

# Use and misuse of urine cultures and antibiotics in catheterised patients at a rehabilitation hospital in Malta

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## ABSTRACT

### Background

One of the most common samples submitted to microbiology laboratories are urine specimens for culture.

### Objectives

To assess the indications for obtaining urine cultures in a cohort of catheterised patients. The appropriateness of antimicrobial therapy in response to urine culture results was also studied.

### Method

All catheterised inpatients at Karin Grech Rehabilitation Hospital in Malta who had urine cultures taken over a 3-month period in 2016 were included. Data included the indication for sample collection, any documented urinary symptoms, culture results, antibiotic use before and after culture result and any change in antibiotic. A departmental presentation on the appropriate care of catheterised patients was delivered and a re-audit was carried out in 2017.

### Results

There were a total of 38 patients who were catheterised and had one or more urine cultures taken in 2016 and 55 in 2017. The commonest indications documented were fever and retention. Their indication was not documented in the medical notes in around 50% of samples taken for both years. The culture result was documented in 15% of cases in 2016 increasing to 40% in 2017. The commonest bacteria cultivated included *E. Coli* and *Klebsiella*. Empirical antibiotics were given in approximately 45% of cases who had a urine culture taken. In both 2016 and 2017, antibiotics were switched due to resistance in around 10% of all episodes when urine cultures were taken.

### Conclusion

Lack of documentation of the indication and culture result was evident. This improved in the re-audit. A high percentage of cultures taken did not influence the clinical management. The study clearly shows inappropriate use of urine culture requests and the need to follow available guidelines.

### Key words

Urinary catheter, bacteriuria, urinary tract infection, health care acquired infection, Malta.

## INTRODUCTION

Urinary tract infections are one of the most common health care associated infections (Magill et al., 2014). Urinary catheters are a common cause of urinary tract infections and sepsis leading to significant morbidity and mortality (Melzer and Welch, 2017). An estimated 3% of people living in the community (Simpson, 2017) and up to 10% of residents in long-term-care facilities have urinary drainage managed with chronic indwelling catheters (Smith and Nicolle, 2001).

Identifying and appropriately treating urinary tract infections early on in this population is of paramount importance. One of the most common samples submitted to microbiology laboratories are urine specimens for culture. These are expensive tests which should be ordered only if clinically indicated.

Differentiation between catheter associated urinary tract infection and catheter associated asymptomatic bacteriuria is important to avoid inappropriate antibiotic use leading to increased resistance (Trautner, 2010).

## Aims

- To audit the indications for obtaining urine cultures in a cohort of catheterised patients.
- To audit the appropriateness of antimicrobial therapy in response to urine culture results.

## METHOD

All catheterised inpatients at a Maltese rehabilitation hospital (Karin Grech Hospital) who had urine cultures taken over a 3-month period (October 2016 to December 2016) were included in the study. The data collected included the indication for sample collection, any documented urinary symptoms, culture results, antibiotic use before and after culture results, any change in antibiotics, data on documentation of culture result and antibiotic use. Data was collected from the medical notes and the hospital electronic database for ordering and viewing results.

A departmental lecture reporting the results of this study was delivered in July 2017. This included recommended guidelines on the use of urine cultures in catheterised patients and appropriate antimicrobial therapy. A re-audit was done over a 3-month period (August 2017 to October 2017). Since this was an audit, ethical approval was not requested but approval was obtained from the chairman of the department of health rehabilitation services.

## RESULTS

There were a total of 38 patients who were catheterised between October 2016 and December 2016. In the re-audit, between August 2017 and October 2017, there were a total of 55 patients who were catheterised. Catheterised patients usually had more than one urine culture taken in the 3-month period with a similar gender distribution (see Table 1).

### Indication for urine culture

Figure 1 summarises the indications for ordering a urine culture as documented on the hospital online order system. The commonest specific indications were fever (13%) and retention (13%) in 2016 whilst in 2017 these included 'UTI' (32%) and fever (10%). Forty six percent did not have a specific description for the indication and were documented as follow up in 2016 and this decreased to 27% in 2017.

Figure 2 summarises the indication for urine culture documented in the medical notes. This was not documented in 50% of samples taken in 2016 and was similar in 2017 at 48%. The commonest indications documented in the medical notes in 2016 were retention (16%) [including suprapubic tenderness (12%) and distended abdomen (4%)] and fever (10%). These were similar in 2017.

