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Urinary Tract Infection

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Abstract: *Urinary Tract Infection (UTI) is an illness caused by micro-organisms in the urinary tract. An audit was carried out in 2019 at the LochRee Practice where 50 female patients who had symptoms of UTI were randomly selected. The patient would submit a urine sample and answer a short questionnaire (Appendix 1). Admin staff would diptest urine. The clinician will then decide if it's appropriate to issue treatment or not. A correct decision was made i.e. no antibiotics prescribed when there was no UTI were 4/11 (36.4%). Incorrect treatment i.e. antibiotic given without an infection 7/11 (63.6%). Correct treatment i.e. antibiotics given when infection confirmed 25/27 (92.6%), two UTIs were missed. 7 out of 44 prescriptions given could have been avoided, in-turn reducing cost and resistance. 13 (26%) patients did not get their urine dipped. 12 (24%) patients did not get a culture and sensitivity test. We recommend that empirical treatment to be commenced when all three on urine dipstick (nitrites, leukocytes and blood) positive. Appropriate management of a UTI would save the NHS from cost burdens and would also save the patient from resistance to antibiotics.*

Keyword: UTI management

I. Introduction

Urinary Tract Infection

- Urinary Tract Infection (UTI) is an illness caused by micro-organisms in the urinary tract.
  - Lower UTI (cystitis) affects the bladder and urethra.
  - Upper UTI (pyelonephritis) affects the renal pelvis and kidneys (COMPASS, 2012) (NICE, 2018a).

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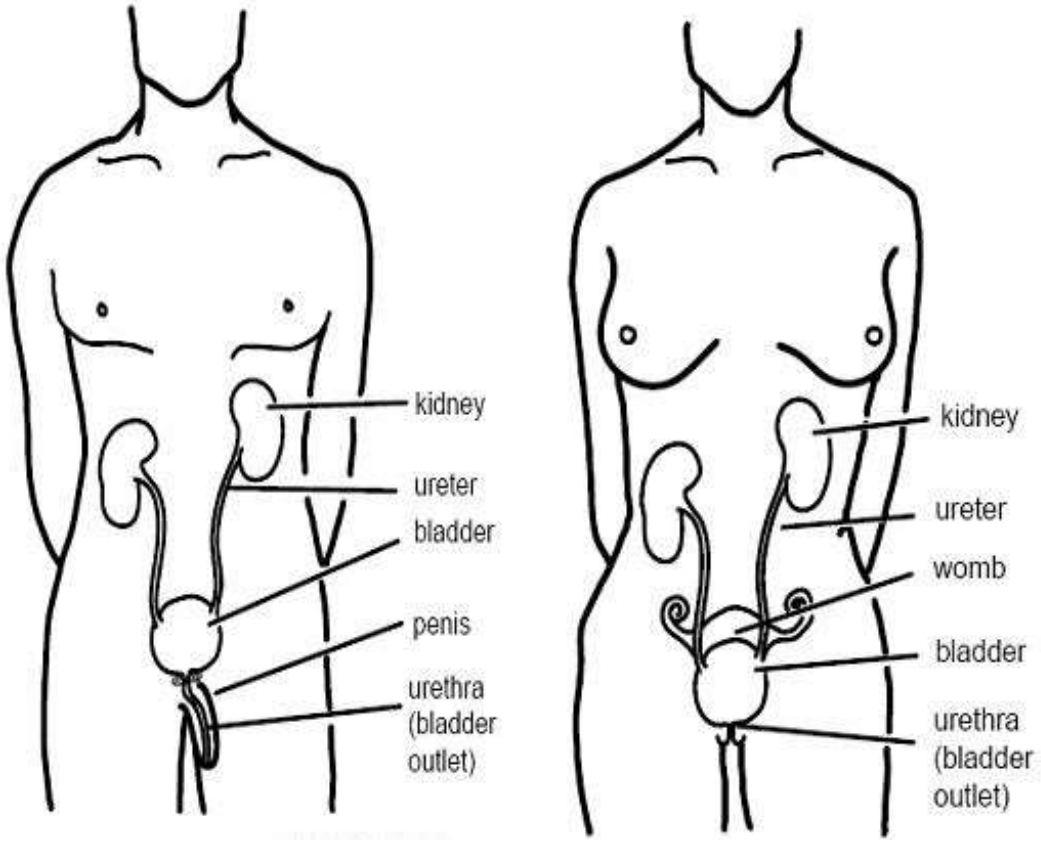


Figure 1 The Urinary Tract in Men and Women.

The urinary tract is made up of two kidneys and their ureters, the bladder and the urethra.
The kidneys filter waste products from the blood and convert them into urine. The ureters transport urine from the kidneys to the bladder. The bladder stores urine. The urethra allows the passing of urine. It is much shorter in women than in men.

Lower Urinary Tract Infection

This is when only the urethra and/or bladder is infected. A diagnosis of lower urinary tract infection can be made using a simple urine-dip test.
The symptoms of a lower urinary tract infection include at least one of the following:

- dysuria
- urgency
- the feeling of not being able to urinate fully
- cloudy, bloody or bad-smelling urine
- lower abdominal pain
- urinary incontinence
- mild fever (a high temperature between 37–38°C)
- Delirium

Treatment of lower UTIs

Lower UTIs are usually treated with a three-day course of antibiotic drugs. Over-the-counter pain relief, such as paracetamol, may also be taken to relieve any associated discomfort. A urine culture and sensitivity should be sent to a laboratory.
In some cases the underlying cause may be prostate disease or other urological conditions, such as a bladder stone or tumour, that prevent complete emptying of the bladder.

