OULUN AMMATTIKORKEAKOULU

MINIMIZING THE PREVALENCE OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

English Instructional Material for Urinary Catheterization of Long and Short Urinary Tracts

Heidi Heikkilä, Jade Holmes & Sarah Lohi
Bachelor's Thesis
Spring 2025
Degree Program in Nursing
Oulu University of Applied Sciences

ABSTRACT

Oulu University of Applied Sciences
Degree Program in Nursing

Authors: Heidi Heikkilä, Jade Holmes & Sarah Lohi
Title of thesis: Minimizing the Prevalence of Catheter-Associated Urinary Tract Infections: English Instructional Material for Urinary Catheterization of Long and Short Urinary Tracts
Thesis supervisor(s): Floro Cubelo, Piia Hyvämäki, Elina Laukka
Term and year of completion: Spring 2025
Pages: 36 + 3 appendices

Catheterization is a frequently performed procedure in nursing, requiring knowledge and adherence to aseptic techniques. The existing instructions in Finland are in Finnish, which creates challenges for nursing students with a foreign language background. The purpose of this thesis was to help bridge the gap for international nursing students at Oulu University of Applied Sciences (Oamk) by translating the Oulu University Hospital (OYS) 2023 catheterization instructions to English and demonstrating them in practice.

This thesis was implemented as a clinical skills lab for first-year international nursing students at Oamk. The process included translating the hospital instructions, presenting the theoretical backgrounds of long and short urinary tract catheterization, and demonstrating the procedures to the students with the use of dummies. The students practiced catheterization in pairs using aseptic technique. To assess the success of this teaching method, feedback was collected from the participants via a Webropol survey.

The survey analysis indicated that students found the lesson and demonstration helpful in learning about urinary catheterization. Many participants reported that the lesson was informative, easy to follow, and engaging. However, the feedback also showed that some students do not yet feel confident enough in skills required for sterile procedures and urinary catheterization. Based on these findings, the translated catheterization instructions are a valuable resource for international nursing students in learning catheterization skills, and future development could include more practical sessions for practice to increase confidence in these hand skills.

CONTENTS

1 INTRODUCTION

Worldwide, urinary tract infections (UTI) affect about 150 million people every year. They are among the most commonly occurring bacterial infections (Werneburg 2022). In Finland, 300,000 UTIs are treated every year, of which 20,000 are hospital-acquired (Vuento 2024). Improper catheterization techniques are a big risk factor for catheter-associated urinary tract infections. As high as 80% of complicated UTIs can be attributed to use of indwelling urinary catheters (Werneburg 2022). According to research by Grana Van Decker et. al. (2021), 9% of hospital-acquired infections are catheter-induced urinary tract infections, and over 60% of them may be preventable.

Nurses are regarded as the main healthcare professionals responsible for inserting and managing urinary catheters and ensuring positive patient outcomes. They must possess the necessary knowledge and skills for catheter care to prevent urinary tract infections, as catheter insertion is an important predisposing factor. (Khasal 2022.) Finland has a strong demand for nurses and the country's own work force struggles with nursing sufficiency (Cubelo et al. 2023). The number of international nurses in Finland is increasing; statistics show that in 2007, 0,8% of the Finnish nursing population were international nurses (Ailasmaa 2010), and in 2022 the percentage had risen to 4,5% (Finnish Nurses Association 2022). It is essential to provide clear instructions to ensure high-quality practice. Lack of sufficient information caused by communication difficulties due to language barriers may result in adverse healthcare outcomes (Pratt 2014). Proper training and competence in catheterization for nurses and students are crucial to minimizing the risk of preventable hospital-acquired infections such as CAUTI (catheter-associated urinary tract infection). CAUTI is understood as a urinary tract infection (including the urethra, bladder, ureter or kidney) that is related to urinary catheter usage (National Healthcare Safety Network 2024).

According to a study done by Lehtoaro et al. (2018), language barriers are shown to have a great effect on employment acquisition and work satisfaction. Having more available instructions in English can help new nurses gain employment and perform safely in their job while learning the local language. Oulu University

Hospital (OYS) and Oulu University of Applied Sciences (Oamk) do not presently have sufficient English material for non-native Finnish speaking healthcare students. The Oulu University Hospital (OYS 2023) and Finnish Institute for Health and Welfare (THL 2023) have up-to-date instructions for urinary catheter insertion and care; however, they are in the Finnish language.

With the increasing number of international nursing students in Finland, we decided to create English-language instructional material about urinary catheterization of the long and short urinary tract, to provide reliable and understandable information that is easily accessible. The instructions are according to Oulu University Hospital's catheterization guidelines (OYS 2023). The material consists of visual and textual instructions and guidelines of how to perform catheterization on a patient. Making this material will benefit not only students, but teachers at Oamk, and possibly international nurses and training staff at the University Hospital in the future.

2 FOUNDATIONS OF URINARY CATHETERIZATION AND CAUTI PREVENTION

Urinary tract infections are among the most common healthcare-related infections world-wide. CAUTI is a urinary tract infection that is related to urinary catheter usage. Nearly all CAUTIs are caused by instrumentation of the urinary tract. Complications from CAUTIs cause various problems: discomfort to the patient, longer hospital stays, higher costs and mortality. (National Healthcare Safety Network 2024.)

2.1 Anatomy of the urinary tract

The urinary tract organs filter blood, produce and excrete urine (Tamadonfar et al. 2019). Healthcare professionals interact with the urinary tract while catheterizing; thus, it is important to understand the anatomy of this system.

The kidneys' main role is to filter waste and excess substances from the blood. This waste becomes urine. Ureters are thin tubes that allow urine to pass from the kidneys to the bladder with the help of the smooth muscles in the walls. The hollow, muscular bladder stores urine until it leaves the body. When the bladder is full to a certain level, signals to the spinal cord give a person the urge to urinate, and urine exits the body through the urethra (Waugh & Grant 2023, 377, 386 – 387, 389.)

The urethra is a channel that provides a pathway for urine flow. It begins at the neck of the bladder and ends at the external urethral orifice, where it exits the body. The short urethra is about 4 cm long with a diameter of 6 mm. It runs downward and forward from the bladder behind the pubic symphysis and opens just in front of the vagina at the external orifice (Waugh & Grant 2023, 387 – 388.) See *photo 1*. The long urethra averages 19 – 20 cm in length and extends from the bladder to the end of the penis (Waugh & Grant 2023, 514), see *photo 2*. When the bladder is full to a certain level, signals to the spinal cord give a person the urge to urinate, and urine exits the body through the urethra (Waugh & Grant 2023, 389).

Defense mechanisms in the urinary system such as the mucosal layer in the lining of the urinary tract, the length of the urethra micturition and the immune system help protect against infection (Soman & Miao 2015; Chenoweth 2021). In catheterization, a thin tube is inserted through the urethra into the bladder to drain urine. The anatomical and physiological integrity of the urinary tract is critically important to maintain a healthy urinary tract. When the integrity is breached, for example through catheter insertion, this bypasses the body's natural defenses, increasing the risk of infection in the urinary tract (Hickling et al. 2015.)

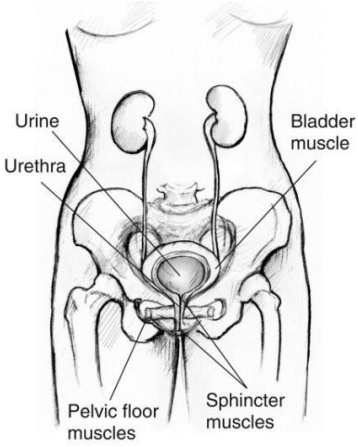


Photo 1: short urinary tract (kidneys, ureters, bladder, urethra). (National Institute of Diabetes and Digestive and Kidney Diseases)

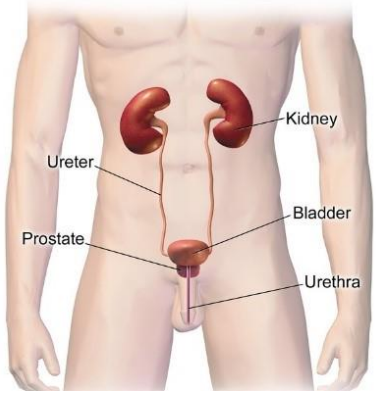


Photo 2: long urinary tract (kidneys, ureters, bladder, prostate, urethra). (Blaus 2017)

2.2 Catheter-associated urinary tract infections

Prevalence

Worldwide, millions of cases of UTIs are reported annually, making them a great healthcare concern. Each year in Finland alone, around 20,000 hospital-acquired UTIs are treated, a significant portion of them being catheter-associated (Vuento 2024). Urinary tract infections are classified as either uncomplicated or complicated. Uncomplicated UTIs typically occur in healthy individuals without structural or neurologic urinary tract abnormalities. This happens predominantly with short urinary tracts, due to anatomic factors such as a shorter distance from anus to urethral opening, shorter urethral length, and a uropathogenic facilitating vaginal/perineal microenvironment enabling easier transit of bacteria to the urinary tract. Complicated UTIs are associated with factors related to functional and structural urinary tract problems such as urinary catheterization, urinary obstruction or retention, renal failure and pregnancy. The most common risk factor for a complicated UTI is indwelling urinary catheterization. (Flores-Mireles et al. 2019.)

Risk factors

CAUTIs result from bacteria entering the urinary tract during insertion of the catheter or while it is in place. Among the most significant CAUTI risk factors are improper catheter insertion, poor catheter maintenance and prolonged catheter use (Flores-Mireles et al. 2019). Catheter insertion and use is one of the largest risk factors for urinary tract infections (Käypä hoito –suositus 2024, Tamadonfar et al. 2019). An important contributor to bacteriuria, and increased risk for CAUTI, is duration of catheterization (Flores-Mireles et al. 2019). Short urethra, older age and not properly maintaining a closed drainage system in the catheter are also risk factors for CAUTI (Patel et al. 2023). As visible in *photo 3*, the short urinary tract is more susceptible to infection, as the bladder is much closer to the urethral opening.

