

**The Impact of Catheter Associated Urinary Tract Infection**  
**Prof. Brett Mitchell, Avondale College, Australia**  
**A Webber Training Teleclass**

## THE IMPACT OF CATHETER ASSOCIATED URINARY TRACT INFECTION

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July 26, 2017

## Disclosures

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- Editor-in-Chief, *Infection, Disease and Health*
- Competitive research grants related to UTIs and CAUTIs
  - Australasian College for Infection Prevention and Control
  - Ian Potter Foundation
  - HCF Foundation
- Industry grant relating to urinary catheter use
  - Senver
- Other competitive research grants unrelated to the topic of UTIs and CAUTIs



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## The impact of CAUTIs

- Assist in providing evidence on the rationale for initiatives to reduce CAUTIs
- Touch on CAUTI prevention strategies



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## Learning outcomes

1. To describe the frequency of healthcare associated and catheter associated urinary tract infections
2. Discuss the impact of CAUTIs
3. Outline key CAUTI prevention strategies



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## What's the problem?

1. Antimicrobial resistance
2. Prevalence
3. Impact for patients and for health services
4. Preventable



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## Background

- Urinary tract infections (UTIs) are common infections (Laupland et al. ,2007)
- 150 million people/year globally (Gupta et al. ,2001)
- 15%-25% of episodes have positive blood cultures (Bahgon et al. ,2007)
- >80% caused by *Escherichia coli* (*E. coli*) (Nicolle, 2008)
- Community acquired (CA) or healthcare associated (HCA) classification



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Problem 1: Antimicrobial resistance

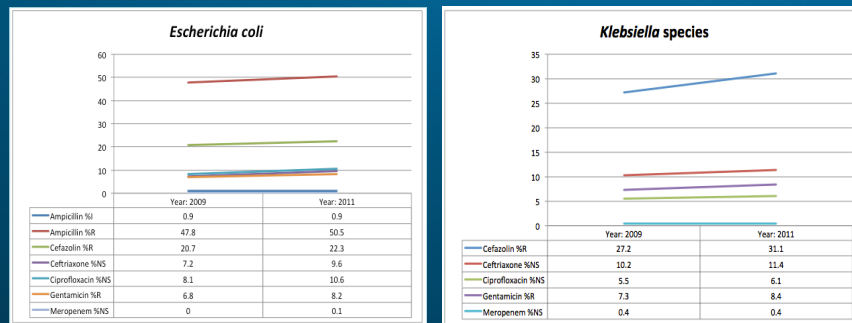
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Antimicrobial resistance

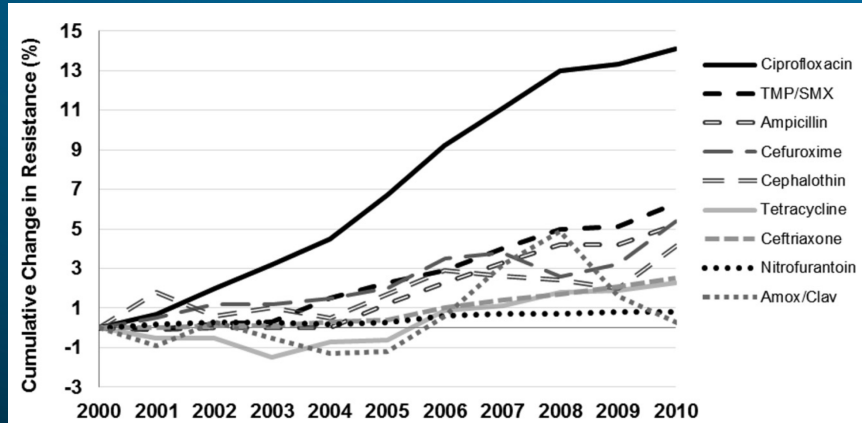
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Courtesy: Australian Group on Antimicrobial Resistance (2012).  
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Cumulative annual change in urinary <sup>10</sup>  
*E. coli* antimicrobial resistance



(Sanchez et al., 2012)



