Thank you for joining the webinar!

NLC
NUTRICIA LEARNING CENTER

Challenges in UTI Surveillance, Diagnosis, and Management in Long-term Care

Presented by:
Denise Cooper, DNP, RN, ANP-BC
Lynn Spalding, MEd, RDN, CSG, FAND

For **Call-in information,** go to **'Event Info' tab** in the **upper left corner** of your screen.

The webinar will begin shortly.

Challenges in UTI Surveillance, Diagnosis, and Management in Long-term Care

Denise Cooper, DNP, RN, ANP-BC

Lynn Spalding, MEd, RDN, CSG, FAND

NLC™
NUTRICIA LEARNING CENTER

About our speakers

Denise Cooper, DNP, RN, ANP-BC

Lynn Spalding, MEd, RDN, CSG, FAND

M FLINT SCHOOL OF NURSING

Challenges in UTI Surveillance, Diagnosis, and Management in Long-term Care

Denise Cooper, DNP, RN, ANP-BC

Lynn Spalding, MEd, RDN, CSG, FAND

NLC™
NUTRICIA LEARNING CENTER

Disclaimer

Opinions and positions expressed by the speaker are solely those of the speaker and do not necessarily reflect the views, opinions or positions of Nutricia North America or any employee thereof.

Let's Get to Know You – Participant Poll

NLC
NUTRICIA LEARNING CENTER

What is your profession?

A. Registered Dietitian
B. Registered Nurse
C. Director of Nursing
D. Provider (MD, PA, NP)
E. Other

Objectives

NLC
NUTRICIA LEARNING CENTER

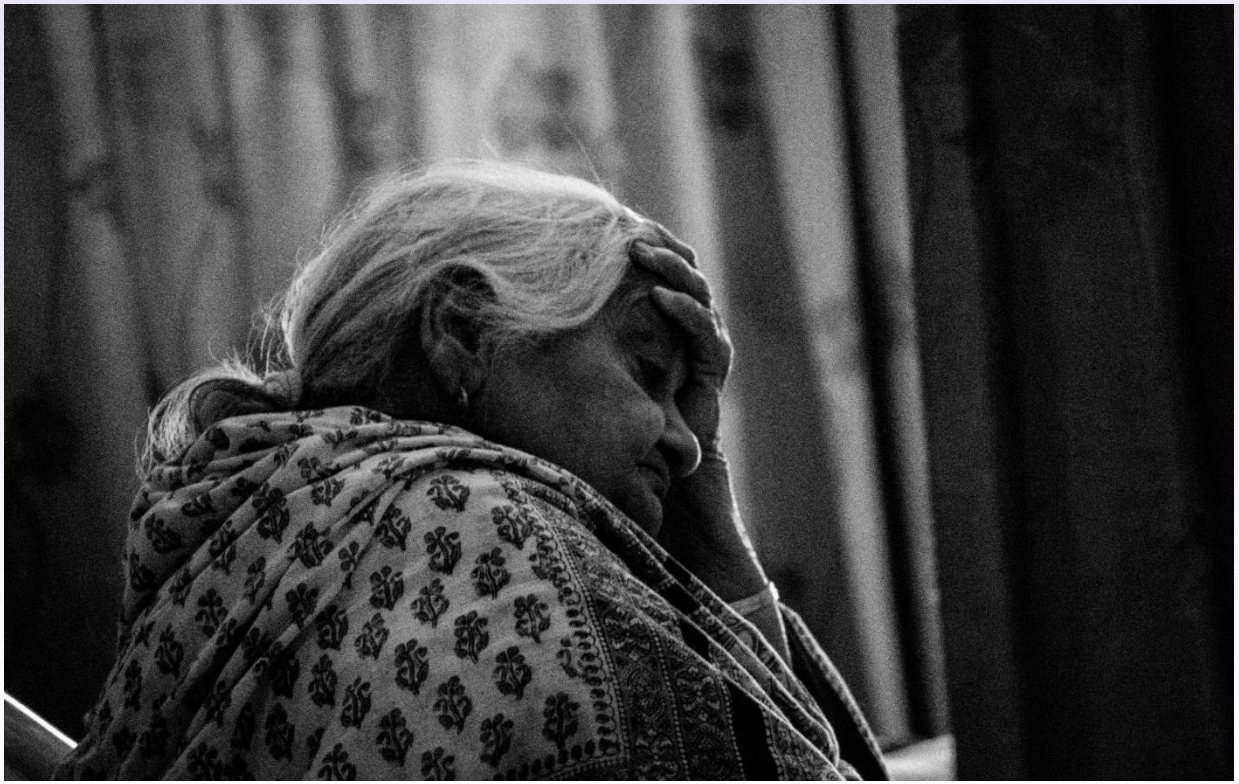
- Identify challenges and strategies to monitor patients for symptoms associated with urinary tract infection.
- Differentiate urinary tract infection from asymptomatic bacteriuria in the long-term care population.
- Discuss evidence surrounding UTI diagnosis and current issues with antibiotic resistance.
- Identify nutrition-related strategies for UTI management including the use of cranberry and hydration.
- Apply knowledge gained about UTI surveillance, diagnosis , and management to a clinical scenario.

UTI Impact on Residents

NLC
NUTRICIA LEARNING CENTER

UTIs are a common infection in the long-term care setting.

What does this mean for our residents?



Benoit, et al. 2008; Rotjanapan, 2011.

Case Study

Mary Frank an 82-year-old resident in your LTC facility with a recent functional status change.

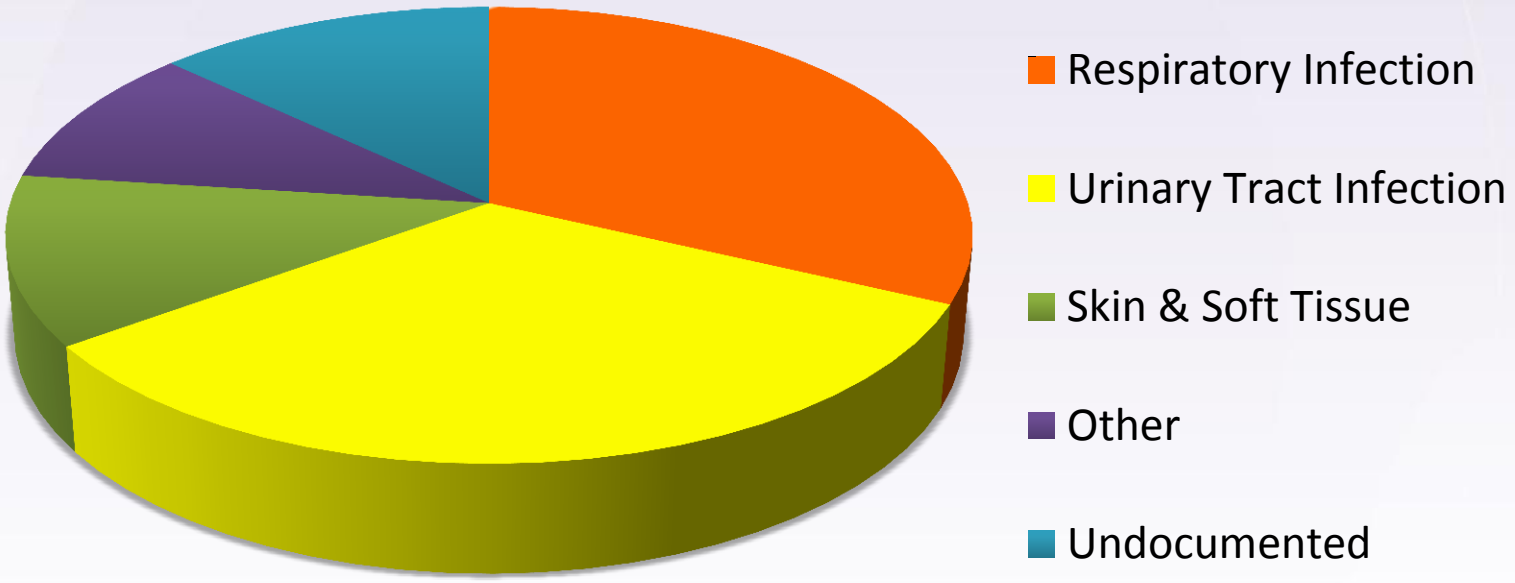
PMH: IDDM, Alzheimer dementia-moderate, Anemia, HTN.

VS: 98.7, 98, 20, 124/88

Her health was stable until a week ago when she seemed to lose interest. Her food acceptance has been about 25-50% per meal over the last week. The nurse reports that her BS have been ranging from 58-390 over the last week which normally run 100-250, and her urine is dark in color. Ms. Franks daughter states "I want her tested for a UTI". Ms. Franks states, I just don't feel well but denies any specific pain or complaints. Her PE is negative except hypoactive BS. If clean-catch urine testing is done, which of the following proves that Ms. Frank has a UTI?

A. Urinalysis with 100,000 CFU bacteria
B. Urine dipstick with positive Nitrates and RBC
C. Urinalysis with 100,000 CFU bacteria and dark urine and abnormal BS
D. Urine dipstick with positive Nitrates, dark urine, and functional status change
E. None of the above

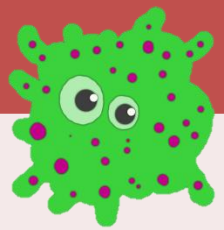
Infections in LTC by Type



Benoit, et al. 2008; Rotjanapan. 2011.

UTI or ASB?