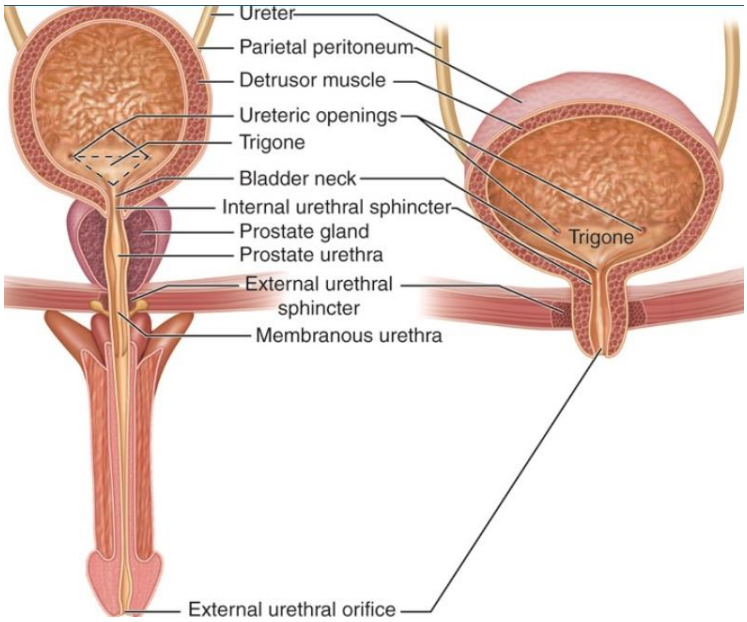


Photo 3: Comparison of long and short urinary tracts, kidneys not pictured (Cenveo). This illustrates the susceptibility of the short urinary tract to infection.

Pathophysiology

Urinary catheters induce inflammation of the bladder and provide a direct pathway for bacteria to enter (Tamadonfar et al. 2019). The catheter surface is ideal for microbial adhesion and formation of biofilm, which can lead to drug-resistant microorganisms and infections that are difficult to treat (Lethongkam et al. 2022). Indwelling urinary catheters create an environment for bacteria to grow. The bacteria causing majority of CAUTIs is a strain of the E. coli bacteria UPEC, uropathogenic Escherichia coli. Other bacteria associated with CAUTIs include enterococcus and S. Aureus. Candida (yeast) is increasingly causing CAUTIs. It typically does not adhere well to the normal bladder mucosa; however, the risk of candida UTI has been associated particularly with the presence of latex catheters. (Flores-Mireles et al. 2019.)

Biofilm is complex and consists of bacterial colonies that reside in an exopolysaccharide matrix that attaches to foreign surfaces in a living organism (Sharma et al. 2023). Surfaces such as a latex catheter represent a perfect surface for bacteria to adhere and start biofilm formation (Ramadan et al. 2021). Biofilm formation on catheters depends on the duration of urinary catheterization. In a study done by Ramadan et al, 10 – 50% of short-term catheterized patients (under 7 days) had biofilm presence, while all long-term catheterized patients (28

days or more) had biofilm presence. All catheter types are susceptible to biofilm attachment and growth, however latex catheters that are widely used for strength, ease of handling and low cost, have the highest tendency of biofilm formation. (Ramadan et al. 2021.)

Complications

Complications due to CAUTIs are common. In addition to patient suffering, research shows that secondary bloodstream infections (Flores-Mireles et al. 2019), cystitis (inflammation or infection of the bladder), prostatitis (inflammation or infection of the prostate gland), catheter encrustation, bladder stones, septicaemia, endotoxic shock and pyelonephritis (kidney infection) are possible (Ramadan et al. 2021). Among non-infectious complications of urinary catheter use are nonbacterial urethral inflammation, urethral strictures and mechanical trauma as serious as urethral or bladder perforation (Patel et al. 2023). CAUTI-related complications lead to longer hospitalization times, increased cost, use of antibiotics and antimicrobial resistance (Ramadan et al. 2021). In serious cases, urosepsis and even death can occur (National Healthcare Safety Network 2024).

Prevention and control

In hospitals and emergency departments worldwide, as many as 50 percent of urinary catheters placed are done without appropriate clinical indication to justify the risk compared to the benefit (Patel et al. 2023). This highlights the importance of having evidence-based reasoning for catheter use.

In Finland, Current Care Guidelines (käypä hoito suositukset) are provided by the Finnish Medical Society Duodecim in collaboration with professional medical organizations. They have provided research indicating that indwelling catheters do not have a higher risk of infection than intermittent or suprapubic catheters when used for less than 5 days (Laato 2019), showing that it is important to remove catheters when not needed. Hospitals also provide infection and prevention control instructions and recommendations. Some of the CAUTI prevention methods given by OYS include using urinary catheters only when necessary, assessing the functionality and need for the urinary catheter daily, ensuring proper aseptic technique when inserting the catheter, and removing catheters as soon as unnecessary (OYS 2023). The Finnish Institute for Health

and Welfare, THL (Terveyden ja hyvinvoinnin laitos 2023), provides guidelines and recommendations for infection prevention, patient safety, and proper medical procedures. They have updated information about catheterization and instructions for proper indications and use of urinary catheters.

When interventions for preventing CAUTI are put into practice, the expected benefits include fewer cases of CAUTI, decreased use of indwelling urethral catheters, reduced need for collecting and treating positive urine cultures, fewer antibiotic-related complications, and lower costs (Patel et al. 2023).

Current guidelines

The Centers for Disease Control and Prevention (CDC 2024) recommends minimizing urinary catheter use and duration. Particular attention should be given to individuals at higher risk for CAUTI. Interventions in clinical settings have focused on strategies reducing unnecessary use of indwelling urinary catheters, ensuring prompt removal and adherence to general infection control principles such as hand hygiene, monitoring of catheter use, aseptic insertions and education of healthcare professionals. (Flores-Mireles et al. 2019.) In Finland, THL (Terveyden ja hyvinvoinnin laitos) explains why healthcare-associated infections such as CAUTIs should be prevented. Studies from Finland show that in addition to patient safety, prevention is significant for public health. It lessens human suffering and brings economic savings. (Finnish Institute for Health and Welfare 2023.)

Education, language and cultural considerations

Non-native Finnish speaking nurses face language and communication issues (Pratt 2014). These are concrete challenges in the healthcare field, especially in countries like Finland, where the number of international students and professionals continues to rise, and the primary language used in teaching and practice is Finnish. Without proper communication and understanding, patient safety and quality of care is at risk (Al-Yateem et al. 2023). According to a study by Pratt (2014), foreign healthcare employees have difficulty understanding guidelines and effectively communicating with coworkers and patients when not fluent in the local language. As previously stated, job satisfaction and the ability

to perform tasks appropriately and safely are affected by language difficulties (Lehtoaro et al. 2018).

The education and attitude of healthcare employees affect outcomes for patients. Nurses play an essential role in safe urinary catheter care. It has been found that there is a notable correlation between knowledge and attitude. (Mong et al. 2022, 210, 214.) Proper training of urinary catheter insertion and care is imperative. Misunderstandings due to language barriers can cause improper techniques, risking CAUTIs and other complications.

As previously stated, Finland has increasing numbers of international healthcare professionals joining the workforce, nurses in particular. This highlights the importance of having educational material available in English, as English is a language widely understood. Oamk currently provides nursing education in the English language. While Oamk offers current and high-quality instruction and guidelines, many of the materials are only available in the Finnish language. This limits accessibility and can hinder professional development for students who are not yet fluent in Finnish.

Cultural differences affect both nursing work and patient care. Personal and intimate procedures are looked at differently in various cultures. To some patients, discussing the urinary system might be considered sensitive or taboo. There may be different expectations related to patient consent, privacy and gender sensitivity among nurses from different cultures. To provide culturally competent care and ensure patients are respected, it is necessary for healthcare professionals to understand and anticipate different beliefs.

Unclear communication can result in misunderstandings and improper care (Pratt 2014). In catheterization, accurate communication and proper understanding ensures that catheters are inserted using sterile techniques to the correct patients in the appropriate situations. Incorporating up to date Oamk-approved teaching materials in English supported with visuals can show inclusivity and priority of the university to provide better integration into the Finnish healthcare system.

2.3 Urinary catheterization of the long and short urinary tract

2.3.1 Indications

Indications for urinary catheter use include urinary retention or bladder obstruction, severe skin problems related to urinary incontinence, administration of medication into the bladder, diagnostic and treatment procedures, major surgeries, monitoring urine output in critically ill patients, intensive care, and terminal care (OYS 2023).

Contraindications for urinary catheter use include blood at the meatus (inserting the catheter can worsen an underlying injury), gross haematuria, evidence of urethral infection, urethral pain or discomfort, low bladder volume/compliance and patient refusal (Haider & Annamaraju 2023).

2.3.2 Choosing the correct catheter

The catheter should be as thin as possible, so that the catheter does not cause any unnecessary pressure in the urinary tract and allows normal secretions to pass through the urethra. The size of the catheter varies from CH 12 to 16 with adults (OYS 2023). Catheter sizes are typically measured in French, and abbreviated either FR or CH. In Finland, CH is used. The size refers to the diameter of the catheter. For catheterizing patients with long urethras, typically the size is 14 – 16 CH, and the length is 40 – 45 cm. For patients with short urethras, the size is 12 – 14 CH and the length is 20 – 25 cm.

The tip of the catheter also varies in size and shape. For example, Nelaton catheter has a straight tip and is used in a normal and intermittent catheterization, and Tiemann catheter has a curved tip and is used in a long urinary tract when there are difficulties for example due to an enlarged prostate (OYS 2023).

Single-use catheters are used for intermittent catheterization. The most common catheter model is a hydrophilic, straight, and round-tipped catheter, which is lubricated with sterile water or saline (THL 2023).

Indwelling catheters, also known as Foley catheters, typically have two separate channels, or lumens. One is for urine drainage and the other for filling the balloon at the tip of the catheter to ensure that the catheter is secure inside the bladder (OYS 2023). Foley catheters can have three lumens, the third is used if it is necessary for the bladder to be flushed, or for medication administration (Satakunnan sairaanhoitopiiri 2019). See *photo 4.*

Teflon or silicone coated latex catheters are for short-term use and need to be changed at least once a month. Catheters made from 100% silicone are for long-term use but need to be changed every three months or according to the manufacturer's instructions. In case the patient has a latex allergy, 100% silicone catheters and non-latex gloves must be used (OYS 2023).

Photo 4. Foley catheters (Saltanat 2013). The different colors in the channels indicate the size of the catheter. A urinary catheter with three lumens is known as a three-way catheter or triple-lumen catheter.

