40-2.94), use of sterile drapes for dressing of the insertion area (OR 1.94, CI 1.25-3.00) and using the term "sterile technique" for indwelling urethral catheterization (OR 1.67, CI 1.13-2.47).

Conclusions: To achieve a uniform practice in aseptic urethral catheterization national and local hospital guidelines should advocate same sterility precautions. Evidence-based guidelines should describe how sterility precautions are accomplished and should be implemented in healthcare-settings.

Background

Healthcare-associated urinary tract infection (HAUTI) is one of the most common healthcare-associated infections and is mostly linked to presence of an indwelling urinary catheter (IUC) [1–4]. To support a uniform and evidence-based practice for indwelling urethral catheterization in adults The European association of Urology Nurses (EAUN) published guidelines for this procedure in 2012 [5]. One of the main strategies in preventing HAUti in patients needing an IUC is to avoid contamination of the sterile IUC during insertion. This requires knowledge about sterility precautions [5–9]. To keep the IUC sterile during insertion EAUN recommends use of sterile lubricants, sterile equipment and aseptic technique. The

Swedish national guidelines for indwelling urethral catheterization are based on the sterility precautions advocated by EAUN. At the same time there exist local Swedish hospital guidelines with different requirements regarding sterility of the IUC and measures during IUC-insertion. These local hospital guidelines supersede the national guidelines and vary with respect to how much they leave to staff to decide what equipment to use and how to perform the catheterization. A situation where international, national and local guidelines are available in parallel could easily cause confusion among staff performing urethral catheterization. Uncertainty might lead to inconsistent use and interpretation of terms, a non-uniform performance of the procedure and impaired patient safety. We wanted to explore how the situation with several guidelines affected behaviour in daily nursing.

Methods

Aim

The aim of the study was to investigate the nurses' self-reported sterility precautions during indwelling urethral catheterization at two acute-care hospitals in Sweden, where the local guidelines differ in their sterility requirements. The study also aimed to analyse factors affecting the participants' conformity with sterility precautions recommended in the EAUN-guidelines for indwelling urethral catheterization on adults.

Design and questionnaire

The study had a descriptive design and was based on a structured questionnaire, with 19 questions in total. Nine questions concerned the participant and the working conditions (profession, graduation year, years in profession, department, years at present department, ward, work shift, origin of the insertion technique, frequency of IUC-insertion) and ten questions concerned the indwelling urethral catheterization procedure. The questionnaire was constructed in collaboration with expertise in urology nursing and infection control and the questions concerning sterility precautions were based on the EAUN-guidelines for indwelling urethral catheterization in adults [5]. The questionnaire was pilot tested for comprehensiveness on healthcare-personnel in urology at another hospital in Sweden prior to the study.

Setting

The study was conducted at two acute-care hospitals in Sweden, hospital A and hospital B, with approximately 600 and 500 beds, respectively. At both hospitals urethral catheterization was performed by registered nurses and assistant nurses. At the time for the survey each hospital had local guidelines for indwelling urethral catheterization. The local guidelines at hospital A were launched in 2006 and updated in 2011. The local guidelines at hospital B were launched in 2011 and updated in 2013. See Table 1 for an overview of the recommended sterility precautions for indwelling urethral catheterization according to the EAUN-guidelines and both local hospital guidelines. EAUN used the term "sterile procedure" to summarize their requirements whereas hospital A used the heading "sterile technique" for their procedure and hospital B called their procedure "non-sterile technique".

Table 1

Overview of guidelines concerning sterility precautions during indwelling urethral catheterization.

Requirements	EAUN-guidelines	Hospital guidelines Hospital A	Hospital guidelines Hospital B
Hand hygiene	Bactericidal alcohol hand rub	Bactericidal alcohol hand rub	Not mentioned
Sterility of the IUC during insertion	Sterile catheter	Sterile catheter	Non-sterile catheter
Preparation area for equipment	On a clean trolley	Not mentioned	Not mentioned
Insertion of the urethral catheter	With sterile gloves	With sterile gloves or sterile forceps held by non-sterile gloves	Not mentioned, refers to the national guidelines
Fluid for urinary bladder washouts	Sterile fluid	Sterile normal saline	Not mentioned

Participants

The participants were registered nurses and assistant nurses in wards with inpatient-care at the departments for surgery, cardiology and internal medicine. Employees on sick leave, parental leave and temporary staff were not included.