NLC
NUTRICIA LEARNING CENTER

UTI		ASB (bacteriuria)
>100,000 cfu bacteria		>100,000 cfu bacteria
+		+
2-3 signs/symptoms		Insufficient OR NO signs/symptoms
=		=
ABX		NO ABX

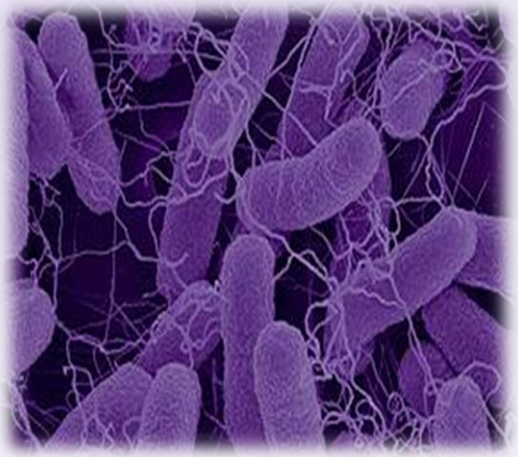
Juthani-Mehta, 2005; Loeb, 2001; McGeer, 1991; Nicolle, 2005; Ouslander, 1995; Phillips, et al, 2012; Rotjanapan, et al, 2011; Schmiemann, 2010; Stone, 2012; Zabarsky, et al, 2008.

Community vs. Long-term Care

NLC
NUTRICIA LEARNING CENTER

ASB incidence in LTC

- 25-50% Women
- 15-40% Men
- ~100% Catheterized residents



ASB in the Community Dwelling Older Adults

- 11-16% Women
- 4-19% Men

CDC, 2012; Nicolle, 2005.

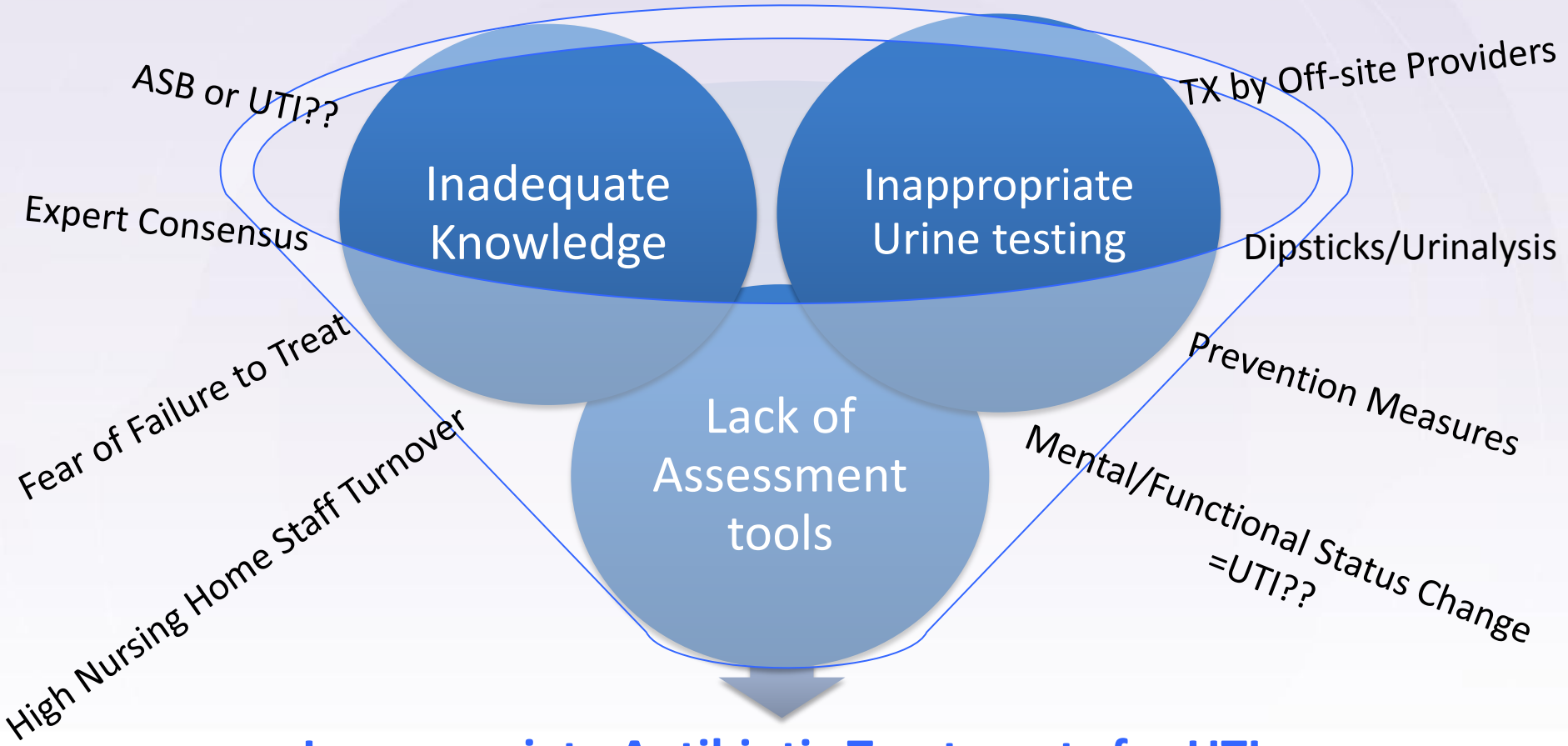
ASB/UTI in LTC

NLC
NUTRICIA LEARNING CENTER

- Increased incidence due to
  - Reduced estrogen/vaginal atrophy & short urethra in women
  - Decreased immune response and malnutrition
  - Benign prostatic hypertrophy in men
  - Increased incidents of HC acquired infections
  - Decreased mobility
  - Increased incontinence
  - Increased co-morbidities
  - Drug resistance & polypharmacy

Brown, 2002; Bergman, Schjott, & Blix, 2011; CDC, 2012; Jepson & Craig, 2007; Nicolle, et al, 2005; Rotjanapan, 2011.

Problem



Inappropriate Antibiotic Treatments for UTI

Adverse Effects | **C-diff** | **ABX Resistance** | **Cost**

CDC, 2012; Genao, 2012; Juthani-Mehta, 2005; Loeb, 2001; McGeer, 1991; Nicolle, 1987, 2005; Petterson, 2008, 2011; Phillips, 2012; Rotjanapan, et al, 2011; Stone, 2012; Takahashi, 2002; Zabarsky, et al, 2008.

Causes of Mental Status Changes

NLC
NUTRICIA LEARNING CENTER

- Worsening of dementia
- Older age
- Metabolic abnormalities
- Psychoactive drugs
- Polypharmacy
- Severe illness
  - Anemia
  - Malignancy
  - Malnutrition
  - Dehydration
  - Infection
  - Stroke

Fong, et al, 2009; Genoa, et al, 2012; Inouye, et al, 2007; Juthani-Mehta, 2008, 2009; Voyer, et al, 2011.

Causes of Functional Status Changes

NLC NUTRICIA LEARNING CENTER

- Change in cognitive status
- Reduced mobility secondary to:
  - Advancing age
  - Cerebral vascular accident
  - Parkinson's disease
  - Dementia

Buhr, et al, 2011; Nicolle, et al, 2005 & 2008.

UTI Diagnosis:

A resident has at least:

- 3 S/S for non-catheterized OR
- 2 S/S for catheterized

+

Positive UA
(>100,000 cfu/ml bacteria present
w/ less than 3 organisms)

Cooper, D., Titler, M. Struble, L., Redman, R. (2017). Using a Multifaceted, Evidence-based Program to Reduce Inappropriate Antibiotic Treatment of Suspected Urinary Tract Infections. In Press March/April.

Cooper Urinary Surveillance Tool ©

Chart VS and S/S Q shift (Resolve after 72 hours if pt. does not meet criteria)

Resident Name_____Room_____Date Initiated_____Baseline Temp_____

NO Catheter-Must have 3 NEW/ACUTELY WORSE S/S simultaneously to progress through algorithm

Please CHECK/DATE ALL that apply Q SHIFT

☐ Fever (>2 degrees F above baseline OR >100 degrees_____
☐ Dysuria OR ☐ frequency OR ☐ Urgency_____
☐ New flank or suprapubic or testicular pain or tenderness_____
☐ Change in character of urine _____
☐ Change in mental status per MDS (E.G. confusion, lethargy)___
☐ Change in functional status per MDS (E.G. ↓ appetite, falls, incontinence of recent onset, decreased activity)_____

Urostomy & Suprapubic Catheters are NOT Indwelling Catheters

OR

Indwelling Catheter-Must have 2 NEW/ACUTELY WORSE S/S simultaneously to progress through algorithm

Please CHECK/DATE ALL that apply Q SHIFT

☐ Fever (>2 degrees F above baseline OR >100 degrees
OR Chills or New onset Hypotension_____
☐ New flank or suprapubic or testicular pain or tenderness_____
☐ Change in urine character OR Purulent D/C at insertion site___
☐ Change in mental status per MDS (E.G. confusion, lethargy)__
☐ Change in functional status per MDS (e.g., ↓appetite, falls, decreased activity)_____

MEETS criteria:

Write order & do urine dip (IF Cath >14 days old, replace 1st)
+ for Leukocytes ☐ Date done_____
+ for Nitrates ☐
IF – for both then NO UTI-
IF + for either Call MD/DO/NP/PA for orders-DATE_____

Does **NOT MEET** criteria:

- Contact MD/DO/NP/PA w/CURRENT S/S for any orders
- May encourage fluids (if no restriction)
- Continue to monitor and report S/S per facility protocol

- UA ordered? ☐ Call MD/DO/NP/PA with S/S & results
- UA ✚ ☐ **OR** if UA ━ ☐ ➔ Resolve No UTI ➔
  ↓
  C&**S ordered** ☐
- Encourage fluids (if no restriction)

- Continue to eval resident UTI: YES ☐ NO ☐
- Was ABX ordered? DATE_____
- Adverse Effects?_____
- Recurrent UTI (2/in 6 mo.)? ☐ YES ☐ NO
- If recurrent UTI start 4 oz. 27% Cranberry juice TID

