Occupational Mucotaneous Exposures to Blood & Body Fluids in U.S. Hospitals: Significance to Public Health Guidelines and Social Responsibility

Amber Hogan Mitchell, DrPH(c), MPH, CPH
University of Texas School of Public Health

I. U.S. Healthcare Workforce Impact: Occupational Health & Safety

II. Occupational Exposure Impact: Percutaneous & Mucotaneous Incidents

III. Occupational Exposure Impact: Mucotaneous Splash & Splatter Incidents

IV. Occupational Exposure Impact: Personal Protective Equipment (PPE) Use

V. National Surveillance: Occupational Exposure to Bloodborne Pathogens

VI. Policy Impact: Percutaneous & Mucotaneous Incidents

VII. Summary

U.S. HEALTHCARE WORKFORCE IMPACT:
OCCUPATIONAL HEALTH & SAFETY

- 10% of the U.S. working population employed in healthcare settings (~31 million people) (BLS 2008)
- Nearly 37 million patient discharges per year (both living and deceased)
  - Of patients admitted to US hospitals, at least 185,000 are HIV-positive (NCHS 2007)
  - 46 per 1000 are colonized or infected with MRSA (Jarvis 2007)
  - In 2007, there were 4.5 million cases of HBV and 849,000 cases of HCV reported to the CDC in the general population (MMWR 2009)
  - Community-associated MRSA (CA-MRSA) infection rate is six-fold higher among HIV-positive patients (996 per 100,000 patients) and significantly increasing since 2000 (Popovich 2010)

Given that nearly 10% of U.S. workers are employed in healthcare and over 10% of the U.S. population will be admitted to an acute care facility, one-fifth of the U.S. population contribute to the potential risk pool of occupational exposure to infectious diseases spread through blood and body fluids.

OCCUPATIONAL EXPOSURE IMPACT:
PERCUTANEOUS & MUCOTANEOUS INCIDENTS

Emerging Risk

Given that patients are living longer with bloodborne diseases like HIV, HBV, and HCV and given the increasing prevalence of multi-drug resistant organisms (MDROs) like MRSA and *C. difficile* and newly emerging viruses like H1N1 flu, the potential of transmission from patient to healthcare worker via splash or splatter may be a more important public health concern than previously thought

(Davies 2007)

MSSIs in High Risk Areas

- MSSIs occur more frequently in high risk hospital areas such as surgery and emergency catheterization laboratories, during dental procedures, in orthopedics and obstetrics, and in emergency field situations.
- In these clinical settings, healthcare workers are exposed to blood and body fluid at high volume and velocity, because procedures involve the use of drills, pressurized water and gas, and venous and arterial blood.

Gerberding 1990, Panlilio 1991, Reed 1993, Jagger 1994, Tokars 1995, Pietrabissa 1997, Puro 2001, Adesunkanmi 2003, Jagger 1994, Puro 2001

OCCUPATIONAL EXPOSURE IMPACT:
PERSONAL PROTECTIVE EQUIPMENT (PPE) USE

Behavioral Drivers of PPE Compliance

Potentially hazardous behaviors are negatively affected by:

- Inadequate training;
- Little understanding of disease transmission;
- Poor comprehension of occupational risk;
- Unavailability and inappropriate selection of PPE;
- Selection of uncomfortable or burdensome PPE;
- High pressure or unexpected situations; and
- An overall risk-taking personality or complacency among healthcare workers.

