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Provisional chapter

# Problem of Catheter Associated Urinary Tract Infections in Sub–Saharan Africa

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Additional information is available at the end of the chapter

## 1. Introduction

Ever since the introduction of the first indwelling catheter with an inflated baloon in 1853 by Dr. Jean Francois Reybard, a French Surgeon, it has become clear what a useful instrument Urologists were given, but at the same time over the years of usage it became obvious that the use of such a simple instrument goes along with some risks as well [1].

To this date every day urological practice cannot be imagined without a catheter but at the same time it has became clear that the use of the catheter has inevitably put the Urologist in a position where he has to deal with the complications that arise from catheterization[2].

One of the most common complications of catheterization is catheter-associated urinary tract infection (CAUTI).

Catheter-associated urinary tract infection (CAUTI) is defined as bacteriuria or funguria with a count of more than $10^3$ CFUs/ml [2,4].

Catheter associated urinary tract infection is the most common nosocomial infection in hospitals worldwide and the incidence has been reported to be approximately 35% [2].

In the USA, CAUTI is the most common nosocomial infection, accounting for more than 1 million cases each year in hospitals and nursing homes (Tambyah and Maki 2000)[3].

Duration of catheterization is a significant risk factor for CAUTI.

It is well accepted that bacterial colonisation with catheterisation is inevitable with some reports estimating the risk to be in the region of 5% per day with almost 100% colonisation risk at 7 to 10 days of catheterisation. The incidence of bacteriuria has been estimated to be about 3% to 10% higher each day after catheter insertion[4].

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Bacteriuria is therefore almost always present in these patients and, unless symptomatic, does not require treatment. Although most Catheter-associated urinary tract infections are asymptomatic, they often precipitate unnecessary antimicrobial therapy[2,4].

Although there have been recommendations to treat CAUTIs only when they are symptomatic, the symptoms associated with CAUTI have not been clearly defined. (Tambyah and Maki 2000)[3]

Apart from duration of catheterisation, which is a well established, CAUTI risk factor in settings such as Sub-Saharan Africa (Zambia in this case), there are a few more worth mentioning such as: catheterization in unsterile enviroment, use of unsuitable catheters for long term catheterization (eg. Latex catheters changed on monthly basis), use of homemade drainage systems, diabetes, malnutrition and immunocompromized (HIV) patient catheterization is also of higher risk for CAUTI.

Most CAUTIs are derived from the patient's own colonic flora and the catheter predisposes to UTI in several ways. The most important risk factor for the development of catheter-associated bacteriuria is the duration of catheterization[2].

The best prevention of CAUTIs would be not to use a catheter at all however this, unfortunately, is not likely in the near future, so attention should be focused on two issues in order to reduce catheter-associated urinary tract infections and these are : Catheter system should be closed and Duration of catheterization should be minimal.

By all means medical staff should also consider an alternative to indwelling urethral catheter. In appropriate patients suprapubic catheterization or intermittent catheterization are much better options than indwelling urethral catheterization.

In everyday medical practice, use of urethral catheters in Sub-Saharan Africa (Zambia ) is very common. There are several reasons for this practice but the main ones are the shortage of educated and trained staff and inaccessibility of health care facilities.

Having Zambia for example, country area 752 618 km$^2$, and population of over 12 million at present there are 8 Urologists.

Urologist patient ratio in Zambia is 1:1,500 000 and furthermore 7 out of 8 Urologists are in the largest hospital in the country, University Teaching Hospital in Lusaka which means that there is severe shortage in urological services.

Two of the most common urological conditions in this population are BPH and urethral strictures and these two are associated with catheterization in most cases urethral and less suprapubic catheterization.

In this setting urethral catheterization is well established procedure for relieving bladder outlet obstruction and the patients are usually on the long term catheterization until they are attended by a Urologist. This creates a huge window of opportunity for development of CAUTIs, which is, unfortunately, the case; and moreover, pushing the health system with limited resources to its final limits.

Average time spent on waiting by BPH patient to be attended by a Urologist is approximately 4 months and in addition to this another 3 to 4 months waiting for operation, if there is indicated surgical procedure. Having all this in mind, it is easy to see that the average catheterization time can take months rather than days and that the considerable risk of symptomatic CAUTIs is present.

