Barry Hunt

Education

- Honour's BSc – University of Guelph (1981 – 1985)
- Post-degree Science – University of Waterloo (1985 – 1986)

Experience

- Medical Lab Technologist – Grand River Hospital (1981 – 1989)
  - Pathology
  - Chemistry
  - Histology
- Hospital Sales and Product Development – Medigas / Praxair (1988 – 1995)
  - Anesthesia Equipment
  - Respiratory Equipment
  - Medical Gases
  - Medical Gas Equipment
- Class 1 Inc.
  - President & CEO (1995 – 2012)
  - Chairman & CTO (2012 – present)
- University of Waterloo
  - Research Scientist, Dept. of Chemistry (2012 – present)

Standards

- CSA (1995 – present)
  - Vice-Chair Strategic Steering Committee for Healthcare
  - Chair, Task Force on Hospital Acquired Infections
  - Member, Technical Committee for Perioperative Care
  - Member, Technical Subcommittee for Plume Scavenging
  - Chair, Technical Subcommittee for Medical Gases & Equipment
- ISO TC121 Anesthesia & Respiratory (2006 – present)
  - Head of Delegation to SC6, Medical Gases and Equipment
  - Head of Delegation to SC8, Medical Suction

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Engineering Hospital Acquired Infection Reduction

November 2014

Barry Hunt

Chairman & CTO
Class 1 Inc.

Vice-Chair,
CSA Strategic Steering Committee for Healthcare

Chair,
CSA Task Force Hospital Acquired Infections

Founder & Chair,
Coalition for Hospital Acquired Infection Reduction

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200,000

The number of Canadians who will be infected by a hospital this year

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10,000

The number of Canadians who will

die

from a hospital infection this year

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$4 Billion

The cost of treating Canadians infected by a hospital this year

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1 in 10

The percentage of Canadian inpatients infected by a hospital this year

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1 in 20

The percentage of hospital infected Canadians who will die this year

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4th

“Hospital Acquired Infection is the 4th largest cause of death with a higher mortality rate than AIDS, breast cancer, and automobile accidents combined.”

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Source: HHS Report January 2009

Annual Deaths

Canada

• Breast Cancer	5,100
• Car Accidents	2,200
• HIV	400
• Hospital Acquired Infections	10,000

US

• Breast Cancer	40,460
• Car Accidents	32,800
• HIV	17,000
• Hospital Acquired Infections	102,000

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Hospital Infection Rates in Developed Countries

HAI in Developed	Nations
Country	Prevalence
Canada	10.50%
Finland	8.50%
France	6.70%
Greece	8.60%
Ireland	7.60%
Italy	4.60%
Norway	5.10%
Scotland	9.50%
Slovenia	4.60%
Switzerland	10.10%
United Kingdom	7.60%
United States	4.50%
WHO 2009	

ICU prevalence rates of HAI in developed countries range from 9-37% in Europe and USA with crude estimates of mortality rates from 12-80%.

In ICU settings, the use of invasive devices is one of the most important risk factors for acquiring HAI.

Catheter related bloodstream infections caused by MRSA may cause US$ 38,000 per episode (WHO).

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=article&id=48:hai-developed-nations&catid=15:infection-rates-in-developed-world&Itemid=22

50%

The percentage of ICU patients worldwide who will develop an HAI

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=article&id=48:hai-developed-nations&catid=15:infection-rates-in-developed-world&Itemid=22

Economics 101

Approximately 2% of healthcare costs are associated with HAI's - $ 4 Billion annually

`	XS	S	M	L	XL
Annual Budget	$ 25,000,000	$ 50,000,000	$ 100,000,000	$ 250,000,000	$ 500,000,000
2%	$ 500,000	$ 1,000,000	$ 2,000,000	$ 5,000,000	$ 10,000,000

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The War on Bugs

Why are we losing?

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Traditional HAIs

MRSA (Methicillin-resistant Staphylococcus aureus)

25%- 30% of the population is colonized with Staph aureus ;
1% is colonized with MRSA.
8% of all hospital infections
70% of Staph aureus in hospitals are MRSA (CDC, WHO).

VRE (Vancomycin-Resistant Enterococci)

> 30% of ICU infections are VRE

C Diff (Clostridium difficile)

13% with hospital stays up to 2 weeks
50% in those with hospital stays longer than 4 weeks
frequency and severity of C. diff infections remains high and it is increasing (CDC, WHO).

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Source:
http://hospitalhygiene.info/index.php?option=com_content&view=article&id=50:common-microbes-associated-with-hospital-acquired-infections&catid=18:hospital-acquired-infection&Itemid=24

C. difficile blamed for 9 death in hospital near Montreal

MONTREAL (CP) — Nine people have died in a Quebec hospital from what doctors believe is a new and more powerful strain of C. difficile.

Since late July, health officials have identified a total of 22 C. difficile cases at Honore-Mercier Hospital in St-Hyacinthe, about 60 kilometres southeast of Montreal.

Doctors are at a loss to explain what caused the outbreak, but are concerned it is a different strain from others found in Quebec hospitals in the past.
The outbreak is even more troubling because the hospital recently underwent widespread renovations.

A spokesperson says 50 per cent of the hospital is being decontaminated and that the work should be finished by next week.

A strain of C. difficile is blamed for roughly 2,000 deaths in Quebec between 2003 and 2004.

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Source:
http://cnews.canoe.ca/CNEWS/Canada/2006/10/27/2145519.html
October 27, 2006

C. difficile outbreak linked to fatal strain

Fourteen people have been diagnosed with C. difficile at a Mississauga, Ont. hospital, and at least one of four people who tested positive after death had the same strain that proved deadly in Quebec.

Meanwhile, CTV News has learned new cases of C. difficile have been confirmed at another Greater Toronto Area hospital. Scarborough Hospital General Division has diagnosed several patients with having the bacterium, CTV's Tom Hayes reports.

Last year, a committee set up by Ontario's chief coroner found that C. difficile was behind 10 deaths at a Sault Ste. Marie hospital. The committee investigated 26 deaths, which were thought to be related to the bacterial infection.

In recent years, hospitals in Quebec have struggled with numerous outbreaks. As recently as December, a person died in a Montreal-area facility due to C. difficile bacteria, bringing the toll at Honore-Mercier hospital to 16.

Source: toronto.ctv.ca
Published Wednesday, Feb. 28, 2007 11:08PM EST

New HAIs

CRE

CPE

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KPC

Last summer, a patient was transferred from a New York hospital to the NIH hospital in Maryland for a lung transplant. As nurses perused the charts that uncovered a startling revelation – the patient was carrying an antibiotic-resistant infection.

Despite extreme measures to contain the superbug, it spread, killing three more patients. The hospital continued with desperation, but still *Klebsiella pneumonia* (KPC) came back stronger and more resistant than the case before. They found the bacteria in the most unexpected places – air vents that had been bleached twice and a sink drain, which prompted them to rip out the plumbing. Guards were employed to monitor nurses and other caretakers- anyone who fell down on the job was promptly fired.

Yesterday, the superbug, although currently contained, claimed a 7th life of the19 patients at the hospital to have contracted the antibiotic-resistant strain of KPC. *The Washington Post* reported on Friday that a young boy has died. He arrived in April from Minnesota and was sent to the research hospital after complications with a bone marrow transplant when he contracted the bug.

More than 41 states have reported outbreaks of KPC since 2000. Currently, 6 percent of hospitals are battling the superbug.

Air Vents
Sink Drains

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Source:
http://www.examiner.com/article/superbug-claims-7th-life-at-nih-hospital

2014 HAIs

MERS

Ebola

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Traditional #1 Defense?

Handwashing

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Just Do It…

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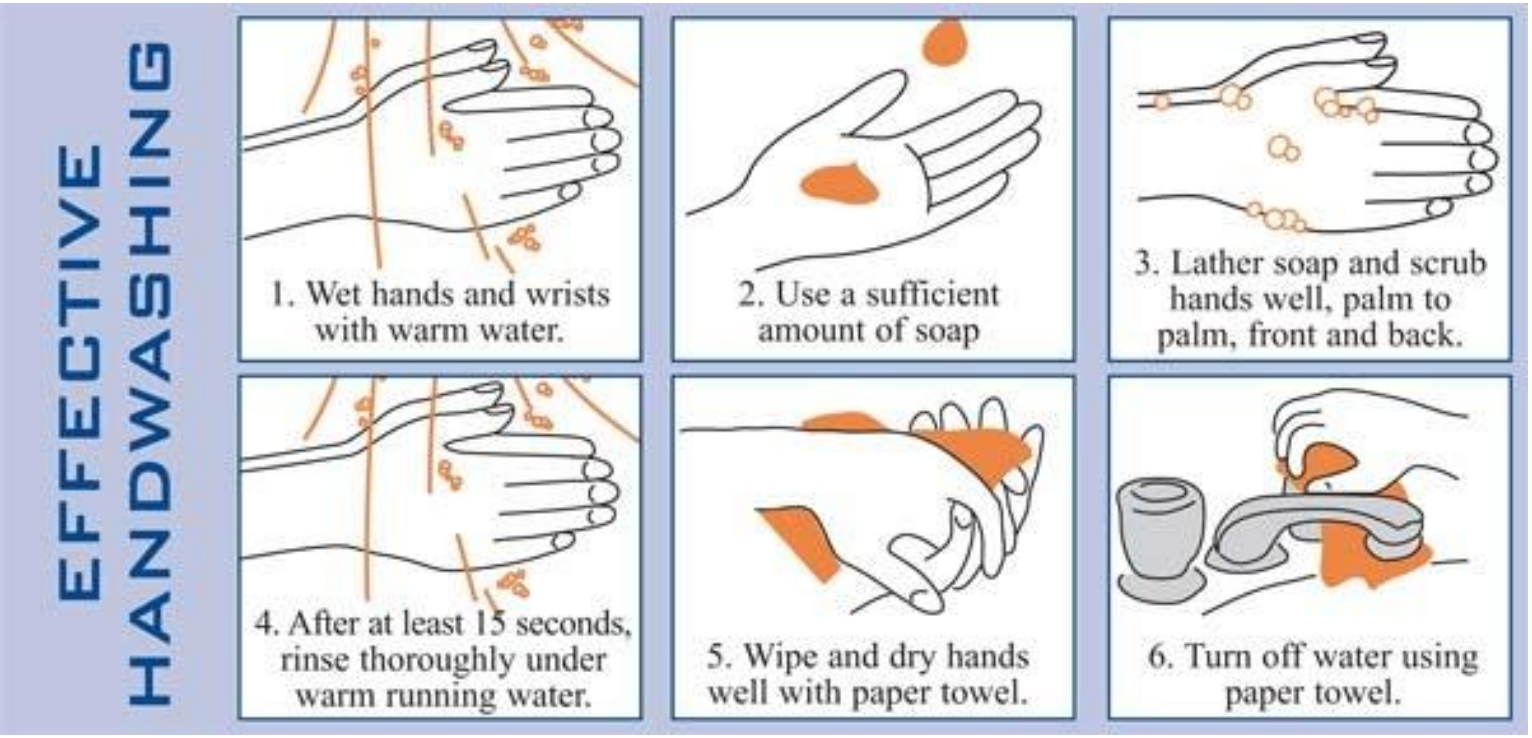
How…



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When…

4 Moments

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Source:
http://www.oahpp.ca/services/jcyh/moments.html

Do people really do it?

Sort of

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5% to 81%

Hand hygiene is a primary measure with proven effectiveness in preventing Hospital Acquired Infections. Despite its important role in the reduction of the transmission of microbial pathogens, overall compliance of healthcare workers with hand hygiene remains low in both developed and developing countries.