Naghavi 2009, Gershon 1995, Krishnan 2006, Matthews 2008, Sacchi 2007
Perry 2003, Jagger 1994. Maddan 2002, Gershon 1995

Epidemiologic Bad News

- 1995 -- Protective eyewear (goggles, faceshields) are worn in 5% of reported exposures in emergency despite common sense knowledge of preventive control strategies
- 1998 -- Out of 367 BBF exposures reported through EPINet, 74% of the cases were not wearing protective equipment such as goggles, face shields, or eyeglasses with side shields
- 1999 -- Operating room personnel have poor compliance with PPE use: as few as 32% wear glasses and 24% wear no eye protection
- 2007 -- Almost half of the splash and splatter incidents in an obstetrics setting the worker was not wearing any personal protective devices

Jagger 1995, Jagger1998, Akduman 1999, Sacchi 2007

NATIONAL SURVEILLANCE: OCCUPATIONAL EXPOSURE TO BLOODBORNE PATHOGENS

Surveillance Time Line: 1961

- 1961, CDC assumed responsibility for the collection and publication of data concerning nationally notifiable diseases as a means of identifying when quarantine measures may need to be instituted to prevent the introduction and spread of diseases into the United States.
  - Voluntary, state-by-state; collected through a centralized system; the National Notifiable Disease Surveillance System (NNDSS).
  - NNDSS cases are collected, analyzed, and published in the Morbidity and Mortality Weekly Reports (MMWR).
  - CDC recommends reporting hepatitis through NNDSS and includes information about whether the cause was a *percutaneous* injury.
  - In NNDSS, there were 73 hepatitis B virus and 21 hepatitis C virus cases reported from "percutaneous injury" in 2007
  - Limitations - no information in NNDSS related to whether the percutaneous injury was occupational, nor what other occupational routes of exposure may have occurred (e.g. mucotaneous). As well, while information is collected about hepatitis, it is not collected for HIV.

(MMWR 2009)

Surveillance Time Line: 1995

- In 1995, the National Surveillance System for Health Care Workers (NaSH) was in put into place.
- In 2007, it was replaced by the Healthcare Personnel Safety (HPS) Component of National Healthcare Safety Network (NHSN).
  - CDC collects data from a sample of US hospitals in order to estimate the magnitude of adverse events among healthcare workers by monitoring occupational exposures and infections among healthcare workers through its NHSN database.
  - HPS/NHSN is voluntary, gathering information on occupational exposure to blood and body fluids, vaccine-preventable diseases, and tuberculosis as a means to assist healthcare facilities, public health agencies, and the CDC to monitor and report trends in exposures.

(www.cdc.gov/nhsn 2009)

- At no time did CDC collect reports of occupational exposures to blood and body fluids, only occupational *seroconversion* cases.
- CDC has investigated 57 confirmed cases of employee seroconversion to HIV following occupational exposure since 1981
  - 48 percutaneous,
  - 5 mucotaneous
  - 2 both percutaneous and mucotaneous, and
  - 2 were unknown

  again with the last case having been reported to CDC in 2000 (CDC 2006).
- No report has been issued by CDC from its NaSH data since 2001 and the last reported new case of occupationally-acquired HIV was in 2000.

Transition from NaSH to NHSN

- Publications from the new NHSN have been limited to healthcare associated infections (e.g., bloodstream infections, ventilator-associated pneumonia) and other patient safety issues, but not occupationally-acquired infections related to either bloodborne or contact pathogens (CDC 2009).
- The latest published NHSN data includes aggregate data from over 2000 facilities contributing information on healthcare associated infections among patients, but none among healthcare workers (Edwards 2009)

Non-Governmental Surveillance: 1991

- One surveillance system instituted outside of the Department of Health and Human Services (DHHS) and used for global surveillance of occupational exposures to blood and body fluids is the Exposure Prevention Information Network (EPINet™).
- Developed by Janine Jagger, M.P.H., Ph.D., and colleagues in 1991 to provide standardized methods for recording and tracking percutaneous injuries and blood and body fluid contacts

(International Healthcare Worker Safety Center 2010)

No Surveillance Must Mean No Risk

- In 2000, the last year that a case of occupational HIV was reported to CDC, EPINet identified approximately 1,552 contaminated sharps injuries and 470 BBF (non-sharps injuries) reported in over 40 facilities (EPINet 2000).
- If there were 2,022 *potential* occupational exposures to BBPs in only 40 hospitals that contribute to EPINet, it can be deduced that there were 100s of thousands of potential exposures when extrapolated out to over 5,000 hospitals (AHA 2010) in the US.