2.3.3 Necessary equipment

- Sterile catheterization package: wash cup, gloves, cleaning swabs and gauzes, syringe, kidney dish, forceps, drape.

If a sterile catheterization set is not available, the equipment can be gathered separately:

- Clean gloves, clean wash cup and gauzes, sterile forceps, or sterile gloves for catheter insertion, sterile drape

Additionally:

- Sterile catheter
- Sterile NaCl or sterile water for “washing” the area
- Sterile syringe to fill up the balloon
- 10% glycerol solution, hypertonic saline solution, or sterile water depending on the catheter
- Urine collection bag and a bag holder
- Bed pad
- Tape for securing the catheter in place
- Xylocain 2% anesthetic gel, or if the patient is allergic to anesthetics, alternatively liquid paraffin or lubricant can be used.

(OYS 2023)

The photos pictured below show the equipment needed for catheterization. *Photo 5* depicts an opened sterile catheterization kit and *Photo 6* is a photo of the additional catheterization equipment.

Photos 5 & 6: Sterile catheterization kit (opened), and equipment for catheterization.

2.3.4 Catheter insertion, removal and replacement

A urinary catheter is inserted as gently as possible. Damage to the urethra creates an ideal environment for infections. The nurse should remain calm and try to relax the patient. Catheterization can be performed with an assistant, or if needed, alone. After the procedure, the reason for catheterization, the time/date, catheter information, healthcare professionals that were involved, and the possible removal date are documented. The urinary catheter's functionality and need for use are to be evaluated daily. (OYS 2023.)

The catheter is removed immediately when its use is no longer necessary. The urine collection bag is emptied before the removal of the catheter. First, the liquid is removed from the balloon with a syringe. After that, the catheter is gently removed from the bladder. If the catheter is stuck, rotate it carefully.

A new catheter is inserted in the following situations:

- Urinary tract infection, if the removal or transition to intermittent catheterization is not possible
- If the catheter has a blockage
- The closed system has opened
- According to the manufacturer's instructions

The urine collecting bag is replaced to a new one at the same time as the catheter is changed (THL 2023).

2.3.5 Complications of catheterization

There are anatomical differences between the long and short urinary systems which affect the catheterization process and susceptibility for infections. In the long urinary system, the prostate gland can obstruct the urethra, making catheterization more complicated than the straight route for the short urinary tract (Cao et al. 2024). The long urethra is better protected from bacterial infections, as it is approximately five times longer than the short urethra and bacteria are less likely to reach the bladder. The short urethra is a predisposing factor to

urinary tract infections. (Waugh & Grant 2023, 397.) Catheterization is quicker and easier in the short urethra, but there is more risk of an associating urinary tract infection.

Longer duration of indwelling urinary catheter usage leads to higher risk of CAUTI. Need for catheterization should be assessed daily, and catheters removed as soon as deemed unnecessary. (Chenoweth 2021.)

2.4 Catheterization of the long and short urinary tracts OYS 2023 instructions

As a crucial part of our thesis work, we translated the most current catheterization instructions to English, from Oulu University Hospital. The 2023 OYS instructions "Virtsateiden katetrointi" have omitted the words male and female, opting for "long and short urinary tracts". In alliance with OYS, our thesis also uses "long and short urinary tracts". The instructions are attached as an appendix. See *Appendix 1.*

3 PURPOSE AND AIM OF THESIS

In collaboration with Oulu University of Applied Sciences, the aim of this thesis was to make instructional material in English teaching the proper catheterization technique of the long and short urinary tract. In creating the instructional material, content of previously made and Oamk-approved instructional video(s), along with current local instructions in evidence-based published material online were used. The product of the thesis can be used by teachers of Oamk in skills testing or learning activities freely.

The purpose of this thesis was to create practical instructional material of long and short urinary catheterization for foreign nursing students. With the material made, the goal is to reduce the chances of CAUTI due to inadequate technique or lack of accessible information. The authors' method to achieve this goal was to use evidence-based information in combination with an experiential teaching method. The material includes a PowerPoint presentation, demonstration of catheterization and learning stations with instructions for student hands-on practice.

4 METHODOLOGY

4.1 Experiential teaching method

Experiential learning simply explained is learning by doing. Kent State University states “...By getting students engaged in hands-on experiences and reflection, they are better able to connect theory and knowledge in the classroom with real world-situations" (Kent n.d..) Nursing by nature is a practical profession as there are many hands-on skills needed. As CAUTI prevention was the motivation for this project, we decided to design teaching material that involves the students to practice the skill themself, as this would be the most effective way to ensure proper catheterization technique.

4.2 Timeline and budget

Timeline

The planning phase of our thesis began in spring 2024. We chose this topic because of its importance and relevance to nursing. We did some brainstorming for ideas of ways to implement this idea and what the theoretical portion should include. Our first idea was to make an instructional video of urinary catheterization for OYS, however, though we contacted several units in the hospital, we were unable to secure a unit to make it for. The hospital was in the process of moving to the new buildings, and we believe everyone was occupied with details related to it. The idea that we chose to implement was to make instructional material and teach it to the first-year English language nursing students at Oamk.

The theoretical phase of our thesis was done in the autumn semester of 2024. The contents of the theoretical portion of this thesis were chosen to give a background of the anatomy of the areas involved in catheterization. Research was done using Oula-Finna library databases, articles, Finnish websites (THL and OYS) and course books from anatomy and physiology. Databases used were Ebsco, Google Scholar, PubMed and ScienceDirect.

The thesis implementation and analysis were done in the spring semester of 2025. On 6.2.2025, the execution of the thesis took place at Oamk, with the first-year class of international nursing students. Section 4.4 reviews the details of this.

Budget

Teachers' hours:

- Classroom hours: Drafting process 14h x 40€ = 560€, Dissertation phase 4h x 120€ (3 teachers) = 480€
- Thesis guidance hours: 4h x 40€ = 160€
- Thesis seminar hours: Dissertation seminar 4h x 120 € (3 teachers) = 480 €, Viva seminar 4h x 120 € (3 teachers) = 480 €
- Total teacher wages = 2,160 €

Student hours spent on thesis: 1,000+, cost: 0 €

Material costs:

- Printing and laminating learning stations: 13 €
- Chocolate for students' thank you: 14 €

Total costs incurred for thesis = 27 €

4.3 Execution

The catheterization material created was introduced and taught to first-year international nursing students at Oamk on 6.2.2025. The authors of this thesis were the personnel implicating the teaching material. The presentation was presented, teaching the theoretical information to the students. Next, we demonstrated the proper technique of catheterization for both long and short catheterization to the group. After the presentation the students practiced the skills by participating in learning stations. At the end of the class, the students answered a Webropol survey related to the experience. The feedback received from the catheterization teaching session provided data for analysis of success.

4.4 Evaluation

To evaluate our thesis project, we gathered feedback from the students participating in our teaching session. Feedback was collected via Webropol survey, shown in *Appendix 3*. Through feedback analysis, we gained understanding of the extent to which the instructional material was helpful in learning the appropriate technique for long and short urinary tract catheterization. Additionally, the material created will be available to teachers and students for future use.

5 RESULTS

5.1 Quantitative results

The quantitative portion of the Webropol survey included questions requesting a number answer on a sliding scale, *shown in Table 1*, and a question about which element of the lecture was most useful for personal learning, with a choice of three answers*, see Figure 1*.

Table 1: Webropol survey answers from questions with a sliding scale of 1-5 or 1-10.

	Min value	Max value	Average	Median	Sum	Standard deviation
How clear and comprehendible was the theoretical part of the presentation? (1-5)	3	5	4.7	5	71	0.6
The demonstration of catheterization was easy to follow. (1-5)	3	5	4.6	5	69	0.6
Do you feel the learning stations guided you to learn catheterization in a simple and effective way? (1-5)	4	5	4.8	5	72	0.4
After listening to the lecture, watching the demonstration and participating in the learning stations do you feel more confident in your ability	2	3	2.7	3	41	0.5

to perform urinary catheterization? (1-5)						
How engaging or informative did you find the lecture? (1-10)	8	10	9.3	10	139	0.9
Would you recommend the use of this lecture on long and short catheterization to English speaking nursing students? (Including the PowerPoint and learning stations) (1-5)	2	3	2.9	3	44	0.3

Students rated the theoretical presentation and demonstration well, suggesting that the content was well-structured and easy to understand. The learning stations were the highest-rated section, which concludes that students found hands-on practice highly beneficial for learning catheterization skills. The students reported relatively low confidence in their ability to perform catheterization after the session, despite rating the other components positively. It is possible that students may have wished for more practice or guidance to feel confident in their skills.

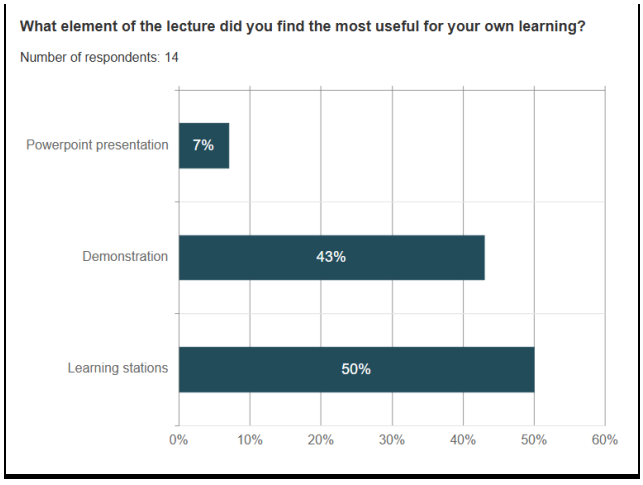


Figure 1: Bar graph showing the most useful elements of the lecture.

5.2 Qualitative results

The qualitative portion of the Webropol survey included open-ended questions about the students' learning experience. Following are the answers received.

Difficulties students experienced during the hands-on practice included:

- Sterility issues (e.g. "staying sterile" and "putting on sterile gloves")
- Technical skill difficulties (e.g. "inserting the catheter")
- Equipment-related problems (e.g. "gloves were too small")
- Some students replied that there were no difficulties (e.g. "none, it was fun" and "no challenges, I feel so good")

All additional feedback received was positive, and among the following themes:

- Clear content (e.g. "the PowerPoint is straightforward" and "Easy to follow")
- Good teaching methods (e.g. "Everything was fine, and we learned really well")
- Appreciation for the instructors (e.g. "Nice job – I really learned a lot" and "Friendly atmosphere boosted my zeal to learn more")

Some students mentioned that having peers teaching them made them feel comfortable. Additionally, when they observed the demonstrators make a mistake and correct it, they felt less intimidated to try the skills.