The Centers for Disease Control (CDC) and the World Health Organization (WHO), suggest the mean baseline rates of 5% to 81%, with an average of 40% of personnel compliance.

The primary means of measuring compliance with hand hygiene protocols and their merits are direct observation, self-reporting or surveys, 'secret shopper' and product usage.

Primary sources of guidelines on hand hygiene are those published by CDC and WHO, and healthcare settings should adopt one such set of guidelines in their hygiene protocols.

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Source:
http://hospitalhygiene.info/index.php?option=com_content&view=category&layout=blog&id=22&Itemid=26

Published Hand Hygiene Compliance

	Before Events %	After Events %
St Joseph's Health Centre - Toronto	87.34	94.51
Southlake Regional Health Centre	91.06	94.22
MacKenzie Health	59.00	78.01
Bluewater Health	91.78	96.71
St Catharines General Hospital Site - Niagara Health System	96.23	97.54
Centenary Hospital Site - Rouge Valley Health System	89.68	92.61
Welland County General Hospital Site - Niagara Health System	95.74	96.78
Niagara Falls The Greater Niagara Hospital Site - Niagara Health System	95.46	96.70
North York General Hospital	83.37	90.01
St Thomas-Elgin General Hospital	83.13	92.78
Royal Victoria Regional Health Centre	89.45	93.20
Toronto East General Hospital (The)	71.59	75.01
Ajax and Pickering Hospital Site - Rouge Valley Health System	88.85	95.26

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Source: http://patientsafetyontario.net/Reporting/en/PSIR_IndicatorComparison.aspx?hosptGroupTypeId=3&IndicatorId=8&hosptid=3734&seltype=1&lhin=3&city=&pc=&dist=0

90%

The typical reported level of hand hygiene compliance in Ontario Hospitals

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40%

RICN's estimated level of hand hygiene compliance in Ontario Hospitals

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15%

The likely level of
hand hygiene compliance
in
Ontario Hospitals

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90% Reported vs 15% Actual

Why the discrepancy?

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Compliance with hand hygiene on surgical, medical, and neurologic intensive care units: Direct observation versus calculated disinfectant usage

Simone Scheithauer, MD (Dr med), Helga Haefner, MD (Dr med),Thomas Schwanz, MD (Dr med), Henna Schulze-Steinen, MD,b Johannes Schiefer, MD (PD Dr med), Alexander Koch, MD (PD Dr med), Astrid Engels, and Sebastian W. Lemmen, MD (Prof Dr med) Aachen, Germany

Background: **Hand hygiene (HH) is considered the single most effective measure to prevent and control health care-associated infections (HAIs).**

Although there have been several reports on compliance rates (CRs) to HH recommendations, data for intensive care units (ICUs) in general and for shift- and indication-specific opportunities in particular are scarce.
Methods: The aim of this study was to collect data on ICU-, shift-, and indication-specific opportunities, activities and CRs at a surgical ICU (SICU), a medical ICU (MICU), and a neurologic ICU (NICU) at the University Hospital Aachen based on direct observation (DO) and calculated disinfectant usage (DU).

Results: Opportunities for HH recorded over a 24-hour period were significantly higher for the SICU (188 per patient day [PD]) and MICU (163 per PD) than for the NICU (124 per PD).

Directly observed CRs were 39% (73/188) in the SICU, 72% (117/163) in the MICU, and 73% (90/124) in the NICU.

However, CRs calculated as a measure of DU were considerably lower: 16% (29/188) in the SICU, 21% (34/163) in the MICU, and 25% (31/124) i the NICU. Notably, CRs calculated from DO were lowest before aseptic tasks and before patient contact.

Conclusions: To the best of our knowledge, this study provides the first data picturing a complete day, including shift- and indication- specific analyses, and comparing directly observed CRs with those calculated based on DU, the latter of which **revealed a 2.75-fold difference.** Worrisomely, CRs were very low, especially concerning indications of greatest impact in preventing HAIs, such as before aseptic task. Thus, the gathering of additional data on CRs and the reasons for noncompliance is warranted.

CR likely skewed by Hawthorne Effect

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Source: Am J Infect Control 2009;37:835-41

Hawthorne Effect

If you follow someone around with a clipboard, they will do their job better…and skew the results

Nurses wash their hands 3X as much when they are being watched

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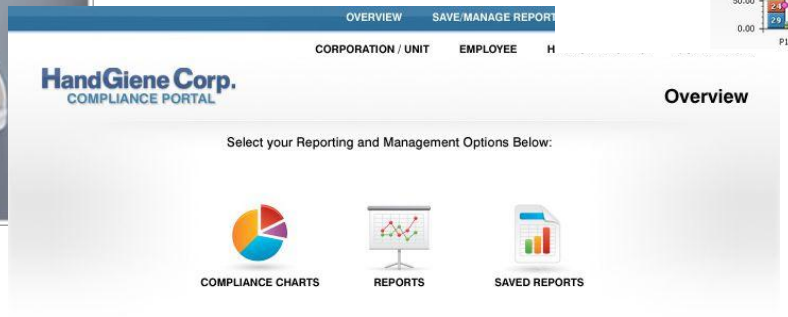
Real Time Monitoring



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Source:
http://www.handgienecorp.com

Hand Hygiene Monitoring Costs

Sample: A Large Ontario Hospital

		Annual Compensation	Total
ICP Director	1	$ 100,000	$ 100,000
ICP FTE	15	$ 70,000	$ 1,050,000
			$ 1,150,000

8,000 Annual Hand Hygiene Audits

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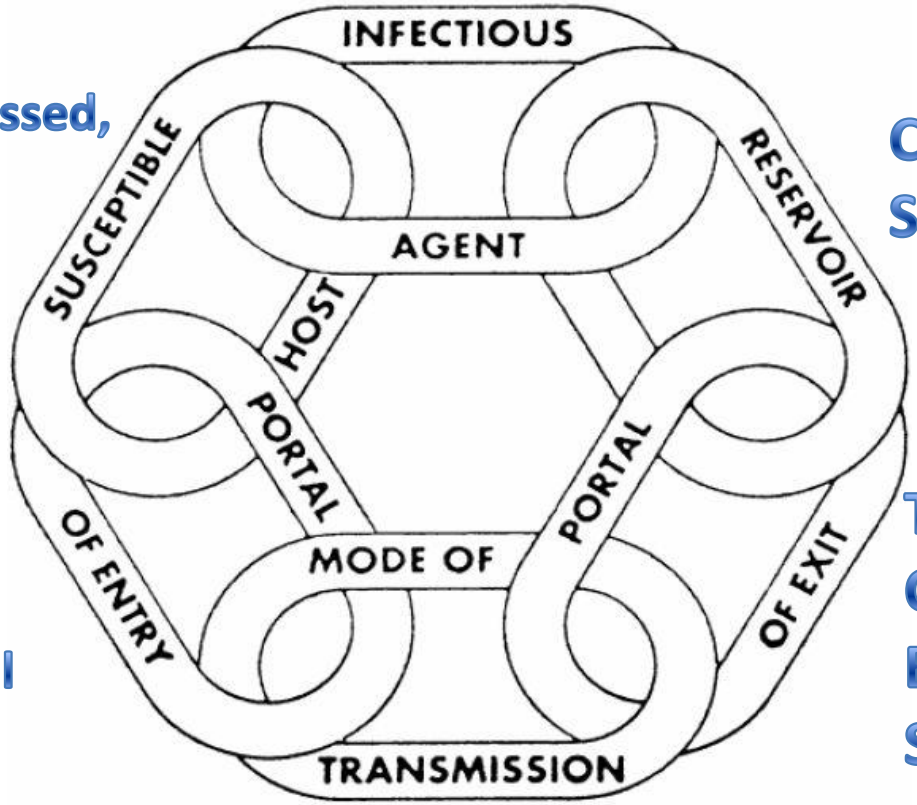
Chain of Infection

Antibiotics, surgery

Sick, Trapped,
Immune suppressed,
Antibiotics



Cleaning
Sterilization

Mouth, Nose
Eyes, Airway
IV, Catheter
Blood, Surgical

Toilet, Vomit
Cough, Sneeze
Blood,
Surgical Smoke

Contact
Droplets
Air

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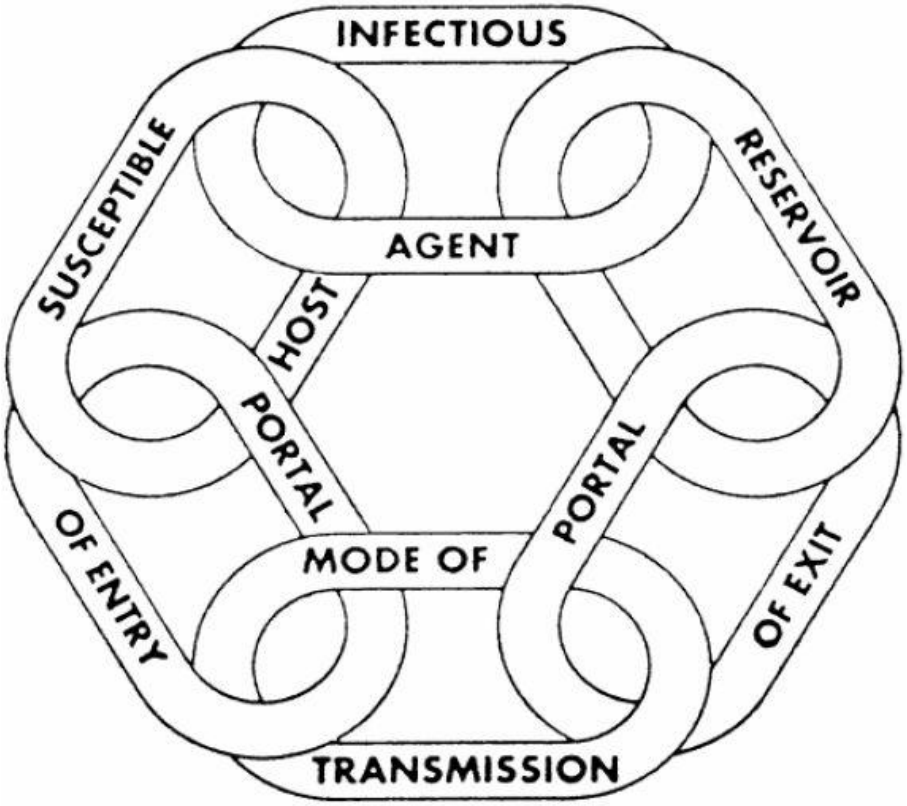
Traditional Approach