POLICY IMPACT:
PERCUTANEOUS & MUCOTANEOUS INCIDENTS

Focus on Needlesticks: OSHA 1991, 2000

Because of the changing national and clinical practice environment over the years, counts and subsequent ratios of blood and body fluids to sharps injuries may be changing for several reasons:

(1) In 2001, OSHA incorporated additional requirements in its Bloodborne Pathogens Standard which may influence preventive controls put in place by hospitals and thus overall sharps exposure incidents

(2) Over time, as hospitals perform risk assessments and evaluate exposures, incidents may decrease as better controls are put into place and awareness among healthcare workers grows

(3) Over time, trends in healthcare may result in changing exposures for example, more surgeries (elective, plastic, cesarean section, etc.) are being performed that can potentially result in more exposures, *however* as technology improves more non-invasive or less-invasive procedures and diagnostics may reduce potential exposures over time

(OSHA 1991, 2001, Jagger 2008, DeCarli 2009, Jagger 2010, Tossini 2010, Jagger 2010)

To be considered…

whether there is a potential positive impact with decreasing sharps injuries due to national focus on engineering controls and potentially no impact on splashes and splatters because national activity, awareness, and policies have remained the same or steady over time. These changes may be seen differently in different hospital areas based on risk, uptake of new protective technologies, increased awareness, changes in procedures, or other impacts.