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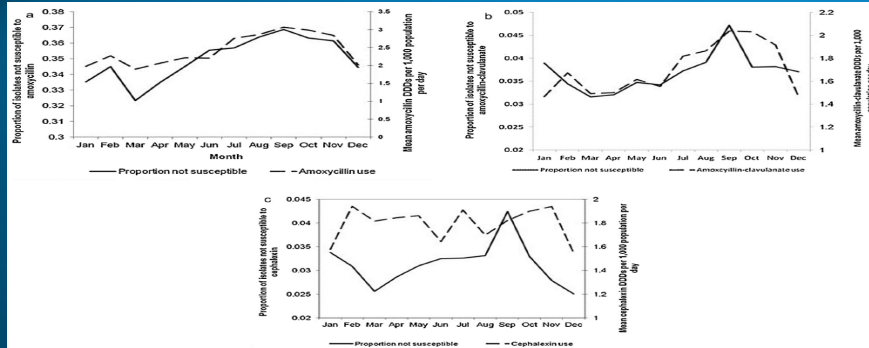


Fig. 1. Antimicrobial use and *Escherichia coli* resistance to that antimicrobial for (a) ampicillin, (b) amoxicillin/clavulanic acid (AMC) and (c) cefalexin. The left y-axis shows the proportion of isolates in each month for 2010–2012, and the right y-axis shows the mean usage in that month for the 3 years. DDD, defined daily dose.

Fig. 1. Antimicrobial use and *Escherichia coli* resistance to that antimicrobial for (a) ampicillin, (b) amoxicillin/clavulanic acid (AMC) and (c) cefalexin. The left y-axis shows the proportion of isolates in each month for 2010–2012, and the right y-axis shows the mean usage in that month for the 3 years. DDD, defined daily dose.

Table 3  
 Effects of season and time lag following increased antimicrobial use on resistance to amoxicillin.

	Univariate regression		Full model, multivariate		Final model	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Outcome: Amoxicillin resistance						
Time (months from start)	1.00 (1.00–1.00)	0.96	1.00 (0.99–1.01)	0.09		
Season (peak July)	1.10 (1.02–1.18)	<0.01	1.18 (1.05–1.33)	<0.01	1.19 (1.10–1.29)	<0.01
Amoxicillin use	1.06 (1.01–1.11)	0.02	1.06 (1.02–1.09)	0.00		
Amoxicillin use, 1-month lag	1.07 (1.02–1.12)	<0.01	1.06 (1.00–1.12)	0.05		
Amoxicillin use, 2-month lag	1.07 (1.02–1.13)	<0.01	1.12 (1.05–1.20)	<0.01	1.11 (1.05–1.18)	<0.01
Amoxicillin use, 3-month lag	0.97 (0.92–1.02)	0.19	0.99 (0.92–1.07)	0.80		

OR, odds ratio; CI, confidence interval.