80%

Especially Hand Hygiene

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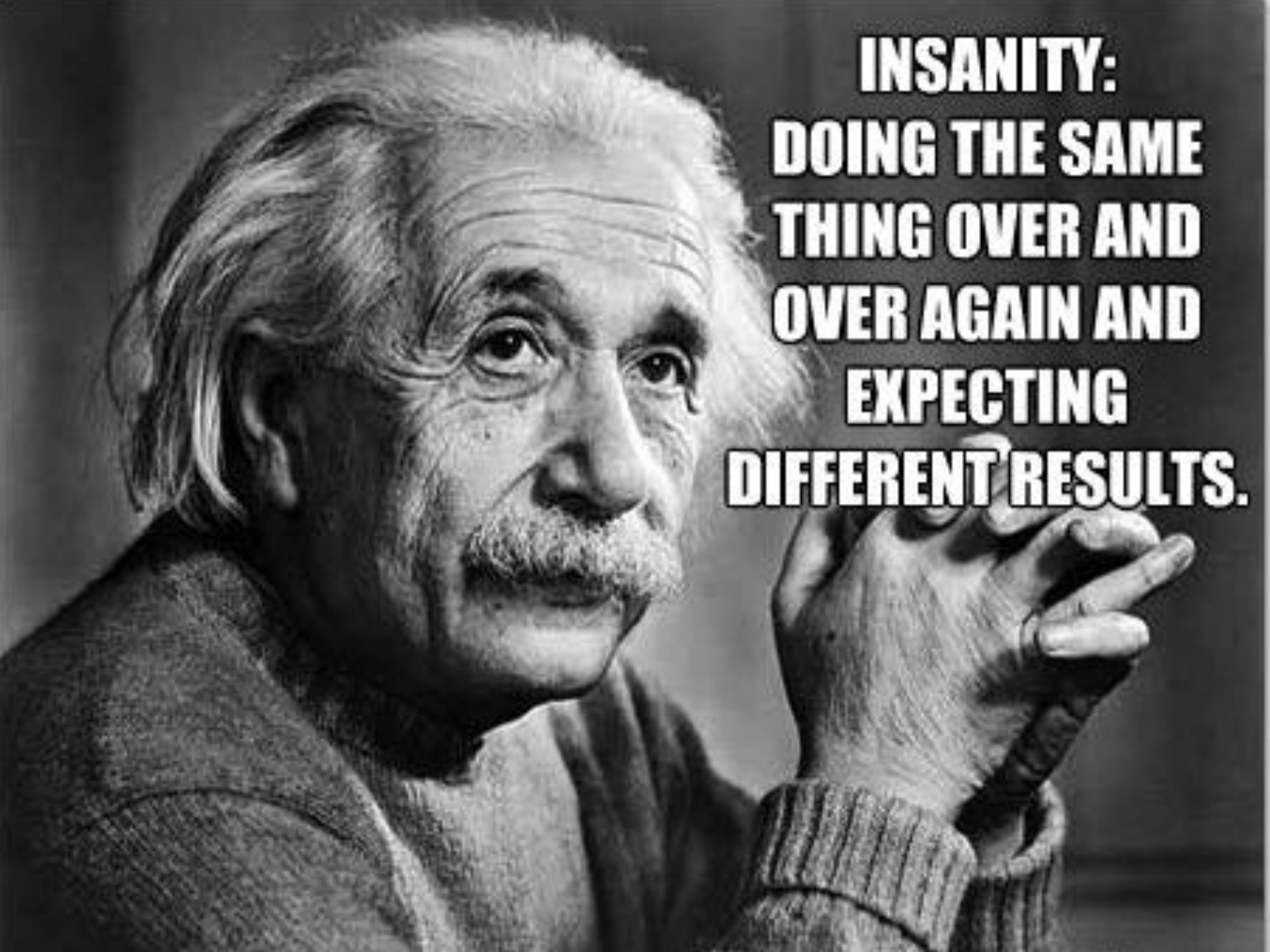
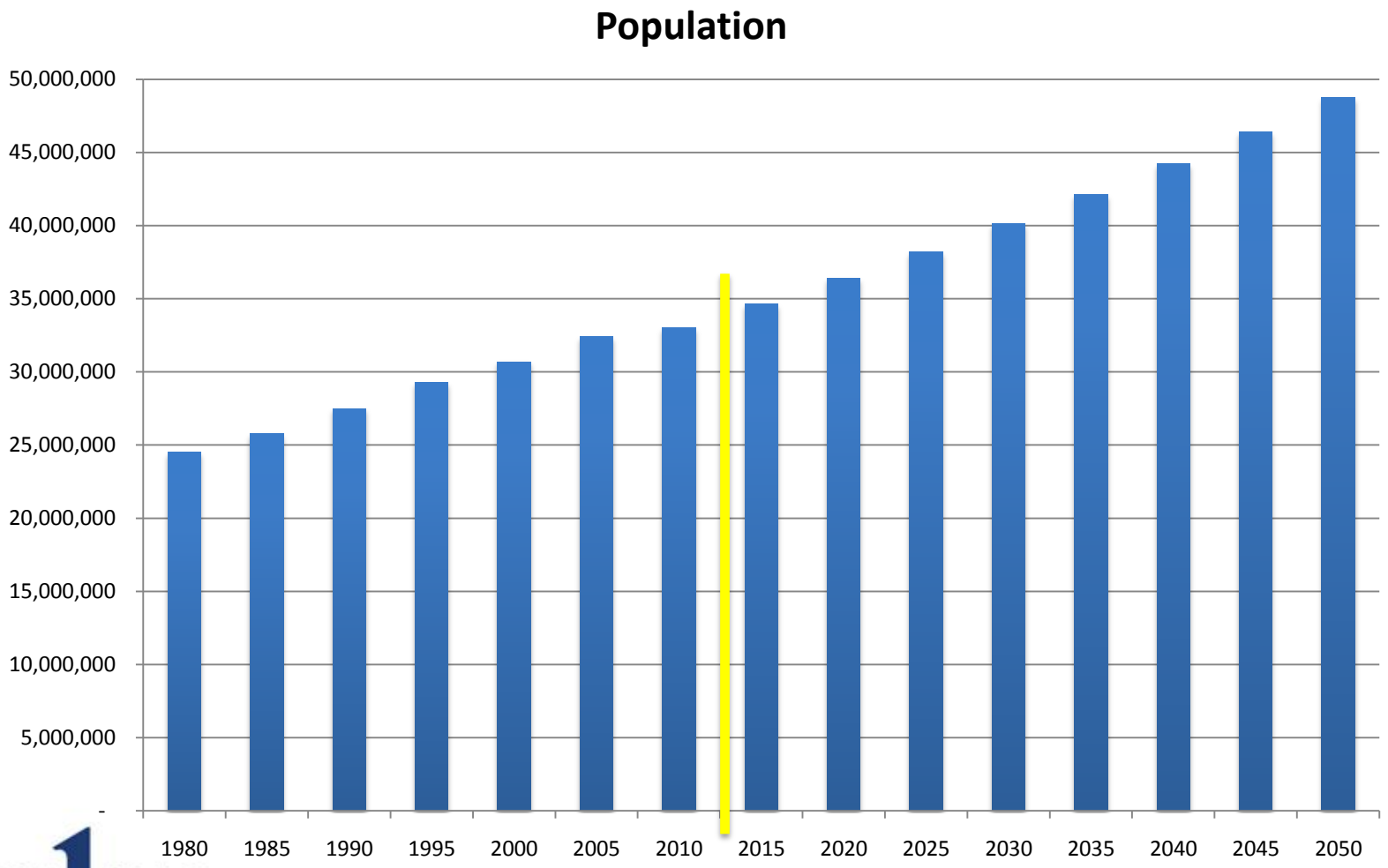

INSANITY:
DOING THE SAME
THING OVER AND
OVER AGAIN AND
EXPECTING
DIFFERENT RESULTS.

Canada



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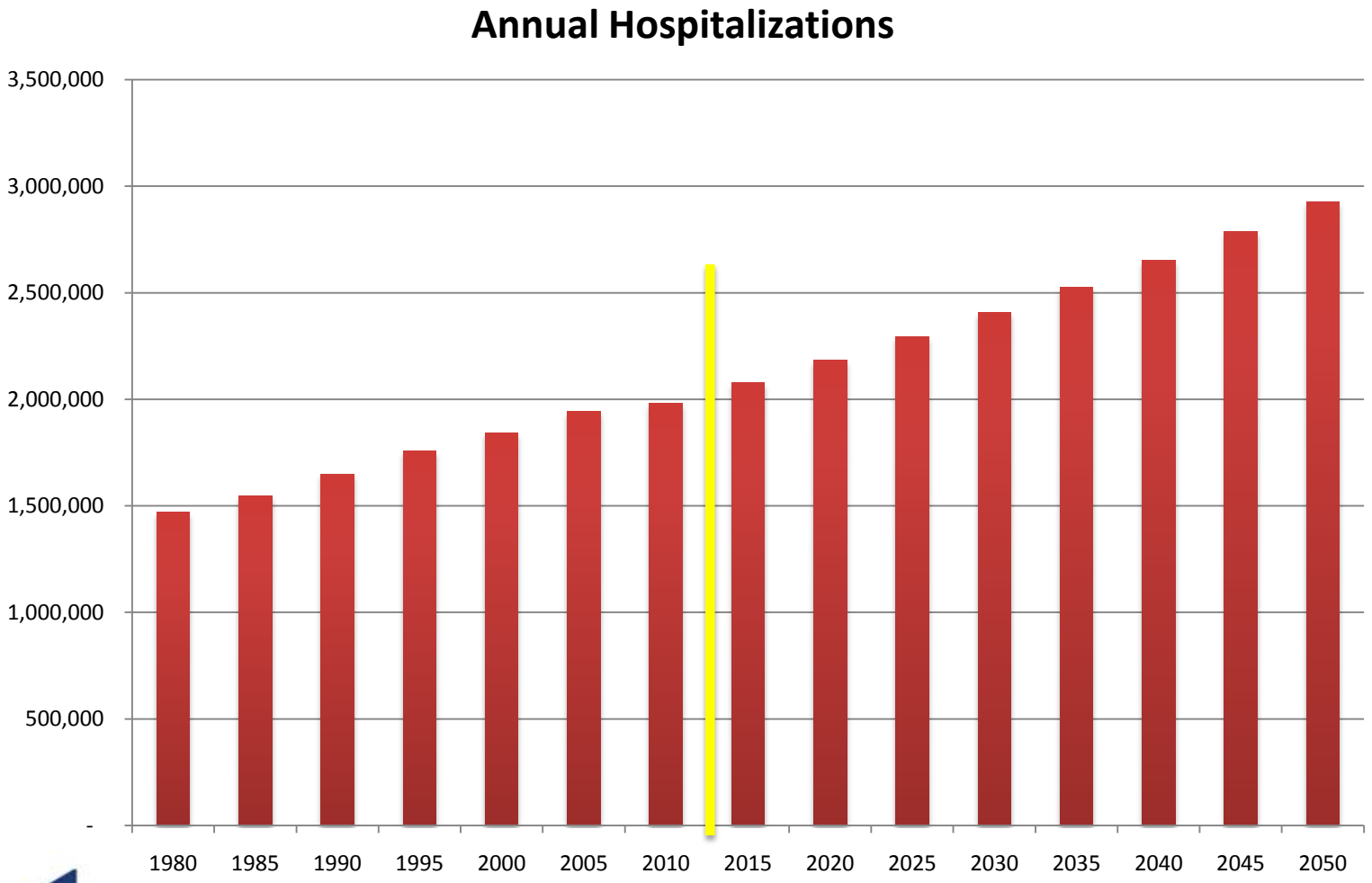
Est. Annual Hospitalizations



