



Hand Hygiene: From An Iconoclastic Idea To A Technology Driven Scientific Practice

KEYWORDS

Hand hygiene, nosocomial infections, multimodal strategy, compliance

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ABSTRACT *Dr. Holmes and Dr. Semmelweis, working independently in Austria and United States, observed that doctors' unwashed hands were the cause of cross infection among patients. Ironically their colleagues vehemently opposed this idea, which ran counter to the popularly held beliefs. In the subsequent decades, with greater understanding of infectious agents and their modes of transmission, an evidence-based link was established between poor hand hygiene and incidence of nosocomial infections. Guidelines were later prepared by Centre for Disease Control (CDC) and World Health Organization (WHO) to standardize the process of implementing hand hygiene interventions. WHO's multimodal strategy and modern monitoring technologies are playing a significant role to improve knowledge, availability of hand hygiene agents and compliance rates around the world.*

Introduction

Hand hygiene was once an iconoclastic idea; born out of observations made by a Hungarian obstetrician and an American physician in the mid nineteenth century. Since then giant strides have been made to understand the relation between hands, hygiene and infection. Today there is considerable evidence to suggest that appropriate hand hygiene is one of the simplest ways to reduce health care associated infections [1]; in spite of this knowledge, achievement of high rates of hand hygiene compliance remained elusive [2]. However, the release of World Health Organization's "Guidelines for Hand Hygiene in Health-Care" and widespread adoption of its multimodal strategy has led to a global improvement in hand hygiene at individual, hospital, regional, and national level [2]. Use of innovative technologies in the realm of hand hygiene has given a fillip to vigour to this practice.

A formidable beginning

Oliver W. Holmes in Boston and Ignaz Semmelweis in Vienna established the relation between handwashing and spread of disease in the mid nineteenth century. Dr. Oliver Wendell Holmes, a Harvard Professor, decided to investigate a spate of deaths due to puerperal fever in 1842 [4]; this included the death of several pregnant women and a physician, Dr. Whitney of Newton, who died a week after he performed a postmortem exam on a victim of the fever. Dr. Holmes published his findings in a paper titled "The Contagiousness of Puerperal Fever", wherein he argued that unwashed hands were responsible for transmission of germs between patients [5]. His observations were derided and rejected by many of his peers [6].

Ignaz Philipp Semmelweis, a Hungarian obstetrician, was appointed assistant lecturer in the maternity department at the University of Vienna's General Hospital in 1844 [1]. This department had two obstetric clinics; medical students assisted deliveries in the first clinics whereas midwives staffed the second clinic. Semmelweis discerned that maternal mortality in the first clinic was higher than the other (16% versus 7%) [7]. He found that doctors and medical students, after the performance of autopsies, had a foul odour on their hands and the odour remained, even after the hands were washed with soap and water. Semmelweis

postulated that some "cadaverous particles" were transmitted from autopsy room to the delivery suites by hands of doctors and students, which increased the rate of puerperal fever in the first clinic. He suggested doctors and medical students to scrub their hands in deodorizing, chlorinated lime solution before every patient examination and particularly after leaving the autopsy room. His intervention resulted in a decline in the maternal mortality rate to 3% in the first clinic. He adopted similar strategy in Pest, Hungary where he managed to reduce the maternal mortality rate to 0.85% in a period of 6 years (1855-1861) [1]. His work sparked a controversy among European obstetricians and led to his personal and professional decline.

Hand Hygiene and Infections: inextricably linked

In a study conducted by Mortimer et al. in 1960s, in Cleveland Metropolitan General Hospital, it was found that nursery personnel could transmit Staphylococci to babies through unwashed hands. Introduction of a 10 second hexachlorophene wash between babies significantly reduced the rate of acquisition of Staphylococcus infection from 92% to 53% [8]. Le et al. conducted a quasi-experimental study between 2000 and 2001 in two neurosurgical wards at Cho Ray Hospital in Vietnam. They found that surgical site infection rate reduced by 54% in ward A, following the introduction of a hand sanitizer with 70% iso-propyl alcohol and 0.5% chlorhexidine gluconate, whereas the infection rate in ward B, where no intervention was made, increased by 22% [9]. A Spanish study conducted over a period of 8 years (1995-2003) observed a 6-fold decrease in bacteraemia when a cluster of measures – including the promotion of hand hygiene – were introduced [10].