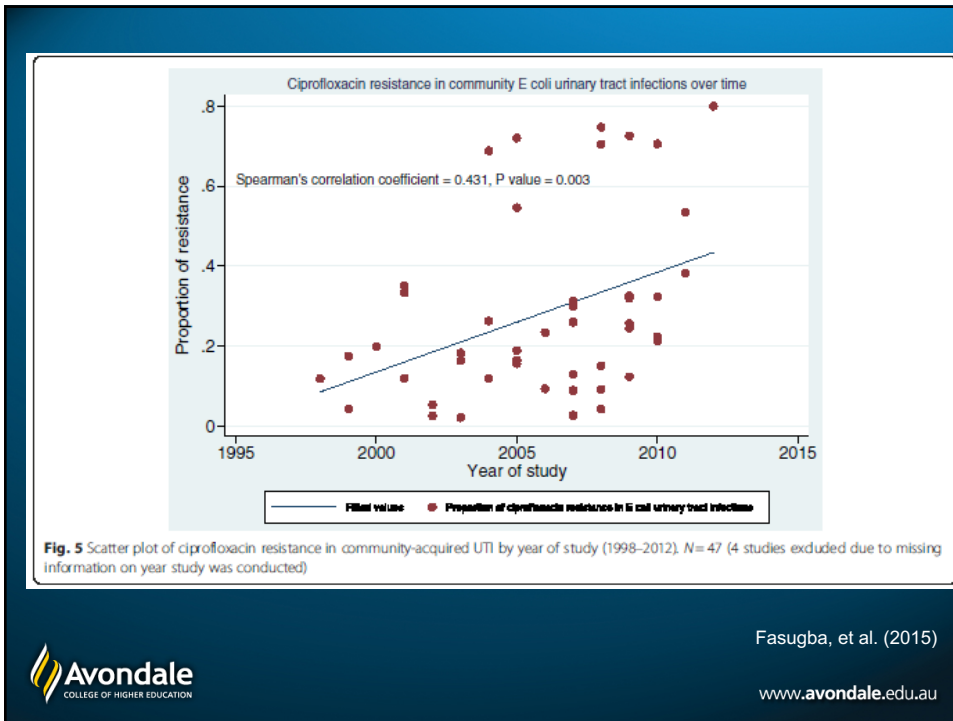
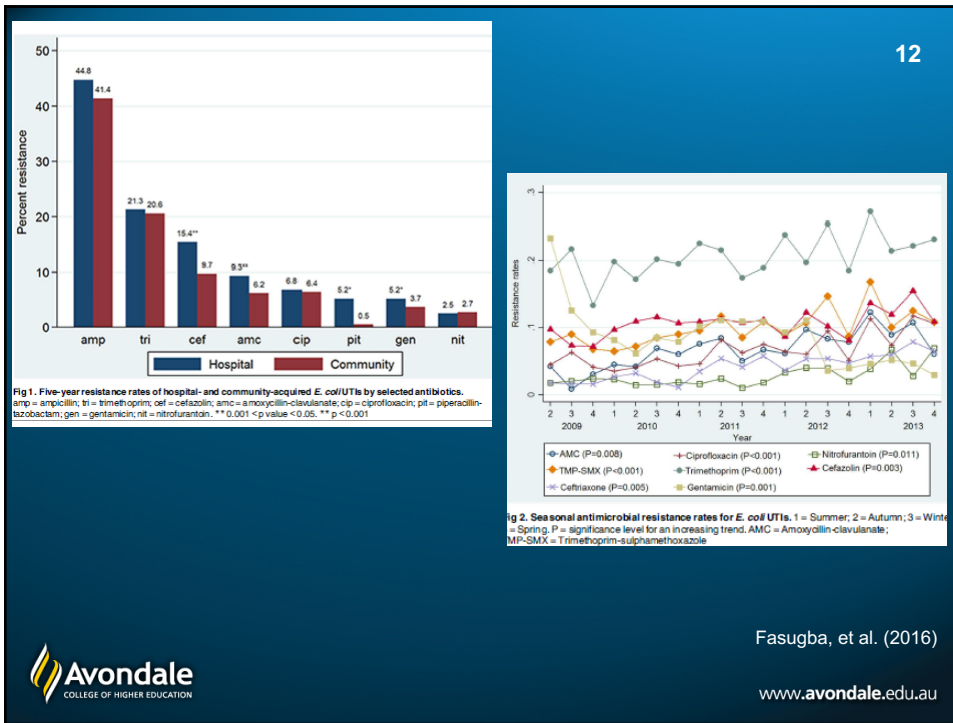
Meumann, et al. 2015 International Journal of Antimicrobial Agents, 46 (4)

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## Antimicrobial resistance: UTIs and patients

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- UTIs are common
- Are becoming increasingly resistant to antimicrobials
- Treatment challenges in the future
  - Increased treatment failure
  - Increased demand / use other ABs (cost, resistance, increase hospitalisation)

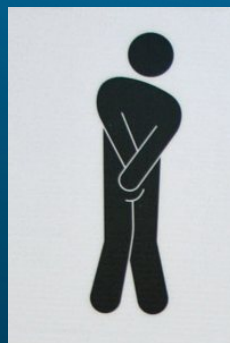
As AMR increases, UTIs will become more difficult to treat



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## Problem 2: Prevalence

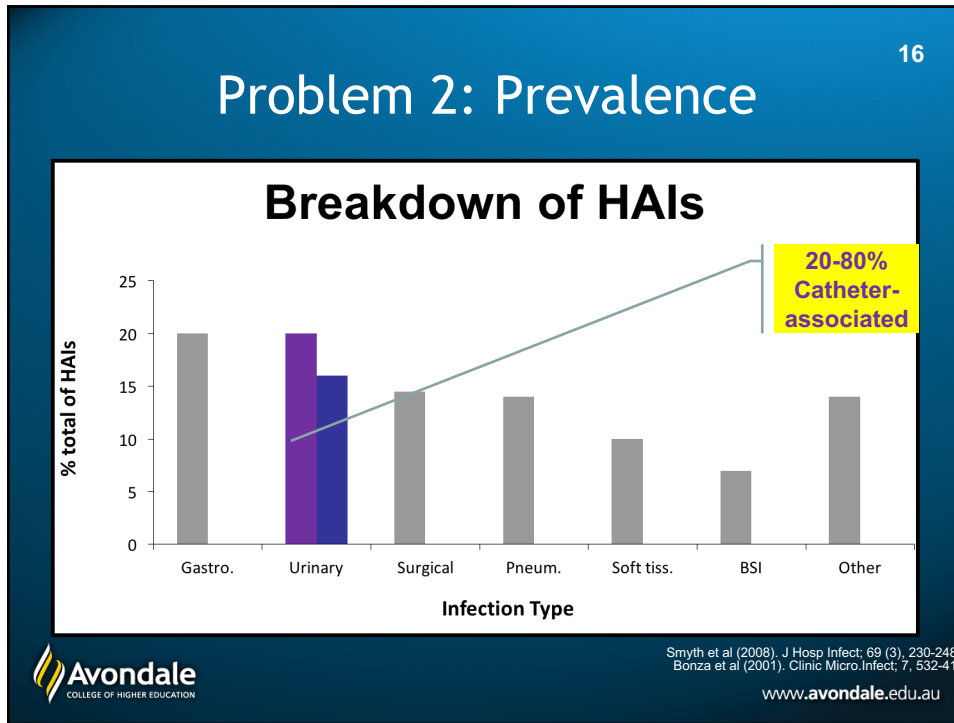
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## Frequency - PPS