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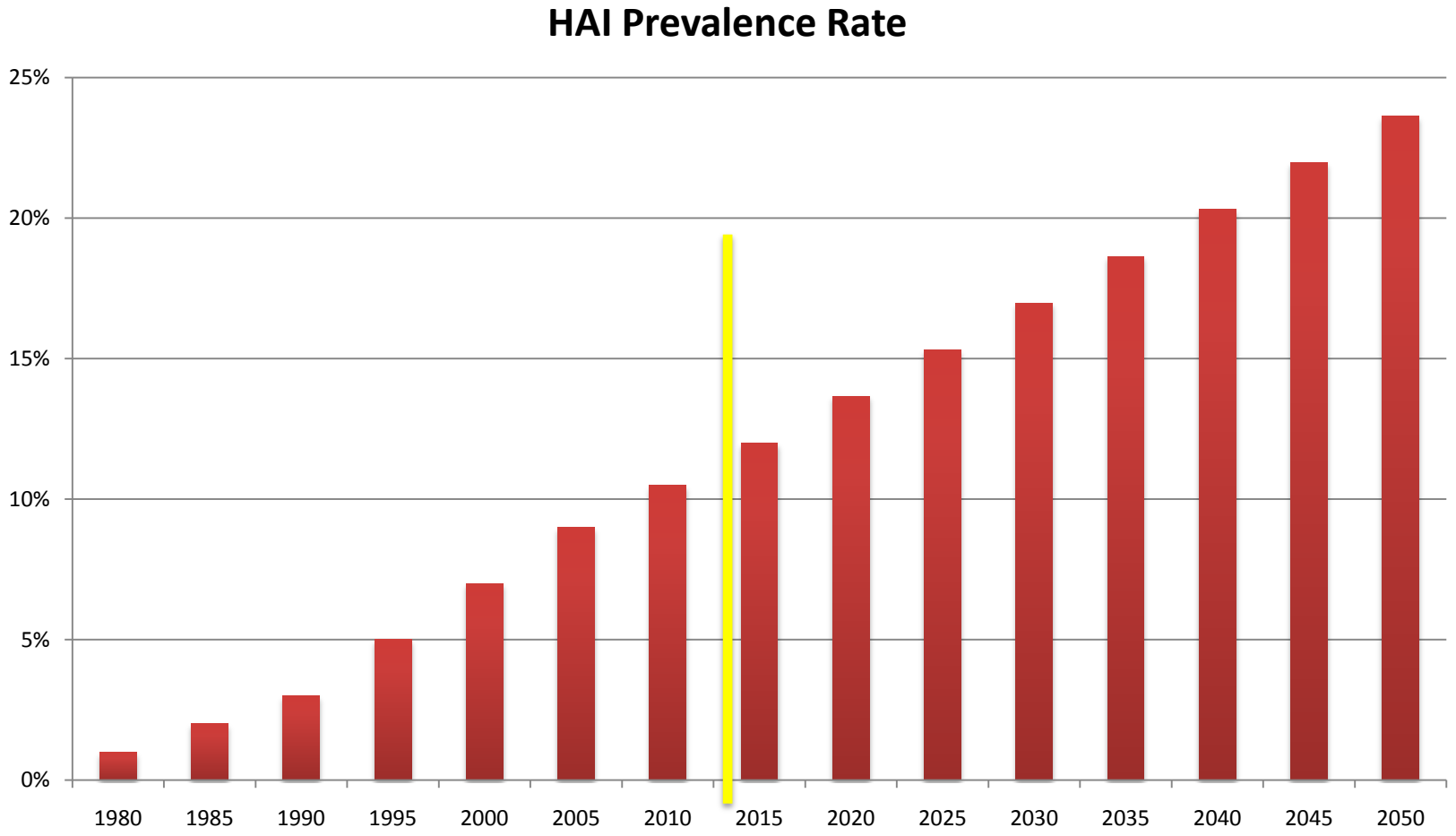
Est. Prevalence Rate



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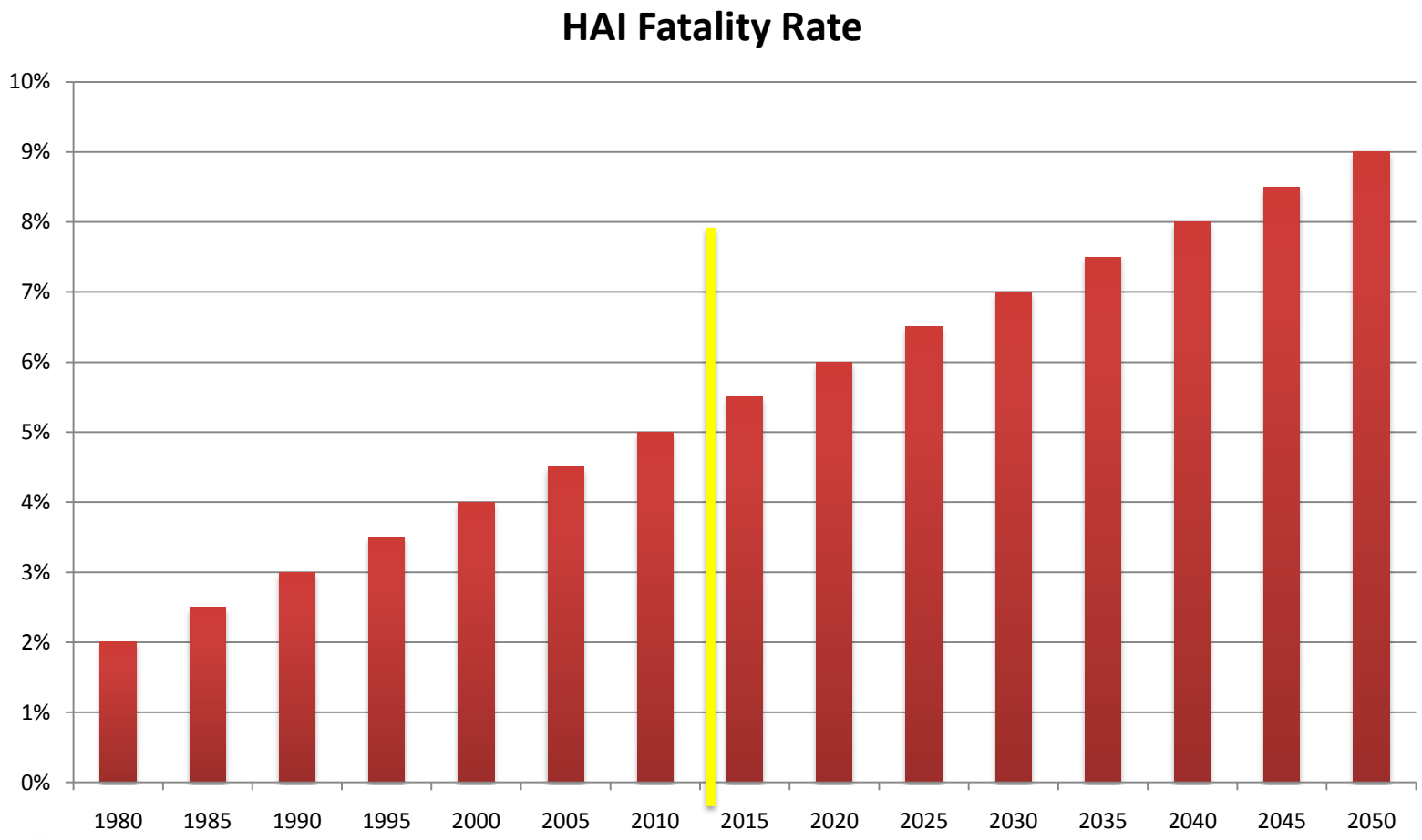
Est. Fatality Rate



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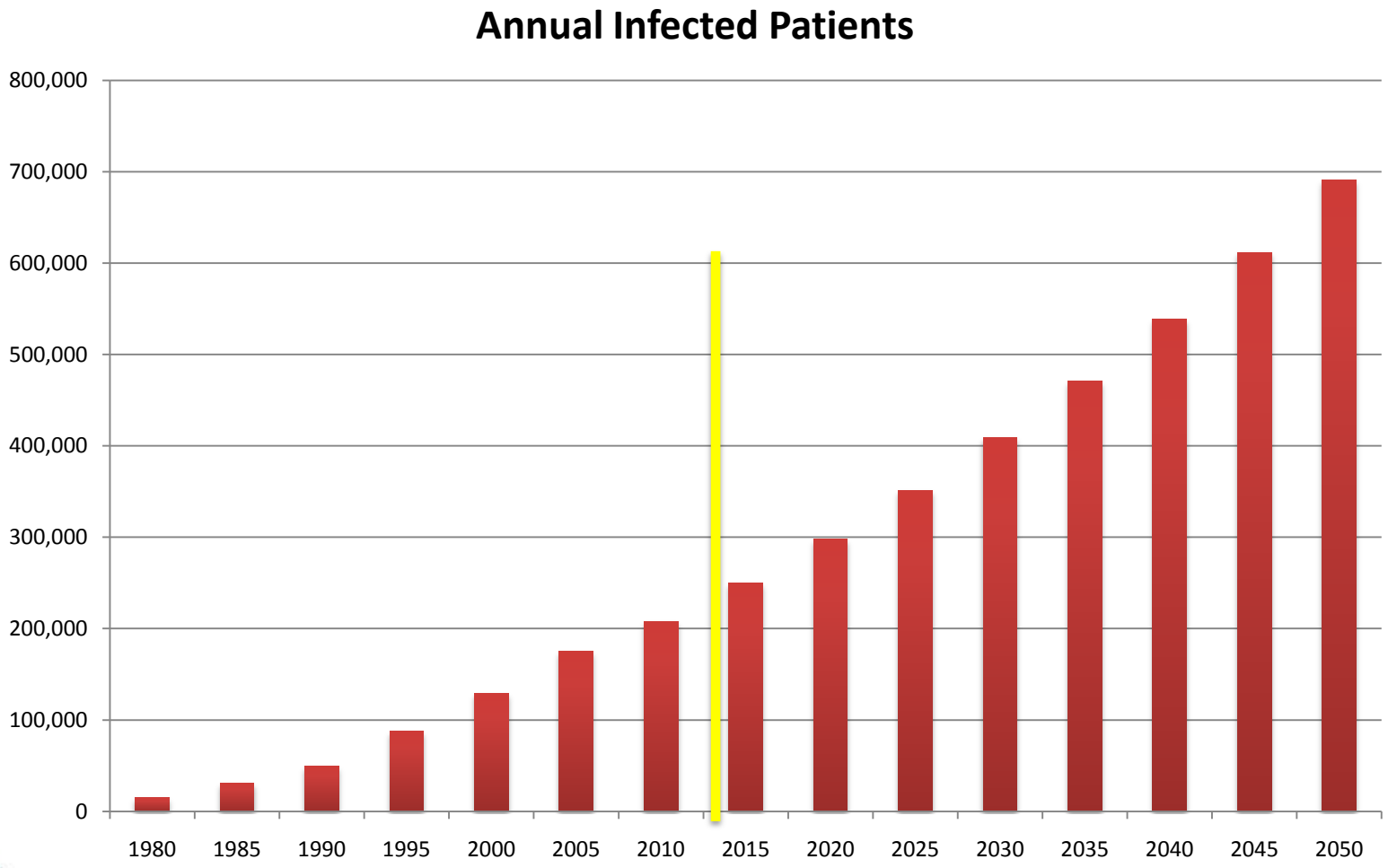
Est. # of Infected Patients



