Improving Hand Hygiene
RFID, Alcohol Sensing, and Direct Observation

Robert J. Sherertz, MD
Professor of Infectious Diseases
Wake Forest University School of Medicine
Winston-Salem, North Carolina, USA
Background

• The 2009 WHO HH Guidelines review recent studies and provide further support for Semmelweis’s initial findings that HH reduces the risk of healthcare associated infection (HAI).

• The problem for 150 years has not been the data supporting HH, but getting healthcare workers to embrace HH!!!
Background

• Recent HAI prevention studies, especially those using bundles, have demonstrated that feeding back compliance data is a powerful tool toward process improvement.

• New technologies offer the possibility of real-time feedback related to HH. Today I will discuss four HH monitoring approaches and their potential to help improve HH:
  – Infrared ID badges
  – RFID (radiofrequency identification) detection badges
  – Alcohol detection badges
  – Direct observation
Thus, radiowaves travel around things better than infrared waves.

- The longer the wavelength, the further it goes
- The longer the wavelength, the better it travels through and around things
- The shorter the wavelength, the more data it can transport
Infrared Badges

• Our hospital has a network of infrared sensors and emitters around our hospital for tracking devices (stretchers, wheelchairs, ventilators, etc). Each emitters has an electronic signature identifying the device and its movement all over the hospital.

• Because of this network the company approached us about the possibility of using the same technology to track hand hygiene.

• While the technology appeared to have potential, its use was greatly hampered by line of sight restrictions – thus, if the detector couldn’t see the employees badge they were not given any credit for a hand hygiene event.
RFID Badges

- **RFID** = radiofrequency identification.
  - RFID uses radiofrequency waves to determine the position of a person or object and track it over time. If the object or person has an identifying signature, then it is possible to know precisely which device or which person is being tracked.

  - It is also possible to outfit alcohol dispensers so that they emit a radiofrequency signal when alcohol is dispensed.

  - While the range of frequencies that can be used is from 120 kHz up to 10 GHz most of the recent applications using this approach have used frequencies on the low end because these are unregulated by our government.
Above is a system currently under investigation at the University of Iowa which tracks: the name of the mote sending the signal, the received signal strength, and the time. In this fashion it is possible to track HCW and proximity to Alcohol dispensers or sinks. Polgreen, ICHE, 2010; 31:1294-97.
Polgreen, ICHE, 2010; 31:1294-97.
Number of Unique Rooms Visited by Job Type

Polgreen, ICHE, 2010; 31:1294-97.
Total Opportunities per Shift by Job Type

- Night Doctors
- Night Critical Support
- Night Nursing Staff
- Day Nursing Staff
- Day Critical Support
- Day Doctors

Polgreen, ICHE, 2010; 31:1294-97.
RFID vs Direct Observation

- Considering a 60 minute total observation period, aggregate simulated observers captured at best 3.5% of all daily opportunities and at worst 1.2%.
- In contrast, RFID technology can monitor personnel movement and HH continuously.

http://compepi.cs.uiowa.edu/index.php/MoteMICU/Description
Alcohol Detection with Feedback

Hand Wash Sensor

Badge w/ LED indicator

Bed Monitor

HyMarks - Wireless signal & real-time data recording system
After applying soap or gel, placing hands under the hand wash sensor triggers several events important to MCH’s infection control program...

First event: Identifies HCW and verifies that hand wash event has occurred

Second event: Activates a green LED on the badge holder indicating that hand wash event has occurred

Third event: When the HCW approaches bedside, the proximity sensing bed monitor determines the status of badge
Mean daily compliance:

- physicians and nurses, similarly, at 94%
- all HCWs was 92% (range: 75-100%)
Direct Observation with Feedback

80% Compliance
Same as last month!
<table>
<thead>
<tr>
<th>Discipline</th>
<th>Compliance In</th>
<th>Compliance Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteer</td>
<td>100%</td>
<td>91%</td>
</tr>
<tr>
<td>Student Physician</td>
<td>96%</td>
<td>100%</td>
</tr>
<tr>
<td>Secretary</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>Nursing Student</td>
<td>91%</td>
<td>93%</td>
</tr>
<tr>
<td>Transportation</td>
<td>90%</td>
<td>92%</td>
</tr>
<tr>
<td>Dietary</td>
<td>90%</td>
<td>98%</td>
</tr>
<tr>
<td>RN</td>
<td>90%</td>
<td>93%</td>
</tr>
<tr>
<td>Phlebotomist</td>
<td>87%</td>
<td>93%</td>
</tr>
<tr>
<td>Resp Care</td>
<td>86%</td>
<td>76%</td>
</tr>
<tr>
<td>Housekeeping</td>
<td>84%</td>
<td>92%</td>
</tr>
<tr>
<td>PT/OT/Rec Therapy</td>
<td>84%</td>
<td>81%</td>
</tr>
<tr>
<td>Nursing Assistant</td>
<td>83%</td>
<td>92%</td>
</tr>
<tr>
<td>Radiology</td>
<td>79%</td>
<td>100%</td>
</tr>
<tr>
<td>Physician</td>
<td>79%</td>
<td>86%</td>
</tr>
<tr>
<td>Other</td>
<td>77%</td>
<td>94%</td>
</tr>
</tbody>
</table>
Conclusions

• **Infrared** – greatly limited by line-of-sight issues
• **RFID** – offers the ability to track personnel, devices, and hand hygiene; without line-of-sight issues. May be expensive.
• **Alcohol detection** – definitive recording of HH events by detection of alcohol. Demonstrated improvement of HH with HAI reduction. Is expensive.
• **Direct Observation** – cruder, but appears to work.
Lt. Commander H. Jackson Sherertz

Pearl Harbor
Midway
D-Day
Bronze Star
British DSC
Purple Heart

Ambassade de France
aux États-Unis

L' Ambassadeur

Washington, April 11, 2011

Dear Mr. Sherertz:

I am pleased to inform you that by a decree signed by the President of the French Republic on February 25, 2011 you have been named a “Chevalier” of the Legion of Honor
Merci Beaucoup