Data collection

Head Nurses at all wards for in-patient care at departments for surgery, cardiology and internal medicine at both study hospitals were asked about participation in the study after verbal and written information about the study. At hospital A, fourteen of 15 eligible wards where indwelling urethral catheterization was practiced accepted participation in the study. One Head Nurse declined study participation due to other ongoing studies and workload at the ward. At hospital B, all 13 eligible wards accepted participation. Verbal and written information was given by the study conductor to the nurses and assistant nurses at the participating wards during ward meetings. The voluntary participation in the study was emphasized and the printed questionnaires were distributed by the study conductor or the Head Nurse to the employees fulfilling the inclusion criteria. The participants were instructed not to discuss the questions in the questionnaire during the study period. The Head Nurses reminded the staff about the questionnaire at ward meetings. Consent was implied when nurses voluntarily returned the answered questionnaires to the study conductor in preaddressed and sealed envelopes within two weeks after distribution. At hospital A, 563 questionnaires were distributed during December 2015 - March 2016. At hospital B, 368 questionnaires were distributed during May 2016 - January 2017. The answers in the returned questionnaires were anonymized prior to data analysis.

Data analysis

Continuous variables were expressed as medians (IQR) and categorical variables as numbers (%). We used Chi-square test, Fisher's exact test and Mann-Whitney U-test to evaluate differences in background characteristics and indwelling urethral catheterization procedure.

We used binary logistic regression to identify variables associated with practicing the sterility precautions for indwelling urethral catheterization as recommended in the EAUN-guidelines. The dependent variable was performing in agreement with all the five the sterility precautions recommended in the EAUN-guidelines as described in Table 1. The twelve explanatory variables were hospital, department, profession, years in profession, work shift, frequency of IUC-insertion, origin of the insertion-technique, type of insertion-technique, periurethral cleaning solution, use of set for catheterization, dressing on insertion area and equipment (disposable vs reusable). We used the model strategy as follows. First, we used univariable models to study crude associations of each explanatory variable with the odds (OR) of factors affecting the participants' conformity with the sterility precautions recommended in the EAUN-guidelines. Secondly, we used multivariable logistic models in a backward and forward procedure to study the adjusted associations. Variables that were significant at

$p < 0.10$ in the univariable analyses were included in the multivariable analyses. The associations are presented as odds ratios (OR) with 95% confidence intervals (CI). An association was considered significant if $p < 0.05$ (two-sided). Finally, we used Hosmer-Lemeshow goodness-of-fit test to assess the adjusted models, with p -levels above 0.05 considered to indicate an acceptable fit. The IBM Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA) was used for all analyses.

Results

Participants

Answers were obtained from 518 of 563 included persons (92%) at hospital A and from 334 of 368 included persons (91%) at hospital B. Among the respondents at both hospitals 33 of them (26 at hospital A, 7 at hospital B) answered that they never inserted indwelling urinary catheters and were excluded from analysis. In total, answers from 492 participants at hospital A and 327 answers from participants at hospital B were analysed. See Fig. 1 for flowchart of the study inclusion process. Not all questions were answered by every participant, thus leading to different numbers of analysed answers for each question.

The characteristics of the participants from both study hospitals are displayed in Table 2. At hospital A, a higher proportion of participants worked at the department of cardiology, worked alternating shifts (both day, evening and night shifts) and had longer professional experience compared to the participants at hospital B.

Table 2
Characteristics of participants from the two study hospitals.

Characteristics	Hospital A (n = 492)	Hospital B (n = 327)	p-value
Profession, n (%)	311 (63.2)	201 (61.5)	0.658
Registered nurse	181 (36.8)	126 (38.5)	
Assistant nurse			
Departments, n (%)	186 (37.8)	62 (19.0)	< 0.001*
Cardiology	223 (45.3)	180 (55.0)	
Internal Medicine		85 (26.0)	
Surgery	83 (16.9)		
Years in profession, median (IQR)	8 (3.5– 18)	5 (2–13)	< 0.001*
Work shift, n (%)	237 (48.2)	198 (60.6)	< 0.001*
Day/evening shift	66 (13.4)	51 (15.6)	
Night shift	181 (36.8)	77 (23.5)	
Alternating shifts (day/evening/night)		1 (0.3)	
Other answers	8 (1.6)		
Frequency of IUC-insertion, n (%)	26 (5.3)	20 (6.1)	0.657
2 times or more/week	212 (43.1)	143 (43.7)	
1–5 times/month	249 (50.6)	163 (49.8)	
Less frequently	2 (0.4)	0	
Other answers	3 (0.6)	1 (0.3)	
Missing			
Origin of the insertion technique, n (%)	287 (60.3)	202 (62.9)	0.459
The hospital guidelines	189 (39.7)	119 (37.1)	
Other answers (national guideline, nursing school, local routine at ward, don't know)			
* Statistically significant differences between hospital A and hospital B.			