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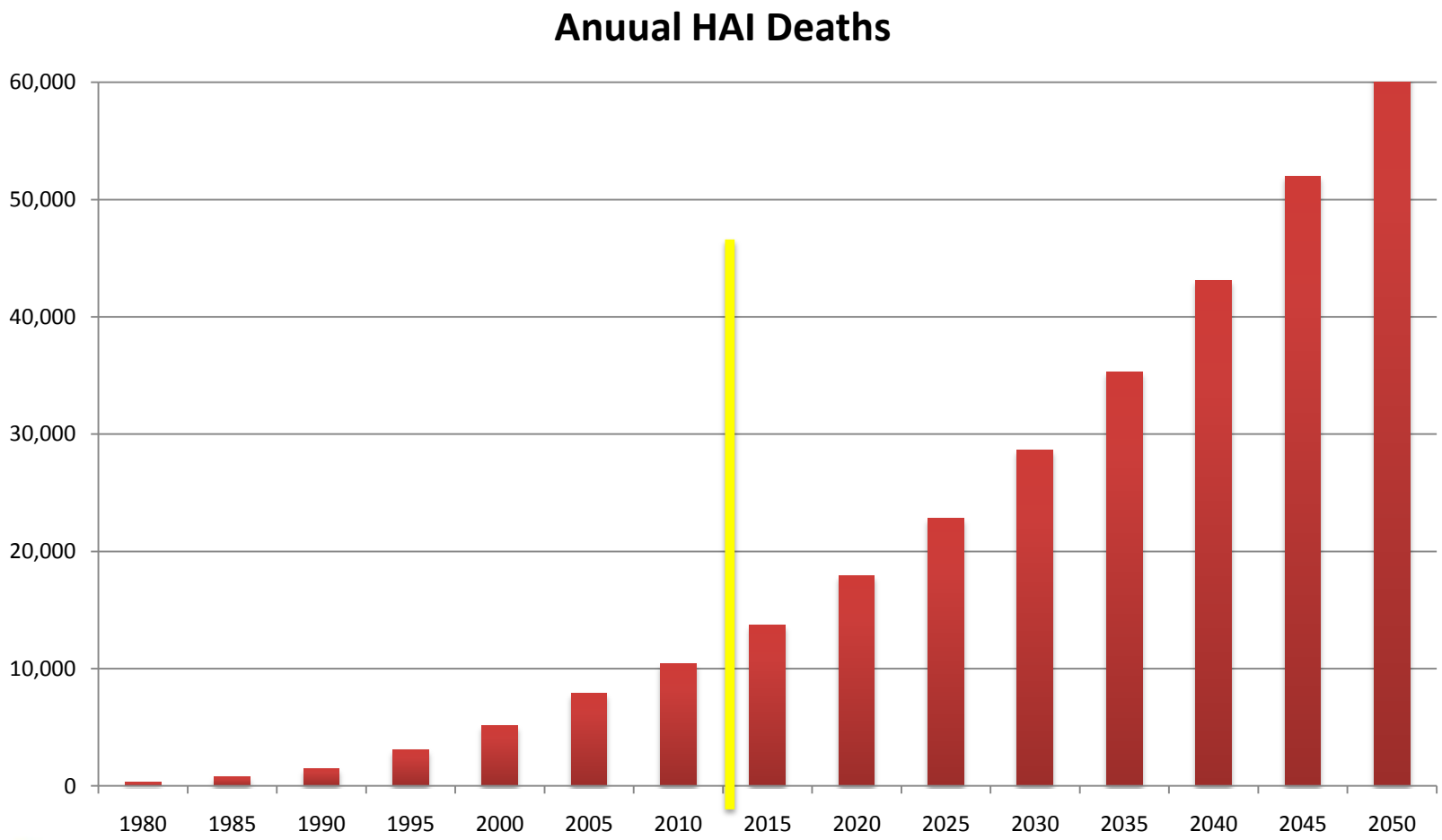
Est. # Deaths



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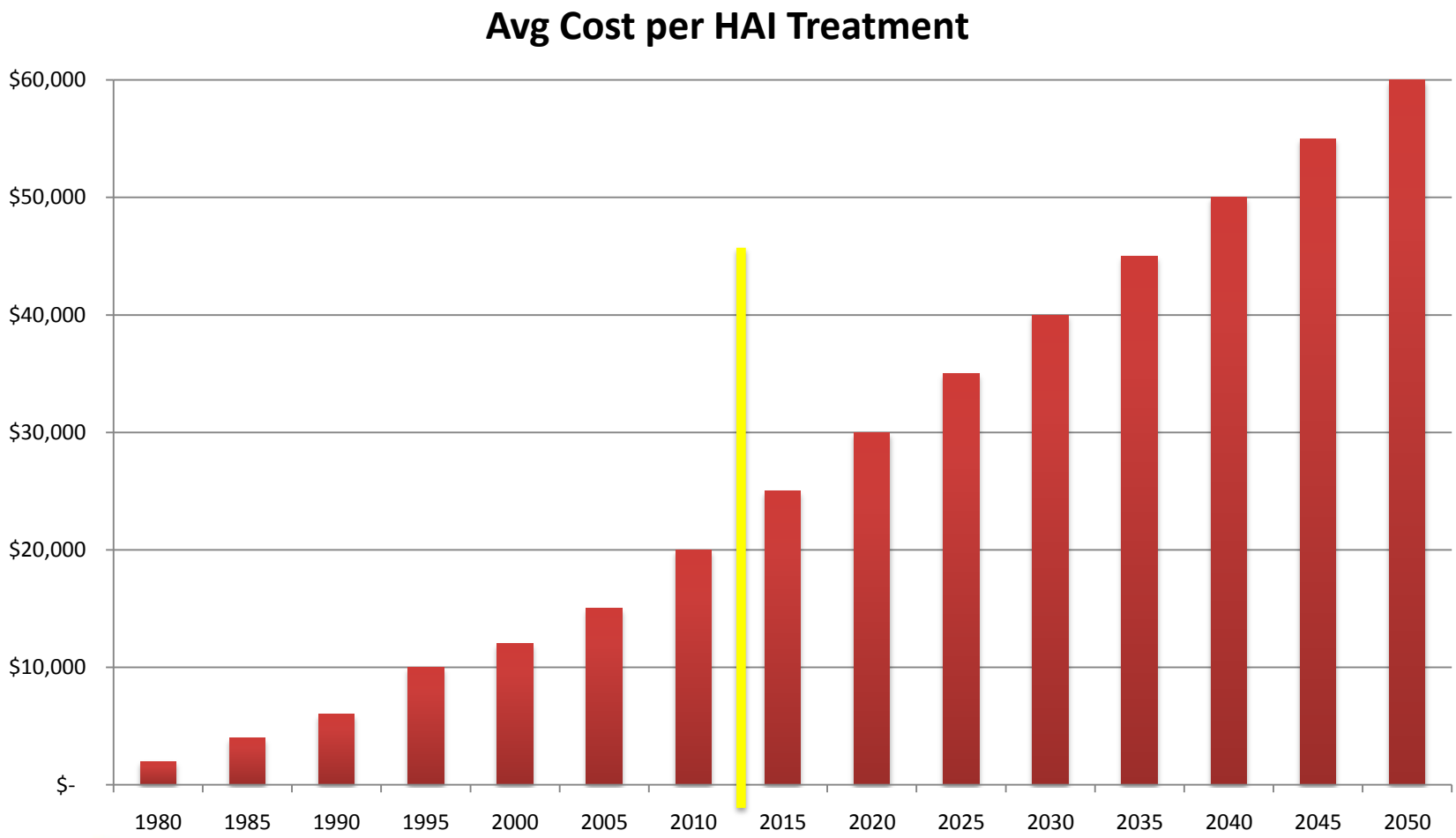
Est. Cost of Treatment



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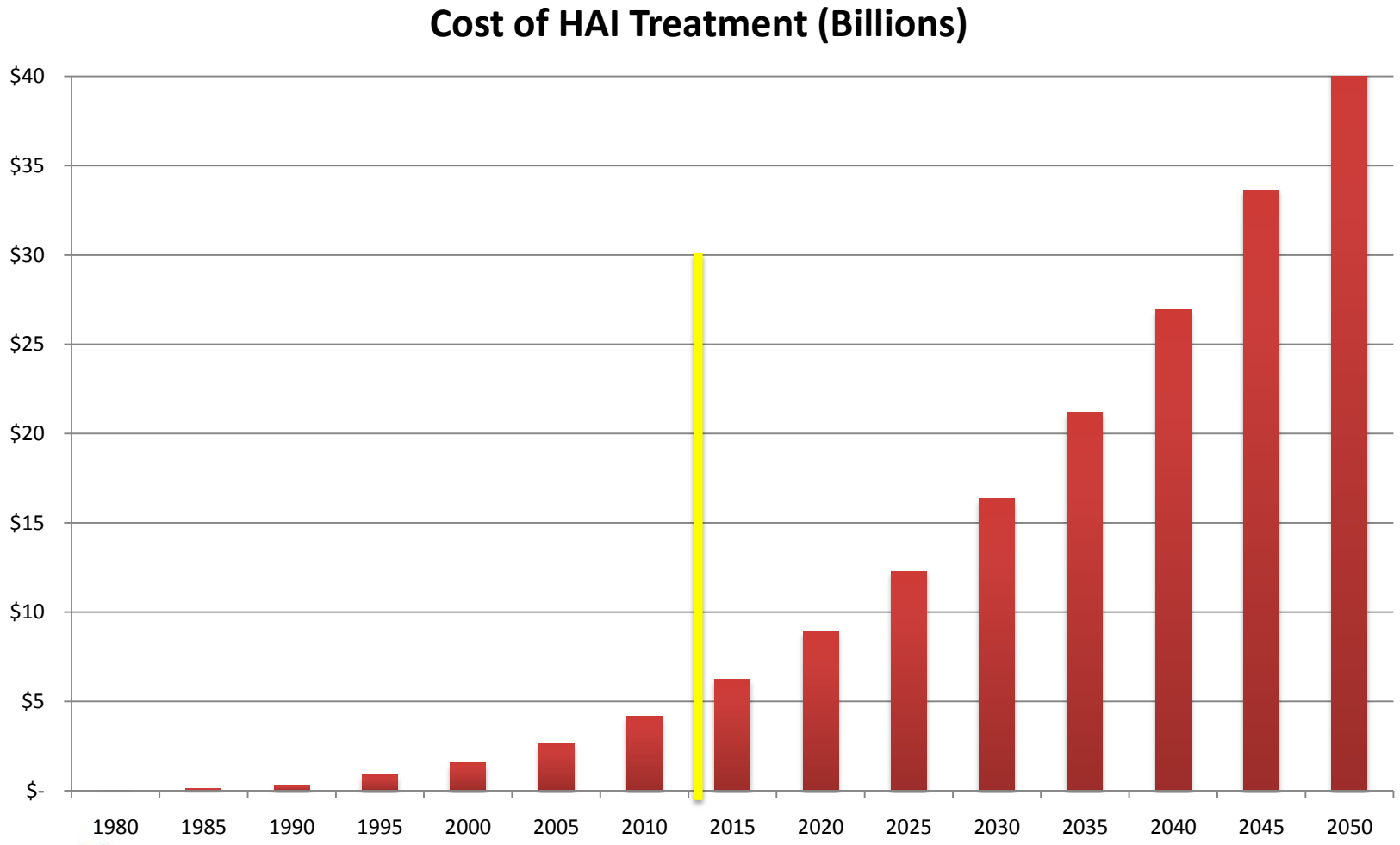
Est. Total Cost of Treatment