SHHHH…

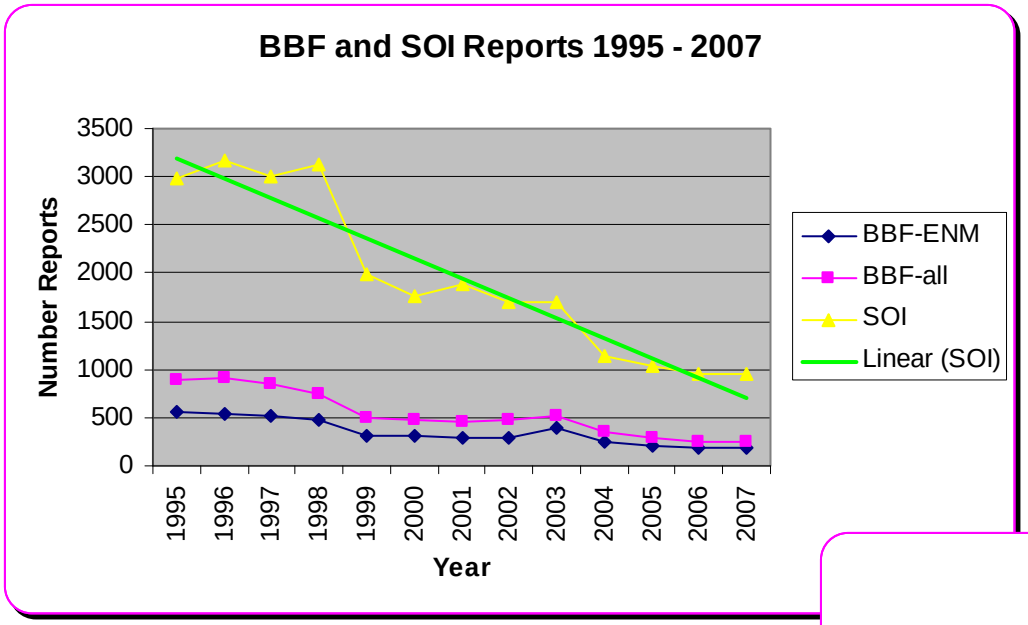
Stay Tuned for New Research

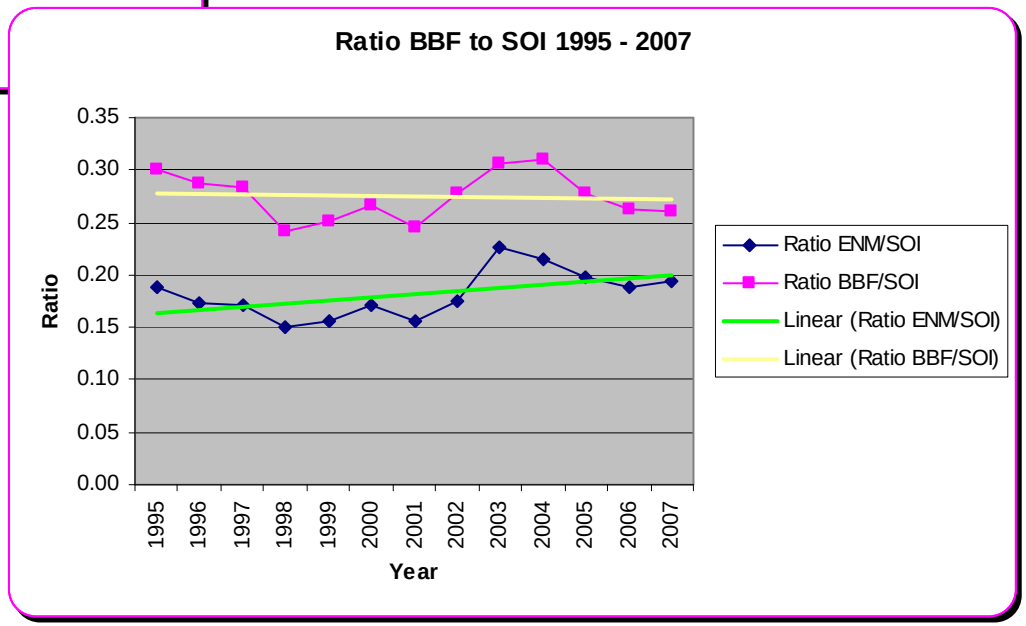
- The ratio of reports of MSSIs to PCSIs is changing over the time period 1995 to 2007.

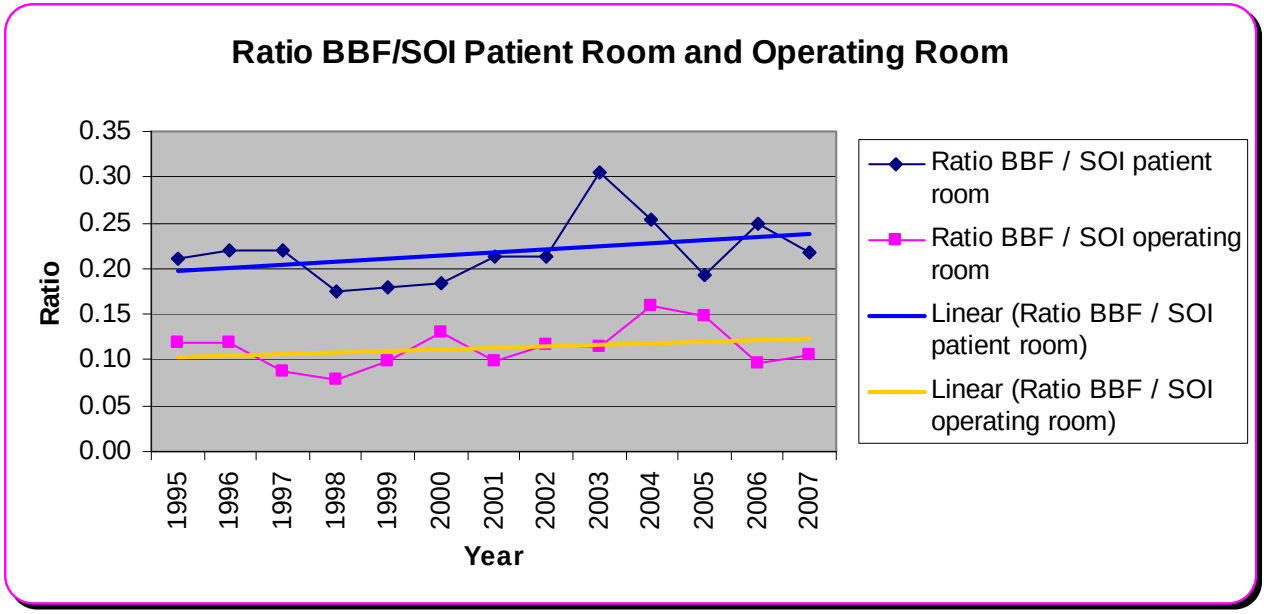
- The ratio of reports of MSSIs to PCSIs is higher in *high risk* hospital areas than those in low risk hospital areas.