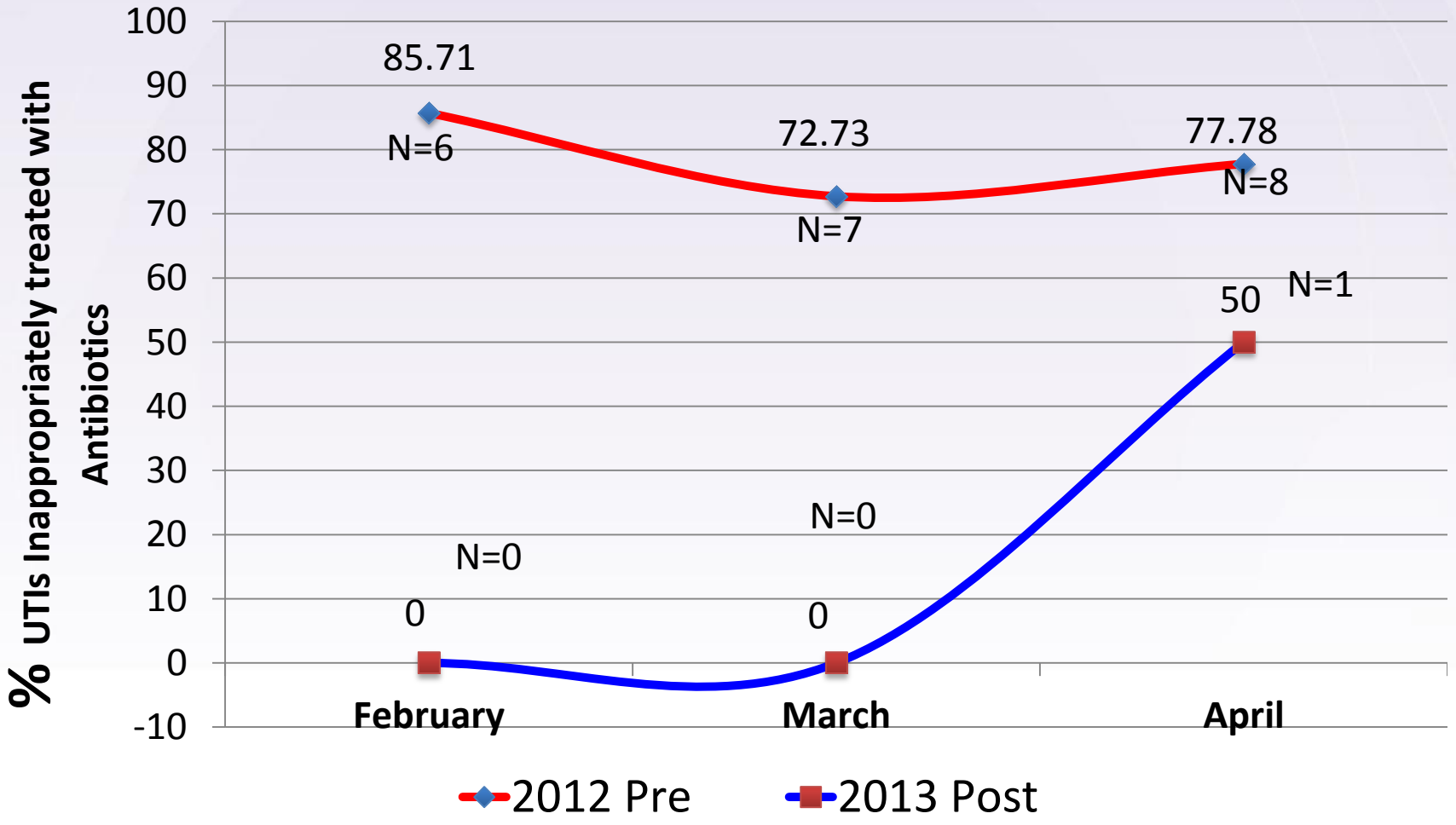
Resolved Date:_____

Nurse Initials____

Cooper, et al, In press Annals of Long-Term Care, March/April 2017

McGeer,1991 Loeb, 2001
Nicolle, 2005 Stone, 2012

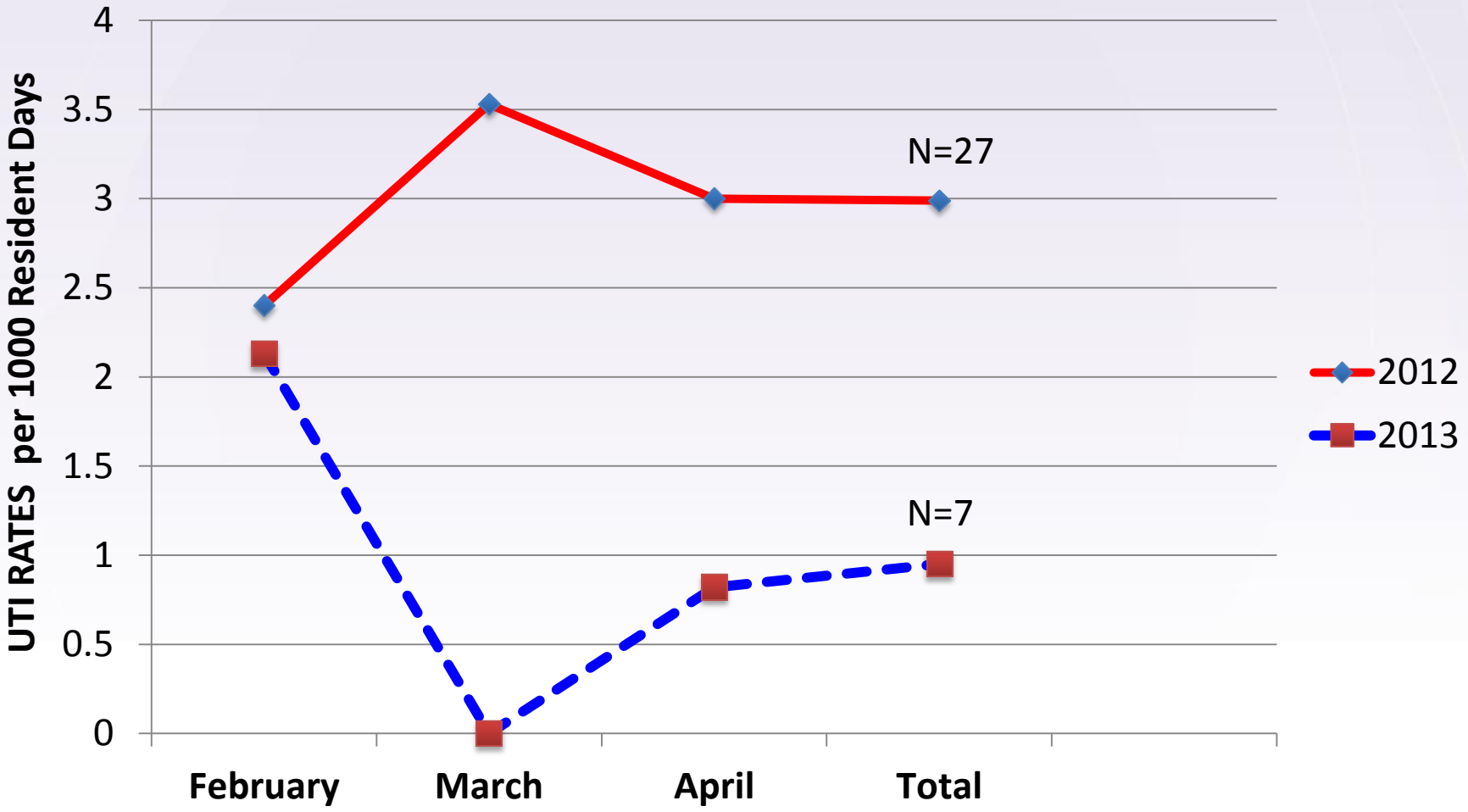
of Inappropriate Antibiotic Treatments for "UTI"



Differences are statistically significant (Chi-square=9.812, Fisher's Exact p-value=0.004)

Cooper, et al, In press Annals of Long-Term Care, March/April 2017

UTI Rates



Statistically significant using Pearson Chi-square (14.957) and Fisher exact test P<.001

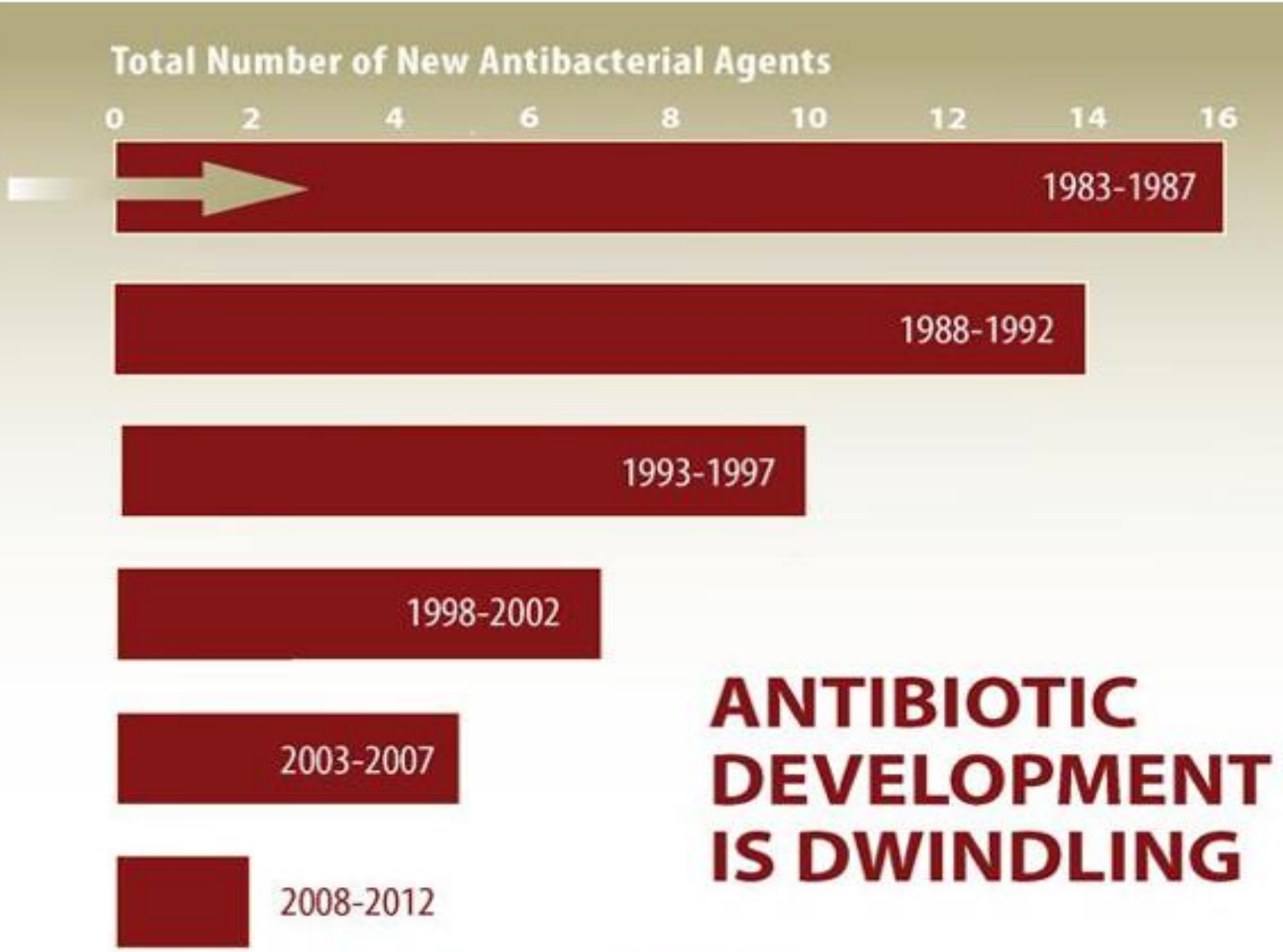
Cooper, et al, In press Annals of Long-Term Care, March/April 2017.

