



## “State of Science In Health Care Epidemiology, Infection Control And Patient Safety” by Professor William Robert Jarvis<sup>1</sup>

1 President, Jason and Jarvis Associates, Hilton Head Island, South Carolina

### ICAS Dinner Talk

29 August 2006, 6.16pm

Singapore Marriot Hotel, Ballroom III, Level 3. Singapore

Dr William Jarvis is a world leader in nosocomial infection control. He has been involved in the prevention and control of nosocomial infections for over 25 years. Dr Jarvis holds a number of positions in CDC, including Assistant Chief of the

National Nosocomial Infections Surveillance (NNIS) System, and the Epidemiology Branch. He coordinated and supervised the Branch at the Centers for Disease Control and Prevention (CDC) for 17 years. He was also responsible for the development and publication of many of the Hospital Infection Program. His other position includes Deputy Editor of Infection Control and Hospital Epidemiology, former President of the Society of Healthcare Epidemiology of America, and is Vice-President and Member of the APIC Research Foundation Board of Directors.

1 Each year, two million cases of Hospital-Acquired Infections (HAIs) occurred in the United States, and these resulted in least sixty to ninety thousand deaths with cost amounting to at least seventeen billion to 29 billion dollars.

With reference to the Center For Disease Control And Prevention’s (CDC) and the National Nosocomial Infections Surveillance System (NNIS), the distribution of HAIs by site were Urinary Tract Infections (30%), Bloodstream Infections (18%), Surgical Site Infections (16%), Pneumonia (15%) and others (21%).

2 The list of common pathogens for Urinary Tract Infections (UTIs), Catheter-Associated BSIs pathogens, SSI and VAP are shown summarized in the table below:

UTIs	Catheter-Associated BSIs pathogens	SSI	VAP
<ul style="list-style-type: none"> <li>- <i>Escherichia coli</i></li> <li>- Enterococci</li> <li>- <i>Pseudomonas aeruginosa</i></li> <li>- <i>Candida</i> spp.</li> <li>- <i>Klebsiella</i> spp.</li> <li>- Enterobacter spp.</li> </ul>	<ul style="list-style-type: none"> <li>- Coagulase-negative staphylococci</li> <li>- <i>Staphylococcus aureus</i></li> <li>- <i>Candida</i> spp.</li> <li>- <i>Klebsiella</i> spp.</li> <li>- Enterobacter spp.</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Staphylococcus aureus</i></li> <li>- Enterobacter spp.</li> <li>- <i>Klebsiella</i> spp</li> <li>- Enterococci</li> <li>- <i>Pseudomonas</i> spp.</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Staphylococcus aureus</i></li> <li>- <i>Pseudomonas aeruginosa</i></li> <li>- <i>Klebsiella</i> spp.</li> <li>- Enterobacter spp.</li> <li>- <i>Candida</i> spp.</li> </ul>

3 Urinary tract infections are the most common site of HAIs. 80% of UTIs are associated with urinary catheterization and approximately 25% of inpatients are catheterized. Attack rates range from 2.0 to 3.1 UTIs per 100 admissions.

In a study by <sup>1</sup>Saint (2000), to determine the extent to which physicians of which of their patients has urinary catheter, published data revealed that the attending doctor has the highest proportion of unaware (38%), resident (28%), Intern (22%) and Medical student (18%).

<sup>1</sup> Saint S et al., Am J Med 2000

Recommendations to prevent catheter-associated urinary tract infections are:

- Use urethral catheter only when necessary
- Use aseptic technique for catheter insertion and manipulation
- Use a closed drainage system
- Consider using an administrative catheter “stop order” to limit inappropriate catheterization.
- Consider silver catheters in high-risk patients who require catheterization for 2-10 days.

4 The Institute for Healthcare Improvement (IHI) on Central Venous Catheters-Associated Bloodstream Infections (CVC-BSIs) prevention are:

- Education.
- Hand hygiene.
- Maximal sterile barrier precautions.
- Chlorhexidine skin antisepsis.
- Optimal site care.
- Catheter removal.
- Monitoring of practices.
- Leadership.

Jarvis shared a comparative efficacy findings in a randomized controlled trial evaluating a chlorhexidine-impregnated patch (Biopatch) and conventional dressing showed a 44% reduction in the incidence of local infection and 60% reduction in the incidence of CR-BSIs, the results showed statistically significant reduction in skin colonization <sup>2</sup>(Maki D et al, 2000).