Sterility precautions during procedure

The participants' answers about sterility precautions when describing how they performed indwelling urethral catheterization are shown in Table 3.

A majority of the participants at both study hospitals called their insertion technique "non-sterile technique". Regardless of what the insertion technique was called, the participants said that the IUC should be kept sterile during procedure. In spite of that only 62–69% used sterile gloves/forceps/the catheter's inner plastic cover to insert the IUC during catheterization thus maintaining the sterility.

Table 3

Participants' answers about sterility precautions during indwelling urethral catheterization.

Survey questions	Hospital A	Hospital B	p-value
Insertion technique, n (%)	139 (28.5)	74 (23.1)	0.011*
Sterile technique**	348 (71.5)	247 (76.9)	
Non-sterile technique			
Sterility of the IUC during insertion, n (%)	403 (82.2)	255 (78.2)	0.175
Sterile IUC**	87 (17.8)	71 (21.8)	
Non-sterile IUC			
Hand hygiene prior to preparing for procedure, n (%)	446 (91.2)	284 (87.1)	0.079
Disinfected hands**	43 (8.8)	42 (12.9)	
Other answers (e.g. clean hands)			
Solution for periurethral cleaning, n (%)	404 (82.8)	274 (84.0)	0.640
Soap and tap water	44 (9.0)	31 (9.5)	
Sterile normal saline 9 mg/ml	40 (8.2)	21 (6.4)	
Other answers			
Area for preparing equipment prior to IUC-insertion, n (%)	304 (55.8)	241 (74.2)	< 0.001*
On a disinfected trolley**	188 (38.2)	84 (25.8)	
Other answers (e.g. bedside table, bed)			
Set for catheterization, n (%)	274 (56.7)	186 (57.4)	0.127
Sterile set	115 (23.8)	91 (28.1)	
Non-sterile set	94 (19.5)	47 (14.5)	
Do not use a set			
Dressing on insertion area, n (%)	95 (19.5)	53 (16.2)	0.225
Sterile drapes for dressing	329 (67.4)	239 (73.1)	
Non-sterile drapes for dressing	64 (13.1)	35 (10.7)	
No drapes used on insertion area			

Bold figure indicates that the hospital guidelines were followed at each hospital.

* Statistically significant difference between Hospital A and Hospital B.

** Correct aseptic technique according to EAUN guidelines.

Survey questions	Hospital A	Hospital B	p-value
Insertion of the IUC, n (%)	336 (68.6)	201 (61.7)	0.042*
With sterile gloves/forceps/inner cover**	154 (31.4)	125 (38.3)	
With non-sterile gloves/forceps			
Type of equipment for IUC-insertion, n (%)	472 (97.1)	302 (92.6)	0.004*
Disposable equipment	14 (2.9)	24 (7.4)	
Reusable equipment			
Fluid for urinary bladder washouts, n (%)	434 (97.3)	279 (96.9)	0.331
Sterile normal saline 9 mg/ml**	3 (0.7)	5 (1.7)	
Tap water	9 (2.0)	4 (1.4)	
Other fluids (e.g. disinfectants)			
Bold figure indicates that the hospital guidelines were followed at each hospital.			
* Statistically significant difference between Hospital A and Hospital B.			
** Correct aseptic technique according to EAUN guidelines.			

Performing in agreement with sterility precautions in the EAUN-guidelines

The final multivariable logistic regression analysis showed that performing in agreement with all the sterility precautions as described in the EAUN-guidelines (see Table 1) was associated with working at departments for surgery and cardiology (OR 2.50, CI 1.78–3.49) and years in profession (OR 1.54, CI 1.03–2.30). It was also associated with use of sterile set for catheterization (OR 2.03, CI 1.40–2.94), use of sterile drapes for dressing of the insertion area (OR 1.94, CI 1.25-3.00) and using the term “sterile technique” for indwelling urethral catheterization (OR 1.67, CI 1.13–2.47). See Table 4 for details in the univariable and multivariable analyses.