<u>Country</u>	<u>Author</u>	<u>Rank</u>
Argentina	Durlach et al, 2012	2
Belgium	Vrijens et al, 2012	1
	Gordts, 2010	1
Canada	Taylor et al, 2016	1
	Gravel et al, 2007	2
Egypt	See et al, 2013	2
Finland	Lyytikainen et al, 2008	2
France	Thiolet et al, 2008	1
Greece / Cyprus	Kritsotakis et al, 2008	2
Ireland/Northern Ireland	Fitzpatrick et al, 2008	1
Hungary	Caine et al, 2013	2
Iran	Lahsaeizadeh et al, 2008	2
Italy	Lanini et al, 2009	2

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## Problem 2: Prevalence

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- HAUTI = 1.4%
- CAUTI 0.9%
  
- 26% of patients received a catheter



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## Patients and health services

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- 82 acute care hospitals; 17 aged care facilities
  
- HAUTI prevalence
  - 1.4% (95% CI 0.8-2.2%) in acute care
  - 1.5% (95% CI 0.8-2.6%) in aged care.
  
- Catheter use
  - acute care (9.3%)
  - aged care (3.3%)



(Mitchell et al., 2016)



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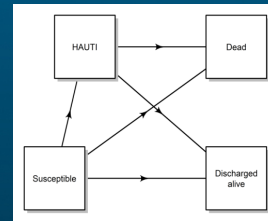
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## Problem 3: Patients and health services

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- Mortality & length of stay associated with HAUTIs
- Noncurrent cohort study, 4.5 years, 8 NSW hospitals
- Mortality: Cox regression model
- LOS: Multistate model



(accepted *Journal Hospital Infection*)



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## Problem 3: Patients and health services

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- HAUTI incidence: 1.73% (95% CI 1.67–1.80)
- Females more likely (unadjusted OR 2.5; 95%CI 2.3–2.7).
- Mortality: varies....
- Extra LOS = four days (95% CI 3.1–5.0)
- Infection significantly reduced the rate of discharge
- Women were more likely to acquire an infection and more likely to be discharged. The elderly were less likely to be discharged

(Mitchell, Ferguson et al, 2016)



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## Problem 4: Preventable

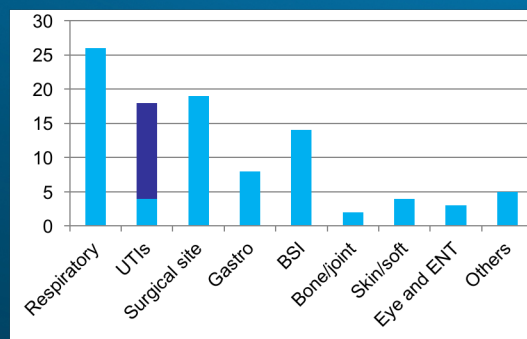


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## Problem 4: Preventable

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### Breakdown of all HAIs



UTIs are one most common HAIs  
CAUTIs represent a large proportion of these  
Reducing CAUTIs = Reduction in HAIs overall



Zarb et al (2012). *Eurosurveillance*.