No suggestions for improvement were given, which suggests that there was overall satisfaction with the session.

5.3 Interpretation

The low recommendation for other English-speaking nursing students was an unexpected result, despite positive ratings in most other categories. Factors such

as difficulties fitting the gloves, remaining sterile and not having enough time to practice may have influenced the recommendation.

Students reported positive feedback for the peer teaching session. Studies have been done on the effects of peer teaching. In one study, it was reported that students felt a comfortable environment and were less intimidated when their peers were teaching. They were more likely to have discussion and ask for clarification than if teachers were teaching. (Zhang et al. 2022.)

A study conducted by Garcia Puerto et al. (2022) explored how a “flipped classroom” effects the outcome of learning urinary catheterisation. A “flipped classroom” suggests that the students teach the other students. This study was conducted on a group of 139 nursing students through a quasi-experimental non-randomised, pre-test post-test design. The results showed significant positive effect on the student’s knowledge of catheterisation and the student’s self-efficacy to perform the task following the “flipped classroom” teaching experience. It was highlighted that in the “flipped classroom” scenario, the students that are being taught orientate themselves with the theoretical material before the teaching event takes place. During the teaching event, the students practice the skill hands-on, “bridging the gap between theory and practice”. (Garcia-Puerto et al. 2022, 5.)

There are a few changes that can be considered to improve student confidence and overall experience in future catheterization learning sessions. It would be beneficial if the students have prior practice of donning sterile gloves and working in a sterile field. Students should have more equipment available so they can practice more than one time. Increasing time allowed to practice catheterization or scheduling additional practice sessions would increase confidence, as it can be built with practice. The limited practice time could have influenced the lower confidence levels, but it does not necessarily indicate a failure in teaching effectiveness.

The survey response rate was 83% (15/18), which represents a good majority of the students. The small sample size, however, does not allow for generalization.

5.4 Conclusion

Overall, the students found the lecture clear (4,7/5), the demonstration effective (4,6/5), and the learning stations highly useful (4,8/5). However, their confidence in performing the skill was low (2,7/5), and the overall recommendation score was lower than expected (2,9/5).

The high scores for our teaching and demonstration give us confidence that we have well-prepared and thorough information about catheterization. To improve future teaching sessions, it would be beneficial to first teach and master sterility, have more hands-on practice time, ensure proper equipment and offer follow-up opportunities for learning reinforcement and confidence-building.

6 DISCUSSION

The purpose of this thesis was to create practical instructional material of long and short urinary catheterization for international nursing students at Oulu University of Applied Sciences. With the material made, the goal was to reduce the chances of CAUTI due to inadequate technique or lack of accessible information. The aim to achieve this goal was by using evidence-based information in combination with demonstrating. The teaching lesson included a PowerPoint presentation, which included theoretical backgrounds of catheterization and catheter-associated urinary tract infections, demonstration of catheterization and learning stations with instructions for student hands-on practice.

Analysis of student feedback suggests that the translated material will benefit English-speaking students in learning catheterization. Students understood the instructions and felt comfortable learning the new procedures. The lessons and demonstrations were well-received and appreciated. However, after one hands-on practice session, some did not feel confident enough in their skills to perform catheterization. This highlights the importance of experiential learning, which gives reinforcement through hands-on learning and repetition.

6.1 Reliability

We translated and produced learning material in English on aseptically performing urinary catheterization. Adhering to reliability standards we used up-to-date intrusions made by local entities- THL (2023) and Oulu university hospital. The catheterization instructions are accurate and medically sound, provided by OYS in 2023. ChatGPT AI was used to assist in the translation, as well as proofreading by native tongue English speakers.

The theoretical chapters of this thesis contained current, evidence-based information. Plagiarism was avoided by ensuring that other authors' information was properly cited and sourced.

Due to the small pool of participants in our study, the results cannot be generalized to larger populations.

6.2 Ethical considerations

This thesis was created and research done according to the guidelines of Oulu University of Applied Sciences and the TENK (Finnish National Board on Research Integrity 2023).

Participants in the teaching session and Webropol survey gave voluntary consent to be in the study. They received information about the purpose of the study, what their participation involved and that their responses would remain anonymous. No personal information would be revealed in the process, and after the feedback analysis, the surveys would be deleted.

Webropol survey questions were formed in a neutral way, ensuring that participants would not be led to a specific response. Participants had the option to give both positive and negative feedback along with suggestions for improvement. See *Appendix 3*.

6.3 Professional growth

The research and making of this thesis provided the authors with a significant expansion of knowledge related to urinary catheterization and CAUTI prevention. This knowledge will be brought into the workforce and will be used in patient care and in teaching others.

REFERENCES

Ailasmaa, Reijo 2010. Sosiaali- ja terveyspalveluiden ulkomaalainen henkilöstö ja suomalaiset ulkomailla. Terveyden ja hyvinvoinnin laitos. Search date 3.10.2024. https://www.julkari.fi/bitstream/handle/10024/80256/Tr18_10.pdf?sequence=1&isAllowed=y.

Al-Yateem, Nabeel, Hijazi, Heba, Saifan, Ahmad, Ahmad Alaa, Masa-Deh, Rami, Alrimawi, Intima, Rahman, Syed, Subu, Muhammad & Ahmed, Fatma 2023. Quality and safety issue: language barriers in healthcare, a qualitative study of non-Arab healthcare practitioners caring for Arabic patients in the UAE. BMJ open 13(12), e076326. Search date 3.10.2024. https://doi-org.ezp.oamk.fi:2047/10.1136/bmjopen-2023-076326.

Blaus, Bruce 2017. Urinary System (Male). Wikipedia Commons. Search date 12.2.2025. https://commons.wikimedia.org/wiki/File:Urinary_System_(Male)_(cropped).png.

Cao, Lijun, Qi, Xin, Liu, Dan, Mao, Xincheng, Luo, Liu, Liu, Mengjiang, Wen, Xinyi, Cui, Chunhong, Qi, Jia, Xu, Junmei & Cui, Yulong 2024. Effect of continuous infusion in alleviating pain during male urethral catheterization. BMC Anesthesiology 24(1):457. Search date 16.2.2025. doi: 10.1186/s12871-024-02848-4.

CDC 2024. Summary of Recommendations from the Guideline for Prevention of Catheter-Associated Urinary Tract Infections (2009). U.S. Centers for Disease Control and Prevention. Search date 22.9.2024. https://www.cdc.gov/infection-control/hcp/cauti/summary-of-recommendations.html.

Cenveo. Drawing Male and female urinary tract – English labels. License: CC BY. Search date 14.2.2025. https://anatomytool.org/content/cenveo-drawing-male-and-female-urinary-tract-english-labels.

Chenoweth, Carol 2021. Urinary Tract Infections: 2021 Update. Infectious Disease Clinics of North America 35(4): 857 – 870. Search date 1.10.2024. https://doi.org/10.1016/j.idc.2021.08.003.

Cleveland Clinic 2023. Foley Catheter. Search date 14.2.2025. https://my.clevelandclinic.org/health/treatments/foley-catheter.

Cubelo, Floro, Langari, Maliheh, Jokiniemi, Krista & Turunen, Hannele 2023. Recognition of nursing qualification and credentialing pathway of Filipino nurses in Finland: A qualitative study. International Nursing Review 71(3): 661 – 669. Search date 1.10.2024. https://doi.org/10.1111/inr.12901.

Finnish Institute for Health and Welfare 2023. Healthcare-associated infections. Infectious Diseases and Vaccinations. Search date 13.10.2024. https://thl.fi/en/topics/infectious-diseases-and-vaccinations/diseases-and-disease-control/healthcare-associated-infections.

Finnish National Board on Research Integrity 2023. The Finnish Code of Conduct for Research Integrity and Procedures for Handling Alleged Violations of Research Integrity in Finland. TENK. Search date 17.2.2025. https://tenk.fi/sites/default/files/2023-11/RI_Guidelines_2023.pdf.

Finnish Nurses Association 2022. Statistics on Nurses. Search date 3.10.2024. https://sairaanhoitajat.fi/ammatti-ja-osaaminen/tilastoja-sairaanhoitajista-2/.

Flores-Mireles, Ana, Hreha, Teri & Hunstad, David 2019. Pathophysiology, Treatment, and Prevention of Catheter-Associated Urinary Tract Infection. Topics in Spinal Cord Injury Rehabilitation 25(3): 228 – 240. Search date 13.10.2024. doi:10.1310/sci2503-228.

García-Puerto, F., Medina-García, M., & García-Puerto, A. M. 2022. 'Flipped Classroom and Self-Efficacy in Learning Urinary Catheterization: A Quasi-Experimental Study', International Journal of Environmental Research and Public Health, 19(22), 15123. Accessed 10 March 2025. https://doi.org/10.3390/ijerph192215123.

Grana Van Decker, Stephanie, Bosch, Nicholas & Murphy, Jaime 2021. Catheter-associated urinary tract infection reduction in critical care units: a bundled care model. BMJ Open Quality 10 (4): e001534. Search date 4.6.2024. doi: 10.1136/bmjoq-2021-001534.

Haider, Mobeen & Annamaraju, Pavan 2023. Bladder Catheterization. StatPearls. Search date 21.1.2025. https://www.ncbi.nlm.nih.gov/books/NBK560748/.

Hickling, Duane, Sun, Tung-Tien & Wu, Xue-Ru 2015. Anatomy and Physiology of the Urinary Tract: Relation to Host Defence and Microbial Infection. Microbiology Spectrum 3(4). American Society for Microbiology. Search date 1.10.2024. doi:10.1128/microbiolspec.UTI-0016-2012.

Kent State University. n.d. What is Experiential Learning and Why Is It Important? Search date 17.2.2025. https://www.kent.edu/community/what-experiential-learning-and-why-it-important.

Khasal, Qasim Ali 2022. Knowledge of Nurses toward Prevention for Catheter-Associated Urinary Tract Infection in Intensive Care Unit at Al Nasiriyah General Hospital. HIV Nursing 22(2): 1516 – 1522. Search date 26.08.2024. doi.org/10.31838.hiv22.02.289.