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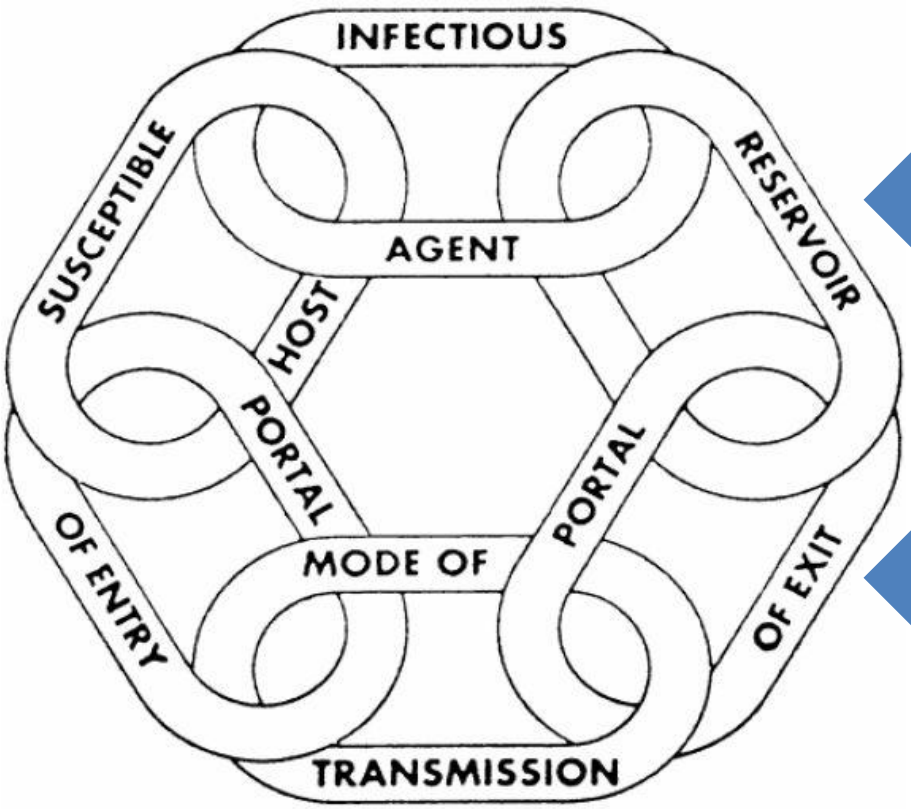
New Target



80%

Air, Water, Touch Surfaces

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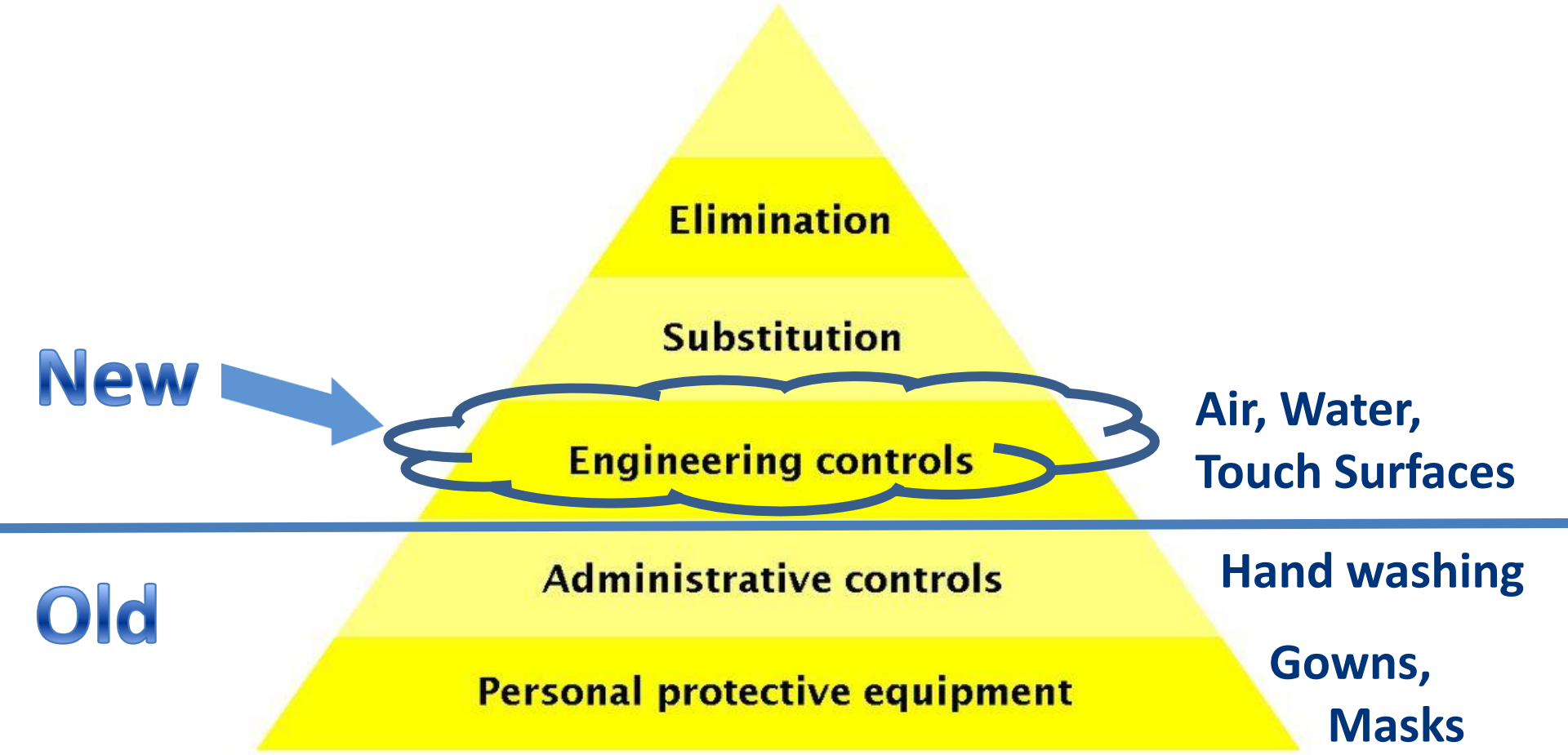
Hazard Control



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80%

The percentage of HAI's that can be reduced by improving the physical environment

Air, Water, Touch Surfaces

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Source: HHS Report January 2009

Air, Water, Touch Surfaces

80% of infectious diseases are transferred by touch

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Source: Tierno, 2001

Traditional Thinking on Transmission

1) Contact

2) Droplets

3) Airborne

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Traditional Airborne

1) Cold
2) Flu
3) Measles
4) TB

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But…

All viruses can become airborne

1) SARS
2) MERS
3) Ebola

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Aerosolization

Range of particle sizes expelled

Larger particles fall to floor or other surface within a few feet

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Small Particles, aka Droplet Nuclei

Water evaporates leaving a small, lightweight particle behind

Low humidity conditions increase small particle droplet nuclei formation

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Droplet Nuclei = Airborne

Small particles can remain airborne for

hours / days / weeks

Small particles can travel for miles

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Aerosolization

Coughing

sneezing,

spitting,

talking,

singing,

suctioning…

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…toilets!
C. difficile, VRE, SARS

Toilet Aerosols

C. Diff can be colonized 12” above toilet with every flush

Aerosols float for 90 minutes

Aerosols settle on surfaces for later transmission

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Small Particles Float

Dust control during construction, renovation, and maintenance

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Superbugs Ride Air Currents Around Hospital Units

Reference: M.F. King, C.J. Noakes, P.A. Sleigh, M.A. Camargo-Valero. Bioaerosol Deposition in Single and Two-Bed Hospital Rooms: A Numerical and Experimental Study. Building and Environment. 2012.

Hospital superbugs can float on air currents and contaminate surfaces far from infected patients' beds, according to University of Leeds researchers. The results of the study, which was funded by the Engineering and Physical Sciences Research Council (EPSRC), may explain why, despite strict cleaning regimes and hygiene controls, some hospitals still struggle to prevent bacteria moving from patient to patient.

It is already recognized that hospital superbugs, such as MRSA and C. difficile, can be spread through contact. Patients, visitors or even hospital staff can inadvertently touch surfaces contaminated with bacteria and then pass the infection on to others, resulting in a great stress in hospitals on keeping hands and surfaces clean.

But the University of Leeds research showed that coughing, sneezing or simply shaking the bed linens can send superbugs into flight, allowing them to contaminate recently cleaned surfaces.

PhD student Marco-Felipe King used a biological aerosol chamber, one of a handful in the world, to replicate conditions in one- and two-bedded hospital rooms. He released tiny aerosol droplets containing Staphyloccus aureus from a heated mannequin simulating the heat emitted by a human body. He placed open petri dishes where other patients' beds, bedside tables, chairs and washbasins might be and then checked where the bacteria landed and grew.

The results confirmed that contamination can spread to surfaces across a ward. "The level of contamination immediately around the patient's bed was high but you would expect that. Hospitals keep beds clean and disinfect the tables and surfaces next to beds," says Dr. Cath Noakes, from the University's School of Civil Engineering, who supervised the work. "However, we also captured significant quantities of bacteria right across the room, up to 3.5 meters away and especially along the route of the airflows in the room."

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Source:
http://www.infectioncontroltoday.com

Low humidity makes it worse…

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Dynamics of Airborne Influenza A Viruses Indoors and Dependence on Humidity

Wan Yang, Linsey C. Marr*

Department of Civil and Environmental Engineering, Virginia Tech, Blacksburg, Virginia, United States of America

Abstract

There is mounting evidence that the aerosol transmission route plays a significant role in the spread of influenza in temperate regions and that the efficiency of this route depends on humidity. Nevertheless, the precise mechanisms by which humidity might influence transmissibility via the aerosol route have not been elucidated. We hypothesize that airborne concentrations of infectious influenza A viruses (IAVs) vary with humidity through its influence on virus inactivation rate and respiratory droplet size. To gain insight into the mechanisms by which humidity might influence aerosol transmission, we modeled the size distribution and dynamics of IAVs emitted from a cough in typical residential and public settings over a relative humidity (RH) range of 10–90%. The model incorporates the size transformation of virus-containing droplets due to evaporation and then removal by gravitational settling, ventilation, and virus inactivation. The predicted concentration of infectious IAVs in air is 2.4 times higher at 10% RH than at 90% RH after 10 min in a residential setting, and this ratio grows over time. Settling is important for removal of large droplets containing large amounts of IAVs, while ventilation and inactivation are relatively more important for removal of IAVs associated with droplets <5 μm. The inactivation rate increases linearly with RH; at the highest RH, inactivation can remove up to 28% of IAVs in 10 min. Humidity is an important variable in aerosol transmission of IAVs because it both induces droplet size transformation and affects IAV inactivation rates. Our model advances a mechanistic understanding of the aerosol transmission route, and results complement recent studies on the relationship between humidity and influenza's seasonality. Maintaining a high indoor RH and ventilation rate may help reduce chances of IAV infection.

Citation: Yang W, Marr LC (2011) Dynamics of Airborne Influenza A Viruses Indoors and Dependence on Humidity. PLoS ONE 6(6): e21481. doi:10.1371/journal.pone.0021481

Editor: Ron A. M. Fouchier, Erasmus Medical Center, The Netherlands

Received March 8, 2011; **Accepted** May 30, 2011; **Published** June 24, 2011

Once airborne…particles settle…and can become airborne again

Foot traffic on carpet

Shaking fabrics – e.g. – bed linens

Resuspension with air movement

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Even “Contact” diseases like Ebola can be transmitted through the air

CDC now recommends facemasks or personal respirators for protection of healthcare workers in addition to barrier PPE

Lab monkeys die when caged in the same room with Ebola infected monkeys…no physical contact

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Spreadability

Increases with decreasing humidity

1. **More viruses shed**
2. **More droplet nuclei created**
3. **Particles travel further**

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Susceptibility

Increases with decreasing humidity

1. **Mucuous membranes dry out**
2. **Dehydration lowers immune response**

Solutions…

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Better Human Behavior or Better Technology ?

Commenting on the future of
infection control in the late 1990s,
Dr Robert Weinstein wrote:

“Given the choice of improving technology or improving human behavior,
technology is the better choice.”

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UV Room Disinfection

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UV Works!