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## Preventable: Catheter use, common & inappropriate

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- Tertiary hospital, 54% inappropriate use, 13% documented reason (Gokula et al, 2004)
- Of 886 admissions, 10.7% catheter first 24hrs, 38% no justifiable reason (Munasinghe et al, 2001)
- STRUTI study: 26% patients received a catheter. 61% no documented reason; 71% no idea who inserted it Mitchell (2015)
- Survey 288 physicians, 31% didn't know pt had catheter, 41% inappropriately catheterised - Saint et al (2000)



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## Preventable: Risk Factors

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- *Female*
- *Older age*
- Non maintenance of closed system
- Catheter duration
- Risk of bacteruria increases with days of catheterisation  
5% per day that catheter is in place



Tenke et al (2008)  
Lo et al (2008)

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## CAUTI: Largely preventable

- CAUTIs are by their nature associated with urinary catheters
- Large number of catheters are inserted/used catheters
  - 26% of patients admitted to hospitals have urinary catheter inserted (Gardner et al, 2016).
- Catheter use is largely inappropriate
  - Reduction in catheter use ..> reduction in CAUTI
- Evidence to suggest that CAUTI initiatives work



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## CAUTI: Largely preventable

- Unnecessary catheter use and other strategies (e.g. reminder system, stop order etc) work

BMJ Quality & Safety Online First, published on 27 September 2013 as 10.1136/bmjqs-2012-001774

 OPEN ACCESS

**Reducing unnecessary urinary catheter use and other strategies to prevent catheter-associated urinary tract infection: an integrative review**

Jennifer Meddings,<sup>1</sup> Mary A M Rogers,<sup>1</sup> Sarah L Krein,<sup>1,2</sup>  
Mohamad G Fakih,<sup>3</sup> Russell N Olmsted,<sup>4</sup> Sanjay Saint<sup>2,1</sup>



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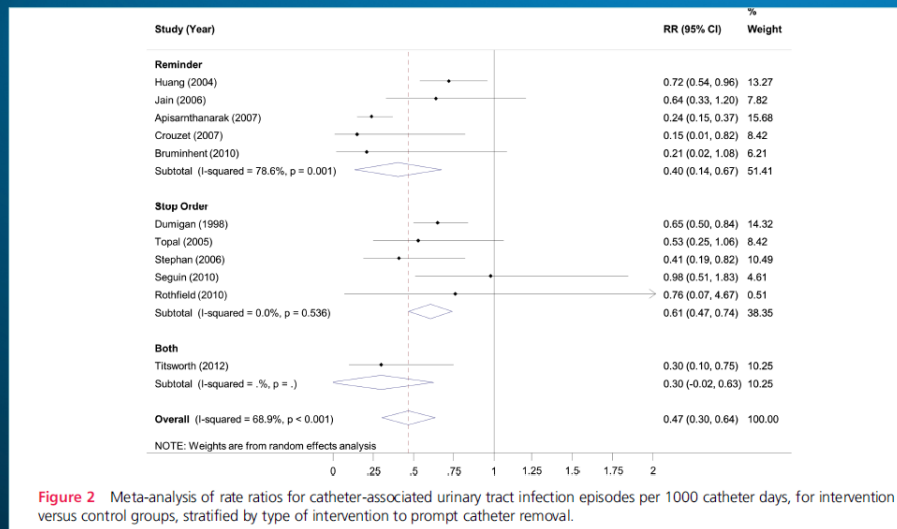


Figure 2 Meta-analysis of rate ratios for catheter-associated urinary tract infection episodes per 1000 catheter days, for intervention versus control groups, stratified by type of intervention to prompt catheter removal.

(Meddings et al, 2013)



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Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

Journal of Hospital Infection

ELSEVIER

journal homepage: [www.elsevierhealth.com/journals/jhin](http://www.elsevierhealth.com/journals/jhin)

Review

## Systematic review and meta-analysis of the effectiveness of antiseptic agents for meatal cleaning in the prevention of catheter-associated urinary tract infections

O. Fasugba<sup>a, b, \*</sup>, J. Koerner<sup>a</sup>, B.G. Mitchell<sup>c, d</sup>, A. Gardner<sup>a</sup>

<sup>a</sup>Faculty of Health Sciences, Australian Catholic University, Canberra, Australian Capital Territory, Australia  
<sup>b</sup>Lifestyle Research Centre, Avondale College of Higher Education, Cooranbong, New South Wales, Australia  
<sup>c</sup>Faculty of Arts, Nursing and Theology, Avondale College, Wahroonga, New South Wales, Australia  
<sup>d</sup>School of Nursing and Midwifery, Griffith University, Brisbane, Queensland, Australia

(Fasugba, Koerner et al, 2016)



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# CAUTI: Largely preventable

Sustainable

Phase	ICU	SDU
P1	7.6	15.3
P2	3.5	6.6
P3	1.0	0.9

Fig 3. Incidence density of CAUTIs per 1,000 catheter days in the ICUs and SDUs. CAUTI, catheter-associated urinary tract infection; ICU, intensive care unit; P1, phase 1 (June 2009-December 2007); P2, phase 2 (January 2008-June 2013); P3, phase 3 (July 2013-August 2014); SDU, step-down unit.