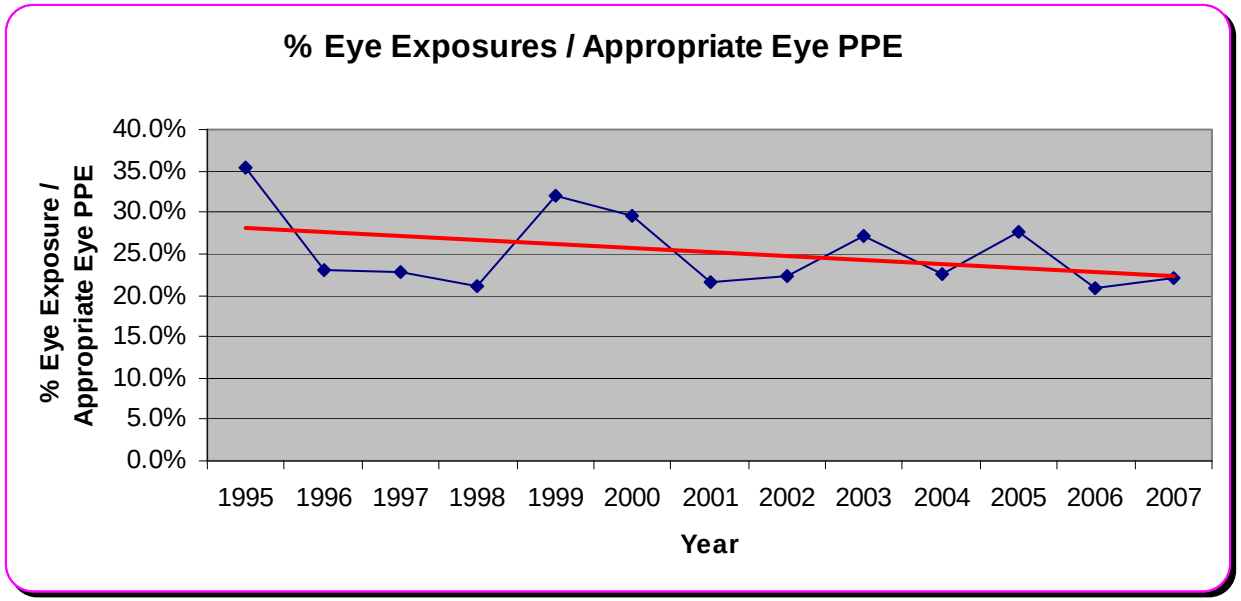
- Healthcare workers who experience an MSSI wear personal protective equipment more frequently in *high risk* hospital areas than those in low risk hospital areas.

Preliminary Analyses for NIOSH-funded Pilot Project Research Training (PPRT) Grant






Ratio BBF/SOI Patient Room and Operating Room
Ratio
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year
Ratio BBF / SOI patient room
Ratio BBF / SOI operating room
Linear (Ratio BBF / SOI patient room)
Linear (Ratio BBF / SOI operating room)


% Eye Exposures / Appropriate Eye PPE
% Eye Exposure / Appropriate Eye PPE
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year

Thank you!

Amber Hogan Mitchell, DrPH(c), MPH, CPH

ambermitchell@luckymail.com

amitch13@its.jnj.com