Catheters are routinely changed on monthly basis and the catheterization in unsterile enviroment, the poor quality of the catheters and lack of urine bags are predisposing factors for CAUTIs.

In order to try to prevent CAUTIs in settings like this, patients on the long term urethral catheterization are advised to take care of hygiene (both gentialia and catheter) and to keep well hydrated (bladder wash out).

It is not uncommon that in the case of symptomatic CAUTI simple change of catheter and hydration can do as much as antibiotic treatment especially having in mind limited choice of antibiotics and the fact that most of the bacteria causing CAUTI are multidrug resistant.

In 2005, we did a research of using intermittent catheterization after urethral stricture management and it showed a reduce in the incidence of UTI by 30%. The idea cannot be implemented as standard policy for the patients because of lack of human resources.

The risk of developing a catheter-related UTI rises by 5% for each day the catheter remains in place (Tambyah et al, 2002)[3]. Having this fact in mind it is clear that catheter associated urinary tract infections can hardly be avoided. On the other hand, in some settings like Sub-Saharan Africa (Zambia) the benefit of catheterization is greater than the risk of getting complications related to catheter associated urinary tract infection.

Although it is widely accepted that the short term catheterization (less than 28 days) is preferred to long term catheterization (over 28 days), in our setting, the majority of the catheterized patients are in the group of long term catheterization. This is because of the fact that urological service is almost exclusive to the biggest medical centres in the country whilst almost completely absent in other health care facilities. This means that indication for catheterization and follow up of the catheterized patients is done mainly by many others health care practitioners for quite a long period of time before the patient actually reaches the Urologist.

From experience, a patient booked for urological procedure like transvesical prostatectomy can spend more than five months waiting for the operation and all this time will be catheterized and therefore will be affected with catheter associated urinary tract infection.

Since we unfortunately don't have any research conducted in this way we can only assume that this prolonged catheterization and subsequent CAUTI can have an impact on some patients in terms of prolonged postoperative recovery, wound infection, bladder fistula etc.

However there are certain steps that might be helpful in order to prevent catheter associated urinary tract infections. In our opinion, which is based on practicing Urology in settings like Sub-Saharan Africa (Zambia), these steps are mainly addressing the issues of real need for catheterization, technique of catheterization and last but not least catheter care.

Before every catheterization there are certain standards that need to be met in order to postpone catheter associated urinary tract infection. These are:

- Assessing the need for catheterization
- Appropriate type catheter selection
- Aseptic technique of catheter insertion
- Catheter care

Practicing every day Urology in Sub Saharan Africa (Zambia) brings certain challenges in order to find the balance between patients' needs, available equipment and up to date urological guidelines and these are sometimes extremely difficult to meet.

In African settings it is quite difficult to avoid catheter associated urinary tract infections and this fact is mainly because factors such as:

1. **Assessments of the patient** that may need catheterization is made quite often by nurses and not by doctors and this fact is mainly due to the fact that vast majority of medical facilities are understaffed.

This fact can result not only in catheter associated urinary tract infection but also in unnecessary catheterisation in the first place.

The other issue is availability of the Urologist; seven out of eight Zambian Urologists are placed in the capital, Lusaka, and this is almost the same issue in other Sub-Saharan countries.

It is not uncommon that patients spend months being catheterized before reaching the urologist and starting urological investigations.

2. **Catheter selection** can have an impact on CAUTI.

Nowadays it is a well-documented fact that some of the catheters can actually reduce the incidence of catheter associated urinary tract infections.

Silver-alloy-coated catheters can reduce catheter associated urinary tract infections by up to 45% (Davenport K, KeelyFX –J.Hosp.Infect- 2005)

However in settings like Sub-Saharan Africa (Zambia) the lack of appropriate catheters is more or less the rule.

Furthermore, the quality of catheters available in this part of the world is often poor and this can also result in catheter associated urinary tract infections.

It has been observed that the catheters we are using are prone to encrustation after a short period of time and this can only be an additional factor in promoting the infection.