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Sustainability of a program for continuous reduction of catheter-associated urinary tract infection

Dorisela A. Bezerra RN, Débora Schmitt da Silva Alencar RN, Ana Maria Guillerme RN, Thelma Tereza Campos MEd, Alexandre E. Marz MD, Eliseu da Silva Victor PhD, Michael R. Elevart MD, MPH, MEd

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(Regagnin et al, 2016)

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# CAUTI: Largely preventable

The NEW ENGLAND  
JOURNAL of MEDICINE

ESTABLISHED IN 1812      JUNE 2, 2016      VOL. 374 NO. 22

A Program to Prevent Catheter-Associated Urinary Tract Infection in Acute Care

Sanjay Saini, M.D., M.P.H., M. Todd Greene, Ph.D., M.P.H., Sarah L. Krein, Ph.D., R.N., Mary A.M. Rogers, Ph.D., David Ratz, M.S., Karen E. Fowler, M.P.H., Barbara S. Edson, R.N., M.B.A., M.H.A., Sam R. Watson, M.S.A., C.P.P.S., Barbara Meyer-Lucas, M.D., M.H.S.A., Marie Masuga, R.N., M.S.N., Kelly Faulkner, M.S.P.A., Carolyn V. Gould, M.D., M.S.C.R., James Battles, Ph.D., and Mohamad G. Fakih, M.D., M.P.H.

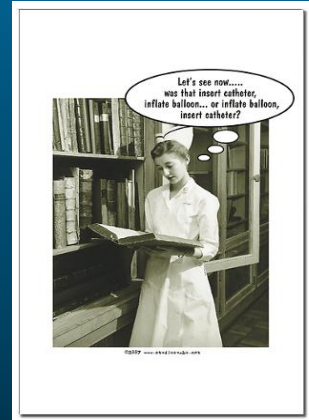
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## Preventable: Guidelines

- ACIPC / ASID (HICSIG)
- HICPAC
- European and Asian guidelines
- EPIC3
- SHEA/IDSA
- NHMRC ICGs



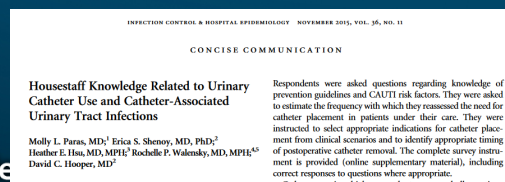
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## But guidelines are not enough..

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Small majority of house staff respondents reported awareness of CAUTI prevention guidelines

Minority of respondents could correctly identify all appropriate/inappropriate indications for catheterization in common clinical scenarios.



(Paras et al, 2015)



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## Who would like a UTI / CAUTI?


- As a healthcare professional / ICP
  - High quality care provide
  - Avoid wherever possible preventable infections
  - Don't want high rates of infection
- As a patient/consumer
  - Physical
    - Frequency (n=8), very painful (n=7), bleeding (n=6), cold/flu like (n=4), stinging (n=3)....
  - Emotional
    - Generally unwell (n=6), normal duties disrupted (n=3)
  - n=27

BMJ RESEARCH

Women's views about management and cause of urinary tract infection: qualitative interview study

G.M. Leydon, senior researcher and MRB fellow; S. Turner, senior research fellow; H. Smith, chair in primary care; P. Little, professor of primary care research on behalf of the UTIC team

(Leydon et al(2010). *BMJ*, 340, c279)


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## Briefly, some other things... challenges

- Surveillance / monitoring
  - What about administrative data?
- Is it a CAUTI / UTI or not?
  - HAI Controversies blog
  - <http://haicontroversies.blogspot.com.au/2016/06/preventing-catheter-associated-urinary.html>


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I am a urinary catheter  
Dark places I must go  
My job is clear  
I have no fear  
I need to ease the flow  
You are the one I am inside  
It enters not your head  
That if I'm left in  
(a mortal sin)  
You could just end up dead  
At times, I am a useful aide  
But my use you should not flout  
On every day  
Someone should say  
It's time to take me out!