Table 1: Sample size of catheterised patients and number of urine cultures taken in each cohort

	Oct 2016 - Dec 2016	Aug 2017 - Oct 2017
Number of catheterised patients who had a urine culture taken	38	55
Male:Female	16:22	26:29
Total number of urine cultures taken	100	96
Average urine cultures booked per patient	2.6	1.75

Table 2: Showing the use of empirical antibiotics and switching due to resistance and sepsis

		Oct 2016 - Dec 2016	Aug 2017 - Oct 2017
Total number of cultures		100	96
Episodes of empirical antibiotics given		46	46
Episodes of switching antibiotics		15	9
Reasons for switching	Resistance	12	8
	Sepsis	3	1

Figure 1: Indications for urine culture as documented on the hospital electronic database in 2016 and 2017

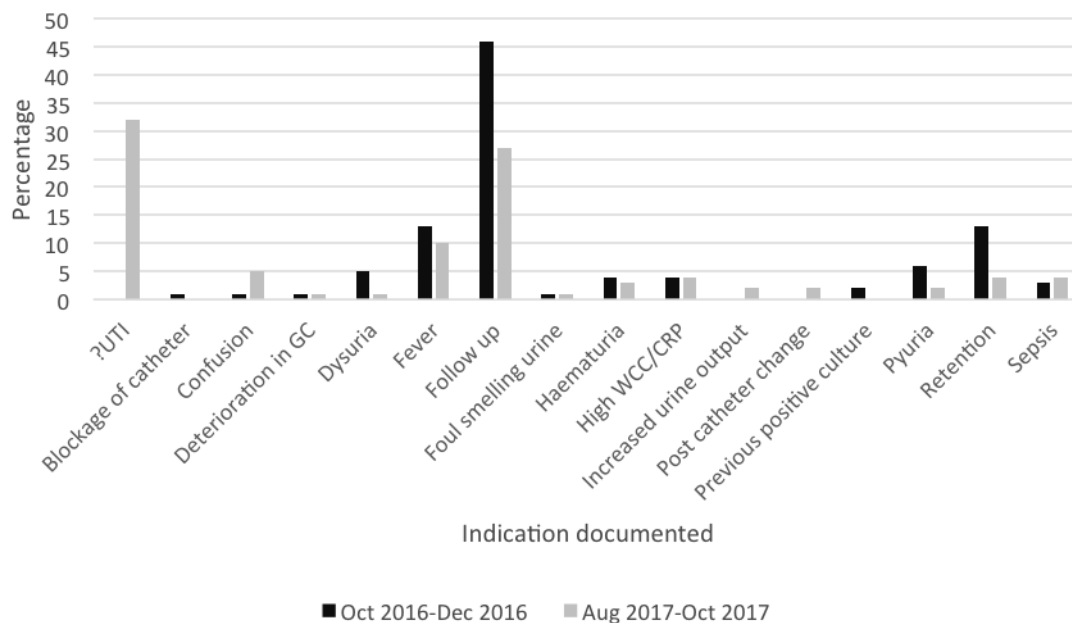
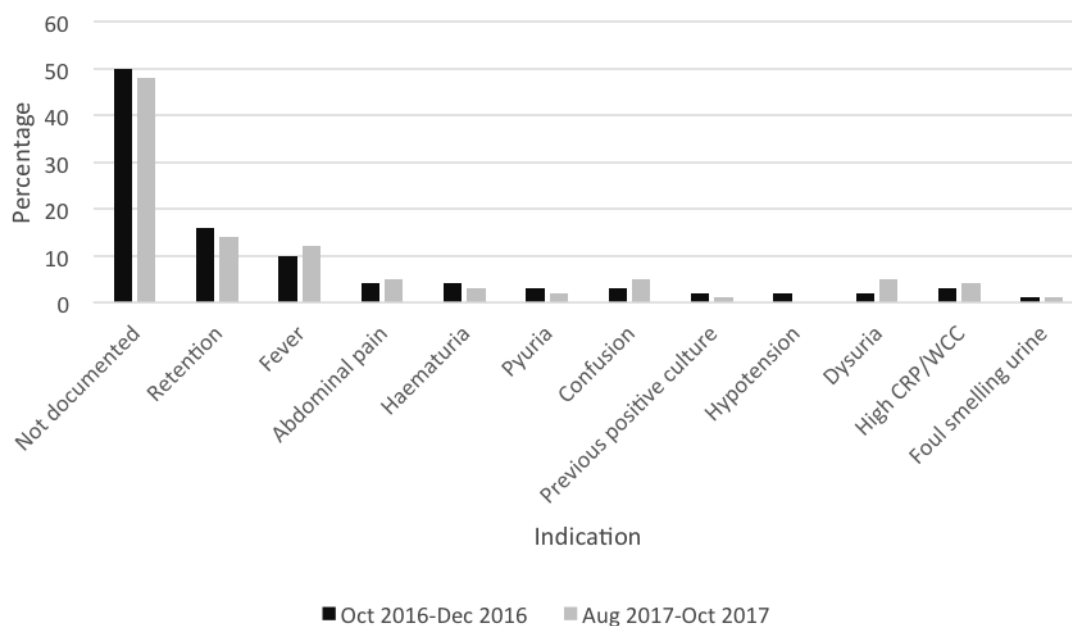