Upper Urinary tract Infections

This is when the kidneys and ureters are infected, often in addition to the urethra and/or bladder. It is a more serious condition than a lower UTI as it can result in kidney damage if not treated. Upper UTIs can be accompanied by bacteraemia, and can be life-threatening if left untreated.

The symptoms of an upper UTI may include those of a lower UTI (see above):

- high fever (a high temperature over 38°C)
- nausea or vomiting
- rigors
- loin pain
- flank tenderness

Treatment of upper UTIs

Treatment for people with upper UTIs usually includes a 7- or 14-day course of antibiotics.

Urine Dipstick

It can be used as an aid to diagnosis:

- If dipstick is positive for nitrite or leukocyte and red blood cells (RBC) UTI is likely.
- If urine dipstick is negative for nitrite and positive for leukocyte, there is still a probability of a UTI.
- If urine dipstick is negative for nitrite, leukocyte and RBC, UTI is less likely.
- Urine dipstick should not be used to diagnose UTI in catheterized women or those over the age of 65 years. (https://www.nhs.uk/conditions/urinary-tract-infections-utis/)

No observational study to date has explored whether there are groups or subgroups of symptoms that more clearly respond to antibiotics. (Little P E. H., 2001) (Little P G. C., 1999). In our Audit, urinary symptoms were a major criterion for inclusion.

Antibiotic resistance, or not prescribing antibiotics, is associated with an increase of over 50% in more severe symptoms. (P Little, 2010).

In a recent study Urine dipstick analysis of 635 urine culture-positive patients was studied. The sensitivity of nitrite alone and leukocyte esterase alone were 23.31% and 48.5%, respectively. The sensitivity of blood alone in positive urine culture was 63.94%, which was the highest sensitivity for a single screening test. The presence of leukocyte esterase and/or blood increased the sensitivity to 72.28%. The sensitivity was found to be the highest when nitrite, leukocyte and blood were considered together. It was concluded that Nitrite test and leukocyte esterase test when used individually is not reliable to rule out UTI. Hence, symptomatic UTI patients with negative dipstick assay should be subjected to urine culture for a proper management. (Anith Mambatta, 2015 Apr-Jun)

Our suggestion would be to commence with empirical treatment for a UTI if the patient had the symptoms and the urine-dip was positive for all 3 (blood, leucocytes and nitrites).

II. Aim

To carry out an Audit on Urinary Tract Infections at the LochRee Medical Practice - Waverly Medical Centre, Stranraer, West Scotland. The audit was carried out in 50 randomly selected women patients in 2019.
To review prescribing data following introduction of a new protocol for screening patients with urinary symptoms, thought to be infective (Appendix 1).

The aim is to reduce a face-to-face consultation with the clinician, so to improve the workload. It was also to see if appropriate treatment was given. 100% urine sample should be dipped if submitted. All positive urine dip should be sent for Culture and Sensitivity. Empirical treatment is commenced if nitrites, blood and leucocytes are positive.

III. Methodology

The UTI Audit was carried out at the LochRee Practice, Waverly Medical centre Stranraer, West Scotland in 2019. Fifty female patients were randomly selected.

Patient would submit a urine sample and answer a short questionnaire. Admin/HCA staff would dip-test urine and leave information for clinician to then decide if appropriate to issue treatment or wait for the Mid Stream Urine Culture and Sensitivity result.

Excluding criteria

Pregnancy, catheterised patients, men and children from the patients selected.

Indications

UTI symptoms:

- dysuria
- urgency
- the feeling of not being able to urinate fully
- cloudy, bloody or bad-smelling urine
- lower abdominal pain
- urinary incontinence
- mild fever (a high temperature between 37–38°C)
- Delirium/acute confusion (sudden onset confusion developing within one to two days) – this is more common in the elderly.
- high fever (a high temperature over 38°C)
- nausea or vomiting
- rigors
- loin pain
- flank tenderness

IV. Results

Following are the results of the audit:

Empirical treatment was commenced on 13 patients who were positive for nitrite, blood and leukocyte in urine-dip. Patients who had a UTI with Nitrite and WBC positive were 16 out of 27 - (59.3%). Patients with Nitrite negative but were UTI positive were 6 out of 27 i.e. (22.2%). Patients who had only a Nitrite positive & UTI Positive were 19/27 – i.e. (70%). The number of patients who had an inappropriate treatment i.e. antibiotics given when there was no infection were 7/11 - (63.6%). The number of patients who had an appropriate treatment i.e. no antibiotic when there was no infection was 4/11 - (36.4%). The number of patients who received antibiotic treatment when infection was confirmed was 25/27 - (92.6%). Two UTIs were missed.