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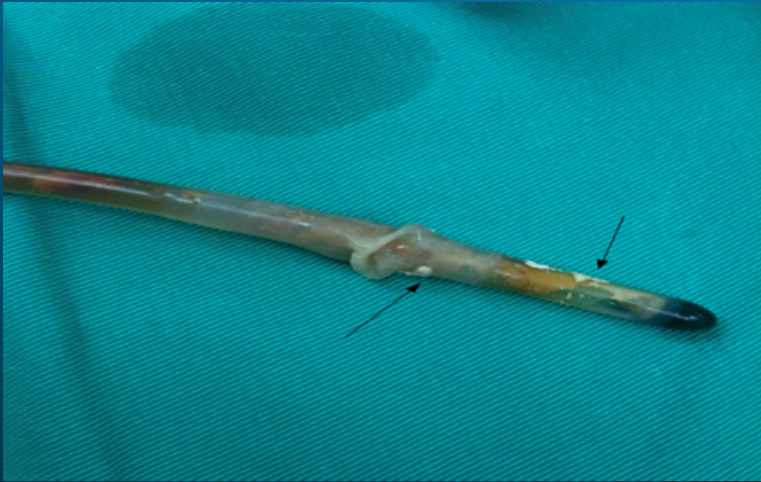
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Martin Keiman. (2015). <https://reflectionsipc.com/>. I'll take the tube out

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Who would like a UTI / CAUTI?

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## The impact of HAUTIs and CAUTIs

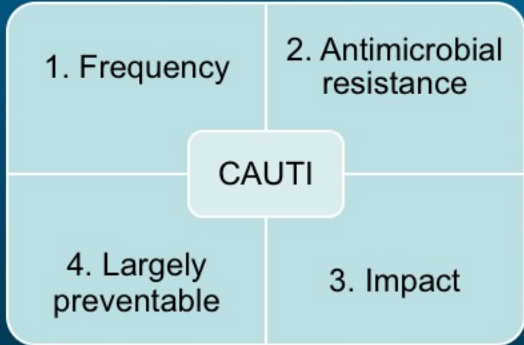
- Emerging problem for patients and the health service
- Current impact is not insignificant
- Common
- Preventable
- QI programs
- Research
- Surveillance

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## Conclusion




1. Frequency

2. Antimicrobial resistance

CAUTI

3. Impact

4. Largely preventable

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- Apisarnthanarak, A., Rutjanawech, S., Wichansawakun, S., Ratanabunjerdkul, H., Patthranitima, P., Thongphubeth, K., ... & Fraser, V. J. (2007). Initial inappropriate urinary catheters use in a tertiary-care center: incidence, risk factors, and outcomes. *American journal of infection control*, 35(9), 594-599.
- Bahagon, Y., Raveh, D., Schlesinger, Y., Rudensky, B., & Yinnon, A. (2007). Prevalence and predictive features of bacteremic urinary tract infection in emergency department patients. *European Journal of Clinical Microbiology & Infectious Diseases*, 26(5), 349-352.
- Fasugba, O., Koerner, J., Mitchell, B. G., & Gardner, A. (2016). Systematic review and meta-analysis of the effectiveness of antiseptic agents for meatal cleaning in the prevention of catheter-associated urinary tract infections. *Journal of Hospital Infection*.
- Fasugba, O., Mitchell, B. G., Mnatzaganian, G., Das, A., Collignon, P., & Gardner, A. (2016). Five-Year Antimicrobial Resistance Patterns of Urinary Escherichia coli at an Australian Tertiary Hospital: Time Series Analyses of Prevalence Data. *PloS one*, 11(10), e0164306.
- Gokula, R. R. M., Hickner, J. A., & Smith, M. A. (2004). Inappropriate use of urinary catheters in elderly patients at a midwestern community teaching hospital. *American journal of infection control*, 32(4), 196-199.
- Gupta, K., Hooton, T. M., & Stamm, W. E. (2001). Increasing antimicrobial resistance and the management of uncomplicated community-acquired urinary tract infections. *Annals of internal medicine*, 135(1), 41-50.
- Gupta, K., Sahm, D. F., Mayfield, D., & Stamm, W. E. (2001). Antimicrobial resistance among uropathogens that cause community-acquired urinary tract infections in women: a nationwide analysis. *Clinical infectious diseases*, 33(1), 89-94.
- Hartman, A. (2013). Ebola and Marburg Virus Infections. In Magill, Ryan, Hill & Solomon (Ed.), *Hunter's Tropical Medicine and Emerging Infectious Disease* (9<sup>th</sup> ed.). Elsevier Saunders: London.
- Laupland, K., Ross, T., Pitout, J., Church, D., & Gregson, D. (2007). Community-onset urinary tract infections: a population-based assessment. *Infection*, 35(3), 150-153.