Why Not JUST Treat?

NLC
NUTRICIA LEARNING CENTER

- Resistance
- Reduced kidney function
- Poly-pharmacy
- Drug allergies
- Adverse drug reactions
- Increased risk of hospitalization
- Cost

CDC, 2012; Das, et al, 2011; Juthani-Mehta, et al, 2005; Nicolle, et al, 1987, 2005; Petterson, et al, 2011; Takahashi, et al, 2002.



Source: *The Epidemic of Antibiotic-Resistant Infections*, CID 2008:46 (15 January)
Clin Infect Dis. (2011) May 52 (suppl 5): S397-S428. doi: 10.1093/cid/cir153

Nutritional Issues with Antibiotics

NLC
NUTRICIA LEARNING CENTER

Increased risk of dehydration

Poor appetite and weight loss

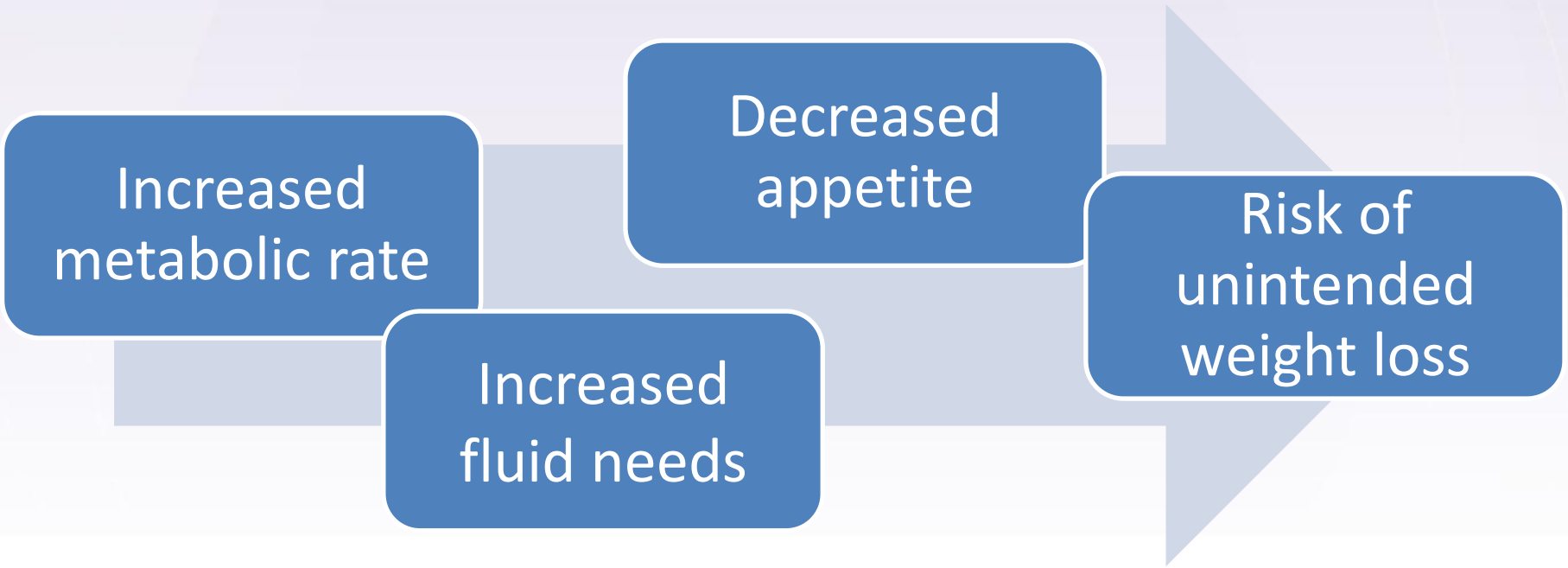
Deplete beneficial microbiota

Nausea and GI upset

Allergic reactions

Food-drug interactions

UTI Impact on Nutritional Status



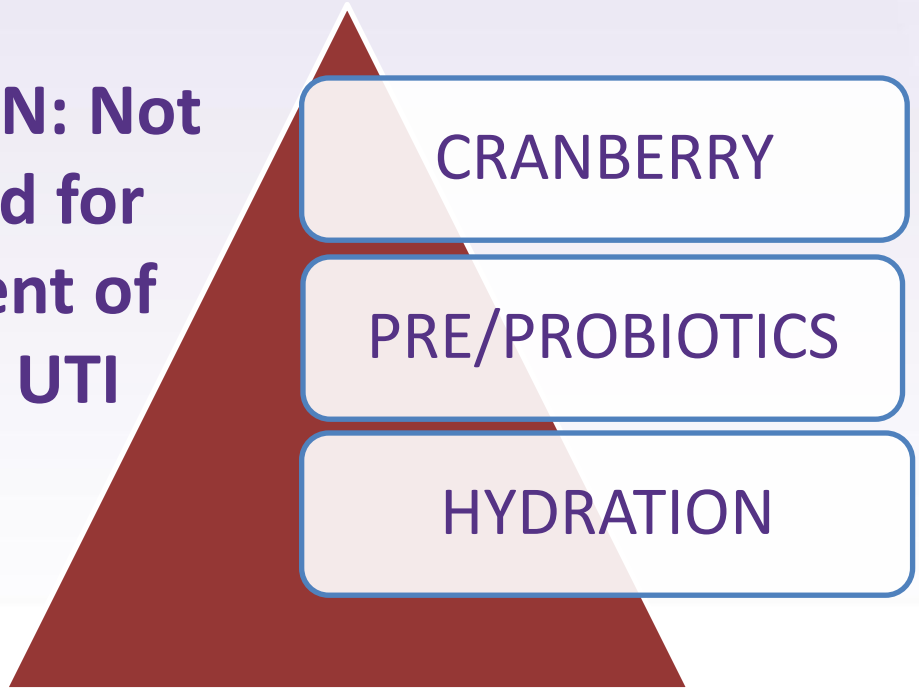
Participant Poll

What type of nutrition interventions are you currently using in your facility for UTI management?

A. Cranberry
B. Hydration
C. Vitamin C
D. Other

Nutrition and UTI Management

CAUTION: Not intended for treatment of existing UTI



Cranberry Use Over the Centuries

NLC
NUTRICIA LEARNING CENTER

- Native Americans used it as management for bladder & kidney diseases
- The 1st research on use of cranberries for urinary health occurred during the 18th century
- Antifungal & antibacterial properties were observed w/ its compounds

Cranberries Contain:

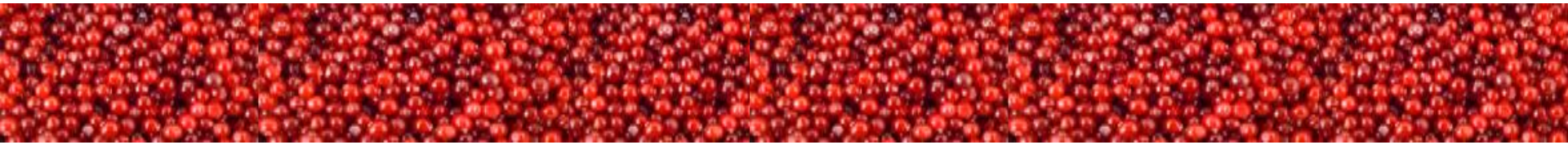
Proanthocyanidins (PACs)

Cranberry

Cranberry's PACs contain a unique A-type structure, while most other foods contain only the more common B-type PACs

B-PAC

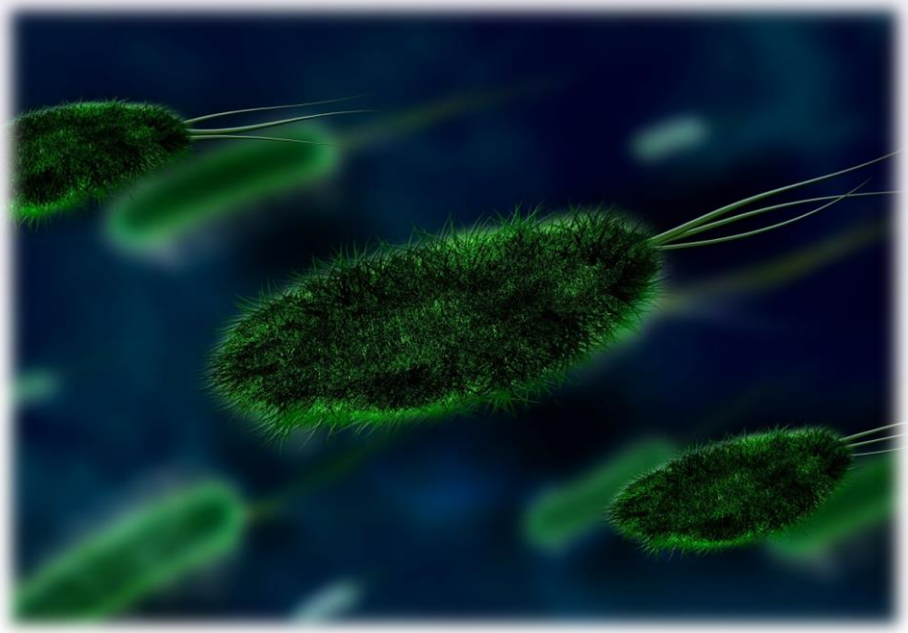
A-PAC



PACs May Have Anti-Adhesion Effect on E.coli

NLC
NUTRICIA LEARNING CENTER

1. Change the shape from rods to spheres
2. Compress fimbriae
3. Alter the cell membranes



How Many PACs are Needed?