Table 4
Factors associated with performing indwelling catheterization in agreement with all the sterility precautions in the EAUN-guidelines.

Explanatory variable	Univariable		Multivariable	
	OR (95% CI) p-value		OR (95% CI) p-value	
Hospital	0.986 (0.724–1.343)	0.930	0.940 (0.664–1.328)	0.724
Hospital A	Reference		Reference	
Hospital B (ref)				
Department	2.313 (1.695–3.155)	< 0.001	2.565 (1.810–3.634)	< 0.001
Cardiology & Surgery	Reference		Reference	
Internal medicine				
Profession	Reference	0.653	Reference	0.329
Registered nurse	1.074 (0.786–1.468)		1.207 (0.828–1.760)	
Assistant nurse				
Years in profession	1.347 (0.936–1.940)	0.109	1.491 (0.978–2.275)	0.063
0–2 years	Reference		Reference	
>2 years				
Work shift	1.245 (0.794–1.953)	0.49	1.233 (0.740–2.054)	0.421
Day/evening/alternating shift	Reference		Reference	
Night shift				
Frequency of IUC-insertion	1.052 (0.777–1.424)	0.742	0.991 (0.702–1.399)	0.959
Each week or month	Reference		Reference	
Less than each month				
Origin of the insertion technique	1.074 (0.785–1.471)	0.654	1.132 (0.797–1.608)	0.489
According to the hospital guidelines	Reference		Reference	
Other answers				
Insertion technique	2.606 (1.856–3.659)	< 0.001	1.540 (1.019–2.327)	0.040
Sterile technique	Reference		Reference	
Non-sterile technique				

Values are expressed as OR with 95% CI and p-values, using logistic regressions.

Explanatory variable	Univariable		Multivariable	
	OR (95% CI) p-value		OR (95% CI) p-value	
Periurethral cleansing solution	0.799 (0.454–1.406)	0.127	0.965 (0.522–1.787)	0.810
Soap and tap water	1.329 (0.644–2.741)		1.166 (0.529–2.569)	
Sterile normal saline				
Other solutions	Reference		Reference	
Use of set for catheterization	2.835 (2.039–3.943)	< 0.001	2.085 (1.429–3.042)	< 0.001
Sterile set	Reference		Reference	
Non-sterile set or no set used				
Dressing on insertion area	3.169 (2.160–4.651)	< 0.001	1.905 (1.219–2.977)	0.005
Sterile drapes	Reference		Reference	
Non-sterile drapes or no drapes				
Equipment for catheterization	Reference	0.123	Reference	0.076
Disposable	1.708 (0.864–3.374)		2.021 (0.929–4.395)	
Reusable or don't know				
Values are expressed as OR with 95% CI and p-values, using logistic regressions.				

Variables that were significant at < 0.1 in the univariable analyses were included in the multivariable analyses.

Discussion

Proper aseptic insertion of the sterile IUC, meaning maintaining the sterility of the IUC during procedure, is one of the corner stones in evidence-based international guidelines for prevention of healthcare-associated urinary tract infections among patients in need of an IUC. The sterility of the catheter is kept by using sterile equipment, lubricants and solutions, by proper hand hygiene and by skills in ensuring not to contaminate the IUC during the whole procedure [5–9]. Our study revealed that a majority of the study participants at both hospitals called their insertion technique “non-sterile technique” (hospital A 71.5%, hospital B 76.9%) although the term “sterile technique” for indwelling urethral catheterization was more common at hospital A ($p = 0.011$).

Irrespective of what the insertion-technique was called, mainly soap and tap water were used for periurethral cleaning prior to catheter insertion (hospital A 82.8%, hospital B 84.0%). It was mostly considered by the participants that the IUC should be kept sterile during insertion (hospital A 82.2%, hospital B 78.2%) which is in accordance with the EAUN-guidelines but not required by the local

guidelines at hospital B. Despite of that only 62–69% of the participants used sterile gloves/forceps for catheter insertion or practiced a non-touch technique by keeping the catheter within its inner plastic cover during insertion. The latter method was uncommon to practice and was not mentioned in neither of the hospital guidelines. Only 16–20% of the participants at both study hospitals used sterile drapes on the insertion area to protect the sterile catheter from contamination during catheterization.