Laato, Matti 2019. Kestokatetroinnin, toistokatetroinnin ja häpyluun yläpuolisen katetroinnin infektioriskien vertailu. Käypä hoito, Duodecim. Search date 15.2.2025. https://www.kaypahoito.fi/nak07631.

Lehtoaro, Salla, Hietapakka, Laura, Kaihlanen Anu-Marja & Heponiemi, Tarja 2018. Factors associated with employment barriers faced by foreign-born nurses in Finland. European Journal of Public Health, 28 (4). Search date 4.6.2024. doi.org/10.1093/eurpub/cky213.523.

Lethongkam, Sakkarin, Paosen, Supakit, Bilhman, Siwaporn, Dumjun, Krittima, Wunnoo, Suttiwan, Choojit, Suntree, Siri, Ratchaneewan, Daengngam, Chalongrat, Voravuthikunchai, Supayang & Bejrananda, Tanan 2022. Eucalyptus-Mediated Synthesized Silver Nanoparticles-Coated Urinary Catheter Inhibits Microbial Migration and Biofilm Formation. Nanomaterials (Basel) 12(22): 4059. Search date 14.10.2024. doi.org/10.3390/nano12224059.

Mong, Ivy, Ramoo, Vimala, Ponnampalavanar, Sasheela, Chan Chong, Mei & Wan Nawawi, Wan Nor Fatihah 2021. Knowledge, attitude and practice in relation to catheter-associated urinary tract infection (CAUTI) prevention: A cross-

sectional study. Journal of Clinical Nursing, 31, 209 – 219. Search date 3.6.2024. doi-org.ezp.oamk.fi:2047/10.1111/jocn.15899.

National Healthcare Safety Network 2024. Urinary Tract Infection (Catheter-Associated Urinary Tract Infection (CAUTI) and Non-Catheter-Associated Urinary Tract Infection (UTI) Events. Center for Disease Control and Prevention. Search date 4.6.2024. https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf.

National Institute of Diabetes and Digestive and Kidney Diseases. The front view of the female urinary tract. National Institutes of Health. Search date 24.1.2025. https://www.niddk.nih.gov/news/media-library/17735.

OYS 2023. Virtsateiden katetrointi: ohje henkilökunnalle. Search date 4.6.2024. https://www.ppshp.fi/dokumentit/_layouts/15/WopiFrame.aspx?sourcedoc=%7BD6E3FE59-E74E-440A-BEB9-3189B491DAD7%7D&file=Virtsateiden%20katetrointi.docx&action=default&DefaultItemOpen=1.

Patel, Payal, Advani, Sonali, Kofman, Aaron, Lo, Evelyn, Maragakis, Lisa, Pegues, David, Pettis, Ann Marie, Saint, Sanjay, Trautner, Barbara, Yokoe, Deborah & Meddings, Jennifer 2023. Strategies to prevent catheter-associated urinary tract infections in acute-care hospitals: 2022 Update. Infection Control & Hospital Epidemiology 44(8): 1209 – 1231. Search date 13.10.2024. https://doi.org/10.1017/ice.2023.137.

Pratt, Godson 2014. Experiences of Foreign Nurses in Finland. -Barriers. Nursing Bachelor's Thesis. Turku University of Applied Sciences. Search date 1.10.2024. https://www.theseus.fi/bitstream/handle/10024/85174/pratt_godson.pdf?sequence=1&isAllowed=y.

Ramadan, Reham, Omar, Nesrene, Dawaba, Mohamed & Moemen, Dalia 2021. Bacterial biofilm dependent catheter associated urinary tract infections: Characterization, antibiotic resistance pattern and risk factors. Egyptian Journal of Basic and Applied Sciences 8(1): 64 – 74. Search date 18.1.2025. https://doi.org/10.1080/2314808X.2021.1905464.

Saltanat, Ebli 2013. Types of catheter. Wikimedia commons. Search date 18.1.2025. https://commons.wikimedia.org/wiki/File:Urinary_catheters_03.JPG.

Satakunnan sairaanhoitopiiri 2019. Virtsarakon katetrointiohjeita hoitohenkilökunnalle. Urologia. Search date 17.2.2025. https://hoito-ohjeet.fi/fi/Ohjepankki/SATSHP/Virtsarakon%20katetrointiohjeita%20henkil%C3%B6kunnalle.pdf.

Sharma, Satish, Mohler, James, Mahajan, Supriya, Schwartz, Stanley, Bruggemann, Liana & Aalinkeel, Ravikumar 2023. Microbial Biofilm: A Review on Formation, Infection, Antibiotic Resistance, Control Measures, and Innovative Treatment. Microorganisms 11(6):1614. Search date 19.1.2025. https://doi.org/10.3390/microorganisms11061614.

Soman, Abraham & Miao, Yuxuan 2015. The nature of immune responses to urinary tract infections. Nature Reviews Immunology 15, 655 – 663. Search date 22.9.2024. https://doi.org/10.1038/nri3887.

Tamadonfar, Kevin, Omattage, Natalie, Spaulding, Caitlin & Hultgren, Scott 2019. Reaching the End of the Line: Urinary Tract Infections. Microbiology spectrum 7(3). 10.1128/microbiolspec.bai-0014-2019. Search date 1.10.2024. https://doi-org.ezp.oamk.fi:2047/10.1128/microbiolspec.BAI-0014-2019.

THL 2023. Virtsarakon kestokatetrin asettaminen ja käsittely. Search date 4.6.2024. Virtsarakon kestokatetrin asettaminen ja käsittely - THL. https://thl.fi/aiheet/infektiotaudit-ja-rokotukset/taudit-ja-torjunta/infektioiden-ehkaisy-ja-torjuntaohjeita/infektioiden-ehkaisy-eri-hoitotoimenpiteissa/virtsarakon-kestokatetrin-asettaminen-ja-kasittely.

Vuento, Risto 2024. Virtsatietulehdus (virtsatieinfektio) aikuisilla. Duodecim Terveyskirjasto. Search date 4.6.2024. https://www.terveyskirjasto.fi/dlk00615.

Waugh & Grant 2023. Ross & Wilson: Anatomy and Physiology in Health and Illness. Fourteenth edition. Pages 377, 386 – 389,514. Elsevier Ltd.

Werneburg, Glenn 2022. Catheter-Associated Urinary Tract Infections: Current Challenges and Future Prospects. Research and Reports in Urology 14,109 – 133. Search date 4.6.2024. doi:10.2147/RRU.S273663.

Zhang, Hui, Xin Liao, Ariel Wen, Goh, Sam,Wu, Xi Vivian & Yoong, Si Qi 2022. Effectiveness of peer teaching in health professions education: A systematic review and meta-analysis. Nurse Education Today 118:105499. Search date 8.3.2025. https://doi.org/10.1016/j.nedt.2022.105499.

APPENDICES

Appendix 1 Urinary Catheterization English Instructions

Appendix 2 Vocabulary

Appendix 3 Webropol Survey

ENGLISH INSTRUCTIONS TRANSLATED FROM "OYS 2023 Virtsateiden katetrointi"

1. General information about catheterization

The reasons for catheterization include bladder emptying difficulties, administration of medication into the bladder, diagnostic and therapeutic procedures, major surgeries, intensive care, and terminal care. Intermittent and repeated catheterization are the primary catheterization options.

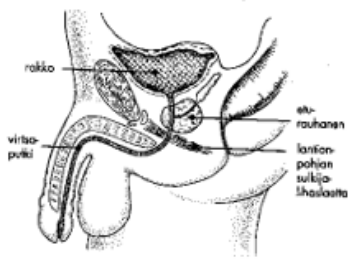
Insert the catheter as gently as possible to avoid causing urethral injuries, as these can create favorable conditions for infections. Relax and calm the patient. Perform the catheterization in a room with good, targeted lighting. The procedure can be done with an assistant or alone if necessary.

Record in the patient's medical notes the reason for catheterization, the time, catheter details, and the person performing the procedure, as well as any planned removal date for an indwelling catheter. Assess the functionality and need for the urinary catheter daily.

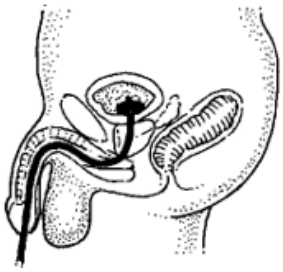
2. The anatomy of the urinary tract

2.1. Pitkä virtsaputki

Pitkä virtsaputki on 15-20 cm pitkä, alle 1cm läpimittainen putki ja siinä on kaksi jyrkkää mutkaa.



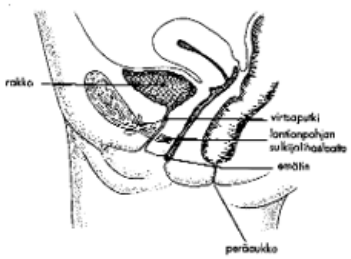
Kuva 1. Pitkä virtsaputki



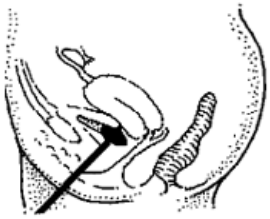
Kuva 2. Kestokatetri virtsarakossa

2.2. Lyhyt virtsaputki

Lyhyt virtsaputki on 3-5 cm pitkä ja loivasti ylöpäin kaartuva alle 1 cm läpimittainen putki. Virtsateiden anatomia on yksilöllinen.



Kuva 3. Lyhyt virtsaputki



Kuva 4. Kestokatetri virtsarakossa

2.1 Long urethra. The long urethra is a 15 – 20 cm long, under 1 cm diameter tube and it has two sharp curves.

2.2 Short urethra. The short urethra is 3-5 cm long and a gently upward-curving tube with a diameter of less than 1 cm. The anatomy of the urinary tract is individual.

3. Preparation for Indwelling Catheterization

3.1. Selection of the Indwelling Catheter

- Foley catheter with at least two channels: one for balloon inflation and the other for urine drainage.
- Catheter material and duration of use:
    - Teflon- or silicone-coated latex catheter for short-term use, to be replaced at least every month.
    - 100% silicone catheter for long-term use, to be replaced at least every three months or according to the manufacturer's instructions.
    - If the patient has a latex allergy, use a 100% silicone catheter and latex-free gloves.
- Catheter size:
    - As thin as possible to avoid unnecessary pressure on the urethra and to allow the normal discharge of urethral secretions.