NLC
NUTRICIA LEARNING CENTER

Amount for anti-adhesion effect:

- Several studies have shown that 36 mg of PACs are required for beneficial effect
- 10 fl oz of cranberry juice (27-33% cranberry)
- 3,750 mg of cranberry powder
- <1 fl oz cranberry concentrate

Avorn, et al. Reduction in bacteriuria and pyuria after ingestion of cranberry juice. *JAMA 1994, Mar 9 27 (10).*

Variation in Cranberry Products

Cranberry Juice:

- High acidity, polyphenolic content, limited solubility of cranberries limits % (< 27%) in juice

Juice Blends:

- Added juice from other fruits to increase % juice

Products <100%:

- Must contain the words “beverage”, “cocktail”, or “drink” on the label

Cranberry Formulations

- Liquid cranberry concentrate
- 100% cranberry juice
- Cranberry capsules
- Cranberry juice cocktail, beverage, drink
- Tablets

**Amount of PACs may vary*

How Long Does it Protect?

Cranberry products beneficial effect on urinary tract health

may start within 2 hrs of consumption & last up to 10 hrs.

Wang, as cited in Shin, 2014.

2012 Meta-Analysis:
RTC on UTI Prevention with Cranberry Products

NLC NUTRICIA LEARNING CENTER

Study	Cranberry No. of Events	Cranberry Total No.	Control No. of Events	Control Total No.	RR (95% CI)	W(fixed), %
Schlager et al,[17] 1999	2	15	3	15	0.67 (0.13-3.44)	2.5
Kontiokari et al,[18] 2001	8	50	18	50	0.44 (0.21-0.93)	14.8
McGuinness et al,[19] 2002	21	62	24	73	1.03 (0.64-1.66)	18.1
Stothers et al,[20] 2002	19	100	16	50	0.59 (0.34-1.05)	17.5
Waites et al,[21] 2004	10	26	8	22	1.06 (0.51-2.21)	7.1
McMurdo et al,[22] 2005	7	187	14	189	0.51 (0.21-1.22)	11.4
Hess et al,[23] 2008	6	47	16	47	0.38 (0.16-0.87)	13.2
Wing et al,[24] 2008	4	125	0	63	4.55 (0.25-83.27)	0.5
Ferrara et al,[25] 2009	5	27	18	27	0.28 (0.12-0.64)	14.8
Fixed-effect model		**639**		**536**	**0.62 (0.49-0.80)**	**100**

Heterogeneity: $I^2 = 43\%$, $P = .08$

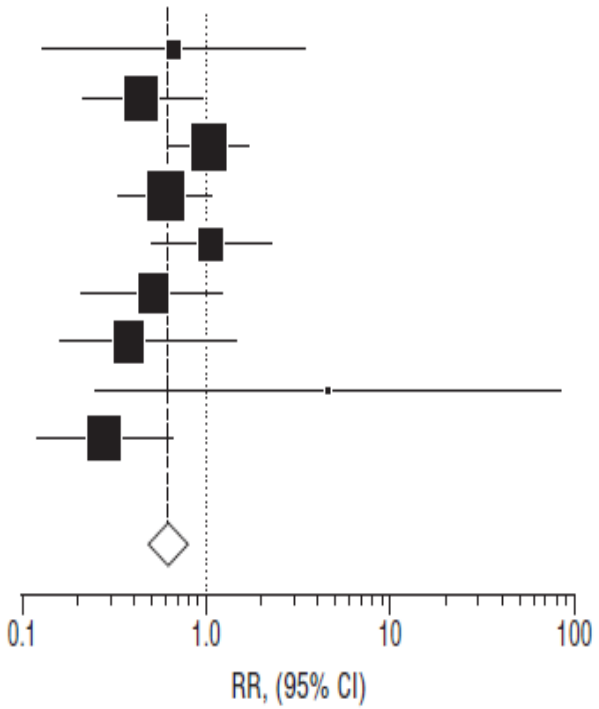


Figure 4. Forest plot: summary effect of cranberry in prevention of urinary tract infection, expressed as risk ratio (RR). W(fixed) indicates weights in fixed-effect Mantel-Haenszel model.

Chih-Hung Wang et al. Cranberry-Containing Products for Prevention of Urinary Tract Infections in Susceptible Populations. *Arch Intern Med. 2012;172(13):988-996.*

2012 Cochrane Database

NLC
NUTRICIA LEARNING CENTER

2004:

- Cranberry had favorable effect

2008:

- Cranberry had favorable effect

2012:

- Low compliance with study, high drop-out rate likely d/t palatability and acceptability of cranberry juice
- Variety of settings were used (when looking at just the LTC residents…)
- Most studies did not report how much PACs or “active” ingredient was studied
- Therefore, cannot currently recommend cranberry juice

2014 Meta-Analysis

NLC
NUTRICIA LEARNING CENTER

Conclusion: Cranberries may be helpful in managing urinary tract health for adults at risk for UTIs Study limitations: product used, drop-out rate

Recommendations for research:

- Form
- Dose
- Dose frequency
- Administration

Wang, as cited in Shin, 2014.

2016 Meta-Analysis Comparison

Title: *Cranberries and urinary tract infections: How can the same evidence lead to conflicting advice?*

Cochrane:

- Weighted for physiological concerns

Wang:

- Weighted equally across UTI populations
- FDA published guidance for research
- Distinguish complicated from uncomplicated UTIs

Conclusion: Women with recurrent UTIs, cranberries seem to be promising, especially with antimicrobial resistance

Liska, Kern & Maki, 2016.

Sorting Out the Research…

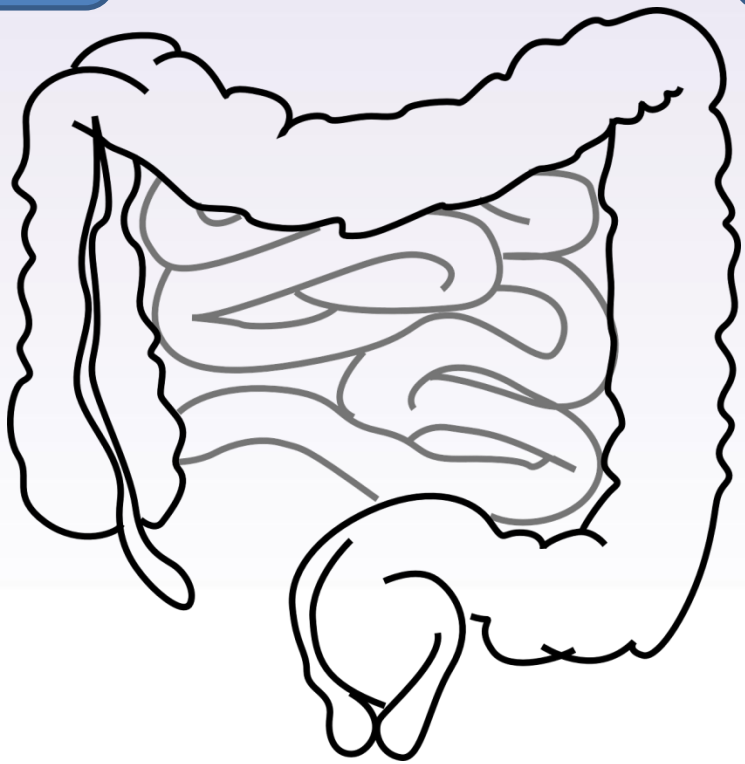
- Due to antibiotic resistance, non-antibiotic options for UTI management will continue to be researched.
- Tips for evaluating research:
  - Look at study basics, researchers, demographics, methods, participants (N number), limitations, need for future research
  - Consider how research applies to your clinical setting