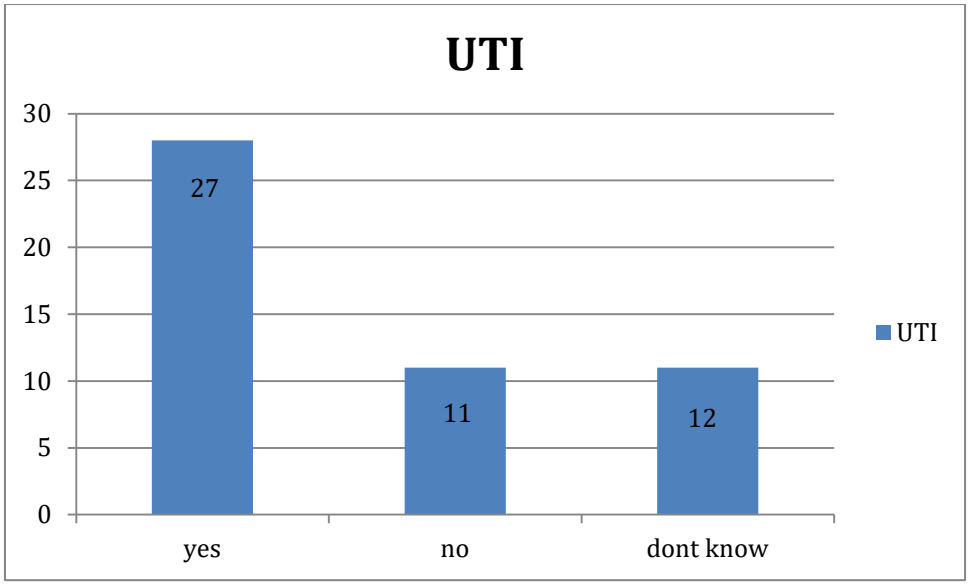


Figure 2 Number of patients who had a UTI

The above figure shows 27 people had a positive culture hence had a UTI. 11 patients did not have a UTI and, 12 of 50 patient's status were unknown as cultures were not carried out.

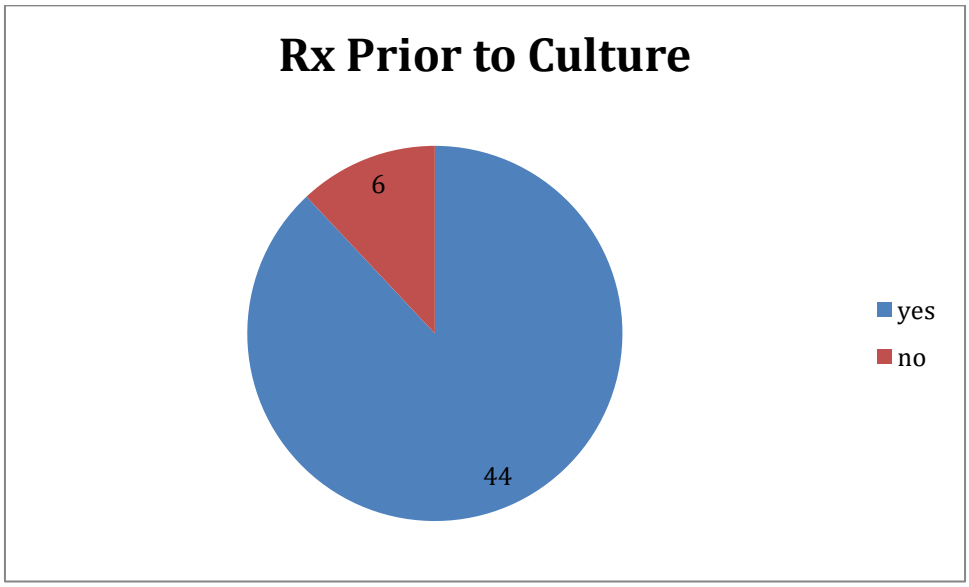


Figure 3. The number of patients treated with Antibiotics prior to a Culture and Sensitivity.

The above figure shows that 44 patients were treated with antibiotics empirically before a culture and sensitivity (C & S). Only 6/50 patients did not get any antibiotics prior to a C & S.

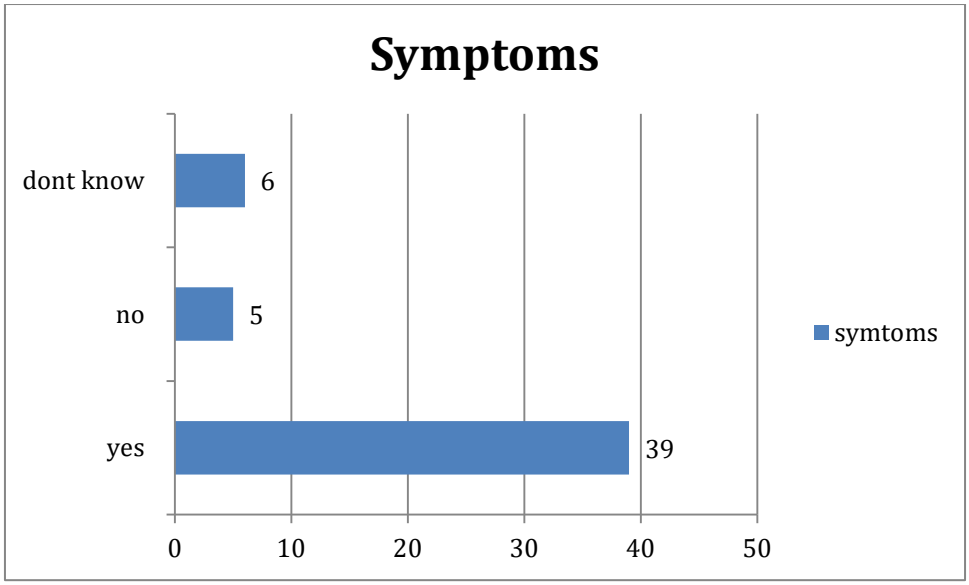


Figure 4. The number of patients with UTI symptoms.