A Foley catheter is not as stiff as catheters used for intermittent catheterization and may be more difficult to manage and easier to contaminate. To our opinion, sterile gloves/forceps are not enough in keeping the sterility of the IUC during insertion. In efforts to protect the Foley catheter from unintended contact with the patient's legs or bed linen, also sterile drapes on insertion area are required during procedure. We believe that a standardized sterile set for urethral catheterization, including all necessary equipment, such as gloves, forceps, and drapes can facilitate a uniform behaviour when performing indwelling urethral catheterization and secure sterility of the IUC throughout the whole procedure. This is also supported in our study as the participants performing in agreement with the sterility precautions described in the EAUN-guidelines (see Table 1) also used a sterile set for catheterization (OR 2.03, CI 1.40–2.94) and sterile drapes for dressing of the insertion area (OR 1.94, CI 1.25–3.00).

An association was found between the use of the term “sterile technique” for indwelling urethral catheterization and performing in agreement with the sterility precautions advocated in the EAUN-guidelines (OR 1.67, CI 1.13–2.47). The inconsistent use of different terms for insertion technique during urethral catheterization and uncertainties in understanding how proper aseptic insertion of the sterile catheter is accomplished has also been reported by others [10–13].

“Non-sterile technique” was mentioned in a study by Carapeti et al in 1994 [14]. The authors compared “sterile technique” with “non-sterile technique” for indwelling urethral catheterization. Important to notice was however that the IUC was kept sterile during the whole procedure with both insertion techniques. Despite that, the changes in the Swedish national guidelines during the 1990s included “non-sterile technique” for IUC-insertion, defined as use of soap and tap water for periurethral cleaning, no dressing on insertion area, use of non-sterile equipment and non-sterile gloves. The previous emphasis on the importance of intact sterility of the catheter and the use of sterile dressing on insertion area during procedure was left out [15]. “Non-sterile technique” was regarded as easier to practice and was also cheaper why sterile gloves and solutions were omitted. The use of the “non-sterile technique” among the participants from both hospitals and in the local guidelines at hospital B, may originate from what was advocated by the Swedish national guidelines during the 1990s, although the national guidelines were updated in 2006 and thus valid during the study period and based on same sterility precautions as advocated in present EAUN-guidelines (see Table 1). The heterogenic practice affecting the sterility precautions in IUC-insertion has been reported by others [16]. In our study there was an association between less than two work years in profession and conformity with the sterility precautions describes in the EAUN-guidelines compared to nurses with longer work years (OR 1.54, CI 1.03–2.30).

The unfortunate adoption of “non-sterile technique” during the 1990s, minor but frequent changes of the national guidelines for indwelling urethral catheterization, different requirements on sterility and equipment in the local hospital guidelines, infrequency in IUC-insertion performance combined with the lack of a detailed description of the IUC-insertion process in local hospital guidelines are factors that counteract a uniform performance of indwelling urethral catheterization. This may jeopardize the patient safety.

Our study highlights the gap between the written national guidelines based on sterility precautions from EAUN and a uniform performance of sterility precautions during procedure among nurses. To fill this gap, emphasizing the sterility of the IUC during the procedure is not enough. For a uniform performance the updated national guidelines for urethral catheterization should include a stepwise description of what sterile equipment to use, how and where to prepare for procedure and how to maintain the sterility of the IUC during procedure [10].

Further, local implementation of the updated guidelines in health-care settings is important [16]. This can be accomplished by training the nurses in aseptic urethral catheterization and validating the compliance to aseptic technique by evaluating the practiced skills on a yearly basis [13, 17–19]. Validated checklists for indwelling urethral catheterization can be used as a facilitator [20]. Also “computer-assisted learning” and “simulation-based learning” can be beneficial in practicing aseptic technique in indwelling urethral catheterization and refining the skills [21, 22].

Why working in departments for surgery and cardiology was more associated with performing in agreement with the sterility precautions advocated in the EAUN-guidelines (OR 2.50, CI 1.78–3.49) compared to working in a medical department needs further investigation.

Methodological considerations

Knowledge may differ from behaviour why self-reported descriptions of sterility precautions during indwelling urethral catheterization rather than observing the actual performance of the nurses may be a limitation in our study. There is, however, no reason to believe that the answers to the questions in this study did not reflect the participants’ actual behaviour. As the aim of the study was to investigate the nurses’ self-reported sterility precautions in indwelling urethral catheterization in the light of different sterility requirements in present local hospital guidelines and the EAUN-guidelines, a questionnaire made it possible to cost-efficiently reach many more nurses from different departments at two hospitals than observation. A validation of the procedure described by the participants requires an observational study of the practiced skills such as conducted by Manojlovich et al [13]. Another limitation is that the study did not include physicians. Urethral catheterization in Sweden is however performed mostly by nurses hence the focus on nurses in the study. The results of our study highlight the importance of a uniform approach to sterility precautions during urethral catheterization, both in national and local hospital guidelines. Implementation of guidelines are needed to achieve a uniform knowledge in and performance of aseptic indwelling urethral catheterization.