Intestinal Health Can Impact Urinary Tract Health

NLC
NUTRICIA LEARNING CENTER

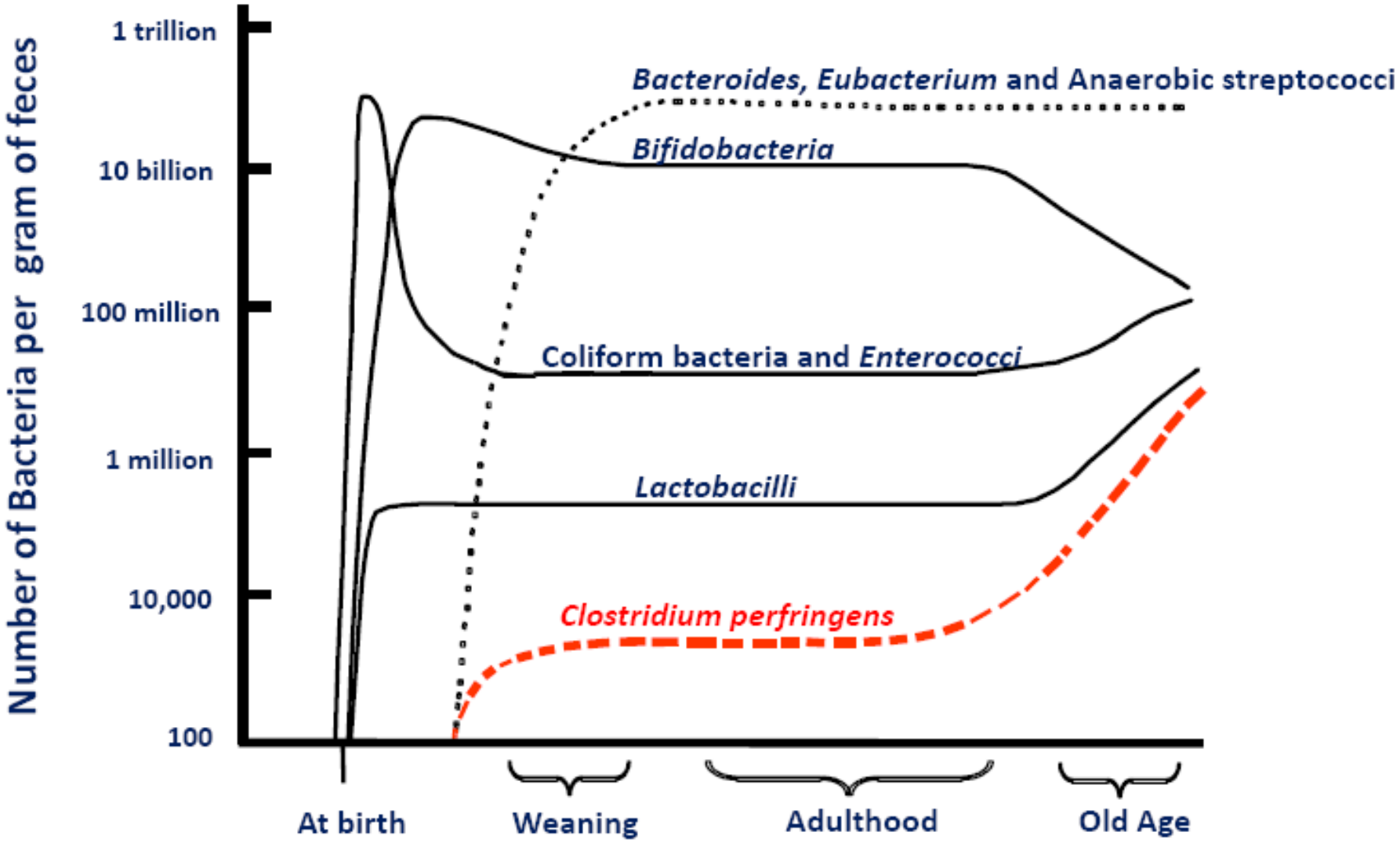
Prebiotics

Probiotics



Colon Health Contributes to Urinary Tract Health

Aging Changes Microbiota



Mitsuoka, 1990.

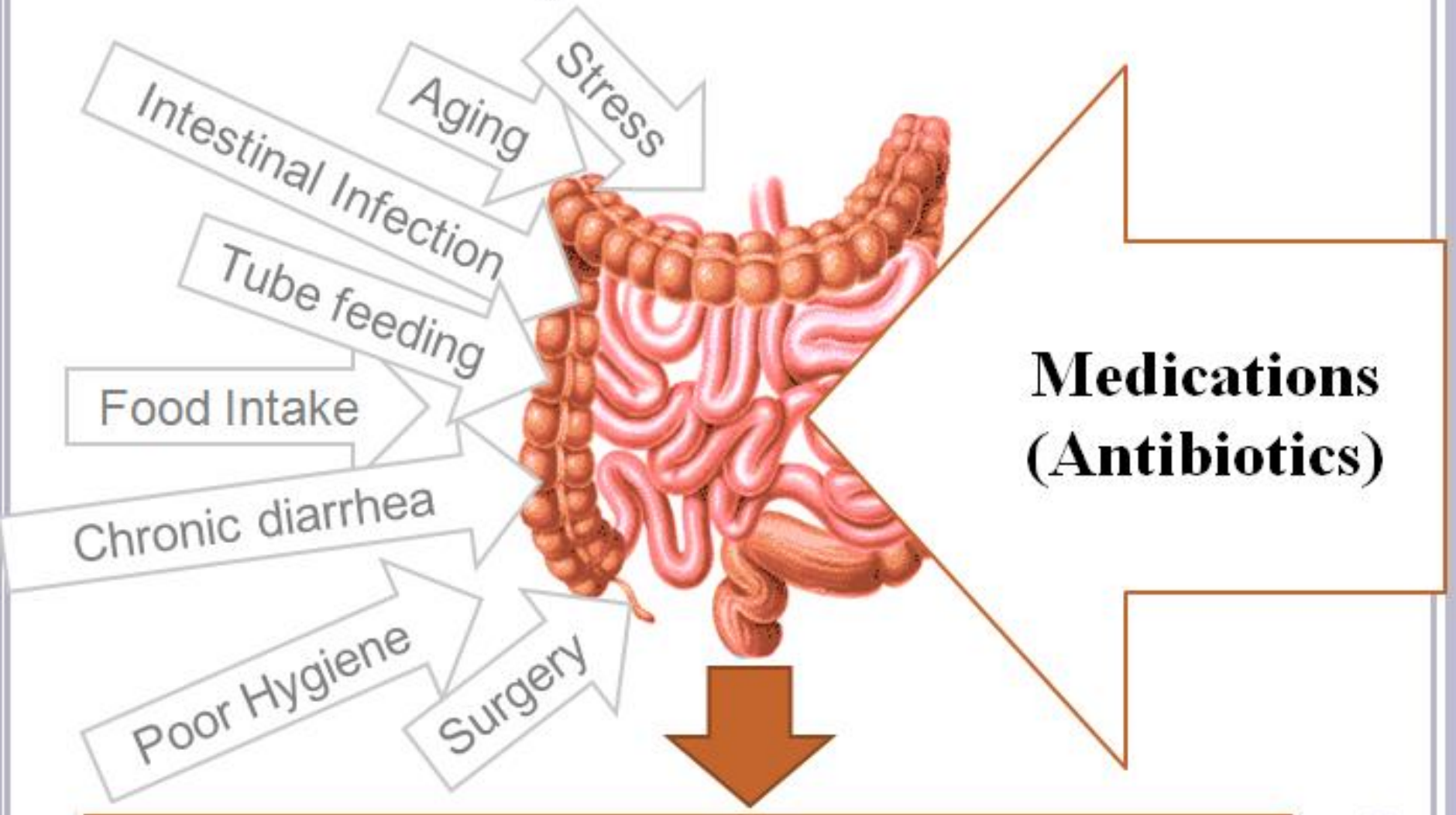
Age-Related Changes & Conditions Leading to the Need for Prebiotics and/or Probiotics

NLC
NUTRICIA LEARNING CENTER

- Decrease in beneficial intestinal bacteria
- Weakening of mucosa allowing bacteria to adhere
- Increase in pH allowing bacteria to proliferate
- Hormonal changes with aging
- Reduced gastric acid
- Impaired intestinal membrane integrity
- Reduced gastric acid and GI upset

Hays & Roberts, 2006; DiFrancesco, 2007; Beerpoot & Geerings, 2016.

Factors Disturbing Intestinal Microbiota



A disturbed microbiota makes residents extremely susceptible & vulnerable to infection & disease

Prebiotics

- Classified as a functional fiber:
  - Non-digestible food ingredients that stimulate the growth and/or activity of beneficial bacteria in the digestive system
- Food for probiotics, proliferating their growth
- Common food grade commercial prebiotics:
  - Fructo-oligosaccharides (FOS)
  - Galacto-oligosaccharides (GOS)
  - Lactulose
  - Inulin
  - Polydextrose



Gibson GR, Roberfroid MB.J Nutr. 1995 Jun;125(6):1401-12.

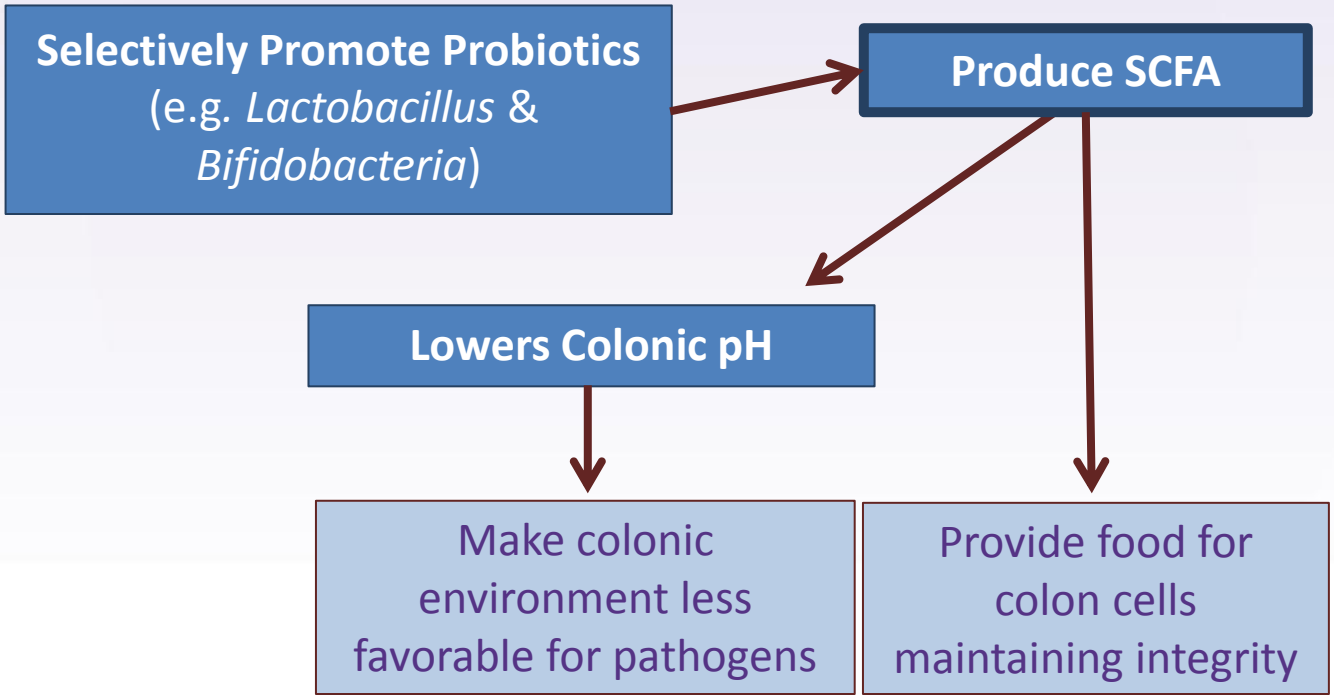
Prebiotics Beneficial Effects in Older Adults