The above figure shows the number of patients with or without Urinary tract infection symptoms. 39/50 was confirmed to have symptoms. Out of the 11 patients who did not have symptoms recorded, 4 had a UTI. Recording of symptoms is very important.

Urine Dipstick Results

The figure below shows White Blood Cells positive on urine dipstick. 33 patients were positive, 4 negative and 13 unknown (urine not dipped).

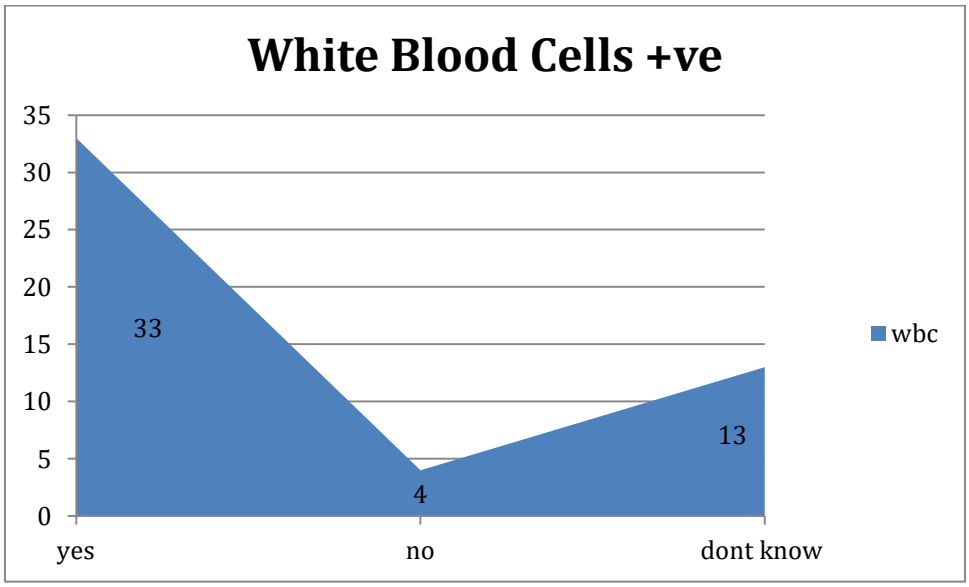


Figure 5. Patients with positive white blood cells on urine dip.

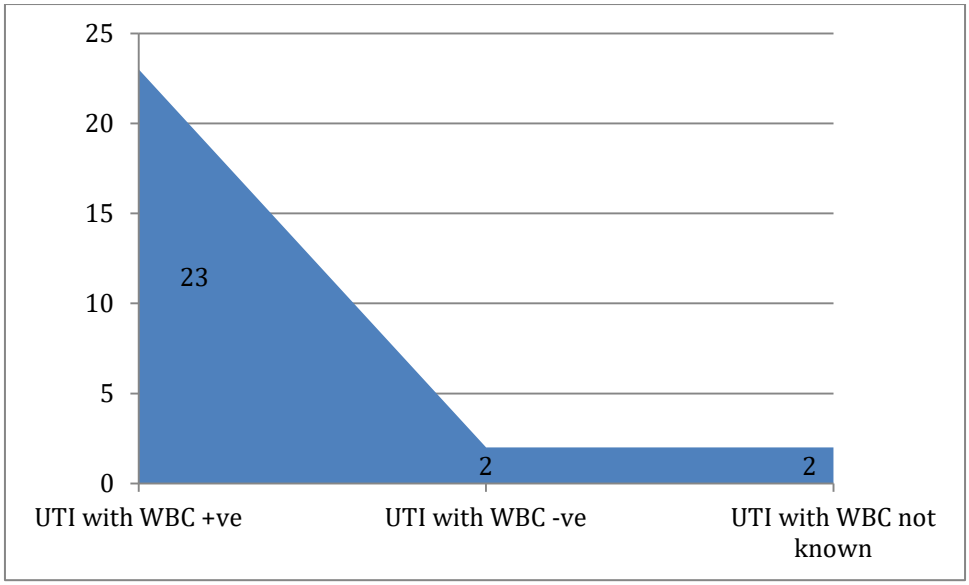


Figure 6. Correlations of UTI with Leucocytes

The above figure shows that out of the 33 patients who had a WBC positive on urine dip, 23 patients (69%) had a UTI. 50% had a UTI with a negative leukocyte count. 2/13 (15%) had a UTI who did not have a urine dip test.

The figure below shows 23 patients had a positive nitrite on urine dip, 12 had a negative test and for 15 patients no results recorded. Of the 23 nitrite positive patients 19 (83%) had a UTI. Only 6 (26%) had a UTI when nitrites were negative. 2 (9%) had a UTI when nitrites were unknown.