Conclusions

Despite evidence-based national guidelines and even though only sterile urinary catheters are available in Sweden, sterility of the IUC is not ensured by the nurses on every occasion of IUC-insertion. A uniform performance of indwelling urethral catheterization requires both evidence-based national guidelines and a stepwise explanation of the principles of aseptic technique applied on urethral catheterization, from preparing for procedure to completed insertion. Local guidelines should not diverge from the national guidelines. To implement the written guidelines, nurses should be given regular training. Their skills in and compliance to aseptic urethral catheterization should be at least annually validated.

Abbreviations

HAUTI

healthcare-associated urinary tract infection

IUC

indwelling urinary catheter

EAUN

the European Association of Urology Nurses

IQR

interquartile range

OR

odds ratio

CI

confidence interval

SPSS

the IBM Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Participation was voluntary. The study was approved by the Chief Medical Officer at both study hospitals. Permissions were also obtained from Head of the Departments and the Head Nurses concerned. Collected data did not include patients or relatives or sensitive personal information as stated in the Swedish Act, why no ethical approval was required under the Swedish Act concerning the Ethical Review of Research Involving Humans, from the Ministry of Education and Research [23]. Data were analysed on group level. Neither the Head Nurses nor other managers did receive any information concerning who answered the questionnaires and who did not. None of the researchers had any professional or private relation to any of the study participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was obtained for the study.

Authors' contributions

AK and AT designed the study. AK coordinated the data collection. All authors participated in data analysis and drafting of the manuscript. All authors read and approved the final version.

Acknowledgements

We would like to thank the Chief Medical Officer, the Head of Departments, the Head Nurses and all the participants at both study hospitals.

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Figures

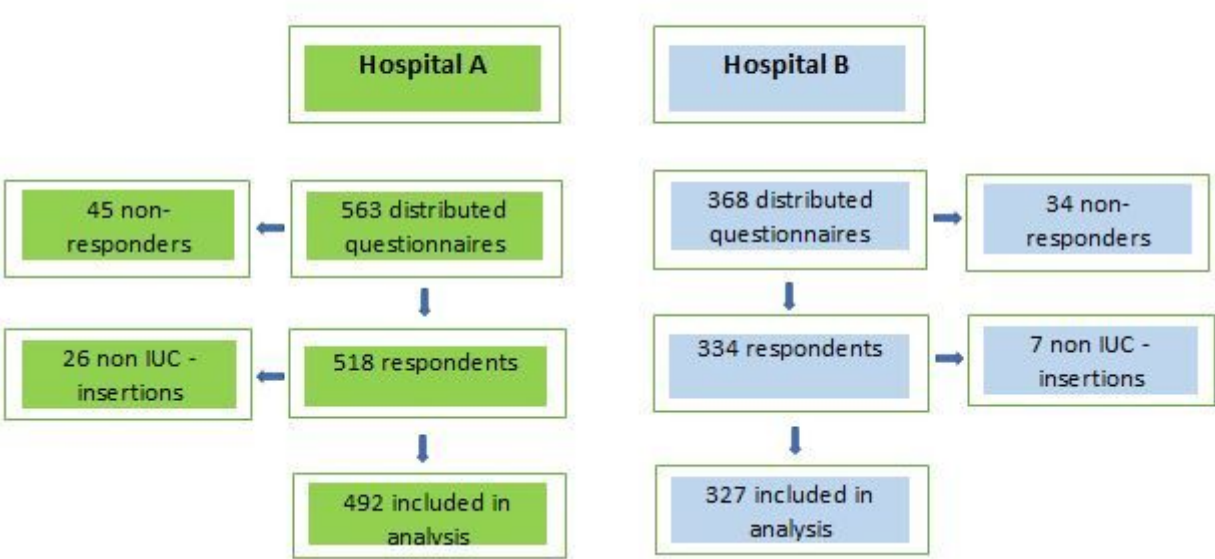


Figure 1

Flowchart of study inclusion process at both hospitals.