NLC NUTRICIA LEARNING CENTER

Target	Age (yrs)	Prebiotic	Outcome	Reference
Microbiota composition	69 ± 2 77-97 68-89	FOS FOS Inulin	– bifidobacteria – bifidobacteria – bifidobacteria	Bouhnik et al, 2007 Guigoz et al, 2002 Kleesen et al, 1997
Immune function	84 ± 7	FOS	↓ markers of inflammation	Schiffrin et al, 2007

Adapted from Tiihonen et al, Ageing Res Rev 2009.

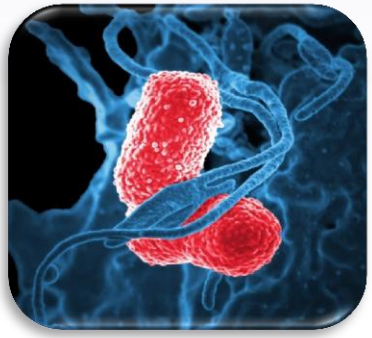
Functions of Prebiotics



Probiotics

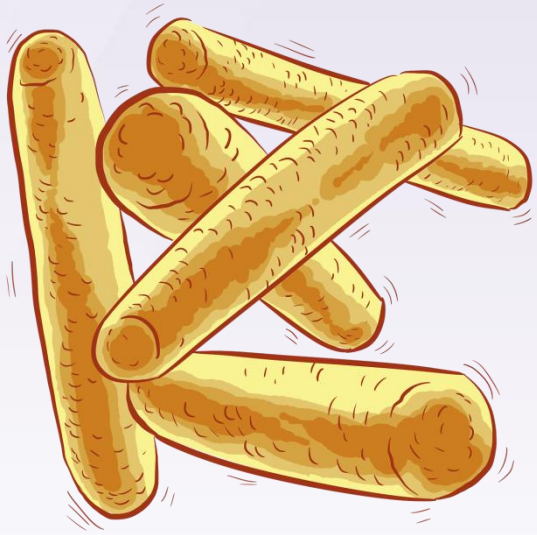
- Probiotics are **live microorganisms** that have been shown to **confer a health benefit**

- Most Common
  - *Lactobacillus (bacteria)*
  - *Bifidobacterium (bacteria)*
  - *Saccharomyces (a nonpathogenic yeast)*



Thomsen M. *Altern Complement Ther*. 2006;12(1):14-20.

Probiotics and UTI Management



Lactobacillus effective when combined with immune therapy and estrogen (Bauer & Bessler, 2016)

Systematic Review:

Favorable results with lactobacillus for urogenital infections (Hansen, et al, 2016)

Hydration

Key Preventive Measure

- Hydration status identified in MDS 3.0 and nutrition assessment

Dehydration:

- Active diagnosis triggers Nutritional Status CAA
- CAA triggered by infection (UTI), factor in delirium, falls, mood and behavior CAAs

Hydration and UTI Management

French study:

- Primary rate of UTI
- Uncomplicated of 5.3%
- Recurrence rate of 30%

Impact of adequate hydration:

- Risk reduction of 45% for primary rate and 33% for recurrence
- Significant cost savings by preventing 27 million UTIs

(Bruyere, et al, 2015)

Hydration

Key Preventive Measure

- Recommended by SHEA/APIC as preventive intervention
- Estimated fluid needs
  - Normal needs = 30 mL/kg
  - Minimum 1500 mL/day
  - 1 mL H20 per Calorie
  - NCM: up to 2 L/day

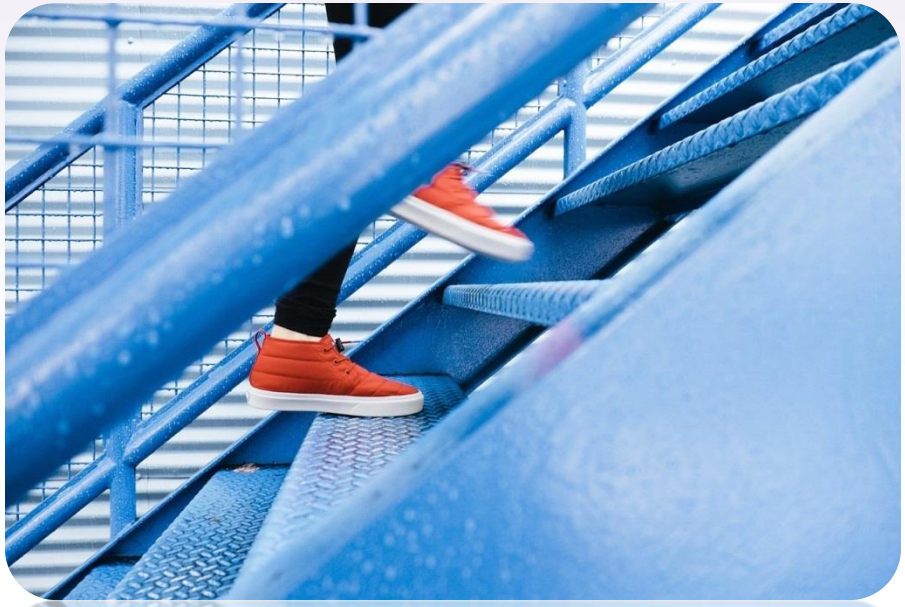
Vitamin C

Urologists may order supplemental vitamin C theory

- Acidify urine
- Decrease bacterial growth
- Studies are mixed (Beerepoot & Geerlings, 2016)
- Be aware of potential GI upset of vitamin C at high doses

NLC
NUTRICIA LEARNING CENTER

WHAT IS YOUR NEXT STEP?



Next Steps:

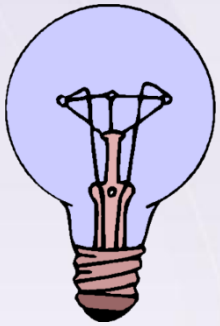
- Be a *Change Champion!*
- Changes in healthcare practices
  - Require commitment
- Educate staff, residents and families
  - Appropriate use of antibiotics
  - ASB treatment may cause:
    - Antibiotic resistance
    - Adverse effects, such as C. diff infections and weight loss
    - Increased cost

Next Steps:

NLC
NUTRICIA LEARNING CENTER

- Education
  - Importance of hygiene
    - Staff and residents
    - Environment
  - Importance of nutrition and hydration
    - Nutrition risk tracking and infections
    - Hydration programs
  - Evaluate and implement UTI management and antibiotic stewardship program
  - Use QAPI program: (Refer to F441, F329, and F428)

Evidence-Based Practice



- Agency for Healthcare Research Quality
- Definition: Evidence-Based Decision-making
- *Evidence-based practice is the use of the best available evidence together with a clinician's expertise and a patient's values and preferences in making health care decisions.*

http://www.ahrq.gov/professionals/prevention-chronic-care/decision/index.html. Accessed 3/9/15.

Case Study

Mary Frank an 82-year-old resident in your LTC facility with a recent functional status change.

PMH: IDDM, Alzheimer dementia-moderate, Anemia, HTN.

VS: 98.7, 98, 20, 124/88

Her health was stable until a week ago when she seemed to lose interest. Her food acceptance has been about 25-50% per meal over the last week. The nurse reports that her BS have been ranging from 58-390 over the last week which normally run 100-250, and her urine is dark in color. Ms. Franks daughter states “I want her tested for a UTI”. Ms. Franks states, I just don’t feel well but denies any specific pain or complaints. Her PE is negative except hypoactive BS. If clean-catch urine testing is done, which of the following proves that Ms. Frank has a UTI?