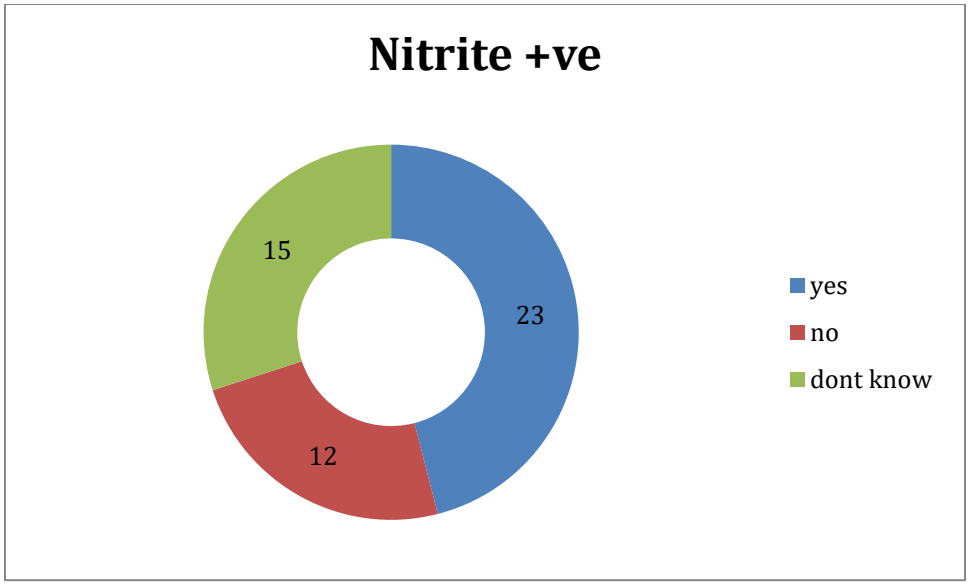


Figure 7. Patients with Nitrite Positive on urine dip.

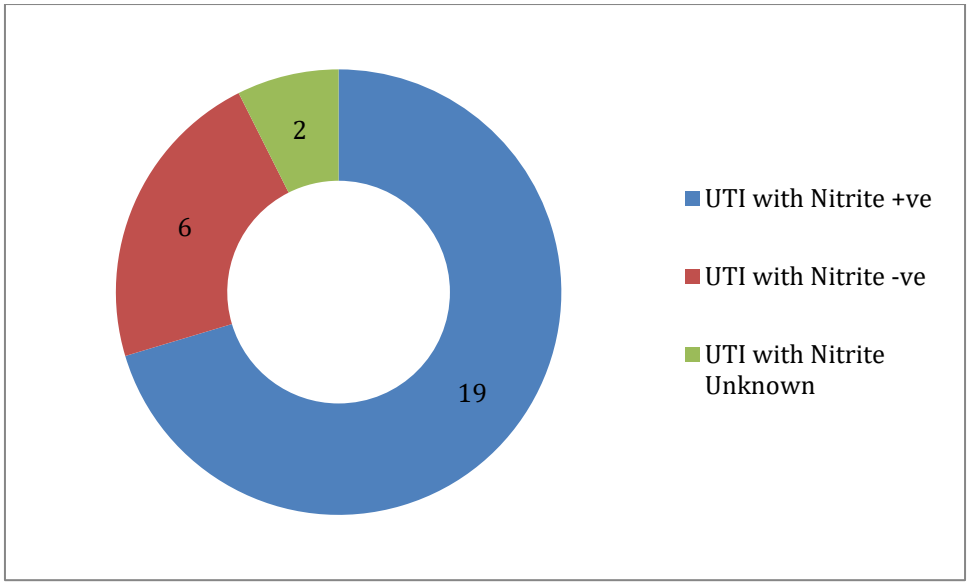


Figure 8. Correlations with Nitrite

The figure below shows 25 patients had blood positive in their urine and 12 did not. 13 patients had unknown results. Of the 25 patients who had blood positive on dip urine test, 17 (68%) had a UTI. 8/12 (67%) had a UTI when blood was negative on dip. 2 (15%) had a UTI when urine-dip was not done.