    - For adults, usually ch 12-16, and for children, ch 6-12, depending on the child's size.
- Catheter tip shape:
    - Nelaton catheter has a straight tip and is used for standard catheterization.
    - Tiemann catheter has a curved tip and is used for long urethras or when catheterization is difficult, such as with an enlarged prostate.
- Balloon size and inflation fluid:
    - The balloon volume varies from 5 to 30 ml, depending on the catheter (information can be found on the catheter).
    - The recommended inflation fluid is 10% glycerol solution, which can remain in the balloon for the entire duration the catheter is in place and does not need to be changed.
    - Alternatively, hypertonic 5.85% NaCl solution can be used.
    - Aqua (water) may also be used, but it may evaporate from the balloon of a silicone catheter, so it must be replaced once a month.

Note! Do not use 0.9% NaCl, as it can crystallize and block the balloon inflation channel.

3.2. Catheterization Equipment

- Sterile catheterization kit: wash bowl + cleaning swabs, forceps, sterile drape, sterile gloves, kidney dish, gauze pads.
- Sterile forceps for moving instruments if needed (depending on the catheterization kit).
- If a kit is not available, the equipment can be gathered separately:
- Factory-clean wash bowl and gauze pads (also for cleaning gel).
- Factory-clean gloves.
- Sterile forceps or clamps (e.g., "pänksit") or sterile gloves for catheter insertion.
- Sterile drape when catheterizing alone.
- Washing solution: sterile NaCl or Aqua.
- Anesthetic gel (Xylogain 2% gel), or if the patient is allergic to anesthetics, use paraffin oil or lubricating gel as an alternative.
- Appropriate catheter.

- Factory-clean urine collection bag with a non-return valve and stand for the bag, or a leg bag with straps.
- Tape to secure the catheter.
- 10% glycerol solution pre-filled syringe or a 10 ml syringe with hypertonic 5.85% NaCl.
- Bed protector and a waste bag.

4. Indwelling Catheterization with an Assistant (for Long and Short Urethras)

The catheterizing nurse or the assisting nurse:

- Explain the catheterization process to the patient and inquire about their previous experience with catheterization.
- Ensure the patient consents to the procedure.
- Guide or assist the patient in performing perineal hygiene if necessary.
- Disinfect hands and gather the necessary catheterization equipment.

Disinfect your hands. Raise the bed to a comfortable height for catheterization. Position the patient appropriately for the procedure. Place a bed protector under the patient.

Catheterizing nurse: Disinfect your hands and put on sterile gloves.

Assisting nurse: Disinfect your hands and open the catheterization kit within the reach of the catheterizing nurse. If no kit is available, hand the necessary sterile items to the nurse during the procedure. Open the anesthetic/lubricating gel syringe package and hand it to the catheterizing nurse.

Catheterizing nurse: Attach the plunger to the anesthetic/lubricating gel syringe.

Assisting nurse: Moisten the cleaning swabs and place them within the reach of the catheterizing nurse.

Catheterizing nurse: Begin catheterization by cleaning the urethral opening and the surrounding area:

- For catheterization of a short urethra: Spread the large and small labia with your fingers to expose the urethral opening. Maintain this position throughout the procedure.

- For catheterization of a long urethra: Firmly hold the shaft of the penis. If the penis has a foreskin, retract it and lift the penis at a 90-degree angle. Maintain this position throughout the procedure.

Catheterizing nurse: Begin cleaning the urethral opening, moving towards the glans or the outer labia, using moistened cleaning swabs/gauze (use a new swab after each stroke). Either use

- A) Forceps to assist, or
- B) Sterile/factory-clean gloves (if a catheterization kit is not available).

Note: After touching the factory-clean wash bowl or performing the perineal cleaning with sterile gloves, the originally sterile gloves are now contaminated.

Catheterizing Nurse: Anesthetize the urethra using the gel/lubricant.

- Insert the cone-shaped tip of the anesthetic syringe into the urethra (at least two 10ml syringes for the long urethra and one for the short urethra).
- Inject the anesthetic slowly, pausing if the anesthetic seeps out. Calm and relax the patient at the same time. It is important that the anesthetic reaches the bladder.
- Wait a couple of minutes for the anesthetic to take effect.

Catheterizing Nurse: Grasp the catheter using either

- A) Sterile gloves, if you used forceps during cleaning, or
- B) Forceps, if you performed the cleaning with sterile gloves, and gently guide the catheter into the bladder.
  For a short urethra: If the catheter enters the vagina, request a new catheter.

Assisting Nurse: Put on factory-clean gloves while the catheterizing nurse inserts the catheter into the urethra.

Catheterizing Nurse: The catheter is in the bladder when urine begins to flow out. Push the catheter in a little deeper to ensure that the balloon is also

completely within the bladder. Gel may clog the catheter, so wait a moment for urine to flow. You may also ask the patient to cough, which can increase pressure on the bladder. When urine appears in the catheter, connect the catheter to the urine collection bag. Fill the catheter balloon. Filling the balloon should not cause the patient any pain.

Clean the area around the urethra of gel. If the patient has a foreskin, return it to its original position over the glans to prevent paraphimosis. Remove the gloves and disinfect your hands. Put on new gloves if necessary.

Assisting Nurse: Secure the catheter with tape over the lower abdomen (for a long urethra) and on the thigh (for a short urethra) to prevent friction and pressure injuries to the urethra.

Remove the protective covering that was under the patient (if necessary, do this together with the catheterizing nurse) and assist the patient with a diaper and pants if needed.

Assisting/Catheterizing Nurse:

- Remove the gloves, disinfect your hands, and put on new gloves. Attach the urine bag to the catheter stand, turn the faucet into the designated pocket, and hang the catheter stand below the level of the bladder. Alternatively, place a leg bag on the patient.

    - Collect the waste and tidy the treatment area.
    - Dispose of gloves in the waste bag and disinfect your hands.
    - Clean the instruments (dispose of single-use items in the trash/reprocess reusable instruments).

Assisting/Catheterizing Nurse: Document the catheterization-related entries in the patient’s treatment record.

5. Indwelling Catheterization Performed Alone

5.1. Catheterization of the Long Urethra

- Explain the catheterization process to the patient and inquire about their previous experience with catheterization.
- Ensure the patient consents to the procedure.
- Guide or assist the patient in performing perineal hygiene if necessary.
- Disinfect your hands and gather the necessary catheterization equipment.
- Disinfect your hands. Raise the bed to a comfortable height for catheterization. Position the patient appropriately for the procedure, lying on their back, and place a bed protector under the patient.
- Disinfect your hands and open the catheterization kit, or if you have collected the items separately, prepare a sterile table.
    - Add the anesthetic/lubricating gel syringes to the catheterization kit/sterile table using forceps. If necessary, arrange the items in the catheterization kit to be easily accessible using forceps.
- Disinfect your hands and put on sterile gloves.
- Place a sterile drape in position.
- Grasp the shaft of the penis firmly. If the penis has a foreskin, retract it and lift the penis to a 90-degree angle. Maintain this grip throughout the catheterization.
- Begin cleaning the urethral opening, moving toward the glans, using moistened cleaning swabs/gauze (use a new swab after each stroke) either:

  A) Using forceps for assistance, or

  B) With sterile/factory-clean gloves (if a catheterization kit is not available).
- Anesthetize and/or lubricate the urethra using gel/lubricant.
    - Insert the cone-shaped tip of the anesthetic syringe into the urethra (at least two 10ml syringes).
    - Inject the anesthetic slowly, pausing if the anesthetic seeps out. Calm and relax the patient at the same time. It is important that the anesthetic reaches the bladder.
    - Wait a couple of minutes for the anesthetic to take effect.

Note: After touching the factory-clean wash bowl or performing perineal cleaning with sterile gloves, the originally sterile gloves are now contaminated.

- Grasp the catheter either

A) With sterile gloves, if you used forceps for cleaning, or

B) With forceps, if you performed the cleaning with sterile or factory-clean gloves, and guide the catheter slowly into the bladder.

- The first bend can be bypassed by taking a firm grip on the penis and lifting it to a 90-degree angle.
- If there is resistance at the level of the external sphincter, it often gives way when you steadily push the catheter while asking the patient to relax.
- An enlarged prostate can complicate the insertion of the catheter. In such cases, a larger catheter often helps as the catheter tip does not bend as easily.
- **Note:** If catheterizing with a Tiemann-tip catheter, ensure that the tip is pointing upward and does not rotate during catheterization.
- If an erection occurs during catheter preparation or during the procedure, catheterization can still be performed despite the erection if the catheter can be inserted into the bladder without obstruction and pain. Alternatively, you may wait for the erection to subside.
- The catheter is in the bladder when urine flows out. Push the catheter in slightly deeper to ensure that the balloon is also fully within the bladder. The gel may block the catheter, so wait a moment for the urine to start flowing. You can also ask the patient to cough, which increases pressure on the bladder.
- Fill the catheter balloon only after you have confirmed that the catheter is in the bladder (see Figure 2). Filling the balloon should not cause the patient any pain. If the patient has a foreskin, return it to its position over the glans to prevent paraphimosis.
- Connect the catheter to the urine collection bag.
- Clean the area around the urethra from gel.
- Secure the catheter with tape over the lower abdomen to prevent friction and pressure injuries to the urethra.

- Remove your gloves, disinfect your hands, and put on new gloves. Attach the urine bag to the catheter bag holder, turn the valve into the designated pocket, and hang the catheter bag holder below the bladder level. Alternatively, place a leg bag on the patient.
- Collect the waste and tidy up the area.
- Dispose of gloves in the trash bag and disinfect your hands.
- Maintain the instruments (dispose of single-use items/clean reusable instruments).
- Document the catheterization-related entries in the patient's medical record.

5.2. Catheterization of a Short Urethra

- Explain the catheterization process to the patient and inquire about their previous experience with catheterization.
- Ensure the patient consents to the procedure.
- Guide or assist the patient in performing perineal hygiene if necessary.
- Disinfect your hands and gather the necessary catheterization equipment.
- Disinfect your hands. Raise the bed to a comfortable height for catheterization. Position the patient appropriately for the procedure; lying on their back, with knees bent and legs apart. Place a bed protector under the patient.
- Disinfect your hands and open the catheterization kit. If you are collecting the items separately, prepare a sterile field.
- Add the anesthetic/lubricating gel syringes to the catheterization kit/sterile table using forceps in a sterile manner. If necessary, arrange the items in the catheterization kit for easy access with forceps.
- Disinfect your hands and put on sterile gloves from the package.
- Use your fingers to spread the large and small labia to expose the urethral opening. Maintain this hold throughout the catheterization.
- Begin cleaning from the urethral opening, moving towards the outer labia. Clean the urethral opening with moistened cleaning swabs/gauze (use a new swab after each stroke) using either
  A) Forceps to assist, or
  B) Sterile/factory-clean gloves (if a catheterization kit is not available).