A. Urinalysis with 100,000 CFU bacteria
B. Urine dipstick with positive Nitrates and RBC
C. Urinalysis with 100,000 CFU bacteria and dark urine and abnormal BS
D. Urine dipstick with positive Nitrates, dark urine, and functional status change
E. None of the above

Pre & Post Case Study Answers

References

- Bergstrom, K. (2010). Development of a radiation skin care protocol and algorithm using the Iowa Model of Evidence-Based Practice.
- Brown, S. (2002) Systematic review of nursing management of urinary tract infections in the cognitively impaired elderly client in residential care: is there a hole in holistic care? International Journal of Nursing Practice, 8(1), 2-7.
- Buhr G., Genao L., White H., (2011). Urinary tract infections in long-term care residents. *Clinical Geriatric Medicine, 27(2), 229-39.*
- CDC (2012). Health care acquired infections. Retrieved from http://www.cdc.gov/vitalsigns/hai/
- Fong, T., Jones, R., Shi, P., Marcantonio, E., Yap, L., Rudolph J,, et. al. (2009). Delirium accelerates cognitive decline in Alzheimer disease. *Neurology 2009, 72:1570*.
- Genao L, Buhr GT. Urinary tract infections in older adults residing in long-term care facilities. *Annals of Long-Term Care: Clinical Care and Aging*. 2012;20(4).
- Inouye, S., Van Dyck, C., Alessi, C., Balkin, S., Siegal, A. & Horwitz, R. (1990). Clarifying confusion: The confusion assessment method. *Annals of Internal Medicine, 113(12), 941-948.*
- Jepson, R. & Craig, J. (2007). A systematic review of the evidence for cranberries and blueberries in uti prevention. Mol. Nutr. Food Res., 51, 738-45.
- Juthani-Mehta M., Drickamer M., Towle V., Phil M., Zhang Y., Tinetti M., et.al., (2005). Nursing Home Practitioner Survey of Diagnostic Criteria for Urinary Tract Infections. *Journal of the American Geriatrics Society*, 53, 1986-90.
- Juthani-Mehta, M. Tinetti, M., Perrelli, E. Towle, V., et. al. (2008). Interobserver Variability in the assessment of clinical criteria for suspected urinary tract infection in nursing homes residents. *Infection Control and Hospital Epidemiology, 29 (5), 446-449.*
- Juthani-Mehta M., Quagliarello V., Perrelli E., Towle V. (2009). Clinical features to identify urinary tract infection in nursing home residents: a cohort study. *Journal of the American Geriatrics Society,* 57(6), 963-970.
- Loeb, M., Bentley, D., Bradley, S., Crossley, K., Garibaldi, R.,Gantz, R., McGeer, A., et.al.(2001). Development of minimum criteria for the initiation of antibiotics in residents of long-term care facilities: Results of a consensus conference. *Infection Control & Hospital Epidemiology, 22 (2), 120-4.*
- Loeb, M., Brazil, K., Lohfeld, L., McGeer, A., Simor, A., et. Al. (2005). Effect of a multifaceted intervention on number of antimicrobial prescriptions for suspected urinary tract infections in residents of nursing homes:cluster randomised controlled trial. British Medical Journal, 331, 669-72.
- McGeer A, Campbell B, Emori TG, Hierholzer WJ, Jackson MM, Nicolle LE, Peppler C, Rivera A, Schollenberger DG, Simor AE, et al. (1991). Definitions of Infection for Surveillance in Long-term Care Facilities. *Am J Infect Control*, 19(1), 1-7.
- Nicolle, L., Mayhew, W., Bryan., W. (1987) Prospective randomized comparison of therapy and no therapy for asymptomatic bacteriuria in institutionalized elderly women. *American Journal of Medicine, 83, 27-33.*
- Nicolle,L., Bradley, S., Colgan, R., 3 Rice, J., Schaeffer, A. & Hooton, T. (2005).Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. *Clinical Infectious Disease, 40,(1), 643-654.*

References - continued

NUTRICIA LEARNING CENTER

- Nicolle, L. E. (2008). Urinary tract infections in older people. *Reviews in Clinical Gerontology, 18(2), 103-114.*
- Ouslander, J., Schapira, M., Schnelle, J., et.al., (1995). Does eradicating bacteriuria affect the severity of chronic urinary incontinence in nursing home residents? *Annals of Internal Medicine, 122, 749-754.*
- Pettersson, E., Vernby, A., Mölstad, S., Lundborg, CS. (2008). Infections and antibiotic prescribing in Swedish nursing homes: a cross-sectional study. *Scandanavian Journal of Infectious Disease*, 40, 393-398.
- Pettersson, E., Vernby, A., Molstad, S., Stalsby Lundborg, C., (2011). Can a multifaceted educational intervention targeting both nurses and physicians change the prescribing of antibiotics to nursing home residents? A cluster randomized controlled trial. *Journal of Antimicrobial Chemotherapy*, 66, 2659-66.
- Phillips, C., Adepoju, O., Stone, N., McMaughan Moudouni, D., Nwaiwu, O., Zhao, H., et.al. (2012). Asymptomatic bacteriuria, antibiotic use, and suspected urinary tract infections in four nursing homes. *BMC Geriatrics,* 12:73, 1-8.
- Rotjanapan, P., Dosa, D., & Thomas, K. (2011). Potentially inappropriate treatment of urinary tract infections in two Rhode island nursing homes. *Archives of Internal Medicine,* 171 (5), 438-443.
- Schmiemann, G., Kniehl, Gebhart, K., Matejczyk, M., & Hummers-Pradier, E. (2010).
- Stone N, Ashraf M, Calder J, Crnich C, Crossley K, Drinka P, Gould C, Juthani-Mehta, M, Lautenbach E, Loeb M, MacCannell T, Malani P, Mody L, Mylotte J, Nicolle L, Roghmann MC, Schweon S, Simor A, Smith P, Stevenson K, Bradley S. (2012). Surveillance Definitions of Infections in Long-term Care Facilities: Revisiting the McGeer Criteria. *Infection Control and Hospital Epidemiology 2012; 33(10):965-977.*
- Takahashi, P., Trang, N., Chutka, D., and Evans, J., (2002). Antibiotic prescribing and outcomes following treatment of symptomatic urinary tract infections in older adults. *Journal of the American Medical Directors Association*, Nov-Dec., 352-55.
- Voyer, P., Richard, S., Doucet, L., & Carmichael. P. (2011). Factors associated with delirium severity among older persons with dementia. *Journal of Neuroscience Nursing, 43, 2.*
- Zabarsky, T., Sethi., A., Donskey, C. (2007). Sustained reduction in inappropriate treatment of asymptomatic bacteriuria in a long-term care facility through an educational intervention. Association for Professionals in Infection Control and Epidemiology, 36 (7), 476-80.

References - continued

NLC
NUTRICIA LEARNING CENTER

- APIC implementation guide: Guide to preventing catheter-associated urinary tract infections. (2014). Association for Professionals in Infection Control and Epidemiology, Inc. ISBN: 1-933013-57-5. 751-4.
- Avorn, et al. Reduction in bacteriuria and pyruria after ingestion of cranberry juice. *JAMA 1994, Mar 9 27 (10).*
- Beerepoot, M. & Geerlings, S. (2016) Non-antibiotic prophylaxis treatment for urinary tract infections. *Pathogens* 5, 36; doi:10.3390/pathogens5020036. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4931387/pdf/pathogens-05-00036.pdf
- Brinstein and Lambert (2016) Developing and implementing antibiotic stewardship in LTC*. Todays' geriatric medicine*. July/August 2016, p. 14-17.
- Design for Nursing Home Compare Five Star Quality Rating System: Technical Users Guide (August 1, 2016) Retrieved from https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandComplianc/downloads/usersguide.pdf.
- DiFrancisco, et al., Anorexia of Aging. 2007 Dig Dis 2007: 25(2), 129-37.
- Gibson GR, Roberfroid MB.. J Nutr. 1995 Jun;125(6):1401-12.
- Hansen, et al. Probiotics for Treatment and Prevention of Urogenital Infections in Women: A systematic review. J Midwifery women's health. 2016 May;61(3):339-55.
- Liska, D., Kern, H. & Maki, K. (2016). Cranberry and urinary tract infections: How can the same evidence lead to conflicting advice? *Advances in Nutrition 7*: 498-506. doi: 10.3945/an115.011197.
- Valvo, M. (2015) UTI Long stay QM [Presentation]. Retrieved from http://qio.ipro.org/wp-content/uploads/2015/09/UTI_QM_Handout.pdf
- APIC implementation guide: Guide to preventing catheter-associated urinary tract infections. (2014). Association for Professionals in Infection Control and Epidemiology, Inc. ISBN: 1-933013-57-5.
- Bauer, HW & Bessler, WG. (2016) Non-antibiotic strategies to prevent recurrence of uncomplicated UTIs in women. *Aktuelle Urol*. 47(3):214-9. doi: 10.1055/s-0042-101846. Epub 2016 May 3.

References - continued

NUTRICIA LEARNING CENTER

- Barbosa-Cesnik C, Brown MB, Buxton M, Zhang L, DeBusscher J, Foxman B. Cranberry juice fails to prevent recurrent urinary tract infection: results from a randomized placebo-controlled trial. ***Clin Infect Dis***. 2011;52(1):23-30.Bruvere, et al., (2015). Urinary tract infections: Economical impact of water intake. *Prog Ural* (10):590-7. doi: 10.1016/j.purol.2015.05.010. Epub 2015 Jun 27.
- Hansen, et al., (2016). Probiotics for treatment and preventions of urogenital infections in women: A systematic review. *Journal of Midwifery Womens Health*. 61(3):339-55. doi: 10.1111/jmwh.12472.
- Mitsuoka, T. Bifidobacteria and their role in human health. *Journal of Industrial Microbiology.* December 1990, Vol 6, Issue 4, pp.263-267.
- Shin, C. (2014) The effects of cranberries on preventing urinary tract infections. *Clinical Nursing Research 23* (1) 54 –79 DOI: 10.1177/1054773813475448 cnr.sagepub.com
- SOM Appendix PP. Retrieved from https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_pp_guidelines_ltcf.pdf
- Tiihonen, K., et al. Human intestinal microbiota *Aging Res Rev* 2010 Apr 9 (2), 107-16.
- Thomsen M. *Altern Complement Ther*. 2006;12(1):14-20.
- Nace, D., Drinka, P. & Crnich, C. (2014). Clinical uncertainties in the approach to long term care residents with possible urinary tract infection. *Journal of the American Medical Association* 15, pp. 133-139. doi: http://dx.doi.org/10.1016/j.jamda.2013.11.009
- Luthje, P. & Brauner, A. (2016). Novel strategies in the prevention and treatment of urinary tract infections. *Pathogens 5* (13). doi:10.3390/pathogens5010013.
- MDS 3.0 RAI Manual (2015). Retrieved from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/MDS-30-RAI-Manual-V113.pdf

Questions?

NLC
NUTRICIA LEARNING CENTER

CEU/CPE Instructions

NLC
NUTRICIA LEARNING CENTER

To receive your CEU/CPE Certificate:

1. Go to www.NutriciaLearningCenter.com
2. Click on “CE Credit Request”
3. Enter code: **SWUTI1** *(letter “I” then number “1”)*
4. Certificate will be visible for download on your NLC dashboard