The most common type of catheter in use in this setting is Latex silicone coated Foley catheter, and when it comes to sizes there is no rule but the most common size is 18 Ch, although it is not uncommon that the patient is catheterized with catheter size 22 Ch, regardless of gender, simply because the fact that this is the only available catheter at the time of catheterization.

The other explanation for usage of the catheters with diameter greater than 18 Ch is belief that these catheters can provide better drainage which can be the true in certain conditions (e.g. haematuria, pyuria) but in most other cases (in our experience) the catheter size 16 Ch will make sufficient urine drainage.

Catheterization of children is even more complicated because of lack of adequate paediatric catheters (most common one is latex silicone coated Foley catheter and most common size available is size 8 Ch).

2. **Catheterization** in Sub-Saharan setting is quite often performed using clean rather than aseptic technique which of course may lead to CAUTI. Main reason for this is that not all of the necessary equipment for catheterization is available all the time especially in remote areas. The things that are available most of the time are: examination gloves, methylated spirit, cotton wool, catheters, and syringes.

Doctors and/or nurses use examination gloves, cotton wool balls and sterile water to clean the genital region, afterwards methylated spirit is used for cleaning and then the catheter is inserted using K-Y gel.

Anaesthetic gels are rarely used for catheterisation because they are not always available and the other reason is the price of these gels (5 US$ per tube which can be more than the daily salary for the majority of the population).

In our practice we usually use catheters sizes 16 Ch and 18 Ch for male catheterization and for female catheterization sizes 14 Ch and 16 Ch, but the actual size that we are going to use is mainly limited with the catheters available.

Although there are certain recommendations to use the smallest possible catheters in order to minimize urethral trauma, pressure necrosis of urethral mucosa and bladder spasms, Urologists in Sub-Saharan Africa are mainly forced to come up with the best possible solution regarding the equipment that is available.

After the catheterization urine bag (if available) is placed and fixed to the patient's leg, it has been observed that patients in our setting are reluctant to have urine bags fixed to the leg, but prefer keeping urine bags in the trouser pockets or even in the inside pocket of the jackets and in this way, make drainage virtually impossible. This is one of the factors that promote catheter associated urinary tract infection due to poor drainage and the urine stasis. Another thing that has been observed is poor urine bag care and this fact also makes the urine bag a source and generator of infection.

Furthermore, the urine bags are not available in remote rural areas and, therefore, it is not unusual to see patient having the same urine bag for months and this fact makes them inadequate to use for the majority of patients.

To avoid urine bags we prefer to use stoppers, this is of course is the case if continuous drainage is not indicated. All the patients, regardless of their education and background, are easily trained to take care of the stopper. The other good thing about the stopper is that in case of unavailability it can be easily substituted with the 2ml syringe plunger which is common



**Figure 1.** The patient with suprapubic catheter with abootle for drainage because there is no urine bag.

practice in settings like this. What has been noticed is that sometimes patients use to make stoppers by themselves from various materials (wood, metal, plastic) exposing themselves to the risk of infection even more.

The other factor that can promote catheter associated urinary tract infection in this setting is overinflating of the balloon of the catheter, although 10 ml of sterile water is more than enough to keep catheter in place and to make urine flow without interruption, it is not uncommon to find that the balloon is inflated with 20ml, 30ml or sometimes even more.

Overinflating the balloon may result in insufficient drainage of the bladder because of the high riding draining tip of the catheter and subsequent residual urine. The other reason to avoid overinflating of the balloon is the fact that this will inevitably lead to bladder irritation and spasms which will have an impact on the patients' quality of life.

The explanation for balloon overinflating is a rather simple one, the majority of nursing staff and junior medical staff in this setting interprets the capacity of the balloon that is indicated on the catheter as an amount of fluid that should be put in the balloon. This is also an indication of how much the urological care and education is really needed in settings like this because a great number of procedures are trained in the "see one, do one and teach one" way.

After the catheterization, we usually do not recommend antibiotics unless it is indicated for some other reason. We are trying our best in educating catheterized patient how to take care of the catheter. Regarding this matter, we teach our patients catheter care and we suggest that external genitalia should be washed on every day basis using just soap and water and at the same time the catheter itself should be washed. Teaching patients also to wash hands before any manipulation with the catheter can also minimize the risk of infection.