Figure 2: Indications for urine culture as documented in medical notes in 2016 and 2017



### Culture results and antibiotic use

Figure 3 summarises the organisms cultured from the urinary catheter samples in both years. Sixty-six per cent of samples sent had a positive culture in 2016 and 56% in 2017. The cultured organism was documented in the medical notes in 15% of cases in 2016 and this increased to 40% in 2017. The commonest bacteria cultivated in 2016 were *E.Coli* (18%), *Klebsiella* (5%) and *E. faecalis* (5%) whilst in 2017 these

were *E. Coli* (22%), *Klebsiella* (8%) and *Klebsiella pneumonia carbapenemase* (KPC) (5%). Culture sensitivity results were available by calling the laboratory. These were never documented in the medical notes in both 2016 and 2017.

There were 46 episodes when empirical antibiotics were given in both 2016 and 2017. The commonest antibiotics used were co-amoxiclav and nitrofurantoin in both years. Figure 4 summarises the empirical antibiotics

Figure 3: Urine culture results in 2016 and 2017 (\*KPC – Klebsiella pneumonia carbapenemase)

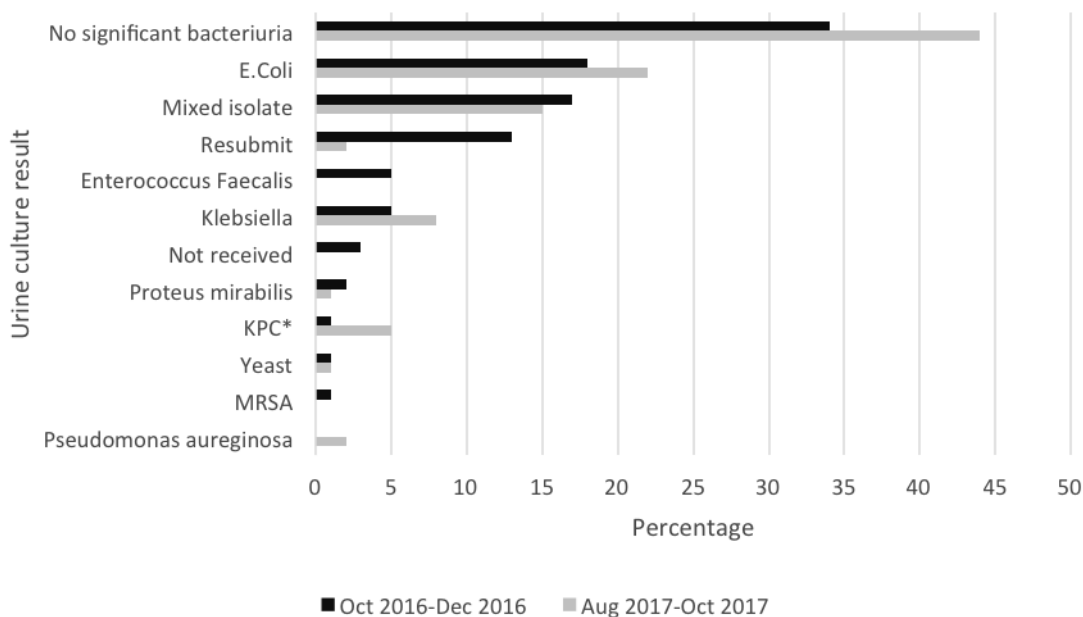
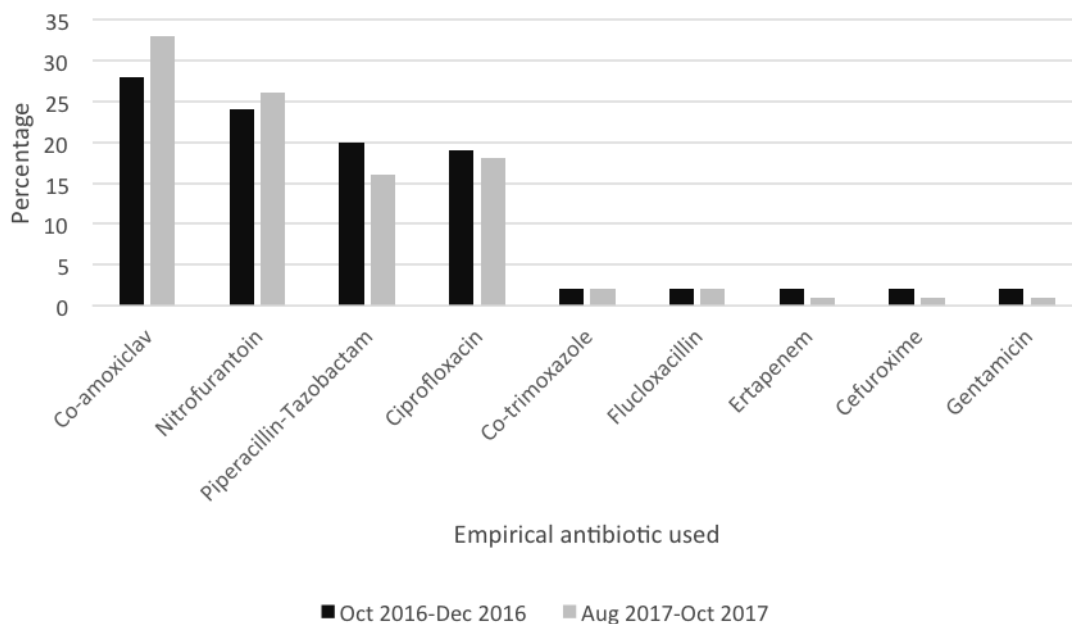