A table on the potential risk factors for bloodstream infections associated with mechanical valves as shown:

<b>Factor</b>	<b>Potential impact</b>
Difficulty cleaning access surface	HCWs may not adequately clean the intricate surface details before access, leading to fluid path contamination.
Gap around plunger harbors bacteria	Gap cannot be accessed for disinfection and can lead to fluid path contamination (esp. with repeated entry-SAS or SASH flushing).
Opaque housing hides incomplete flushing of media based fluids	During course of normal manipulation of catheter, small amounts of bacteria and media-like fluids contaminate the valve. If these organisms proliferate, then they can be infused with subsequent manipulations.
Internal manipulation obscure fluid path	Impossible to visually confirm complete flushing.

The minimum data that needs to be collected if considering a change in intravenous device are:

- CVC-BSI rate (for comparisons before and after the change).
- Needlestick injury rate for healthcare workers secondary to IV manipulation or connector access.
- Catheter occlusion and thrombolytic use (if selecting a positive pressure device).

CDC guideline recommendations for the prevention of CVC-BSIs

- Education of clinicians.
- IV team.
- Chlorhexidine skin site preparation.
- Full barrier precautions for catheter insertion.
- Aseptic catheter insertion/manipulation.
- Use CVCs only when necessary; remove as soon as possible.
- Antimicrobial-coated catheters, when BSI rates remain high after implementing the above recommendations.
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<sup>2</sup> Maki D et al., ICAAC, Toronto, Canada, 2000

- 5 The prevention of Ventilator Associated Pnuemonia are:
- Standard infection control practices.
  - Minimizing duration / intensity of sedation and device exposure.
  - Positioning patient in semi-recumbent position (40 degree).
  - Appropriate use of enteral feeding, antibiotics and select medical devices.
  - Use of sterile water for irrigation.
  - Closed suction system.
  - Mouth-care-chlorhexidine mouth/teeth cleaning.

6 Patients who acquire a Surgical Site Infection (SSI) are 60% more likely to spend time in the ICU, 5 times more likely to spend time in ICU and twice as likely to die.

The CDC guidelines to prevention of SSI are:

- Appropriate operating room air ventilation / circulation
- Hand hygiene
- No shaving
- Keep OR door closed and limit people in the room
- Appropriate skin prep-let dry
- Appropriate antimicrobial prophylaxis – right agent, right timing, stop at 24 hours (at longest)
- Normothermia (peri-operatively)
- Glucose control (peri-operatively)
- Sterilization of equipment (limit flash sterilization): tracking of instruments. Monitoring of SSI rates (target high risk procedures) and risk adjust rates. Feedback SSI rates to surgeons.

7 Professor William Jarvis reiterated the importance of hand hygiene, as it is the cornerstone of prevention. Research on handwashing compliance in healthcare workers, 1998-99, showed that physicians had the lowest compliance in all studies (17%-30%). In a published research by <sup>3</sup>Boyce (1999), the barriers to handwashing compliance include; perceived or real time constraints, skin irritation and dryness, inconvenient location of sinks, lack of personal responsibility, lack of awareness that hand hygiene effects clinical outcome. Antiseptic hand rinses of 60% to 70% alcohol solutions are effective against most bacteria, fungi and viruses, protective against hand drying. In summary, the use of antiseptic hand rubs as supplement to handwashing increases hand hygiene compliance, decreases nosocomial infections, however, alcohol hand rub should not be carried out if hands are visibly soiled or contaminated with organic material and consider placement and dispenser carefully.

8 Surveillance is essential to determine, reduce and prevent HAIs. The types of surveillance activities, i.e. targeted versus whole house surveillance should take into account the reason for surveillance and the availability of resources, i.e. personnel resources. Other points to take note for surveillance activities are:

- Select high impact/visibility areas such as cardiac, implant surgery, ICU, and grow the program.
- Risk adjust infection rates.
- Be aware of the public reporting issue.

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<sup>3</sup> Boyce, Ann Intern Med, 1999

9 “Are arguments against implementing the SHEA guidelines valid?”

Studies not well designed	>150 studies have found the SHEA approach works. Virtually all studies assessing the SHEA approach have found it works.
Individual components of the 3 recommendations have not been individually assessed	Most CDC and other Society Guidelines make multiple recommendations without having assessed the individual impact of each component.
Costs too much	Multiple studies have shown that the SHEA approach is cost effective.
SHEA approach may not work for endemic MRSA infections or in non-university/academic settings	Studies evaluating the SHEA approach have shown that it works for epidemic or endemic MRSA infections and in all populations or types of hospitals.
The SHEA approach will not work if we do not have enough isolation rooms	The SHEA approach has been evaluated in Brazil and Slovenia and in locations with limited isolation rooms. Innovative approaches to isolation together with the SHEA approach will reduce MRSA transmission.

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