53 to 56% reduction in MRSA and C. Diff

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Source:
Simmons, Journal of Infection Prevention, 2013
Levin, American Journal of Infection Control, 2013

Disinfection: Target level

Log 6

= 99.9999%

= 1 survivor out of 1 million

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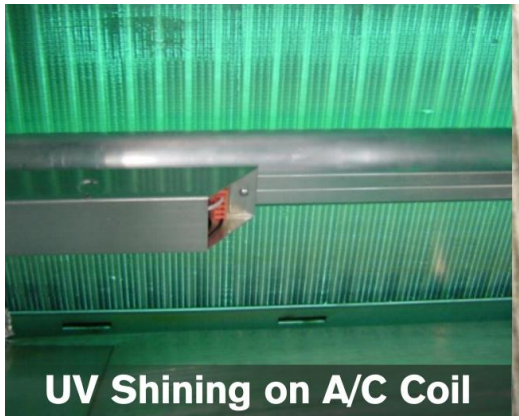
UV Bathroom Air and Surfaces
5 min fully automated disinfection

- No-Touch Disinfection (NTD) solution for unoccupied bathrooms
- Easily mounts to the wall
- Irradiate all high-touch areas with high-intensity UVC germicidal light
- Help reduce HAIs by eliminating pathogens such as MRSA, C.diff & VRE
- Safety features guarantee a safe 5 minute disinfection cycle following each bathroom visit

UV Coil and Filter Disinfection

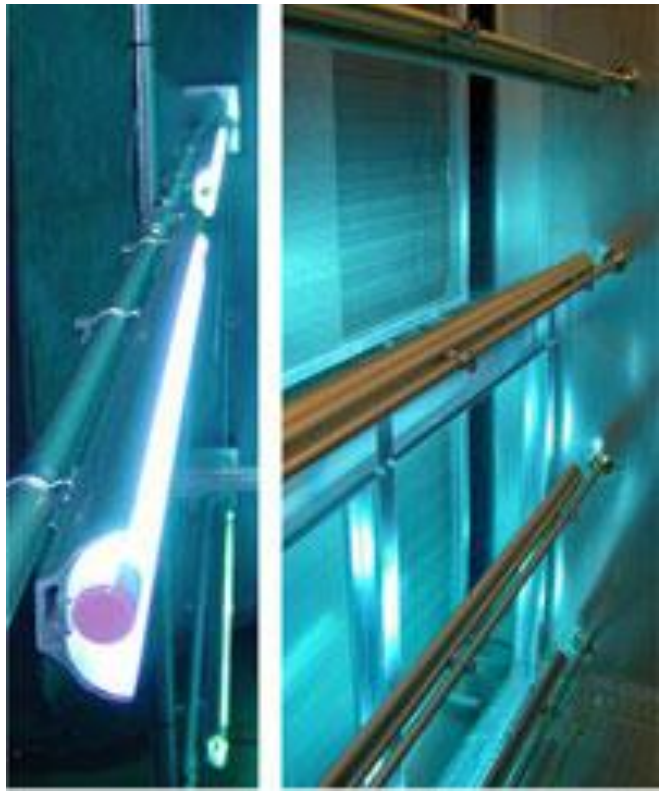
Can eliminate viruses, bacteria, mold

Prolongs filter & coil life



UV Shining on A/C Coil

Mold growth on A/C Coil



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UV HVAC Air Disinfection

Can eliminate viruses, bacteria, mold in air especially in critical care areas – ICU, NICU, OR

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UV Room Air Disinfection

Can reduce viruses, and bacteria, critical care areas –

Isolation Rooms, ICU, NICU, OR

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Journal of Perinatology (2011), 1–8

www.nature.com/jp

ORIGINAL ARTICLE

Effect of enhanced ultraviolet germicidal irradiation in the heating ventilation and air conditioning system on ventilator-associated pneumonia in a neonatal intensive care unit

RM Ryan[1,2,3], GE Wilding[4], RJ Wynn[1], RC Welliver[5], BA Holm[1,2,6] and CL Leach[1]

[1]Department of Pediatrics, Neonatology, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA; [2]Gynecology-Obstetrics, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA; [3]Pathology and Anatomical Sciences, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA; [4]Biostatistics, School of Public Health and Health Professions, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA; [5]Department of Pediatrics, Infectious Disease, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA and [6]Pharmacology, School of Medicine and Life Sciences, University at Buffalo, State University of New York, Women and Children's Hospital of Buffalo, Kaleida Health Systems, Buffalo, NY, USA

Objective: The objective of this study was to test the hypothesis that enhanced ultraviolet germicidal irradiation

Conclusion: eUVGI decreased HVAC microbial colonization and was associated with reduced NICU environment and tracheal microbial

62%

The reduction in treatment costs for VAIs (Ventilator Associated Infections)

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$50,000

The one-time cost of the solution

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$850,000

The annual savings in treatment costs

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HVAC – Pressure & Flow

Negative pressure / directional airflow

- bathroom < patient room < hallway

Downflow in bathroom

- Exhaust bathroom below and behind toilet, NOT in ceiling

Future - Exhaust toilet bowl

- connect to toilet exhaustor

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Fast acting self-sanitizing surfaces around the patient

For example, copper…

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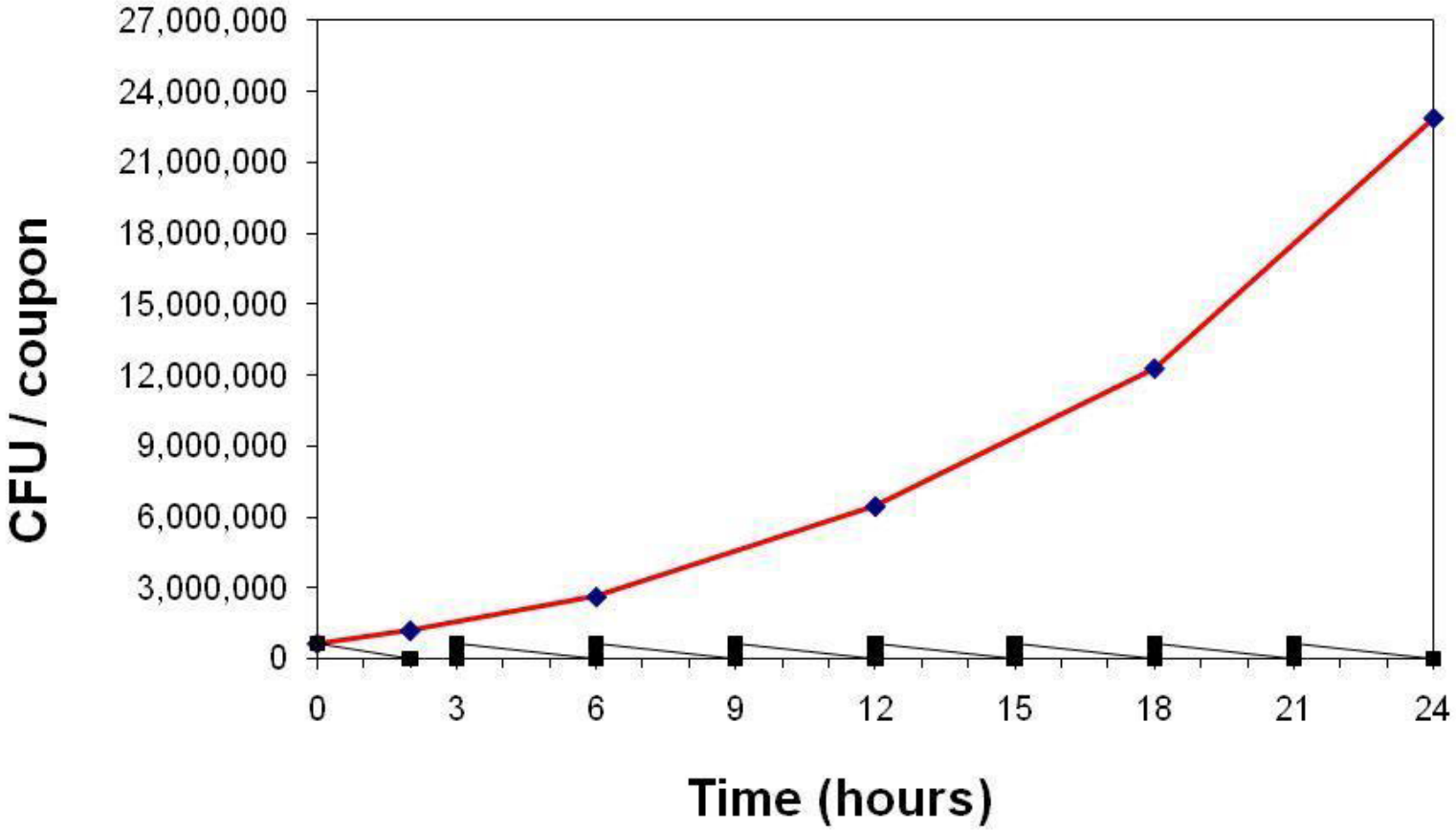
3.2.2. Architectural Interiors

37 pages

- **“infection control” 23 times**
- **“stainless steel” 19 times**

Stainless steel has zero infection control properties; it harbours bacteria and cannot be properly cleaned; it fosters uncontrolled bacterial growth

Copper vs Stainless Steel



8 inoculations over 24 hours; no cleaning

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Copper is EPA Registered

EPA approved label claim:

"This doorknob is made from an Antimicrobial Copper alloy which continuously kills greater than 99.9% of MRSA within 2 hours of exposure."

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EPA Statement

"[Antimicrobial Copper has] been **rigorously tested** and [has] demonstrated antimicrobial activity. After **consulting with independent organizations** – the Association for Professionals in Infection Control and Epidemiology (**APIC**) and the American Society for Healthcare Environmental Services (**ASHES**) – as well as a leading expert in the field (Dr. William A. Rutala, Ph.D., M.P.H.) the Agency has concluded that the use of **these products could provide a benefit as a supplement to existing infection control measures. "**

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Source:
http://www.epa.gov/pesticides/factsheets/copper-alloy-products.htm

Multi-site clinical trial

- Funded by the US Department of Defense
- Trials at three sites:

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Source:
http://www.antimicrobialcopper.com/uk/news-and-download-centre/news/research-proves-antimicrobial-copper-reduces-the-risk-of-infections-by-more-than-40-percent.aspx


Memorial Sloan Kettering Cancer Cente


Ralph H. Johnson
VA Medical Center
stryker
stryker

WHO 1st International Conference on Prevention and Infection Control

Geneva, Switzerland, 1st July 2011

Lead investigator comments:

Bacteria present on ICU room surfaces are probably responsible for **35-80% of patient infections,** demonstrating how critical it is to keep hospitals clean.