First guidelines

Centre for Disease Control (CDC) developed the first national hand hygiene guidelines in 1980s. CDC suggested the use of nonmedicated soap and water for routine hand wash; medicated soap and water in high-risk areas, interventions and patients; alcohol based hand rubs when soap and water are unavailable [11]. In 1995, the Association for Professionals in Infection Control (APIC) supported the use of hand rubs in wider clinical settings [12]. Healthcare Infection Control Practices Advisory Committee, in its revised guidelines issued in 2002, suggested the use of al-

cohol based hand rubs as the standard practice for hand hygiene, and advised hand washing to be reserved for particular situations [12].

World Health Organization (WHO) steps in

WHO launched its first Global Patient Safety Challenge in the form of 'Clean Care is Safer Care' in 2005 [13]. This challenge aimed to reduce the incidence of health-care associated infections through the promotion of best hand hygiene practices globally. To achieve this WHO launched "Save Lives: clean your hands" campaign in 2009. This campaign achieved various milestones like: the development of first international guidelines on hand hygiene in health care; adoption of an innovative and user-friendly "My Five Moments of Hand Hygiene" approach; and creation of multimodal improvement strategy and implementation tools [13]. Multimodal strategy is a 5 step process, which includes: facility preparedness in terms of resource generation and leadership; baseline evaluation of current practices, perception, knowledge and infrastructure; implementation of improvement programme by increasing the availability of soap, hand-rubs, sinks, etc.; evaluation of the programme effectiveness; and the development of a long-term action plan to inculcate hand hygiene in the hospital's culture [12].

Current Status

Erasmus et al., in their review of 96 empirical studies published before 2009, found that only 40% of the healthcare providers complied with hand hygiene guidelines [14]. Ever since the launch of WHO campaign, more than two thirds of Ministries of Health from UN Member States pledged to implement national or statewide hand hygiene awareness and improvement interventions [13, 15]. Despite remarkable differences between cultures, levels of development and resources, political climate, healthcare system and patient population in developed and developing countries, significant increase has been reported in hand hygiene compliance (from below 50% to above 65%), and knowledge and also an increase in the procurement of hand hygiene supplies and their availability [16, 17, 18, 19].

Novel technologies

Direct observation by trained personnel is important to maintain high compliance rates; this is both, time consuming and resource intensive. Nowadays electronic and video monitoring systems are available to provide instant feedback and real time reminders [20]. Electronic counting devices and alcohol sensors introduced in soap and hand-rub dispensers can provide information about hand hygiene frequency [21, 22]. Wireless electronic systems – employing badges, sensors and electronic prompts like: beeps, blinking lights and prerecorded voice - can keep a tab on the entry and exit of healthcare workers from patient's room; their use of hand hygiene product dispensers; they also provide unit-based compliance data [22]. Video cameras are also being used near hand cleaning areas to observe the compliance and give instant feedback [22]. Such systems hold immense promise to improve monitoring and compliance rates.

Conclusion

Hand hygiene has evolved from a fantastic idea - conceived by two brilliant, but misconstrued doctors in the mid nineteenth century - to an evidence-based practice. There is today a tremendous body of research to conclusively link hand hygiene with reduced rates of infection. As safe care has become a byword for high quality care, concerted efforts have been made the world over to standard-

ize the process of cleaning hands. World Health Organization and its affiliates have made tremendous efforts to further knowledge and implementation of hand hygiene and with the advent of smart technologies compliance rates are improving in both low-and high-income countries.

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