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- Lo, E., Nicolle, L., Classen, D., Arias, K. M., Podgorny, K., Anderson, D. J., ... & Yokoe, D. S. (2008). Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. *Strategies*, 29(S1), S41-S50.
- McNulty, C. A. M., Bowen, J., Foy, C., Gunn, K., Freeman, E., Tompkins, D., ... & Smith, G. E. (2006). Is there an opportunity to reduce urinary catheter-related infections? Exploring variation in catheterisation rates in care homes. *British Journal of Infection Control*, 7(1), 22-28.
- Meddings, J., Rogers, M. A., Krein, S. L., Fakhri, M. G., Olmsted, R. N., & Saint, S. (2013). Reducing unnecessary urinary catheter use and other strategies to prevent catheter-associated urinary tract infection: an integrative review. *BMJ quality & safety*, bmjqs-2012.
- Meumann, E. M., et al. (2015). Urinary Escherichia coli antimicrobial susceptibility profiles and their relationship with community antibiotic use in Tasmania, Australia." *International Journal of Antimicrobial Agents* 46(4): 389-393.
- Mitchell, B. G., Ferguson, J. K., Anderson, M., Sear, J., & Barnett, A. (2016). Length of stay and mortality associated with healthcare-associated urinary tract infections: a multi-state model. *Journal of Hospital Infection*, 93(1), 92-99.
- Mitchell, B. G., Fasugba, O., Beckingham, W., Bennett, N., & Gardner, A. (2016). A point prevalence study of healthcare associated urinary tract infections in Australian acute and aged care facilities. *Infection, Disease & Health*, 21(1), 26-31.
- Mitchell, B. G., Fasugba, O., Beckingham, W., Bennett, N., & Gardner, A. (2016). A point prevalence study of healthcare associated urinary tract infections in Australian acute and aged care facilities. *Infection, Disease & Health*, 21(1), 26-31.
- Munasinghe, R. L., Yazdani, H., Siddique, M., & Hafeez, W. (2001). Appropriateness of use of indwelling urinary catheters in patients admitted to the medical service. *Infection control and hospital epidemiology*, 22(10), 647-649.
- Nicolle, L. E. (2008). Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis. *Urologic Clinics of North America*, 35(1), 1-12.



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## References

- Nimmannitya, S. (2009). Dengue and Dengue Haemorrhagic Fever. In Cook and Zumla (Ed.), *Manson's Tropical Disease* (22<sup>nd</sup> Ed.). Elsevier: London.
- Paras, M. L., Shenoy, E. S., Hsu, H. E., Walensky, R. P., & Hooper, D. C. (2015). Housestaff Knowledge Related to Urinary Catheter Use and Catheter-Associated Urinary Tract Infections. *infection control & hospital epidemiology*, 36(11), 1355-1357.
- Regagnin, D. A., da Silva Alves, D. S., Cavalheiro, A. M., Camargo, T. Z. S., Marra, A. R., da Silva Victor, E., & Edmond, M. B. (2016). Sustainability of a program for continuous reduction of catheter-associated urinary tract infection. *American journal of infection control*, 44(6), 642-646.
- Saint, S., Wiese, J., Amory, J. K., Bernstein, M. L., Patel, U. D., Zemencuk, J. K., ... & Hofer, T. P. (2000). Are physicians aware of which of their patients have indwelling urinary catheters?. *The American journal of medicine*, 109(6), 476-480.
- Sanchez, G. V., Master, R. N., Karlowsky, J. A., & Bordon, J. M. (2012). In vitro antimicrobial resistance of urinary *Escherichia coli* isolates among US outpatients from 2000 to 2010. *Antimicrobial Agents and Chemotherapy*, 56(4), 2181-2183.
- Taylor, R., Agbenyega, T. (2013). Malaria. In Magill, Ryan, Hill & Solomon (Ed.), *Hunter's Tropical Medicine and Emerging Infectious Disease* (9<sup>th</sup> ed.). Elsevier Saunders: London.
- Tenke, P., Kovacs, B., Bjerklund Johansen, T. E., Matsumoto, T., Tambyah, P. A., & Naber, K. G. (2008). European and Asian guidelines on management and prevention of catheter-associated urinary tract infections. *International Journal of Antimicrobial Agents*, 31, 68-78.



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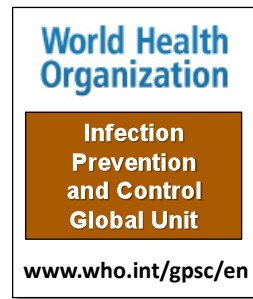
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