- Anesthetize and/or lubricate the urethra with gel/lubricant.
    - Insert the conical tip of the anesthetic syringe into the urethra.
    - Slowly inject the anesthetic, pausing if the anesthetic leaks out. Calm and relax the patient at the same time. It is important that the anesthetic reaches the bladder.
    - Wait a couple of minutes for the anesthetic to take effect.

Note: After touching the factory-clean wash bowl or performing perineal cleaning with sterile gloves, the originally sterile gloves are now contaminated.

- Grab the catheter using either
  A) Sterile gloves if you used forceps during cleaning, or
  B) Forceps if you performed the cleaning with sterile or factory-clean gloves

and guide the catheter slowly into the bladder.

- If the catheter goes into the vagina, take a new catheter. Leave the catheter that has gone into the vagina as a marker so that a new catheter does not easily go into the vagina.
    - The catheter is in the bladder when urine starts to flow out. Push the catheter a little deeper to ensure that the balloon of the catheter is also completely in the bladder. The gel may clog the catheter, so wait a little while for the urine to come out. You can also ask the patient to cough, which increases pressure on the bladder.
- Inflate the catheter balloon only after confirming that the catheter is in the bladder (see Figure 4). Inflating the balloon should not cause the patient any pain.
- Connect the catheter to the urine collection bag.
- Clean the area around the urethra of gel.
- Secure the catheter with tape to the thigh to prevent urethral friction and pressure injuries.
- Remove the gloves, disinfect your hands, and put on new gloves. Attach the urine bag to the catheter bag holder, turn the tap into the designated pocket, and hang the catheter bag holder below the level of the bladder. Alternatively, place a leg bag on the patient.
- Gather any waste and tidy the environment.

- Remove the gloves into a trash bag and disinfect your hands.
- Sterilize the instruments (dispose of single-use items and send reusable ones for reprocessing).
- Make documentation related to the catheterization in the patient's medical record.

6. Instructions for the Use of Indwelling Catheters

6.1. Closed Urine Collection System and Hygiene

- Disinfect your hands and use factory-clean gloves when handling the urine collection system.
- Always connect the catheter to a closed urine collection system, as the risk of infection increases if you disconnect the catheter from the urine collection bag or valve.
- In the hospital, use a urine collection bag equipped with a long hose that can be emptied from the bottom, secured to a bag stand.
- Upon discharge of the patient with a catheter, connect the catheter to a leg bag and secure it to the lower leg or thigh with adhesive strips.
- You can also connect a valve to the catheter if the patient does not have an overdistended bladder and is able to empty their bladder regularly every 3-4 hours. However, do not use a cap that needs to be removed every time the bladder is emptied.
- Ensure the free flow of urine by keeping the collection bag below the level of the bladder and ensuring that the catheter is not kinked.
- The urine bag should be emptied into a patient-specific clean container; the faucet should not touch the container. Avoid splashing. The container should be changed to a clean one after each emptying.
- Empty the container into a disinfection and rinsing unit.
- The urine collection bag should be changed as needed and whenever the catheter is changed.
- Ensure daily perineal hygiene for patients with indwelling catheters. Also, wash the base of the catheter and the catheter itself from the outside.

6.2. Urine Sample Collection and Treatment of Urinary Tract Infections

- Collect a urine sample from indwelling catheter patients only if the patient has symptoms of a urinary tract infection, such as fever, back pain, burning sensation, and hematuria. Simply having a foul odor or cloudy urine is not considered symptoms.
- Clamp the catheter for at least two hours before collecting the urine sample.
- Collect the urine sample according to the laboratory's instructions using a syringe from the urine collection tube's sampling port, using vacuum technique with a guide or needle and syringe. Wipe the sampling site with denatured alcohol, for example, with sterile wipes moistened with A12t, and allow the alcohol to dry before puncturing.
- Symptomatic urinary tract infections in indwelling catheter patients are treated with an antibiotic according to urine culture sensitivity testing.
- Before starting antibiotic treatment, the catheter should be removed. If this is not possible, the catheter should be changed as soon as possible (1-2 days) after starting antibiotic therapy.
- Routine antibiotic prophylaxis is not necessary for patients with indwelling catheters.

6.3. Flushing of Indwelling Catheter

- When the indwelling catheter patient reports the urge to urinate, check that the catheter is open.
- If the catheter is blocked, flush the catheter with 0.9% NaCl solution.
- Use the following flushing materials:
    - Sterile syringe (100 ml) and a sterile solution cup for the flushing fluid. Alternatively, you can take the flushing fluid through a medication administration cannula.
    - 0.9% NaCl solution as the flushing fluid.
    - Factory-clean sterile gloves for the person performing the flushing.
    - A clean curved bowl for draining the flushing fluid from the bladder.
- Inject about 50 ml of flushing fluid into the bladder through the catheter and allow the fluid to drain into the curved bowl, or you may also gently draw the fluid back into the syringe.

- Monitor that the amount of fluid injected matches the amount that comes out. The bladder should not be overfilled.
- If the flushing fluid does not drain from the bladder, consult a physician.

6.4. Patient Guidance

- Instruct the indwelling catheter patient on how to take care of the catheter independently.
- Teach the patient the following:
    - Hand disinfection in the healthcare facility; at home, washing hands is sufficient.
    - Secure the catheter either to the abdomen or thigh.
- Personal hygiene: wash once a day. Also, wash the catheter base and the catheter from the outside.
    - Sufficient fluid intake (1.5–2 liters per day).
    - Keep the urine collection bag below bladder level.
- Additionally, instruct the discharging indwelling catheter patient on:
    - Changing the urine collection bag or the tap catheter valve as needed.
    - In case of problems (e.g., if there is no urine output from the catheter, the patient has symptoms of a urinary tract infection, urine is bloody, or the catheter comes out of the bladder), contact their own wellness center or the unit where the catheter was placed.
    - The catheter is usually changed or removed at their wellness center.
- Upon discharge, provide the patient with supplies (urine collection bags, tap catheter valves) and, if necessary, prepare a care notice for the local health center/supply distribution for free distribution of medical supplies.
- In addition to verbal instructions, provide the patient with written home care instructions (Instructions for Indwelling Catheter Patients).

7. Removal of Indwelling Catheter

- The catheter must be removed as soon as it is no longer needed or if the catheter becomes blocked.

- Disinfect your hands and gather the necessary equipment (syringe, container, and trash bag).
- Disinfect your hands again and put on factory-clean sterile gloves.
- Empty the urine bag.
- Empty the catheter balloon using a syringe by aspirating the balloon through the filling channel. Slowly pull the catheter out and place both the catheter and urine bag directly into the trash bag.
- Remove the gloves and disinfect your hands.
- Monitor the success of urination after catheter removal.
    - If there are difficulties starting urination, pain medication, a good urination position, and a warm shower may help.
    - If the patient is unable to urinate, they should be catheterized with a single-use catheter. Replacing the indwelling catheter should be avoided.

7.1. Problem Situations Related to Catheter Removal

- If the catheter is encrusted and you cannot remove it, you can apply anesthetic gel inside the catheter as well as into the urethra alongside the catheter. Gently rotate the catheter and allow it to slide out.
- If the balloon filling valve is broken and you cannot remove the balloon filling fluid, you may cut the catheter above the filling valve, and the balloon may gradually empty by itself.
- If the balloon still does not empty, a physician may puncture the balloon under ultrasound guidance using a needle through the abdominal wall or via the rectum.

8. Intermittent and Single Use Catheterization

Single-use catheterization refers to the individual, one-time emptying of the bladder using a single-use catheter. Intermittent catheterization refers to the regular emptying of the bladder 1 to 6 times a day when the bladder does not empty spontaneously or when there is a significant residual urine volume left. Intermittent catheterization is a better option for preventing infections and complications than an indwelling catheter or suprapubic cystostomy catheter.

Catheterization can be performed by a healthcare professional, the patient themselves, or a family member.

8.1. Selection of Catheter

There are various types of catheters available:

- Straight non-valved tip catheter (used for standard catheterization).
- Curved tapered or drop-tip catheter (used when catheterization is difficult or unsuccessful with a non-valved catheter).
- If the patient performs intermittent catheterization at home, the same catheter type should be used in the hospital. A hydrophilic catheter should be used for catheterization, lubricated according to the manufacturer's instructions. The most common catheter sizes for adults are size 12 or size 14.

8.2. Intermittent/Single Use Catheterization Performed by Healthcare Professionals

8.2.1. Catheterization Equipment

- Gather the catheterization equipment with disinfected hands.
    - Appropriate hydrophilic catheter.
    - Sterile catheterization kit: collection cup + cleaning wipes, forceps, sterile drape, sterile gloves, funnel, and gauze.
    - If necessary, sterile forceps for transferring equipment (depending on the catheterization kit).
- If the kit is unavailable, the equipment can be gathered separately:
    - Factory-clean collection cup and wipes, factory-clean gloves, sterile forceps/tweezers, or sterile gloves for catheter placement. Sterile drape for single catheterization.
    - For cleaning solution, use sterile NaCl or Aqua.
    - Urine collection container or bag for measuring urine output.
    - Bed protection and trash bag.