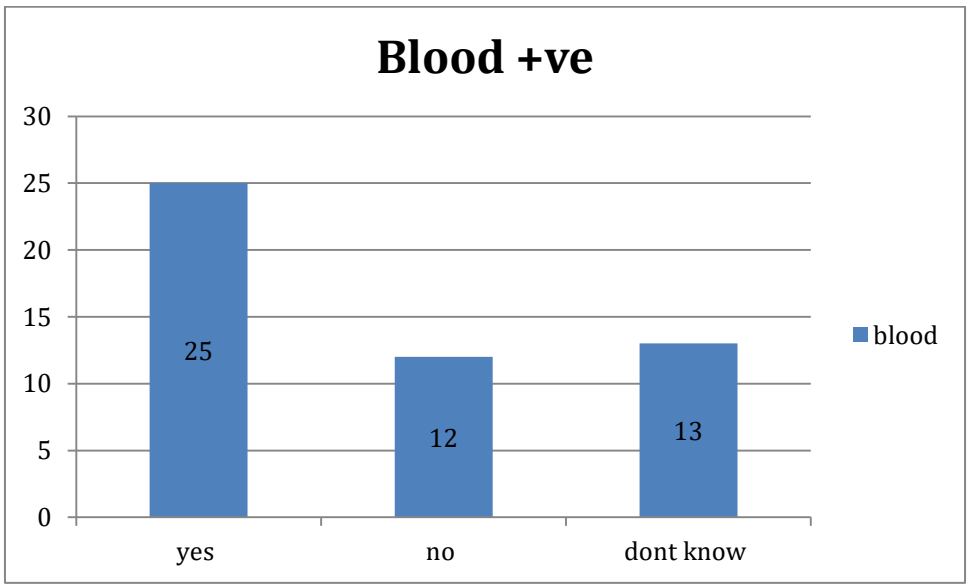
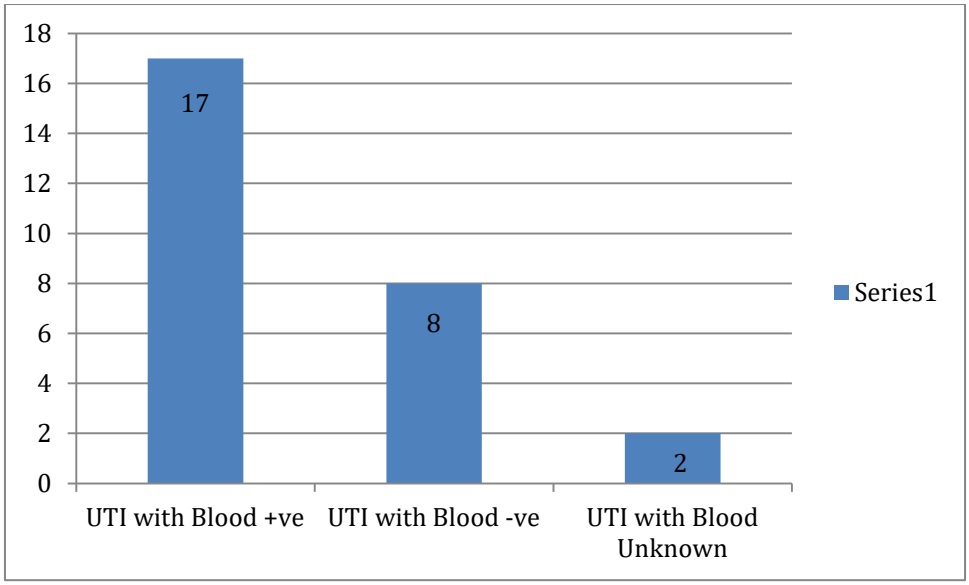


Figure 9. Patients with positive for blood on urine dip test.



Definitive test

The figures below shows 27 patients had a positive culture and hence were UTI positive. 10 patients did not have a UTI and for 12 patients results were unknown.

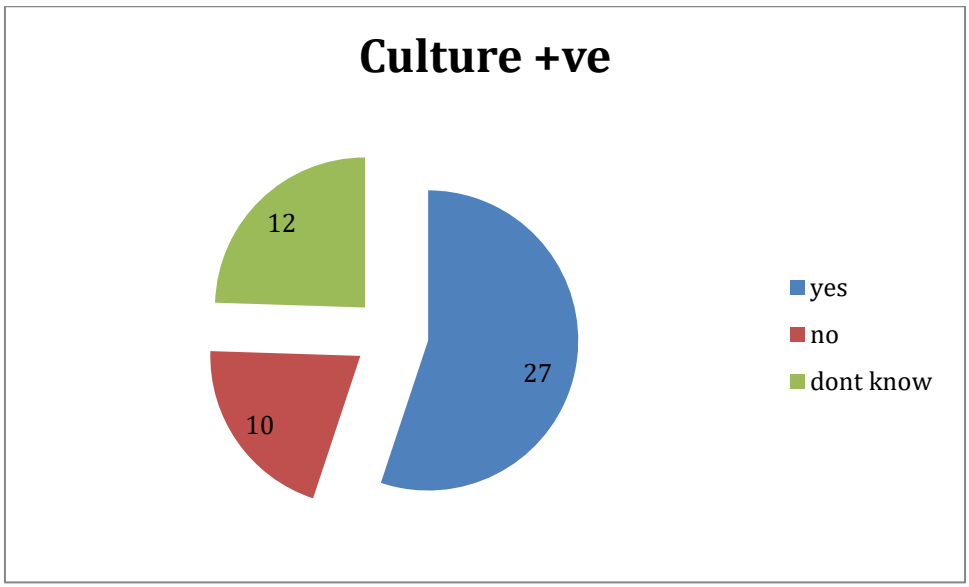


Figure 10. The number of patients who had a positive urinary culture

Correlations

To begin we would like to answer our initial question to empiric treatment given if all 3 (blood, nitrites and leucocytes positive). The figure below shows that 13 (93%) patients did get empirical treatment and only 1 did not. It was interesting to know that one patient who did not receive empirical treatment did not have a UTI hence appropriate treatment given.