The other thing that we insist on is regular water intake, some 2 to 2½ litres/day is recommended to all of our catheterized patients. These measures are rather convenient for the majority of patients and we find that the majority of patients comply with these measures.

In settings like this, one must have in mind that it is not always possible to have patients under close medical control and it is not uncommon to see catheterized patients with a catheter that has not been changed for months. Having this in mind, we find it extremely useful to insist on small, easily achievable things that can make a difference in every day urological practice.

Following these simple rules, even in settings like this, we do not see high incidence of severe infection or urosepsis due to prolonged catheterization.

When it comes to the most common pathogens isolated from our experience these are: Escherichia coli, Enterococcus spp., and Pseudomonas aeruginosa. Of course in case of long term indwelling urinary catheters, mixed bacterial pathogens are rather common.

We do not tend to treat these infections unless symptomatic, and from our experience these infections are very hard to treat due to fact that these infections are usually caused by multi-resistant bacterial pathogens. Another limiting factor is the availability of latest antibiotics.

Most common antibiotics available almost in every part of Sub-Saharan Africa are Cotrimoxazole, Nitrofurantoin and Ciprofloxacin. Thanks to the unfortunate fact that the most widely used antibiotic for almost every urological infection is Ciprofloxacin, it is not a rare case that, nowadays, bacterial resistance to this useful antibiotic is very common.

Facing all these challenges, we found that the most reliable way to prevent possible complications of CAUTI in long term catheterized patients in our setting are vigorous catheter care and proper hydration of the patient rather than unrestrained usage of precious antibiotics.

From our experience, we found that in terms of preventing CAUTI, intermittent catheterization is a much better option than long term catheterization. We found that even in our setting, it is rather easy to train patients to perform self-intermittent catheterization and to train patients for this procedure is not a demanding task. Of course, there are some limiting factors for intermittent catheterization and this is mainly because of availability of catheters, the cost of catheters and lubricating gel which are quite often out of reach for majority of patients.

The other useful thing may be proper education of nursing staff in order to become more critical when it comes to catheterization.

We should always have in mind that the patient should be catheterized only when medically indicated and never to make life easier for medical staff or family members which is, sadly, sometimes the case.

At the end, we can conclude that when it comes to catheterization and catheter associated urinary tract infection we can say that these infections, in general, are very difficult to avoid once the patient is catheterized it is only a question of time for it to occur, especially in long term catheterizations.

The things we can do to postpone CAUTI, if not avoid, in our setting would be to follow the strict indications for catheterization, to keep an indwelling catheter as short a period of time as possible and to pay attention to catheter care.

One of the major characteristics of practicing, not only Urology but Medicine in general, in Sub-Saharan Africa (Zambia) is that, due to numerous limitation factors, both medical staff and patients are forced to make the maximum out of the available resources in order to provide the best possible care.

Health care professionals should be conscious of the fact that communication should be a two-way process and that it should involve all the parties who are involved.

There is also the need for the health care professionals to educate the patients according to their individual needs.

The practical knowledge related to participants' awareness of their urinary catheter needs and practices such as features of supplies, intervals for changes, urinary catheter insertion emptying the urine bags, and changes associated with sex.

Patients living with chronic illnesses such as living with an indwelling urinary catheter are being taken care of in their homes by close relatives, whereby, they go to the hospitals only on appointments made by the doctor, for treatment and change of their catheter. Living with the indwelling urinary catheter is a condition that needs the patient to be taken care of by a skilled professional or trained personnel base in the community. Considering the lack of adequate means of communication in some parts of the country and considering the fact that not everybody can afford communicating by means of phoning, it becomes a problem to the patients in relation to the burden of illnesses and problems associated with urinary catheterization (expulsion of the urinary catheter, blockage, and leakage of urine etc.).

Health care professionals should consider their meeting with patients as a process, whereby communication should be a two-way process and not one-way; and also a time when communication should be regarded as free from imposing.

## 2. Education of healthcare workers

An education programme should be available at induction for new staff and on a regular basis for HCWs and should include the following:

- Indications for catheterisation.
- Insertion technique.
- Maintenance of the catheter system.
- Obtaining a urine specimen.
- Signs and symptoms of infection.
- Catheter removal

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