8.2.2. Performing Catheterization

- Explain catheterization to the patient and ask about their previous experiences with catheterization.
- Ensure that the patient gives consent for catheterization.
- Guide or assist the patient in performing perineal hygiene once a day.
- Position the patient in an appropriate catheterization position: for a long urethra, the patient should lie on their back; for a short urethra, the patient should lie on their back with their knees bent and legs apart. Place a bed protector under the patient.
- Disinfect your hands and prepare the catheterization equipment for use.
- Prepare the catheter according to the catheter type: squeeze the sterile solution from the catheter pack into the catheter bag or use a ready-to-use catheter. Open the catheter package.
- Disinfect your hands and put on sterile or factory-clean gloves. If the catheter has a holder or hygiene cover, you can catheterize with factory-clean gloves.
- At the start of the cleaning, take a firm grip on the shaft of the penis while pulling the foreskin back, and lift the penis to a ninety-degree angle, or use your fingers to spread the labia majora and labia minora, exposing the urethral opening. Maintain this grip throughout the catheterization.
- Begin cleaning at the urethral opening, moving toward the glans or external labia. Clean the urethral opening using forceps with moistened wipes (change the wipe for a new one after each swipe). Do not contaminate the sterile gloves.
- Take the catheter out of the bag with sterile gloves and gently guide the catheter into the bladder.
- If using factory-clean gloves, hold the catheter from the holder or hygiene cover and guide the catheter into the bladder.
- The urinary catheter must remain sterile during catheterization. If the catheter becomes contaminated, start the intermittent catheterization process over or ask someone else to hand you a new catheter.
- Allow the bladder to empty and measure the urine volume if necessary.
- Once the bladder is empty, withdraw the catheter from the bladder.
- Place the catheter directly into a separate trash bag.

- Remove the gloves, disinfect your hands, and put on new gloves.
- Dispose of the waste in general waste, empty the urine collection container, and care for the instruments (dispose of single-use items in the trash/reprocess reusable items).
- Remove the gloves and disinfect your hands.

8.3. Intermittent Catheterization by the Patient/Caregiver

- A healthcare professional can teach the patient how to perform intermittent catheterization independently.
- The professional selects a suitable catheter for the patient and instructs them on its use.
- Patient Instruction: Intermittent Catheterization Guide for Patients.
- A referral for catheters will be made for the patient to the medical supply distribution, allowing the patient to receive catheters for free.

8.3.1 Catheterization Supplies

- Hydrophilic catheter (also known as ready-to-use catheter, or a catheter that includes lubricant).
- A mirror if needed for self-catheterization.
- Cleaning supplies at home: shower or washcloths and tap water.
- If a caregiver performs the catheterization, they may choose to wear factory-clean gloves.

8.3.2 Performing Catheterization

- Catheterization can be performed while sitting, standing, or lying down.
- Perform perineal hygiene once a day.
- Wash hands with soap and water.
- Prepare the catheter for use.
- Catheterize using clean, bare hands. The caregiver may choose to wear factory-clean gloves.

Catheterization Technique:

- Use one hand to hold the penis, gently lifting it upwards, while the fingers of the other hand spread the labia, and if necessary, use a mirror to locate the urethral opening.
- Take the catheter out of the bag with the other hand and guide it steadily and calmly through the urethra into the bladder while avoiding contamination. If the catheter type has a hygiene cover or sleeve, the patient/caregiver can use it for assistance.
- Allow the bladder to empty.
- Once the bladder is empty, withdraw the catheter, and dispose of the catheterization supplies in general waste.
- Measure the urine volume if necessary.
- Wash hands after catheterization.

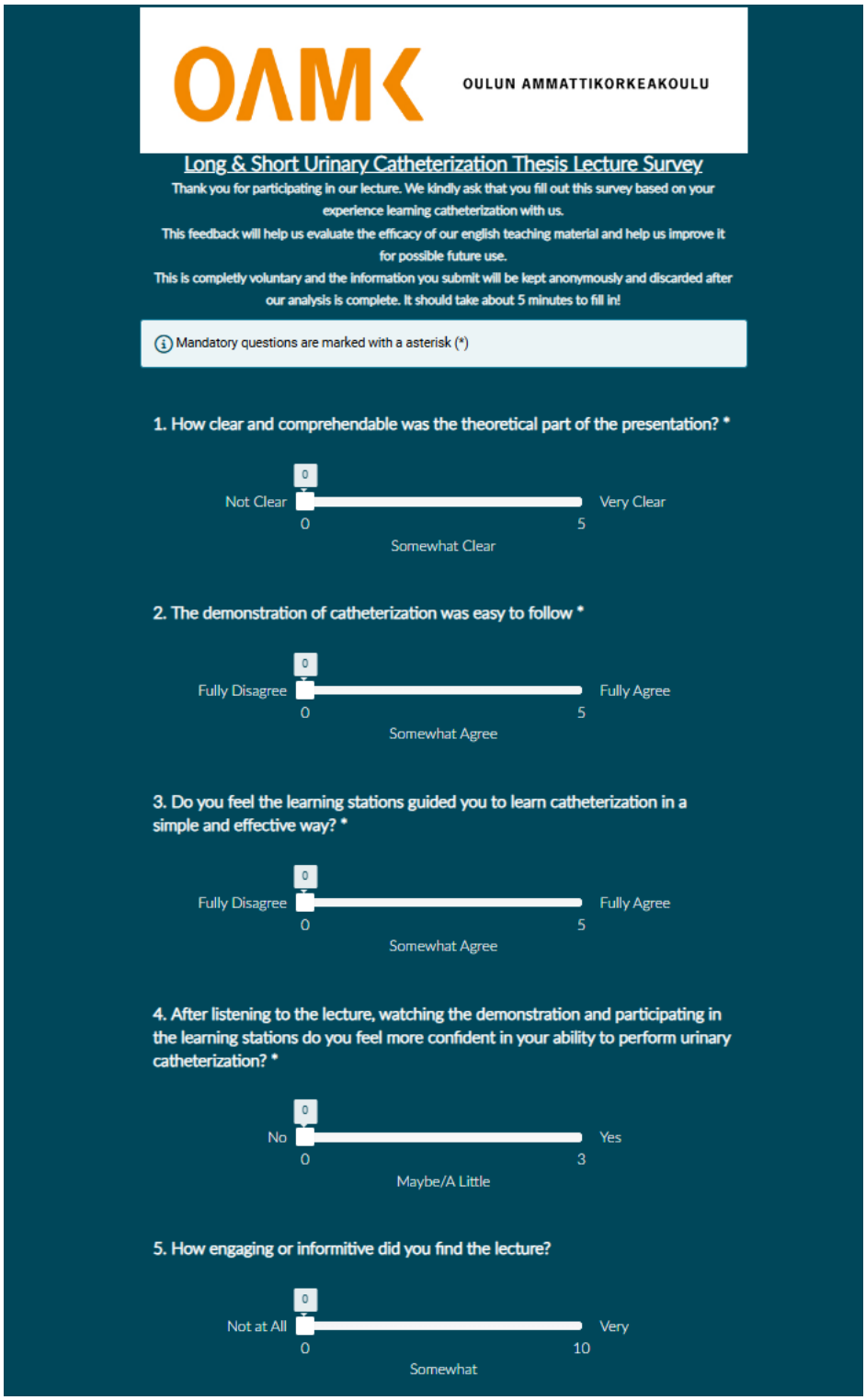
VOCABULARY **APPENDIX 2**

anesthetic gel	puudutusgeeli
assisting nurse	avustaja hoitaja
attachment straps	kiinnitysnauhat
balloon	katetripallo
bed protector	vuodesuoja
bladder	virtsarakko
catheter	katetri
catheter flushing	katetrin huuhtominen
catheter set	katetrointipakkaus
catheter tip	katetrin kärki
catheterization	katetrointi
catheterizing nurse	katetroiva hoitaja
channel	kanava
cleaning swabs	pesusykeröt
disinfection	desinfiointi
documentation	kirjaaminen

kidneys	munuaiset
labia	häpyhuulet
long urinary tract	pitkä virtsatie
care plan	hoitosuunnitelma
patient guidance	potilaan ohjaus
perineal hygiene	alapesu
prostate	eturauhanen
residual urine	jäännösvirtsa
short urinary tract	lyhyt virtsatie
sphincter muscle	sulkijalihas
sterile	steriili
sterile drape	steriililiina
sterile gloves	steriilit suojakäsineet
syringe	ruisku
tape	teippi
ureter	virtsanjohdin

factory-clean gloves	tehdaspuhtaat käsineet
filling valve	täyttöventtiili
forceps	atulat
foreskin	esinahka
glans penis	terska
glycerol solution	glyseroliliuos
hematuria	verivirtsaisuus
indwelling catheter	kestokatetri
intermittent catheter	kerta- tai toistokatetri
irrigation fluid	huuhteluneste
kidney dish	kaarimalja

urethra	virtsaputki
urethral opening	virtsaputken suu
urinary tract infection	virtsatietulehdus
urinary tract	virtsatie
urine	virtsa
urine collection bag	virtsankeräyspussi
urine culture	virtsaviljely
urine sample	virtsanäyte
vagina	emätin
valve	hana
wash bowl	pesukuppi



OULUN AMMATTIKORKEAKOULU

Long & Short Urinary Catheterization Thesis Lecture Survey

Thank you for participating in our lecture. We kindly ask that you fill out this survey based on your experience learning catheterization with us.
This feedback will help us evaluate the efficacy of our english teaching material and help us improve it for possible future use.
This is completly voluntary and the information you submit will be kept anonymously and discarded after our analysis is complete. It should take about 5 minutes to fill in!

Mandatory questions are marked with a asterisk (*)

1. How clear and comprehendable was the theoretical part of the presentation? *

Not Clear — Very Clear
0 — 5
Somewhat Clear

2. The demonstration of catheterization was easy to follow *

Fully Disagree — Fully Agree
0 — 5
Somewhat Agree

3. Do you feel the learning stations guided you to learn catheterization in a simple and effective way? *

Fully Disagree — Fully Agree
0 — 5
Somewhat Agree

4. After listening to the lecture, watching the demonstration and participating in the learning stations do you feel more confident in your ability to perform urinary catheterization? *

No — Yes
0 — 3
Maybe/A Little

5. How engaging or informitive did you find the lecture?

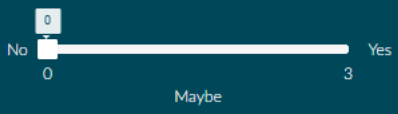
Not at All — Very
0 — 10
Somewhat

6. What element of the lecture did you find the most useful for your own learning?

- ◯ Powerpoint presentation
- ◯ Demonstration
- ◯ Learning stations

7. What challenges did you face during the hands-on-practice?

8. Would you recommend the use of this lecture on long and short catheterization to Englsih speaking nursing students? (Including the Powerpoint and learning stations) *



9. Please feel free to give a comment, feedback or areas to improve regarding the lecture (including the Powerpoint, the demonstration and learning stations).

Submit