Figure 4: Empirical antibiotics used in 2016 and 2017



used in both years. Antibiotics were switched in 15 of these episodes in 2016 and 9 in 2017. Switching was due to resistance and sepsis (See Table 2).

**DISCUSSION**

Catheterised patients invariably have a bacteriuria and these may be asymptomatic. Existing guidelines advise not to treat asymptomatic bacteriuria in those with

indwelling catheters since antibiotics increase side-effects and antibiotic resistance. Urine cultures from catheterised patients should only be sent when there are signs and symptoms of infection. Urine microscopy and dipstick analysis should not be used in catheterised patients to diagnose urinary tract infections since they are of limited use (SIGN - Scottish Intercollegiate Guidelines Network, 2012). Local guidelines regarding antibiotic

choice in catheterised patients are also available on the online hospital database (Urinary Tract Infection, Clinical Practice Guidelines Mater Dei Hospital Malta, 2017).

Data from the medical case notes showed that there was no documentation of the urine culture indication for around 50% of the samples taken in both 2016 and 2017. There was an improvement in documenting the indication on the online hospital ordering system from 46% in 2016 to 27% in 2017. While the educational session has contributed to improve online documentation, regular interventions are needed to improve written documentation in the medical case notes. The lack of documentation did not necessarily mean that these cultures were not indicated; however our results have emphasised unacceptable poor documentation and need for improvement.

The commonest organisms cultivated included *Escherichia coli*, *Enterococcus faecalis* and *Klebsiella* in 2016 and *Escherichia coli*, *Klebsiella* and *Klebsiella pneumoniae* carbapenemase (KPC) in 2017 (see Figure 3). The culture result only shows bacteriuria and does not signify a urinary tract infection. Documentation and acknowledgement of culture result was only present in 15% of cases in 2016 and increased to 40% in 2017, showing an improvement. Culture sensitivity results to antibiotics was never documented in both years. The educational event might have contributed to this increase in documentation and acknowledgement of culture result; however there is a need for further improvement. Urine culture results take a few days to process and, if a urinary tract infection is suspected, empirical antibiotics should be started. Empirical antibiotics were given in approximately 45% of cases that had a urine culture taken. This could have included the same patient on different occasions. Antibiotic switching due to resistance, based on the urine culture result, was similar in both years.

This study clearly shows that a high percentage of cultures ordered (up to 75%) did not influence the clinical management. Inappropriate use of these tests leads to a waste of valuable and limited resources. The bacteria cultured were sensitive to the empirical antibiotic chosen in most cases, with however around 10% of cases needed switching due to antimicrobial resistance. This underlines the usefulness of urine cultures in directing therapy when indicated.

The lack of documentation was a limitation of the study but also highlighted the need for improvement in this area. The small sample size was another limitation. There has been a considerable

improvement in the documentation of urine culture indication and acknowledgement of the culture result after the intervention. However, further improvement in this area is needed. Regular auditing, increased educational events, checklists and active involvement of management and policy makers might help improve standards leading to appropriate use of urine culture testing. It would also be interesting to perform this audit in both primary and secondary care involving a larger sample size. This will potentially improve quality of care and decrease unnecessary costs which can be used better elsewhere.

## CONCLUSION

Lack of documentation of the urine culture indication and acknowledgement of the result was evident; however there was an improvement in the re-audit following the intervention. A high percentage of cultures taken did not influence the clinical management. The study clearly shows inappropriate use of urine culture requests and the need to follow available guidelines. This latter would help avoid waste of valuable and limited resources.

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