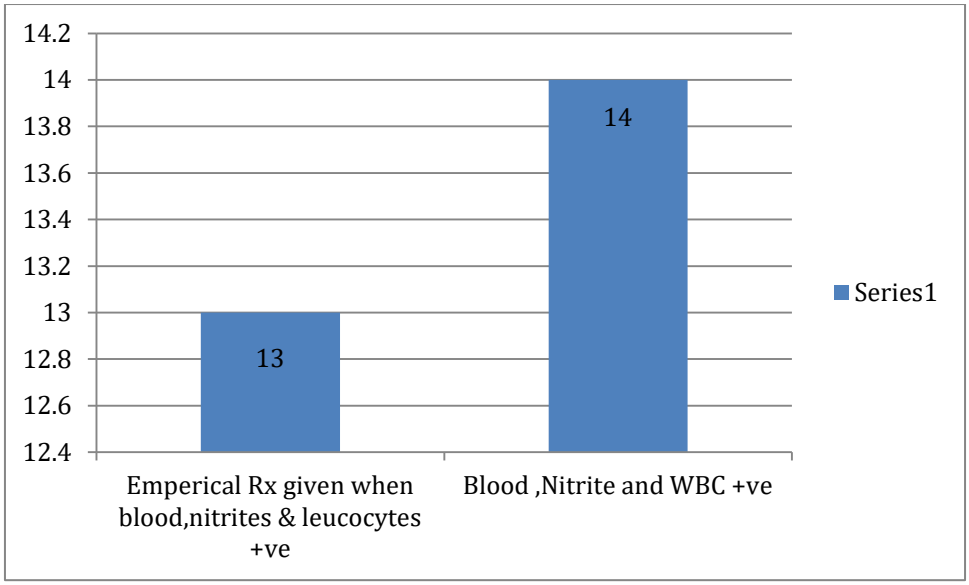


Figure 11. Correlation between empirical treatment when all 3(Nitrites, Blood and Leucocytes) positive.

The figure below shows correlations with urine dipstick parameters. We found that 6 patients with a nitrite negative on urine dip had a UTI. In contrast to 19 patients who were nitrite positive were also positive for a UTI. 16 patients with a nitrite being positive and WBC positive were confirmed to have a UTI.

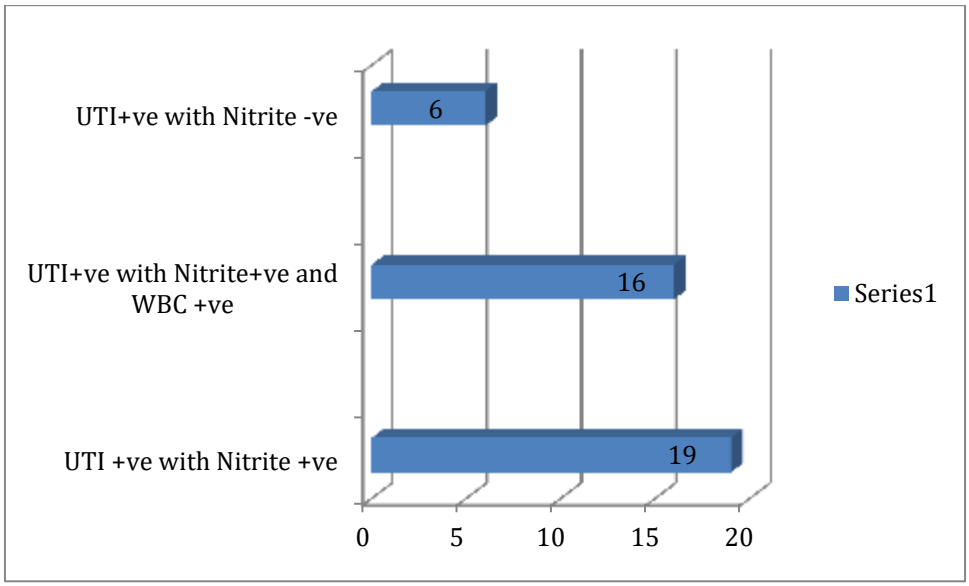


Figure 12. UTI positive and its correlation with urine dipstick

The figure below shows that 24 patients had appropriate treatment i.e. the right antibiotic when UTI positive on culture and sensitivity. It also meant that amongst the 24 patients no antibiotic was used when there was no UTI detected on culture. 14 patients had inappropriate management i.e. prescription of incorrect antibiotics or treatment given when not required or treatment not given when required. For 12 patients' unknown outcome as cultures were not done.

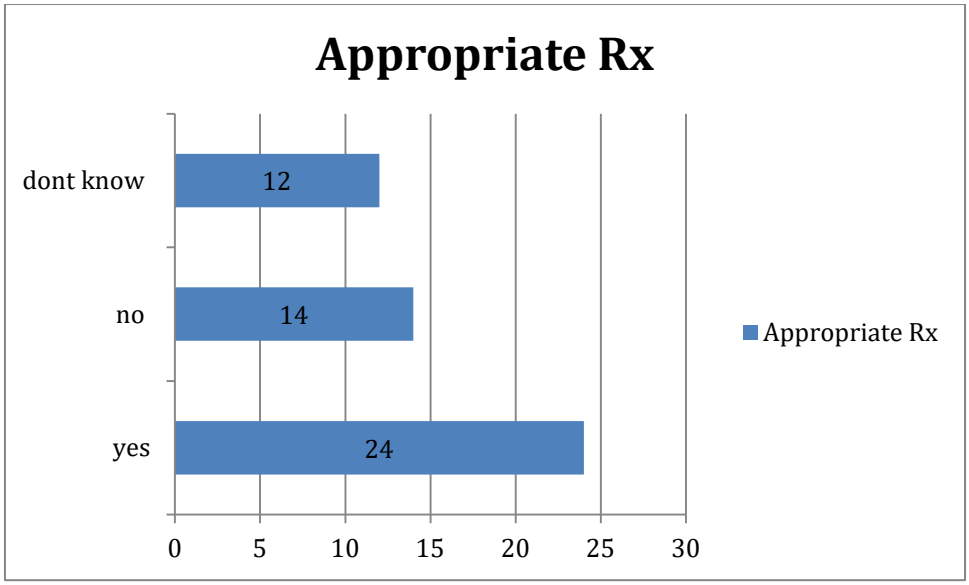


Figure 13. The number of patients' who received appropriate treatment.