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Source:
http://www.antimicrobialcopper.com/uk/news-and-download-centre/news/research-proves-antimicrobial-copper-reduces-the-risk-of-infections-by-more-than-40-percent.aspx

97%

The reduction in surface pathogens by changing touch surfaces to copper

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55%

The reduction in
ICU HAIs
if the 6 copper touch surfaces
remain throughout the patient's stay

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Copper Clinical Trial
14 Infections Prevented

Infections/Patients in Copper Rooms: 10/294 patients

Infections/Patients in Control Rooms: 26/320 patients

Normalizing to the number of patients in the Copper Rooms:
(26 x 294)/320 = 23.9 = 24 Infections in Control Rooms

24 - 10 = 14 infections prevented by copper

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ROI- Copper Clinical Trial

Low Cost Scenario (assumes $29K/HAI)

- 14 infections prevented X $29,000/Infection = **$406,000 Costs Saved**
- $406,000 ÷ 338 days = **$1201 per day**
- $52,000 ÷ 1201/day = **43.3 day payback period**

- High Cost Scenario (assumes $43K/HAI)
- 14 infections prevented X $43,000/Infection = **$602,000 Costs Saved**
- $602,000 ÷ 338 days = **$1781/day**
- $52,000 ÷ $1781/day = **29.2 day payback period**

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Results may vary. :)

2012 Case Studies of Antimicrobial Copper

1. Centre Hospitalier de Rambouillet, France
2. Centre Inter Générationnel Multi Accueil (CIGMA), France
3. Craigavon Area Hospital, Northern Ireland
4. Evangelisches Geriatriezentrum (EGZB)
5. Homerton Hospital, London, UK
6. Hua Dong Hospital, China
7. The Kohitsuji Child Center, Mitaka, Tokyo, Japan
8. The Medical University of South Carolina, Charleston
9. Mehiläinen Medical Facility, Pori, Finland
10. Mejiro Daycare Center for Children, Japan
11. Memorial Sloan-Kettering Cancer Center, New York, USA
12. Ochiai Clinic, Japan
13. The Ralph H Johnson Veterans Medical Center, USA
14. Roberto del Rio Children's Hospital, Chile
15. Ronald McDonald House of Charleston, USA
16. Santiago Bueras Station, Chile
17. Sheffield Teaching Hospitals NHS Trust, UK
18. St Francis Hospital, Mullingar, County Westmeath, Ireland
19. Trafford General Hospital, UK
20. UHB Selly Oak Hospital, Birmingham, UK
21. University Medical Center Groningen, Netherlands
22. West-Finland Deaconesses' Institution Veterans' Nursing Home and Rehabilitation Institution
23. Willmott Dixon Healthcare Campus of the Future, UK
24. WSSK Hospital, Wroclaw, Poland

24 Studies
13 Countries

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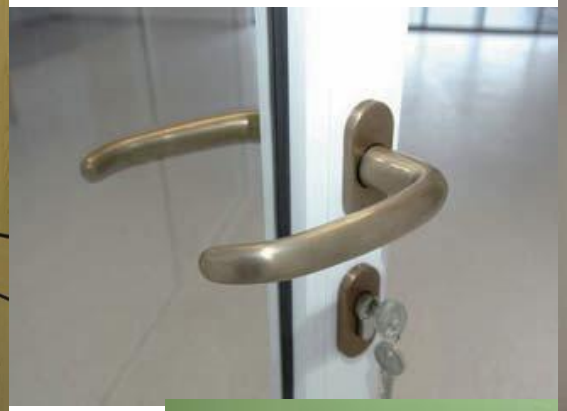
Source:
http://www.antimicrobialcopper.com/uk/news-and-download-centre/case-studies.aspx

Antimicrobial Copper Case Studies



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Antimicrobial Copper Case Studies

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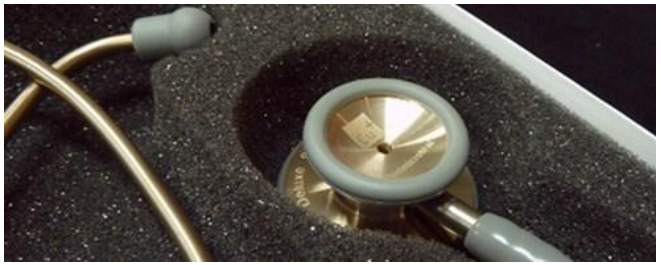
Case Study - Roberto del Rio Children's Hospital - ICU with extensive antimicrobial copper installation

Antimicrobial Copper Medical Equipment



REGISTERED CUVERRO®
ANTIMICROBIAL
COPPER ALLOYS

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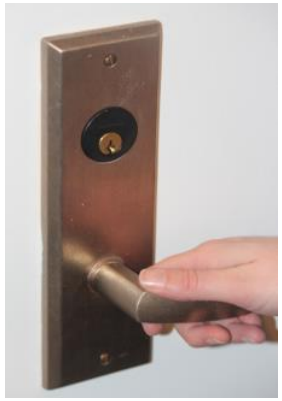
Changing stainless steel to copper locksets reduced bacteria by 94%

Before

1,936
CFU/100 cm^2

After



43
CFU/100 cm^2

4,475
CFU/100 cm^2

233
CFU/100 cm^2

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Grand Central Station,
New York City

Copper has Staying Power…

563 CFU/100cm^2

88 CFU/100cm^2

1,866 CFU/100cm^2

51 CFU/100cm^2

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…after 100 years!

Architectural

- Handrails – Copper, copper-coating, anti-microbial
- Door Hardware – copper / brass
- Paint – photocatalytic additive in all clinical areas




Plumbing

- Copper toilet seats
- Z8000 compliant sinks with antimicrobial coating

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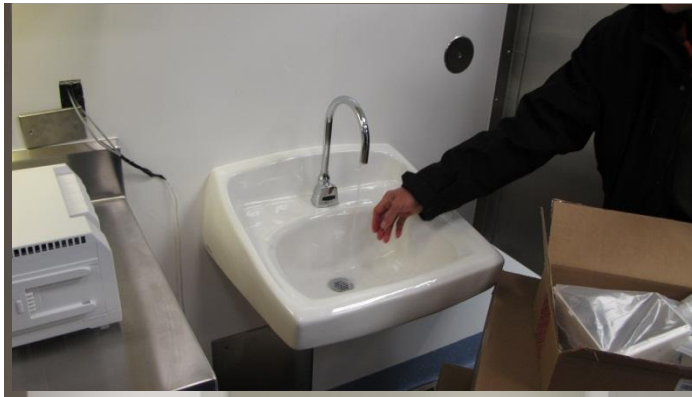
Plumbing

- Tepid water recirc loop to sinks
  - No mixing valves
  - No faucet handles
  - IR controls
  - Deadleg connections and access panels behind paper towel holder or mirror
- Cold water loop to toilets
  - Clear re-use water – e.g. – R.O. backwash
- UV incoming water supply
- Cu / Ag ionization for Legionella



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Med Gas – Plume

Central Plume Scavenging – coming 2017

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Future - RTLS & Business Intelligence

Ultrasound tranceivers and sensors installed in building with resolution to 4” distance

Allows staff, patients, and equipment to be tracked in real-time

Enables intelligent outbreak management: real-time “patient-zero” tracking, contact tracking, mode of transmission determination.

Also enables asset tracking, materials management, etc.

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Case Study

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Joseph Brant HAI Background

2007:

- 200 cases of C. Difficile
- 91 deaths
- Class action lawsuit
- Settled out of court in 2013 for $9M
- Likely spent ~ $10M on treatments for these 200 patients
- Likely cost for legal, staff salaries, etc: ~ $5M
- Total cost of 2007 outbreak: $24 M

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30 Year HAI Costs

Assume:

- 350 infections per year
- 40 deaths per year
- $17,000 to 40,000 per case to treat

Over the next 30 years:

- Assume average $20,000 per infection
- 10,500 infections
- 1,200 deaths
- Cost: $210,000,000

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Over the next 30 Years…

Prevalence may increase:	260%
Fatality Rate may increase:	410%
Cost of treatment may increase:	650%

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At tomorrow's rates…
30 Year HAI Reduction Savings

@ 50%:

- 6,800 infections
- 1,200 deaths
- $340,000,000

@80%:

- 10,800 infections
- 1,990 deaths
- $544,000,000

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30 Year Business Case at tomorrow's HAI rates

Net Present Value of Base Construction:	$400M
Approximate Costs of HAI Reduction Innovations:	$ 5M
Approximate 30 Year HAI Cost Savings @ 50%:	($340M)
NPV of Proposal w/ Innovations:	$60M

Additional Benefits:

- 6,800 fewer HAI's
- 1,200 fewer deaths
- Hospital shielded from future class action and negligence lawsuits

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30 Year Business Case Calculator

# of Beds	300
Expected Annual HAIs / Bed	2.0
Initial Expected # of Annual HAIs	600
Initial Average Cost of HAI Treatment	$ 45,000
Expected HAI Incidence Rate Increase	1%
Expected HAI Treatment Cost Increase	3%
	30 Years
Expected HAIs	20,841
Expected Average HAI Treatment Cost	106,041
Expected Total HAI Treatment Cost	$ 1,519,601,794
Expected Cost Savings @ 20%	$ 303,920,359
Expected Cost Savings @ 50%	$ 759,800,897
Expected Cost Savings @ 80%	$ 1,215,681,435

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CHAIR

Coalition for Healthcare Acquired Infection Reduction

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R & C Dixon Consulting Ltd

SANUVOX

UNIVERSITY OF WATERLOO

Health Sciences Centre Winnipeg

AEREUS TECHNOLOGIES

INFONAUT
evidence-based infection control

FRANKE
KINDRED

Chairman: Barry Hunt
Deputy Chairman: Richard Dixon

CHAIR

Coalition for Healthcare Acquired Infection Reduction

MISSION

CHAIR Canada is committed to saving lives and supporting the creation of a safe healthcare environment for Canadian patients, staff and visitors by achieving an 80% reduction in healthcare acquired infections (HAIs) by 2024.

CHAIR
Coalition for Healthcare Acquired Infection Reduction

WHO WE ARE

CHAIR Canada is a volunteer not for profit group of industry and healthcare professionals working together to reduce healthcare acquired infections (HAIs).

We believe up to 80% of HAI's can be eliminated by managing the physical environment within healthcare facilities.

We are committed to working with professionals, universities, hospital executives, facility engineers, housekeeping staff, infection control professionals, professional and trade associations, CSA, Ministries of Health and Health Canada to develop and promote transformative ideas, standards and technologies to make a real and timely difference.

CSA HCF Infrastructure Standards

2016	Design
	Electrical
2016	Plumbing
2015	HVAC
	Lighting
	Area Measurement
	Fume Hoods
2017	Medical Gas
	Assessment
2018	Commissioning
2017	Infection Control during Construction

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Conclusion

Technology and engineering solutions are key

in the battle against

HAIs…

but technology alone will not win the war.

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We need to do everything right…

Culture

Training

QMS

Standards

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Top 10 Approaches…

1) Intermittent Surface Disinfection **>50%**

- UV Patient Rooms – terminal cleaning
- UV Bathrooms – C. Difficile, VRE, CRE, CPE
- UV ORs – between cases

2) Persistent Self-sanitizing surfaces **>50%**

- Fast-acting around the patient (e.g. – copper)
- Persistent – ceilings, walls, floors

3) HVAC **>50%**

- UV – Critical care areas – ICU, NICU, BMT, Burn Units, OR
- 50 – 55% Humidity

4) Real Hand Hygiene **>50%**

- Technology-assisted compliance
- Patient and family empowerment
- Staff training and culture

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Top 10 Approaches…

5) Staff Uniforms
   - Bare below the elbows
   - White coats and scrubs changed and laundered daily
   - Self-sanitizing

6) Bed Linens, Gowns
   - Self-sanitizing,
   - Laundered and changed daily

7) Patient Hygiene
   - Daily shower or Chlorhexidine bathing

8) Housekeeping
   - UV Disinfection Training
   - Respect and Retention

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Top 10 Approaches…

9) Temperature & History Screening

- Mandatory for outbreaks (e.g. – Ebola, SARS, MERS)
- Mandatory for critical care areas (Burn Units, Bone Marrow Transplant, ICU)
- Staff
- Visitors
- Patients

10) **Do it right culture**

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Any Questions?

Barry Hunt

Chairman & CTO
Class 1 Inc.

Vice-Chair,
CSA Strategic Steering Committee for Healthcare

Chair,
CSA Task Force Hospital Acquired Infections

Founder & Chair,
Coalition for Hospital Acquired Infection Reduction

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