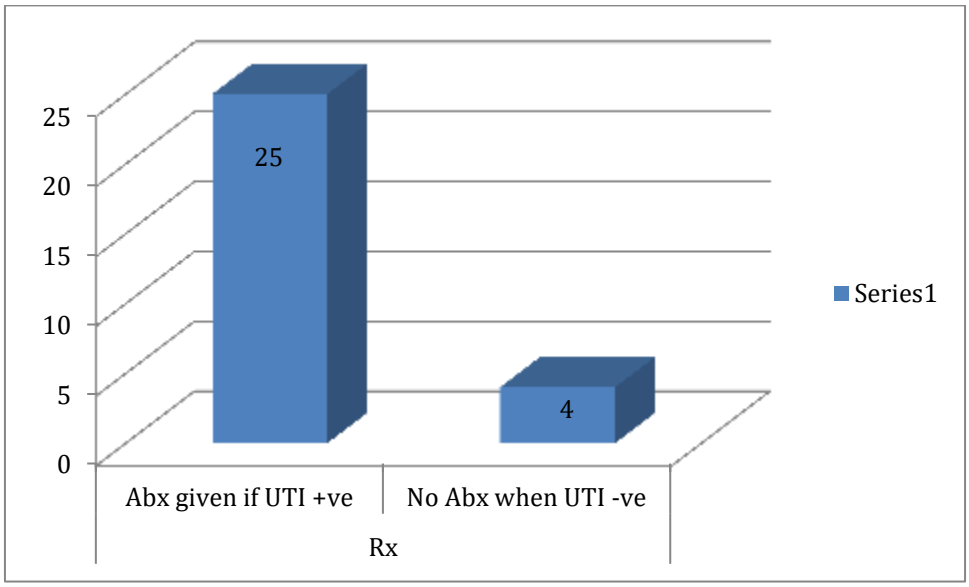


Figure 14 Antibiotics given if UTI positive or not.

The above figure shows that antibiotic treatment was given to 25 patients who had a positive culture. But this is not necessary that the correct antibiotic would have been prescribed. Four patients had appropriate management i.e. no antibiotics prescribed when UTI was negative.

The figure below describes inappropriate treatments. Here 7 patients were prescribed antibiotics when culture was negative and 2 patients were prescribed antibiotics when both nitrites and culture were negative.

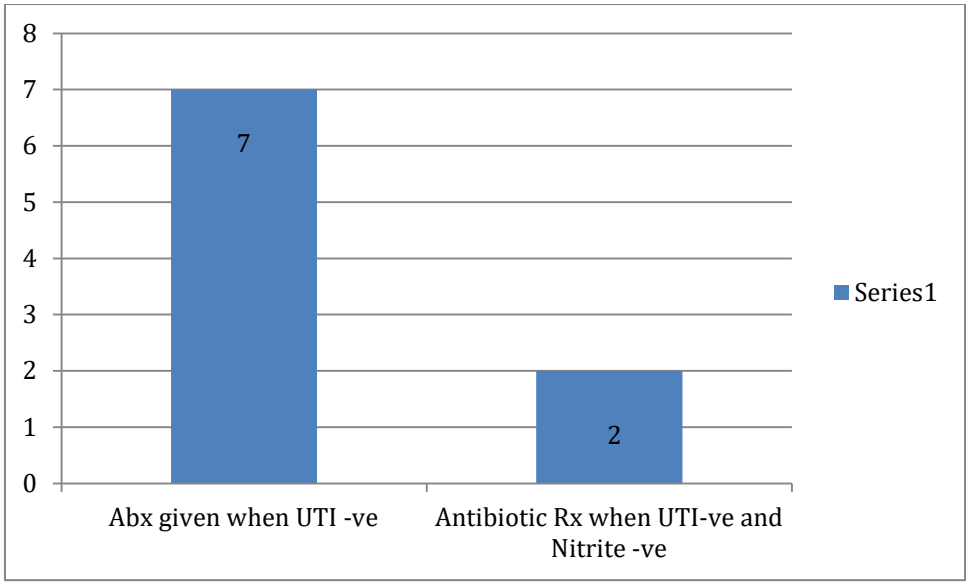


Figure 15. Inappropriate Treatment.

V. Conclusion

To treat as a possible UTI it is best to have a combination of all 3 Nitrite, Blood & Leucocytes) positive prior to culture and sensitivity. However, if WBC and blood are negative but Nitrite is positive and symptoms suggest that they have an ongoing UTI then it is still ok to issue empirical antibiotics, otherwise wait for Culture and Sensitivity result. 13 (93%) patients' received empirical treatment. Zero patients were treated with antibiotics that had a Nitrite negative with WBC positive and a negative culture. 13 (26%) patients did not get their urine dipped. 12 (24%) patients did not get a culture and sensitivity test. The potential to remove issuing an inappropriate antibiotic prescription is enormous, 7 out of 50 patients sampled did not require an antibiotic. So 7 (16%) out of 44 prescriptions given could have been avoided.

Appropriate management of a UTI would save the NHS from cost burdens and would also save the patient from resistance to antibiotics.

VI. References

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